The Effects of Implementing Best Practices on 30-Day Readmission Rates in Adults Following CABG Surgery

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THE EFFECTS OF IMPLEMENTING BEST PRACTICES ON 30-DAY READMISSION RATES IN ADULTS FOLLOWING CABG SURGERY

by

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DEDICATION

I would like to dedicate this EBP project to my husband Bob who’s love, assurance, and understanding has been insurmountable. To my four awesome children, Lauryn, Matthew, Rebekah, and Elizabeth, who have sacrificed of themselves to support me throughout this endeavor, and to my extended family and friends for their patience and encouragement throughout this journey.

"I can do all things through Christ which strengtheneth me." Philippians 4:13 (KJV)
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ABSTRACT

Coronary artery bypass graft (CABG) surgery is one of the most frequent and expensive cardiac surgical procedures in the U.S. today. Complications from CABG surgery are one of the top causes of 30-day hospital readmissions. Readmissions after CABG surgery are often preventable and add to health care costs. Recent government legislation mandates penalties for hospitals with excess readmission rates. The purpose of this evidence-based practice project was to determine if implementation of best practice recommendations effected 30-day readmission rates following CABG surgery. A critical appraisal of the literature was conducted to identify best practice recommendations. The Iowa model and Lewin’s Change Theory guided this project. The project included 127 patients who had undergone isolated CABG surgery. The best practice model included writing order sets, revising patient education material, developing a discharge check list, and providing staff education. Sixty-five patients were in the pre-intervention group and 62 in the post-intervention group. Demographic characteristics of the two groups were compared. Using an independent samples t-test, age and LOS were not significantly different ($p > .499$), and using a chi-square test of independence, no significant differences were found for gender, race, tobacco use, secondary diagnosis or surgery timing ($p > .291$). Chi-square tests revealed no significant difference in the prescribing of BB and statin medication ($p > .089$), while a significant difference was found in the prescribing of aspirin and ACEI/ARB medication ($p > .000$). A significant difference was found when comparing referrals to care management ($p = .004$), homecare ($p = .000$), and cardiac rehabilitation ($p = .000$). Use of the cardiac surgery education booklet, education specific to cardiac diet ($p = .000$), smoking cessation ($p = .000$) and securing of 14-day appointments also showed a significant difference between groups ($p > .000$). Analysis of 30-day re-admission rates was done using a Chi-square test and revealed a significant difference in the pre-
intervention group (16.9%) and the post intervention group (4.8%) ($\chi^2(1) = 4.724$, $p = .000$). Results demonstrated consistent use of best practices following adult CABG surgery reduced 30-day hospital re-admission rates. Replication of this evidence-based practice project has been adopted by the project manager's institution.
CHAPTER 1

INTRODUCTION

In March 2010, President of the United States Barack Obama signed into law the Patient Protection and Affordable Care Act (ACA) (US Department of Health and Human Services [HHS], 2013). The law was designed to provide affordable and more accessible health care for all Americans. Some of the provisions of the ACA law have already been implemented, and others have not yet to be executed. In an effort to decrease health care costs and improve quality of care, a focus of the ACA has been placed on decreasing 30-day hospital readmissions (HHS, 2013).

A retrospective study of Medicare patients found the all-cause 30-day hospital readmission rate from 2007 to 2011 to be 19% (Gerhardt et al., 2013). The Centers for Medicare and Medicaid Services (CMS) determined that the readmission rate was excessive and that it was an indicator of deficient quality of care. Therefore, on October 1, 2012 the ACA of 2010 put requirements on the HHS to develop a program to reduce hospital readmissions (HHS, 2013). The Hospital Readmission Reduction Program (HRRP) was developed to offer incentives to hospitals that put into practice strategies to reduce unnecessary readmissions. This program also requires the CMS to reduce payments to hospitals with excess readmissions (Centers of Medicare & Medicaid Services [CMS], 2013). CMS defines readmissions as a readmission to a hospital within 30 days of a discharge from the same or another hospital, for any cause (CMS, 2013). The term hospital refers to a short-term inpatient acute care facility (CMS, 2013).

Beginning in fiscal year 2012, the CMS adopted readmission measures for three diagnoses, Acute Myocardial Infarction (AMI), Heart Failure (HF), and Pneumonia (PN). Under the ACA, CMS has been granted the ability to cut hospitals’ pay by 1% for what they deem to be excessive readmissions for these causes (CMS, 2013). By 2014, CMS
plans an expansion of the readmission measures to include patients readmitted for acute exacerbations of chronic obstructive pulmonary disease (COPD), and patients readmitted following elective total hip arthroplasty (THA), and total knee arthroplasty (TKA). By 2014, hospitals could lose up to 3% of their reimbursement for these added conditions (Centers for Disease Control and Prevention [CDC], 2013). It is currently predicted that by 2015 the list of conditions will expand to include vascular surgeries and coronary artery bypass graft surgery (CABG) (Price, Romeiser, Gnerre, Shroyer, & Rosengart, 2013). Because coronary artery bypass graft (CABG) surgery is one of the most expensive surgeries in the United States (US), averaging $100,000 per admission, it has received a great deal of attention from CMS (Price et al. 2013).

Based on the CMS rulings, a hospital in the Midwest, that performs an average of 380 CABG surgeries a year and has a higher-than-predicted 30-day readmission rate could stand to lose $300,000 a year on CABG surgeries admissions alone. The full implication of the HRRP is not fully known. What is clear, with the current healthcare reform developing, is that evidence-based improvements must be implemented in an effort to reduce readmissions related to CABG surgeries.

**Background**

Coronary artery disease (CAD) is the most common type of heart disease and claims more than 385,000 lives a year in the US (CDC, 2013) It is the leading cause of death in the US for men and women, and people of most races (CDC, 2013). CAD is estimated to cost the US over $108 billion each year in health care services, medications and productivity losses (CDC).

CAD develops from blockage of the coronary arteries due to atherothrombosis. The blockages are caused by a progressive build-up of plaque under the lining of the walls of the coronary arteries. The plaque is made up of calcium, fat, and cholesterol found in the blood. This plaque or stenosis causes decreased blood supply or ischemia
to the heart which leads to myocardial infarction (MI). Risk factors for CAD include hypertension (HTN), dyslipidemia (DLP), diabetes mellitus (DM), smoking tobacco, and obesity due to poor diet and inactivity (The American Heart Association website, 2013).

CAD is initially treated with lifestyle modifications such as a low cholesterol diet, smoking cessation, and regular exercise. These modifications are often coupled with medical therapy such as aspirin for anticoagulation, nitrates for vasodilation, beta blockers for HTN control, and statins for plaque stabilization (The American Heart Association website, 2013). When lifestyle modifications and medical therapy are not effective, CAD can progress causing coronary muscle-damaging and life-threatening coronary artery occlusions (Bojar, 2011).

CABG surgery can be appropriate treatment for CAD depending on the patient's symptoms, imaging study findings, and the severity of the stenosis (Bojar, 2011). CABG surgery can relieve angina, prevent MI, and improve survival more effectively than medical therapy. CABG surgery is recommended for symptomatic patients with left main CAD, 3-vessel CAD, or 2-vessel CAD marked by stenosis of the proximal left anterior descending coronary artery (Patel, Dehmer, Hirshfeld, Smith, & Spertus, 2009).

Bojar (2011) identifies that traditional CABG surgery is performed through a sternotomy incision. The patient is placed on cardiopulmonary bypass while the myocardium is preserved using cardioplegia. The bypassing of coronary plaque is done with conduit from saphenous vein grafts harvested from the legs, use of the internal mammary or radial arteries.

CABG is the most common surgical treatment for multivessel CAD (Fasken, Wipke-Tevis, and Sagehorn, 2001). Although CABG is a lifesaving intervention, changes can occur both physically and psychologically in the early postoperative period that can pose problems for patients. These changes can include but are not limited to respiratory issues, fluid volume overload, cardiac dysrhythmias, cerebral vascular accident, urinary
tract infections, gastrointestinal dysfunction, deep vein thrombosis, wound infections, medication interactions, and depression (Fasken et al., 2001). These postoperative changes, without proper management, can lead to poor patient outcomes and readmissions. Such hospital readmissions within 30-days following CABG surgeries have been found to be costly and often are preventable (Fasken et al.).

Statement of Problem

Data from the literature supporting the need for the project. Complications from CABG surgery are one of the most frequent reasons Medicare patients are readmitted to the hospital within 30-days postoperatively (Fasken et al., 2001, p.107). In a recent study, researchers from the Harvard School of Public Health, found CABG surgery had the highest 30-day readmission rate of six surgical procedures (Tsai, Joynt, Orav, Gawana, & Jha, 2013). This study also found that hospitals, which had low readmission rates, also had low mortality rates. The study found a link between quality scores and readmissions rates. The hospitals that had higher quality scores also had lower readmission rates. Fasken et al., (2001), found strong evidence that supported a relationship between surgical readmission rates and the quality of care provided. Based on this data, recommendations were made for hospitals to focus on improving their surgical care. The findings suggested an opportunity for policy makers to improve surgical quality and reduce unnecessary readmission spending and they provided support to the CMS plan, which expands its excess readmission penalties to include surgical procedures (Tsai et al., 2013).

Organizations have begun addressing the 30-day readmission issue on local levels. In 2012, the Michigan Society of Thoracic and Cardiovascular Surgeons (MSTCVS, 2013) developed a cardiac quality initiative to address the issues of hospital readmissions following CABG surgery. This decision stemmed from the new health care reforms, which have threatened penalties for readmissions and lack of payment for
those unplanned readmissions. Data collected from participants have been used to
determine the severity of the readmission dilemma statewide. Recent MSTCVS data
indicated a statewide 30-day hospital readmission rate following CABG surgery in 2012
was 13.2% (MSTCVS, 2013). This figure is generated from the institutions in Michigan
that submit quality and outcomes data to the MSTCVS registry each quarter.

In a national initiative for quality improvement and patient safety, The Society of
Thoracic Surgeons (STS) developed a national database in 1989. Best practices, quality
measures, public reporting, and star ratings have been based on the data collected and
logged in this national registry. The data from this registry has, in recent years, been
linked with CMS and used as an important tool in clinical research as well as in
reimbursement. Hundreds of publications have been written using this data and have
advanced knowledge in the field of cardiac surgery (STS, 2013).

The 2010 ACA provided a new context for public reporting. CMS began collecting
data and publishing it in an effort to educate the public regarding the quality of care from
their health care providers. Today these data are also used to compare performance
metrics or best practices among hospitals and providers (HHS, 2013). Members of STS
are beginning to publically report their readmission rates, which is not yet mandatory, in
an effort to bring the issue of excessive 30-day readmissions to the forefront.

Based on the evidence accumulated by STS quality process and outcome
measures in the area of adult CABG surgery have been developed and maintained.
These measures are currently endorsed or being considered for endorsement by the
National Quality Forum, an organization, that works to improve the quality of health, care
in the US (STS, 2013). Key discharge measures include:

- Anti-lipid treatment at discharge
- Anti-platelet medication at discharge
• Betablocker (BB) at discharge
• Angiotensin converting enzymes inhibitors (ACEI), or Angiotensin receptor blocker (ARB), when indicated at discharge
• Anti-arrhythmic medication when indicated at discharge
• Smoking cessation education
• Cardiac Rehabilitation

Although these broad evidence-based measures have been found to improve patient outcomes following CABG surgery, continued efforts must be made to address postoperative CABG readmissions specifically (Price et al., 2013). Due to the recent health care reforms, a primary focus of the STS has been placed on the reduction of preventable hospital readmissions following cardiac surgery. Identification and reduction of avoidable readmissions following CABG surgery and compliance in the use of evidence-based initiatives are vital to decrease health care costs related to CABG surgery, improve patient safety, and improve patient outcomes.

Studies on the use of best practices and their effect on readmissions following CABG surgery are limited, yet predictors and trends following CABG surgery are quickly being identified (STS, 2013). Much of the research examines the causes of 30-day readmissions while providing practice change recommendations.

Price et al. (2013) reviewed records of CABG patients who had surgery in their institution from July 2000 to June 2011 to identify literature-based indicators of 30-day readmissions. This study was initiated to discover causes for their readmission rate of 13%. The findings indicated that readmissions were taking place within the first one to two weeks following surgery. The identified causes included surgical site infections, pleural effusions, and fluid overload. Their recommendations were early follow up
appointments, within one to two weeks after discharge. This allows for complication identification and intervention, which could prevent a readmission (Price et al., 2013).

A study presented at the 2013 American Association for Thoracic Surgery (AATS) conference reviewed the records of 54 rehospitalized patients post-CABG surgery. The goal was to identify causes in an effort to reduce readmission rates. In this study, the three most common reasons for readmission were incision infections at 30%, congestive heart failure (CHF) at 24%, and cardiac arrhythmias at 13%. An impressive finding in this study was that the readmitted patients had not seen a physician in the early postoperative discharged period ($p < 0.0001$) (Manier et al., 2013).

Risk factors for readmissions following CABG surgery were the focus of the research done by Hannan and colleagues (2003). In this study, of the 16,325 patients post-CABG in New York from January 1, 1999 to December 31, 1999, 2,111 (12.9%) were readmitted within 30 days. The two most common causes of readmissions found were post-surgical wound infections at 28% and CHF at 16%, both of which occurred within the first 14 days (Hannan et al., 2003). Although it seemed that the risk factors suggested patient-related causes for readmission such as demographics and co-morbidities, an important system-related factor, outpatient coordination of care or post-discharge care was also identified.

In 2011 Hannan and colleagues did a retrospective analysis on the 30-day readmission rates of 33,936 patients post-CABG in New York State. They found the reasons for readmissions were postoperative infections, heart failure (HF), and other postoperative complications such as pleural effusions and dysrhythmias. Recommendations from this study included enhancement of inpatient and outpatient coordination of care and closely monitoring patients for complications of CABG following discharge (Hannan et al., 2011).
The American Heart Association (AHA) held a session on improving outcomes after cardiac surgery in 2013. From their regional registry, results on 30-day readmissions following CABG surgery were presented. The data revealed that infections, effusions, rhythm disturbances, and CHF were the leading causes of 30-day readmissions. Early follow-up appointments were recommended for all patients but were variably scheduled and only 54.1% of the patients had appointments in the early post-discharge period. The study recommended that closer attention to volume status, effusions, and postoperative follow up could substantially decrease readmission rates (The American Heart Association website, 2013).

A systematic review by Fasken and colleagues (2001) assessed the literature in reference to unplanned readmissions of cardiac surgery patients from 1989 to 1999. Seventy-four articles were reviewed and 17 of those were critiqued and included in this article. Readmission rates and days post discharge ranged from 3.2% - 13.8% within seven to 14 days post discharge. When CABG surgeries were extrapolated in this study, 629 of the 1000 discharges resulted in readmissions. The main postoperative complaints by patients listed in this review were edema at 67%, shortness of breath at 47%, and wound drainage at 57%. Recommendations in this review included effective discharge planning, close post discharge monitoring and timely follow up appointments to avoid readmissions after CABG surgery (Fasken et al., 2001).

Other studies analyzed the use of evidence-based practice or evidence-based medications and the effects on patient outcomes after CABG surgery. A study by Fillio et al. (2008) evaluated the use of evidence -based medication in patients post-CABG . The study found significant underuse of medications that were supported by evidence to reduce subsequent cardiac events in patients who had undergone CABG surgery.

Arora and colleagues set out to reveal the most beneficial interventions to reduce death and repeat hospitalizations following CABG surgery. In this systematic review, of
4000 patients undergoing CABG surgery, the utilization of evidence-based cardio
protective drugs reduced rehospitalization from 14.8% to 6.4%. Statistically significant
data supported the use of anti-platlet, ACEI/ARB, statin, and BB therapy for improved
patient outcomes following CABG surgery (Arora, Sowers, Saunders, Probstfield &
Lazaar).

Discharge planning has been found to be essential in providing patient support,
which leads to an uneventful transition after discharge following CABG surgery.
Coordination with rehabilitation facilities, skilled nursing or homecare organizations
provides better continuity of care. Early patient contact aids in prevention of
readmissions and mortality. Discharge education including medication management,
diet, exercise, and smoking cessation is vital to optimize long-term results after CABG
surgery (Bojar, 2011).

Thirty-day hospital readmissions following CABG surgery is of growing concern.
The literature identifies trends in causes for readmissions following adult CABG surgery.
Recommendations have been made for consistent use of evidence-based cardio
protective medications at the time of discharge, thorough patient education and
discharge planning. Based on the findings and recommendations discovered in this
literature review, a thorough assessment of 30-day readmissions following CABG
surgery was conducted in a Western Michigan hospital to determine if an EBP change
was warranted.

Data from the clinic agency supporting the need for the project. A Western
Michigan hospital where this EBP project was proposed, has developed a cardiac
surgery division team to identify and address its own outcomes. It tracks quality
measures, morbidity, and mortality rates. The cardiac surgery data that were collected
by this hospital are submitted to the Society for Thoracic Surgeons (STS) and to the
MSTCVS. The most recent data on postoperative patients following CABG surgery
indicating that 30-day post-CABG readmission rates within the institution almost doubled from 11% in 2010 to 19.9% in 2011 and staying elevated at 18.4% in 2012 (MSTCVS). These rates are well above the 2012 national average of 13.1% (MSTCVS). The top reasons for readmissions included sternal infections, fluid overload, pleural effusions, and dysrythmias (MSTCVS). Additional data indicated non adherence to cardiac surgical quality measures which directly correlate to 30-day readmission following CABG surgery. Administration of evidence-based cardio protective medications at the time of discharge, one of the quality measures, rated below national averages. Compliance rating for administration of these medications ranged from 83.7% to 98.3% (MSTCVS). Discharge medications should include BB, ACEI/ARB, antiarrythmics, aspirin and lipid lowering agents (MSTCVS, 2013). BB post-CABG has been found to reduce the risks of atrial fibrillation and treat HTN. ACEI have been found to increase blood flow to the myocardium after MI. Antiarrythmics control the rapid irregular heart beat found in atrial fibrillation. Postoperative aspirin has been found to improve blood flow and prevent clot formation in CABG, while statins prevent re-stenosis of the grafts (Bojar, 2011).

Prior to the implementation of this EBP project this hospital had a lack of standardized teaching material. A cardiac surgery patient information booklet had been developed in 2007 but was being used very inconsistently and had not been updated since its development. The institution had a video-on-demand education system on trial which had two videos specific to CABG surgery. Interviews with staff nurses indentified that patients were not consistently receiving this form of education. It was also discovered that many staff nurses did not know how to access the media. The discharge instructions that were being used were from a shared data base with other hospitals and were vague and incomplete. Order sets for transfer from the cardiac surgical unit to step-down unit and from step-down unit to discharge did not include evidence-based cardio protective medications, cardiac rehabilitation referrals, or discharge planning referrals.
The follow-up plan also had gaps. The patients were not being scheduled to see their surgeon for four weeks postoperatively and the cardiologist or primary care physician appointments were not consistently being arranged for the patient at the time of discharge.

With the results of the data review revealing a higher than average rate of hospital readmissions after CABG surgery, the rate of evidence-based medication usage being suboptimal, the disparities in discharge planning, and the prolonged periods until follow-up, it was felt that this was an excellent opportunity for an EBP project. This evidence, in the dawn of health care reform, only made the proposition stronger. The EBP proposal was brought before the hospital cardiac quality committee and the chief nursing officer all of who were in support of this project.

**Purpose of the EBP project**

The purpose of this EBP project was to determine if the implementation and adherence to best practice recommendations would have an effect on 30-day readmission rates following adult CABG surgery. The intention was to improve patient outcomes by implementing changes to current practice.

**PICOT Format**

The following PICOT question was developed: In adult patients following CABG surgery (P), does the implementation and adherence to best practice methods (I), when compared to current practice methods (C), decrease 30-day readmission rates (O), over a 3-month period (T)?

**Significance of the Project**

CABG surgery is one of the most frequently performed cardiac surgeries (STS, 2013) and the most expensive surgical procedure being performed in the US today. Complications from CABG surgery are one of the most frequent causes of 30-day hospital readmissions (Price et al., 2013). Hospital readmissions after CABG surgery
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have often been found to be preventable and add to health care costs. These readmissions have drawn attention from both policy makers and government health care organizations. Health care reform regulations are being developed to penalize hospitals for excessive unplanned 30-day readmissions. To control costs hospitals are being forced to develop strategies to decrease their unnecessary 30-day hospital readmissions rates. Although many strides have been made to reduce these readmissions, there is still great opportunity for improvement in this area. The data obtained for this EBP project has provided an evidence-based foundation for a cardiothoracic surgery program to implement and reinforce current best practices.
THEORETICAL Framework, EBP Model, and Review of the Literature

The theory and model chosen to guide this EBP project were Kurt Lewin’s Three-Step Change Theory and the Iowa Model respectively. Lewin’s Theory provided a foundation on which to promote change while the Iowa Model helped identify opportunities and evidence-based solutions.

Theoretical Framework

With the development of new healthcare reform, the reduction of 30-day readmissions for adult patients following CABG surgery has become the focus of many healthcare providers and hospitals. Complications from CABG rank among the highest reasons for 30-day hospital readmissions in all cardiac procedures (Price et al., 2013). These statistics, coupled with reduced payments from CMS for excessive readmissions, have prompted immediate action (Rumsfeld & Allen, 2011). Focusing postoperative care to include evidence-based cardio protective medication regimens, standardized patient education, discharge planning, and close postoperative surveillance is vital (Rumsfeld & Allen). The Kurt Lewin Theory helped to guide the process of practice change.

Description of theoretical framework. Kurt Lewin developed his theory during the 1940s while working at the Massachusetts Institute of Technology. He had been called upon to help find a way to combat religious and racial prejudices. He viewed behavior as a balance of opposing forces, and he believed that “driving forces” help facilitate change while “restraining forces” hinder change. By analyzing these forces, Lewin developed the three phases of change theory to help shift the balance toward the direction of a planned change (Lewin, 1951). In his theory, Lewin uses ice as an analogy. If you have and ice cube and want to change it into the shape of a cone you must first
“unfreeze” it to make it changeable. Then you must “transition” the water into the new form. Finally, you can solidify the new shape by “refreezing” it (Lewin, 1951).

The first stage, which Lewin referred to as “unfreezing,” is an important first step (Connelly, 2012). It involves understanding why it is necessary to get away from current practices and produce change. This first step is about creating awareness and laying the groundwork for change. The more one believes that change is necessary, the more motivated one becomes to make it happen. “Unfreezing” and getting ready for change is about finding and providing the evidence before one takes action (Lewin, 1951).

Within the unfreezing phase, a decision-making technique called “force field analysis” is used (Connelly, 2012). This technique helps one analyze the forces for or against change, and it helps articulate the rationale behind the change. It is a way of presenting the evidence that strengthens the forces that supports the change. Through persuasive evidence, this technique weakens those opposed to making change (Lewin, 1951).

Using Lewin’s theory aided in identifying the restraining forces that threatened to impede change. The staff and providers were used to the status quo. The status quo had to be broken down before new practices could be put into place. There was a lack of understanding related to the importance of EBP and there was concern that change in practice would take more time and decrease productivity. Through “force field analysis”, driving forces were also identified. Effort was put into staff and provider education, using strong leadership. Sessions were held to help the staff and providers understand the financial and patient outcome consequences related to non-adherence to evidence-based practice. Once the staff and providers were equipped with knowledge that they lacked, they were challenged to change their practice patterns. Having a better understanding of the potential harm to patients and the reimbursement issues, the staff and providers went into crisis mode, which built a motivation to change. This motivation
was sustained through reinforcement and quality assessment by the leadership in this project.

Stage 2, the transition stage, is often a difficult one and can take time (Connelly, 2012). It is in this stage that the process of change occurs and new practices are put into place. As changes are made, people may resist as they face the new or the unknown. In this phase, acceptance of new ideas, behaviors, and practices is needed. This stage is a time when support of the change is imperative, and this support can be done through training and coaching. Constant communication of the desired change and the benefits of the change are needed so those involved do not lose sight of the goal (Lewin, 1951).

Kurt Lewin referred to stage 3 as “freezing/refreezing.” This stage sets stability once a change has been made. It is about setting a new normal. For this stage to be successful, leadership must continually reinforce the change through education and quality assessment. These actions ensure that the change is accepted, continued and maintained. Maintaining the change is an ongoing process (Lewin, 1951).

**Application of theoretical framework to EBP project.** CABG surgery improves the quality of life and helps patients return to normal lives. Despite the positive effects of CABG surgery, it can cause physical, emotional, and social issues for patients during the postoperative period (Theobald & McMurray, 2004). These issues, if not properly managed, can lead to unnecessary hospital readmissions (Hannan et al., 2011). Most hospital readmissions following CABG surgery occur shortly after discharge, and modification in post-discharge practices can reduce readmissions (Price et al., 2013). Kurt Lewin’s Three-Step Change Theory can be applied when making these modifications.

In the unfreezing stage of this project it was determined that hospital readmission rates were above the state and national averages (STS, 2013). It was also established that evidence-based cardio protective medication use was below the state and national
average following CABG surgeries (MSTCVS, 2013). With expectations that these readmissions would soon no longer be reimbursable and that reimbursements would be tied to value of care, the need for a change was identified. Based on this information a compelling message as to why change has to occur was created. After a literature search of best practice recommendations in post-CABG surgery was conducted, a vision in terms of change in practice could then be communicated to providers and staff. Evidence-based recommendations provided the changes that needed to be made in practice. The literature supported better compliance in the use of evidence-based medications at discharge, standardized patient education material, discharge planning and early postoperative period patient surveillance (Price et al., 2013).

Once the need for change had been identified and the types of change were determined, the transition to change could take place. This process started by sharing knowledge with the providers and the hospital staff. By educating them in the best practice methods, the providers and staff could in turn incorporate that into their practice. Change is not one event it is a process. This process of change involves not one individual but a whole team. In this case this team includes management, providers, educators, direct patient care staff, and the patients themselves. The process also involved development of tools necessary to carry out the change. New orders sets were written to ensure that patients were receiving evidence-based cardio protective medications, a provider discharge check sheet was developed to ensure that proper medications were prescribed at discharge, that timely follow up appointments were secured and that referrals for discharge services were made. A cardiac surgery patient education booklet was updated to include activity restrictions, incision care, medication management, diet recommendations, smoking cessation, and daily postoperative monitoring.
The final stage of freezing/refreezing was carried out through the routine use of the best practice tools that prompted: compliance of evidence-based discharge medications, discharge planning, discharge teaching with standardized material, and securing early postoperative follow-up appointments at time of discharge. Staff and providers received in-service education that reinforced the importance of evidence-based medications which are recommended for patients after CABG surgery, and the tools developed to prompt compliance of these medications. Education sessions were conducted to introduce a discharge process that would promote a continuum of care. This process included standardized patient education material and its delivery, discharge planning referrals for home transition, and early postoperative office appointments. Once new practices were established, improvement in outcomes was tracked. These data were shared with the care team to reinforce positive forces. This helped the providers and staff develop ownership in the change (Lewin, 1951).

**Strengths and limitations of the theoretical framework for the EBP project.**

Lewin’s change theory was beneficial in several ways during this EBP project. The theory provided the framework for taking practical steps toward change in practice patterns. According to Lewin’s change theory, by looking at change as a progression with individual stages, preparation can be made for what is coming and a transition plan can be developed. It indicates that one must start by understanding why the change must take place and staff and providers can obtain a better understanding of the need for change through the sharing of current facility data. Then once people learn and understand why change is necessary they become more motivated to change. Lewin’s theory encourages transparency and being open to participants’ concerns or doubts as a method to promote engagement. By developing a multidisciplinary team, a forum for collaboration and cooperation is created. Helping staff and providers to understand the problem and help formulate a plan for change keeps them involved and connected. It is
clear in Lewin’s theory that the change process does not take place quickly. Time is needed for people to embrace the change and redirect old habits. Explaining how the change will look and how it will be of benefit aids in making for successful change. Developing ways to insure that change is incorporated in daily practice offers confidence and stability for those carrying out the change. Through education, staff and providers understand what is expected of them. Tools can be created with changes incorporated within them to aid in new practices. Auditing can be conducted to insure change in practice is consistent. Time and communication are the keys to successful change in this theory. Lewin focuses on reinforcing change and maintaining the change into the future (Kritsonis, 2005).

A limitation to this theory is that healthcare is ever changing. One could argue that in the freezing/refreezing stage there is no opportunity for further change. Once freezing has taken place, it might be hard to move forward when future evidence directs change. In that sense this theory might seem to suggest that the process of change has a definite end. Lewin, however, stresses that the level of change, or the desired period for the change, should be included in the objectives (Kritsonis, 2005). It is important to understand that this stage requires ongoing evaluation. The change will be based on evidence and outcomes. If the new practice does not provide optimal outcomes, then that practice will have to be reassessed and additional changes may be warranted. Having staff and providers involved in an evaluation process can provide ongoing assessment of change needs. Continuing team meetings can insure that best practices are routinely assessed and updated as needed.

**EBP Model of Implementation**

Patients who have undergone CABG surgery have historically had high rates of 30-day readmissions (Hannan et al., 2003). These rates have been an accepted consequence of CABG surgery for years. There has been little need for hospitals or
providers to change these outcomes until now. The Affordable Care Act has, in recent years, directed focus toward decreasing hospital readmissions (HHS, 2013). Under requirements written in the Affordable Care Act, CMS will begin paying hospitals and their providers based on quality measures and will begin penalizing them for excessive unnecessary readmission rates (CMS, 2013). These penalties and payment structure changes are driving a paradigm shift in the way healthcare is provided for patients who undergo CABG surgery. Focus is being directed toward evidence-based practice and cost effective quality care (STS, 2013). The implementation of the Iowa model provided guidance to providers in making decisions that will promote positive patient outcomes.

**Description of the EBP model.** M. G. Titler PhD, RN; developed the Iowa Model at the University of Iowa in 1994 to promote quality care through research-based practice (Titler et al., 2001). It has since been revised and updated into the model that was used in this project. This model helps focus providers on knowledge and problem focused triggers. It leads us to question current practices and to find ways to improve practice through the use of current research (Titler et al.). This model presents several steps which help identify problems, promote development of solutions and provide feedback. The seven steps of the Iowa Model include:

- selection of a topic
- forming a team
- evidence retrieval
- grading the evidence
- developing an EBP standard
- implementing the EBP
- evaluation (Doody & Doody, 2011).
The first step in this model is to select a topic by identifying a problem focused or a knowledge focused trigger (Melnyk & Fineout-Overholt, 2005). This program manager (PM) identified that 30-day readmission rates in her facility were above the state and national average for adult post-CABG surgery patients (STS, 2013). Also noted was that knowledge and implementation of best practices were at sub-optimal levels (MSTCVS, 2013). It was not well known among some hospital staff and providers why certain cardio protective medications are used post-operatively. Discharge planning and early post-operative surveillance was not seen as a necessity or made a priority. The topic of implementation of evidence-based best practices and their effect on outcomes was presented to the cardiac surgery division team and the chief nursing officer, all of whom believed that this was a priority topic based on its effects on patient outcomes and financial reimbursement.

Step two in the Iowa Model is to form a team. The composition of the team developed to reduce readmissions after CABG surgery was based on the topic and the stakeholders. A cardiac surgery quality team was formed to include both clinicians and management. The members were chosen based on those who could provide input and support implementation of the project. A multidisciplinary approach was used to involve all care providers. This approach promoted receipt of input from different perspectives to allow team members to be involved in the change process from its inception, and to promote ongoing feedback. Members of the team included, the cardiac surgeons, the cardiac surgery practice NP, a cardiac operating room manager, the cardiac surgery data collection specialist, a registered nurse from the cardiac surgical unit and surgical floor, a discharge planner, and the cardiac clinical nurse specialist. A bottom-up approach was taken when formulating the team. This approach has been found to be helpful in making evidence-based practice changes (Doody & Doody, 2011). Rather than mandates coming down from management, it has been believed that those who provide
direct care need to be a part of the change from the beginning (Titler et al., 2001). The team reviews current data and provides input on development of evidence-based protocols, order sets, educational material and implementation of practice change.

The next step in this model is to gather evidence in the literature and determine how it can be used in practice (Melnyk & Fineout-Overholt, 2005). The following PICOT question was developed: In adult patients who have undergone CABG surgery (P), does the implementation and adherence to best practice methods (I), when compared to current practice methods (C), decrease 30-day readmission rates (O), over a 3-month period (T)? Multiple literature searches were conducted by this PM following identification of the PICOT question. The searches produced sufficient evidence to support a practice change in the CABG surgery patient.

Step four, grading the evidence, involves addressing the quality areas in the research and the strength of the overall evidence (Doody & Doody, 2011). The quality of evidence was appraised with the Critical Appraisal Skills Program (CASP) (Critical Appraisal Skills Programme [CASP], 2013). Quality scores were assessed utilizing the CASP appraisal tool. The level of evidence was determined using Melnyk’s Hierarchy of Evidence (Melnyk & Fineout-Overholt, 2005). This tool provided guidance to determine what types of studies would provide the most reliable answer to the PICOT question. The guidelines were appraised with The Appraisal of Guidelines for Research and Evaluation (AGREE) Instrument (Agree, 2013), which evaluates the process of practice guideline development and the quality of reporting.

The fifth step involves developing an evidence-based standard. After the evidence was graded and appraisal was completed, the team determined that there was sufficient data to move forward with developing practice changes in the postoperative care of CABG surgery patients. Determination was based on clear and consistent
Implementation of the EBP project required changes in written policies, order sets, education materials and practice patterns. There needed to be direct interaction with all staff and providers to support these changes (Doody & Doody, 2011). The literature provided consistent recommendations in the postoperative care of the CABG surgery patient. Adherence to these recommendations has been found to increase quality of care and decrease hospital readmissions in this population. The evidence-based recommendations which would drive the changes included; adherence to use of evidence-based cardio protective medications at discharge, early postoperative surveillance, discharge planning with community referrals, and consistent patient discharge education.

Once these recommendations were integrated into written materials, the education of team members could take place to support the changes. Providing information in a diffuse manner and highlighting the strengths and benefits when introducing change, were done through in-service education, audits, and continuous feedback (Titler et al., 2001).

The final step is evaluation and it is an ongoing process. This step is necessary to see what role the evidence has played in practice. By gathering outcomes data prior to implementation of the change in practice a baseline can be established (Doody & Doody, 2011). Gathering the same data set after the implementation of change will reveal how the evidence has contributed to improvement in decreasing hospital readmissions and adherence to evidence-based medications at discharge.

**Strengths and limitations of the Iowa Model for the EBP project.** A strength seen in the Iowa Model is that the model incorporates the whole team (Melnyk & Fineout-Overholt, 2005). By utilizing all the stakeholders, different perspectives can be
brought to the table. Because the proposed change requires a variety of evidence to support it, a multidisciplinary approach can assist in approaching the change from their individual points of view. Another strength of the model is its emphasis on the continuous evaluation of the process, including feedback loops, analysis, and evaluation (Melnyk & Fineout-Overholt, 2005). This promotes individualizing the evidence to the setting and promoting acceptance from the team members.

A limitation of this model is that, with time constraints and productivity expectations, the EBP change may take low priority for some staff. Some could see the proposed change as additional work. It needs to be made clear that poor outcomes can result if evidence-based care is not provided to help staff and providers understand the importance of having evidence to support what they do (Titler et al., 2001). Another limitation can stem from a lack of understanding on the part of the hospital staff about the importance of the need for change or the leadership’s ability to convey such information. Strong leadership is needed to encourage and reinforce positive change (Melnyk & Fineout-Overholt, 2005).

**Literature Search**

**Identification of sources examined for relevant evidence.** The 2011 American College of Cardiology Foundation (ACCF) and American Heart Association (AHA) Guideline for Coronary Artery Bypass Graft Surgery and The Society of Thoracic Surgeons (STS) 2013 Quality Performance Measurement Guidelines were guidelines that provided recent evidence on strategies to improve patient care and decrease hospital readmissions following CABG surgery. The ACCF/AHA guidelines were found through an internet search using the key words ACCF/AHA CABG guidelines. Because its recommendations are based on the highest levels of evidence available these guidelines were used. These recommendations are peer reviewed and nationally supported (The American Heart Association website, 2013). The STS guidelines were
found through an internet search using the key words STS guidelines or quality measures. These quality guidelines were used because the STS organization is devoted to providing the best possible outcomes for its patient population. They are developed with direction from the ACCF/AHA and are endorsed by the national quality forum, and its measures are used by the CMS (STS, 2013).

**Search engines.** In addition to the search for guidelines, a comprehensive literature search was done using the Elton B. Stephens Company (EBSCO), Medline, Cumulative Index to Nursing and Allied Health (CINAHL), and Academic Search Premier databases. A Valparaiso University librarian assisted in the initial search. Stemming from the recommendations made in the articles found in the initial search, a subsequent search was conducted adding additional key words and the Joanna Briggs Institute Clinical Online Network of Evidence for Care and Therapeutics (JBI Connect), and the Cochran Health Group. The assistance of both the Valparaiso University librarian and the librarian from Borgess Medical Center was utilized for this subsequent search.

**Key words.** The key words used in the initial search, which were used in combinations included “CABG” or “coronary artery bypass graft surgery” and rehospitalization or readmission, best practice*, “quality improvement**”, and “evidence-based practice**”. Because a link was identified between readmissions and the discharge process in the initial search, an additional search was conducted to seek out more evidence. This subsequent search utilized the words “CABG” or “coronary artery bypass surgery” and discharge planning, discharge instructions, discharge care, and education.

**Inclusion and exclusion criteria.** The inclusion criteria included (a) publication dates limited to 1999-2013, (b) adult subjects, (c) journals written in English, (d) studies that considered CABG surgeries specifically, (e) studies that assessed risk factors for readmission following CABG, (f) studies that made evidence-based recommendations to
reduce readmissions following CABG, and (g) studies that made recommendations in transition from hospital to home following CABG.

The exclusion criteria included articles that (a) scored low on the CASP, (b) were written in a foreign language, (c) were published prior to 1999, (d) used pediatric subjects, (e) studied only CABG in combination with valve surgery or other cardiac surgeries, (f) made no recommendations for practice, and (g) were duplicate articles.

The initial search yielded 398 articles, 44 from CINAHL, 212 from Medline and 142 from Academic search (see Table 2.1). Ten were obtained by a hand search, and 8 were obtained through cross referencing bibliographies. After a review of abstracts and screening against inclusion and exclusion criteria, eight articles were found to be appropriate for this project. The search designs included a total of five cohort studies, a case-control study, and three systematic reviews. The second search yielded 588 articles. Twelve were obtained through a hand search, and six through cross referencing bibliographies. From these, an additional four articles were used which focused specifically on patient education and discharge planning. Of these four articles, two were systemic reviews, one a qualitative study and one a cohort study.

**Levels of evidence.** The Melnyk’s Hierarchy of Evidence was used to rate the level of evidence in the EBP project (Melnyk & Fineout-Overholt, 2005). Table 2.2 lists the studies used in this EBP and their respective levels of evidence. There are seven levels of evidence within this hierarchical arrangement. Level I is considered the highest level of evidence and includes systematic reviews or meta-analysis of all relevant randomized control trials (RCTs). Level II includes evidence obtained from well-designed RCTs. Evidence from well-designed control trials without randomization is categorized under Level III. Level IV contains evidence from well designed case-control and cohort studies. Systematic reviews of descriptive and qualitative studies are classified in Level V. Level VI includes evidence from single descriptive or qualitative
Table 2:1

**Literature Search Strategies**

<table>
<thead>
<tr>
<th>Search engine</th>
<th>Search terms</th>
<th>Number of hits</th>
<th>Abstract reviewed</th>
<th>Hand searched</th>
<th>Cross referenced</th>
<th>Duplicate Full review</th>
<th>Included in project</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBSCO (Medline CINAHL ASP)</td>
<td>“CABG” or “coronary artery bypass graft surgery” and rehospitalization or readmission, best practice*, or “quality improvement**”, or “evidence-based practice**”</td>
<td>398 total articles</td>
<td>189</td>
<td>10</td>
<td>8</td>
<td>38</td>
<td>78</td>
</tr>
<tr>
<td>EBSCO (Medline CINAHL ASP JBI Cochran Health)</td>
<td>“CABG” or “coronary artery bypass graft surgery” and Discharge planning or instructions or care or education</td>
<td>588</td>
<td>160</td>
<td>12</td>
<td>6</td>
<td>46</td>
<td>22</td>
</tr>
<tr>
<td>Google</td>
<td>AHA/ACC Coronary artery bypass graft surgery guideline</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Google</td>
<td>STS guidelines or quality measures</td>
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<td></td>
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</tbody>
</table>
Table 2.2.

*Levels of Evidence for Best Practice Recommendations in Adult Patients following Coronary Artery Bypass Surgery*

<table>
<thead>
<tr>
<th>Rating Scale</th>
<th>Level of Evidence</th>
<th>Number of Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I</td>
<td>Evidence from systemic reviews or meta-analysis of all relevant randomized control trials (RCTs)</td>
<td>4</td>
</tr>
<tr>
<td>Level II</td>
<td>Evidence obtained from well designed RCTs</td>
<td>0</td>
</tr>
<tr>
<td>Level III</td>
<td>Evidence from well designed control trials without randomization</td>
<td>0</td>
</tr>
<tr>
<td>Level IV</td>
<td>Evidence from well designed case-control and cohort studies</td>
<td>7</td>
</tr>
<tr>
<td>Level V</td>
<td>Systemic reviews of descriptive and qualitative studies</td>
<td>0</td>
</tr>
<tr>
<td>Level VI</td>
<td>Evidence from single descriptive or qualitative studies</td>
<td>1</td>
</tr>
<tr>
<td>Level IV</td>
<td>Opinion of authorities and/or reports of expert committees.</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>
studies. The lowest level of evidence is Level VII which contains the opinions of authorities and/or the reports of expert committees.

Studies were appraised using the CASP. These critical appraisals were used to thoroughly examine research to judge its trustworthiness, its value, and its relevance to the EBP project (CASP, 2013). There is an appraisal tool specific to the type of study design being analyzed. In this appraisal process a series of 10 questions address issues such as; study design, levels of evidence, relevance, quality, statistics and outcomes, and risks and benefits (CASP). Quality of the study was based on the results of the response to the questions on the CASP checklist. Each question in the CASP has a value of 2 points with a total score of 20 points. The score reflects the quality of the study. A score of 0 to 7 is not acceptable, 8 to 14 is a fair rating, and 15 to 20 is considered excellent. Twelve studies were used in this EBP project after grading levels of evidence and completing appraisals. Evidence with a score of 7 or less on the respective CASP tool was not included in this review.

The 2011 ACCF/AHA Guideline for CABG Surgery and The STS 2013 Quality Performance Measurement Guidelines for CABG Surgery were also key resources in this EBP project. The ACCF/AHA guidelines have a classification of recommendations and a level of evidence to support each of its recommendations (The American Heart Association website, 2013). These guidelines were appraised using The Appraisal of Guidelines for Research & Evaluation (AGREE II) Instrument. The AGREE II consists of 23 key items, which are divided into 6 domains. Each domain reviews specific guideline qualities. Those domains include (1) Scope and purpose, (2) Stakeholder involvement, (3) Rigour of development, (4) Clarity of presentation, (5) Applicability, and (6) Editorial independence. Two global ratings are then given after the domains are scored. Each of the domains and the global ratings are scored on a 7-point scale (1 being the lowest and 7 being the highest). Grading tools are provided to aid in accuracy. The final score is
based on the graded score divided by the total possible score for each domain and converted to a percentage (AGREE 2013). The 2011 ACCF/AHA Guideline and The STS 2013 Quality Performance Measurement Guidelines were appraised using the AGREE II tool and were scored at 96.8% and 96.2% respectively and these guidelines were recommended for use. Table 2:3 provides a summary of the literature.

**Table 2:3**

**Summary of the Literature**

<table>
<thead>
<tr>
<th>Design &amp; Level of Evidence</th>
<th>Subjects</th>
<th>Intervention</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arora, Sowers, Saunders, Probstfield, Lazar, (2006)</td>
<td>Systematic Review Level I</td>
<td>N=4000 patients post CABG</td>
<td>This review identified interventions most beneficial to reduce cardiac death and repeat hospitalization. Review included; anti-platelet therapy, ACE inhibitors, Statins, Beta-blockers, Smoking cessation, exercise, cardiac rehabilitation, diet, emotional, and hormonal therapy at discharge.</td>
</tr>
<tr>
<td>Study</td>
<td>Study Type</td>
<td>Patients</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>------------</td>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>D'Agostino et al, (1999)</td>
<td>Cohort Study</td>
<td>N=1363 patients post CABG</td>
<td>Study was to determine prevalence of 30-day readmissions after CABG, identify diagnosis for readmission, and identify pre-discharge factors that influenced readmission.</td>
</tr>
<tr>
<td>Fasken, Wipke-Tevis, Sagehorn, (2001)</td>
<td>Systematic Review</td>
<td>N = 1000 patients post CABG</td>
<td>17 articles reviewed to determine factors associated with unplanned readmissions following cardiac surgery.</td>
</tr>
<tr>
<td>Fillion, Pilote, Rahme, Eisenberg, (2008)</td>
<td>Cohort Study</td>
<td>N=2389 patients post CABG</td>
<td>To determine the use of aspirin, ACE inhibitor, beta-blocker and statin therapy in light of cardio protective benefits</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------</td>
<td>---------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Fredericks, DaSilva (2009)</td>
<td>Systematic review</td>
<td>N = 54,367 patients post cardiac surgery</td>
<td>Review of 92 studies that identified patient behaviors, number of postoperative infections, presence of heart failure, and rate of readmissions in adult post cardiac surgery patients</td>
</tr>
</tbody>
</table>
### Recommendations

- **Fredericks, Ibahim, Puri, (2010)**  
  Systematic review  
  **Level I**  
  N = 6039 patients post CABG  
  25 studies reviewed to determine what approach, mode and dose of education is most effective in post-CABG patients  
  Recommendations were made to provide individualized education, using multimedia, and in multiple sessions to improve self care behaviors  
  Excellent 18

- **Hannan et al, (2003)**  
  Cohort Study  
  **Level IV**  
  N = 2111 of 16,325 patients readmitted after CABG surgery  
  Identify causes of 30 day readmission in post CABG patients  
  Top reasons for readmissions were infections 28%, heart failure 15.9%, MI 7.9%, and arrhythmias 7.7%. Average days from discharge to readmission were 8.7 days. Suggestions were made to further study quality measures: lack of use of aspirin and beta blockers at discharge could be the cause of readmissions and thus indicate low quality of care.  
  Fair 14

- **Hannan et al, (2011)**  
  Cohort Study  
  **Level IV**  
  N-30,953 patients post CABG  
  Analyzed 30 day readmission rates in patients post CABG. Reasons and predictors were identified and recommendations were made.  
  The total readmission rate was 16.5%  
  Top 3 reasons for readmission were post-operative infections 16.9%, heart failure 12.8% and arrhythmias 6.3%.  
  Excellent 20
Insufficient coordination of inpatient to outpatient care was sighted as a large factor in these readmissions. Recommendation was close postoperative monitoring.

Manier et al, (2013)  
Case Control Study Level IV  
N = 1,033 patients post CABG  
Studied patients following CABG surgery to develop strategies to diminish readmissions  
54 of the 1,033 (5.2%) were readmitted. 79 not readmitted were time matched patients in control group. Most common reasons for readmission included: infection 16 of the 54, heart failure 13 of the 54, and arrhythmias 7 of the 54. Recommendations included: aggressive coordination of medical care postoperatively, early postoperative provider visits. And medication compliance education. Failure to see a provider early in the postoperative period lead to a higher chance of readmission (\( p = <0.0001 \)). Poor medication compliance led to readmissions (\( p =0.02 \)).

Excellent 18
<table>
<thead>
<tr>
<th>Study</th>
<th>Design Type</th>
<th>Level</th>
<th>N (post CABG)</th>
<th>Evaluated variables and literature based associates to readmissions following CABG surgery</th>
<th>Readmission rate</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price, Romeier, Gnerre, Shoyer, Rosengart, (2013)</td>
<td>Cohort Study</td>
<td>IV</td>
<td>1,205 patients</td>
<td>Evaluated variables and literature based associates to readmissions following CABG surgery</td>
<td>13%</td>
<td>Readmission was 6 days. Reasons for readmission included: infections 17%, pleural effusion 15%, arrhythmia 5%, heart failure 7%. Readmissions within week of discharge 60%. Recommendations: post discharge practice modifications such as thorough medication reconciliation and securing one week follow up appointments.</td>
</tr>
<tr>
<td>Theobald, McMurray, (2003)</td>
<td>Qualitative Study</td>
<td>VI</td>
<td>30 patients</td>
<td>Interviews were conducted with 30 patients and their carers 4-5 weeks after CABG to assess issues, concerns and needs.</td>
<td>Support systems were critical in allaying fears. Need identified for adequate transition to home after CABG. Early discharge planning needed. Need for more professional support and follow up after discharge.</td>
<td></td>
</tr>
<tr>
<td>Tsai, Joynt, Orav, Gawande, Jha (2013)</td>
<td>Cohort Study</td>
<td>VI</td>
<td>3,004 hospitals, 480,000 discharges after surgery, 6 procedures studied</td>
<td>Identify a relationship between hospital readmission rate and quality measures.</td>
<td>CABG ranked highest of all procedures in readmissions rates at 17.4%. Hospitals with higher adherence to evidence-based guidelines have less readmissions.</td>
<td></td>
</tr>
</tbody>
</table>
Levels and appraisal of relevant evidence.

The literature was searched to identify ways to decrease readmissions following CABG surgery. The findings in the literature supported the use of cardio protective medications at discharge, lifestyle modifications, and discharge planning to include patient education, early post-operative surveillance and community referrals. These levels of evidence of these studies were assessed using Melnyk’s Hierarchy of Evidence. Quality was appraisal using the CASP and AGREE II tools. The review of the evidence has been broken down into two categories and organized according to its level of evidence from highest to lowest.

Medications and lifestyle modification recommendations at discharge.

Four articles were retrieved which support the use of cardio protective medications and lifestyle modification. These included a level I systematic review, two level IV cohort studies, and a level VI cohort study. Evidence to support cardio protective medication use at discharge and lifestyle modification following CABG surgery comes from the ACCF/AHA practice guidelines.

The ACCF/AHA task force has instituted practice guidelines for CABG surgery developed from evidence–based medicine. The researchers used evidence-based guidelines to classify the level of the intervention. Recommendations were classified based on levels of evidence supporting a particular intervention. Class I indicates that there was evidence to find the treatment beneficial. Class II indicated that there was conflicting evidence about the treatments usefulness. Evidence level A indicated that data were derived from multiple randomized trials or meta-analyses. Evidence level B indicated that data were the result of a single randomized trial or nonrandomized studies. Some of the perioperative recommendations included, 100 to 325 mg of aspirin within six hours postoperatively and then indefinitely continued to maintain saphenous vein patency and reduce adverse cardiovascular events (class I evidence A).
Statin therapy was recommended for all CABG patients unless contraindicated (class I evidence A). It was recommended ACEI or ARB be initiated in CABG patients postoperatively and be continued infinitely for those who have a left ventricular ejection fraction (LVEF) of 40% or less, HTN, chronic kidney disease or DM, unless contraindicated (class I, evidence A). Smoking cessation education was recommended to be provided during hospitalization for CABG (class I, evidence A). Cardiac Rehab was recommended for all patients following CABG (class I, evidence A). A low-fat diet was recommended for all patients post-CABG (class I, evidence A) (The American Heart Association website, 2013). The STS has developed quality measures based on these guidelines (STS, 2013).

A level I meta-analysis of nearly 4000 patients who had undergone CABG surgery was conducted to determine the most effective interventions in reducing ischemic events in patients’ post-CABG (Arora, Sowers, Saunders, Probstfield, & Lazar, 2006). The benefit of each medication therapy intervention was assessed using number needed to treat (NNT) analysis. In this analysis, antiplatelet therapy (class I, evidence A) reduced the incidence of vein graft closure from 30% to 21% following CABG surgery. Aspirin therapy was also found to reduce occurrences of MI, stroke and bowel infarction. ACEI (class I, evidence A) were found to be effective cardio productivity and secondary prevention following CABG surgery. Patients receiving statin therapy (class I, evidence A) had less restenosis in vein grafts 5 years after CABG surgery ($p = <0.0001$). A 29% reduction in the need for coronary revascularization (6.5% compared to 9.2%; $p = 0.03$) for post CABG surgery patients on statin therapy was found. Based on the evidence found in the studies analyzed, statins accompanied by a low cholesterol diet, are recommended for all post-CABG surgery patients. Beta blockers (class I, evidence B) offer survival benefit to patients post CABG surgery. Beta blockers were also found to be useful in managing arrhythmias and HTN in patients following CABG surgery. Cardio
protective medicine therapies were associated with reduction in readmissions (14.8% vs. 6.4%; \( p < 0.01 \)) when used after CABG surgery. The review did show that cardio protective medications begun after CABG surgery did reduce ischemic events, improve quality of life and prolong life. It also revealed that compliance to these therapies reduced readmissions.

This review also looked at lifestyle modification (Arora et al., 2006). It found that patients who stopped smoking (class I, evidence B) following CABG surgery had a 41% reduction in the need for repeat coronary revascularization, while continued smokers had a 68% risk of death from all causes, and a 75% risk of cardiac death. Saphenous vein grafts were disease-free five years post CABG surgery at the rate of 52% in non-smokers as compared to 39% in smokers. Cardiac Rehabilitation (class I, evidence B) was found to improve mobility, build exercise tolerance, and get patients back to work sooner. Regular exercise was recommended following CABG surgery. Working large muscle groups 30 to 60 minutes, three to six times a week was supported for optimal outcomes (class I, evidence B). The study also found that patients who participated in cardiac rehabilitation assume secondary prevention behaviors such as continuing in a regular exercise program. Though the benefits of diet, exercise, smoking cessation, and cardiac rehabilitation was harder to quantify, the review indicated that these interventions benefit all patients post-CABG (Arora et al., 2006).

In the level IV cohort study by Filion et al. (2008), the use of evidence-based cardio protective medications were found to be suboptimal when the charts of 2,389 patients who had undergone CABG surgery were reviewed. The use of ACEI/ARB at discharge following CABG surgery was 23%. The use of aspirin had the highest compliance rate, at 74.9%, while betablockers use was low at 58.8%. Statins were found to have the lowest rate of use at 42.4%. The study noted that patients who are prescribed medications at discharge were more likely to be compliant and persist in
following their medication regimen, which led to preventing unnecessary medication related hospital readmissions. A weakness to this study was that patients with contraindications to these medications were not identified. This might have justified why some patients did not have these medication prescribed. Considering that, there was ample evidence to support the use of evidence-based cardio protective medications to improve patient outcomes after CABG surgery.

Another level IV cohort study conducted at Harvard by Tsai et al. (2013) targeted six of the common and most costly surgeries. Of these, CABG surgery had the highest readmission rate. The researchers sought to identify the top reasons for readmissions following surgical discharge. Of particular interest in this study was the link between quality scores and readmission rates ($p = 0.21$). Quality scores were based on STS quality measure guidelines and included prescription of cardio protective medications, referrals to cardiac rehabilitation, and smoking cessation education at the time of discharge. The findings suggested that hospitals with high adherence to evidence-based guidelines have lower hospital readmission rates. The strength of this study was that the authors were able to identify a direct correlation between following EBP and improved outcomes. Further investigation could have been done to evaluate the discharge practices and its impact on readmissions.

Hannan et al. (2003) sought out to identify predictors of readmissions within 30-days for patients following CABG surgery. The average days from discharge to readmission were 8.7 days. This retrospective, level IV cohort study identified heart failure, infection and arrhythmias as the three most common causes of 30-day readmissions. Also identified were eleven risk factors associated with readmissions. They included the demographics of female sex, African American race, advanced age, and co-morbidities such as COPD, DM, HF, and renal failure. These risk factors were considered consistent findings from previous studies. However, the logistic regression
model's c-statistic that predicted readmissions, was low at 0.62. A value of 0.5 indicates the model is no better than chance at predicting an outcome where as a value of 1.0 indicates a perfect prediction. This finding indicated that although risk factors needed to be identified, there may be other causes related to readmissions. Some of these causes were believed to be related to process measures such as use of cardio protective medications at discharge.

The results of the proceeding studies provide support for increasing adherence to utilization of cardio protective medications in all patients following CABG surgery except where contraindicated. Lifestyle modifications such as, smoking cessation, participation in a cardiac rehabilitation program and following a cardiac diet was strongly supported in the literature. These recommendations are supported by the AHA/ACCF and STS and have been incorporated into their 2011 CABG guidelines. Complying with these recommendations have been found to provide positive patient outcomes and decrease readmissions in the post-CABG surgery population.

**Discharge planning.** In the literature search evidence was found to support smooth care transitions for patients after CABG surgery. Seven articles were retrieved which support implementation of discharge planning. Included in the seven articles were three level I systemic reviews, two level IV cohort studies, a level IV case control study, and a level VI qualitative study. The literature is organized according to its level of evidence from highest to lowest.

In studying factors associated with unplanned readmissions following cardiac surgery, Fasken et al. (2001) found trends in their systematic review. These included common complications, readmission frequency, and common causes as well as strategies to prevent further readmissions. Of the 1000 patients who had CABG surgery, 629 patients were readmitted within 14 days after discharge. Postoperative complications that persisted up to 6 weeks in as many as 50% of patients were wound
drainage (57%), edema (67%), and shortness of breath (47%). Readmission rates ranged from 13.8 to 62.9%. Risk factors associated with readmissions in these articles included being female, being African American, being over 65, having decreased functional status, having chronic diseases, and having a lack of in-home clinical care. These studies also found that socioeconomic and social support factors, such as postoperative assistance or care, were related to readmissions ($p < 0.01$). Several studies revealed implications for practice. By understanding factors associated with readmissions, risks can be identified, interventions can be developed, and models can be developed to decrease readmissions. In these studies, comprehensive discharge planning including patient education, coordination of follow-up appointments, and community referrals were found to be effective in reducing readmissions following cardiac surgery.

Fredericks and DaSilva (2010) conducted a systemic review to explore the experiences of patients who had undergone CABG surgery. The authors suggested that postoperative complications that lead to hospital readmissions is related to the patient's level of self-care behaviors during the first three months of the postoperative period. The three main self-care behaviors after discharge included deep-breathing and coughing, medication administration, and medication management. Ninety-two studies were included in this review in the U.S., Europe, and Canada. The average readmission rate was 16%. The main reasons for readmission were stroke (16.5%), heart failure (13.3%), and respiratory issues (13.3%). Statistically significant correlations were found between self-care behaviors and the number of infections ($r = -0.185, p = 0.04$) and, self-care behaviors and hospital readmission rates ($r = -0.198, p = 0.00$). The negative $r$ value indicates a negative correlation between self-care and infections, and self-care and readmissions. As with self-care, increased infections and readmissions went down. Postoperative infection and hospital readmission ($r = 0.150, p = 0.02$) had a positive
correlation which indicates that patients with infections were more likely to be readmitted (Fredericks & DaSilva). The data showed that educating the patient in self-care behaviors such as deep-breathing and coughing, and proper medication management can prevent postoperative complications that can lead to a hospital readmission.

Fredericks, Ibrahim, and Puri (2009) explored the approach, mode and dose of education most effective in producing a positive change in the CABG patient. Twenty-five studies, including 6039 patients, were included in the systemic review. Approach to education, medium, format dose, and outcomes of education were all analyzed. Based on the enhancement of self-care knowledge, the study identified that individualized multimedia education provided in multiple sessions was the most effective in educating patients who had undergone CABG surgery. This was indicated by showing larger effect sizes (ES). In the 12 studies that assessed the effect of CABG surgery education on self-care knowledge, the individualized education group reported higher post-test knowledge than the standard education group. Thirteen studies evaluated self-care behavior as an outcome of CABG education studies. In these studies the mean effect size was larger for individualized education than standard education, supporting individualized education for this patient population. Seven studies looked at symptom experience. Of those, the ES was larger for the individualized education group than for standardized approach. In the mode of delivery studies, the ES was larger in the combined education group when knowledge, behavior and symptom experience groups were assessed. The high-dose interventions were found to produce better outcomes in the areas of knowledge, behavior, and symptom experience. Though this study did not assess a correlation between self-care and hospital readmissions, it did indicate that improving self-care behaviors following CABG surgery enhanced the maintenance of health behaviors thus improved patient health outcomes (Fredericks et al.).
D’Agostino et al., (1999) performed a cohort study to determine 30-day hospital readmission rates after cardiac operations identify diagnoses responsible for readmission and identify factors that influenced readmissions. Of the 1692 patients they reviewed, 1363 were CABG surgeries, and 225 patients were readmitted (13.5%) within 14 days after discharge. Reasons for readmission were congestive heart failure (15.6%), atrial fibrillation (12.9%), chest pain (12%), and wound problems (10.2%). Readmissions took place an average of 11.7 days after discharge. Patients that were identified as having a higher risk of readmission were older, with lower ejection fractions, and chronic diseases such as peripheral vascular disease, heart failure, and history of stroke. By identifying patients at higher risk and their reasons for readmission, this study suggests that careful evaluation of the patient along with discharge planning for required services increased post-operative surveillance, and thus substantially reduced readmissions. When a predisposing factor for a readmission can be identified, then an early action plan can be developed with the goal of avoiding adverse outcomes.

Manier et al. (2013) analyzed outcomes and risk factors among 1033 patients after cardiac surgery. Of these 55 patients 5.2% were readmitted within 30 days of discharge. Seventy-nine non-admitted patients were time matched as a control group. The three most common causes of readmissions were infections (30%), heart failure (24%), and arrhythmias (13%). The co-morbidities in these readmitted patients were poor functional status ($p = <0.001$), low ejection fraction ($p = 0.001$), chronic obstructive pulmonary disease (COPD) ($p = 0.001$) and chronic renal insufficiency ($p = 0.01$). Other risks of interest were being over 65 years of age, having low socioeconomic status ($p = 0.02$), and failure to take discharge medications ($p = 0.015$), and failure to see health care provider early ($p = <0001$). Conclusions indicate socioeconomic status, medication compliance, and early post-discharge monitoring reduced the need for readmissions.
Hannan et al (2011), in a cohort study, analyzed 30,953 CABG patients in New York. The readmission rate was between 8.3% and 21.1%. The main reasons for readmission were infections (16.9%), heart failure (12.8%), and dysrhythmias (6.3%). The significant risk factors were risk factors with $p$ values at $< 0.0001$ and included being over age 70 years of age, being female, having a body mass index (BMI) of over 35, diabetes, having COPD, and having Medicaid insurance. From this study, the authors speculated that the coordination of care from the inpatient setting to the outpatient setting was a large factor in readmissions and that improving the systems related transition of care issues could greatly reduce readmission rates. By identifying a population at higher risk for readmission and identifying the most common reasons for readmission, a discharge plan tailored to a patient’s needs can be developed. The discharge plan may include visiting nurse services, outpatient therapy, inpatient rehabilitation, or an office visit within a week of discharge. This article supports that this type of coordination of care can reduce hospital readmissions.

Strategies to reduce readmissions after CABG were investigated in the cohort study by Price et al. (2013). One hundred fifty-eight readmissions of the 1205 CABG surgeries were reviewed. A 13% readmission rate was found, and 60% of them were readmitted in the first week after discharge. The discharge to readmission time was 6 days on average. Reasons for readmissions were infections (17%), pleural effusions (15%), arrhythmias (5%), and heart failure (7%). The recommendations from the findings in this study included modifying discharge practices to include early post-discharge surveillance.

There were consistent trends found in the data collected for this EBP. The majority of patients readmitted after CABG surgery were readmitted in the first 2 weeks after discharge. The reasons for readmissions can often be identified through early warning signs such as weight gain, shortness of breath, edema, fever, wound
appearance changes, palpatations, blood pressure changes or tachycardia.

Comprehensive discharge education that includes self-care behaviors can equip patients, following CABG surgery, to identify warning signs and know what actions to take if issues are identified. Discharge planning has been found to provide postoperative support for this patient population. The most common risk factors such as advanced age, female sex, African American race, and low socioeconomic status and co-morbidities such as DM, COPD, heart failure, renal failure and, low LVEF associated with readmissions can be indicators of postoperative care needs. By identifying a patient’s risk factor, early discharge planning and individualize education can ensue. Community resources can be obtained and early post-discharge appointments with the healthcare provider can be arranged. These resources and early follow up visits can provide much needed postoperative surveillance that can evade unnecessary hospital readmissions for patients following CABG surgery.

Construct EBP

Synthesis of appraised literature. The results of the literature review indicated several interventions, which reduces 30-day hospital readmission in adult patients after CABG surgery. These interventions need to be incorporated into postoperative care of the patient following CABG surgery. Recommendations include:

- adherence to use of evidence-based cardio protective medications at discharge
- discharge planning
  - early postoperative surveillance
  - ease in transitions
  - securing community referrals
- securing follow up appointments within 14 days of discharge
• standardized patient discharge education that include:
  ▪ lifestyle modification including:
    • a cardiac diet, smoking cessation, and cardiac rehabilitation
  ▪ self-care behavior including:
    • weight, blood pressure, and temperature monitoring, medication regimen, activity restrictions, and incision care

The literature reviewed supports the ACCF/AHA guideline recommendation in the use of aspirin, ACEI/ARB, BB, and statin medications at discharge following adult CABG surgery. Moreover the use of these recommended cardio protective medications has been found to reduce hospital readmissions (Arora et al., 2006). These evidence-based drugs have also been found to provide secondary prevention. The goal of secondary prevention is to halt or slow the progression of the disease. The use of BB prevents atrial fibrillation and treats HTN. Taking a low dose of aspirin can improve blood flow and reduce the risk of myocardial infarction. ACEI /ARB improves blood flow to the myocardium, which improves heart function. Statin drugs decrease plaque and restenosis (Filion et al., 2008). Failure to prescribe cardio protective drugs has been linked to high readmission rates (Hannan et al., 2003). Adherence to evidence-based guidelines lowered readmission rates (Tsai et al., 2013).

The literature supports the need for adequate post-discharge support (Theobald & McMurray, 2004). This support can be provided through comprehensive discharge planning. When patients were interviewed in the Theobald and McMurray (2003) study, they found that patients who had undergone CABG surgery had their fears allayed by having support systems in place. Careful patient evaluation prior to discharge, to assess for transitional needs, may substantially reduce hospital readmissions (D'Agostino et al.,
Discharge planning can be effective in reducing readmission rates (Fasken et al., 2001). Insufficient coordination of the inpatient to outpatient transition was sighted as a large factor contributing to in hospital readmissions in a cohort study by Hannan (2011).

Most hospital readmissions have been found to take place in the first 14 days following discharge after CABG surgery (D’Agostino et al. 1999; Fasken et al., 2001; Price et al., 2013). Early postoperative surveillance, through home nursing care and early postoperative office visits, has been found to be a key factor in the reduction of 30-day readmissions in adult CABG surgery patients and is an important part of the support needed by patients after CABG surgery (D’Agostino et al.; Fasken et al.; Fredericks & DaSilva, 2010; Hannan et al., 2011; Manier et al., 2013; Price et al.; Theobald & McMurray, 2004). Early, post-discharge contact provided an opportunity to detect complications of CABG surgery and often deferred unnecessary visits to the hospital (D’Agostino et al.; Fasken et al.; Fredericks & DaSilva, 2010; Hannan et al., 2011; Manier et al., 2013; Price et al.; Theobald & McMurray, 2004).

As Fasken et al. stated, “Comprehensive discharge planning must involve patient’s education” (2001, p.113). Many studies cite that education for patients who have undergone CABG surgery needs to be consistent and individualized to the patient’s needs. By teaching self care behaviors performance can be enhanced in those who have had CABG surgery (Fredericks & DaSilva, 2010). Self-care behaviors such as daily weight, temperature, and blood pressure monitoring, as well as behavior modifications, can decrease post-CABG surgery complications (Fredericks, Ibrahim, & Puri, 2009). The ACCF/AHA 2011 guidelines recommend all CABG surgery patients receive smoking cessation and cardiac rehabilitation education (The American Heart Association website, 2013). Manier, et al. (2013) found that patients who had medication education were more apt to be compliant in taking their medications and had fewer readmissions after CABG surgery. Thorough medication reconciliation, which includes medication education at
discharge, has been found to decrease readmissions following CABG surgery (Price et al., 2013).

**Best practice model recommendations.** CABG surgery has drawn the attention of the US government in the last several years and is on the horizon for upcoming CMS penalties for 30-day hospital readmissions (Tsai et al., 2013). Patients who have undergone CABG surgery are at risk for readmissions because of their risk factors, co-morbidities, and post-operative complications. Reduction of these often preventable readmissions has become a focus of health care payers and health care providers. This is because CABG surgery is one of the most expensive surgeries and when compared to other most frequently performed surgeries in the U.S. and has the highest rate of readmissions (Tsai et al.). Reasons for readmissions have been identified with consistent data across studies. Based on these data, and on the changes in health care, a change in practice must occur. Evidence has been compiled that supports practice change in the care of adult CABG surgery patients. Best practice recommendations have been developed based on appraisal of the literature and guideline recommendations. The recommendations are as follows:

- use of evidence-based cardio protective medications at discharge, unless contraindicated
  - aspirin
  - statin
  - betablocker
  - ACE I/ARB (when indicated)
- discharge planning to ensure postoperative surveillance
  - making community referrals as indicated
- securing follow up appointments within 14 days of surgery
• standardized multimedia patient discharge education
  ▪ lifestyle modifications
    • cardiac diet recommendations
    • smoking cessation
    • referral to cardiac rehabilitation
  ▪ self care behaviors
    • medication management
    • activity restrictions
    • incision care
    • monitoring of weight, temperature and blood pressure

**Answering the clinical questions.** The use of evidence-based CABG surgery recommendations were drawn from the literature and the ACCF/AHA and the STS guidelines. These resources were used to develop the change in practice. Lewin’s three stages of change theory and the Iowa model were the tools used to facilitate the change. The changes in practice were ensuring that patients were prescribed evidence-based cardio protective medications at discharge, had discharge planning referrals made, had follow-up appointments secured at the time of discharge, and received patient education in various forms. Revised order sets, discharge provider checklists and patient education materials were developed to standardize the process. This PM worked with the cardiac CNS to make revisions to these materials. Feedback was sought from the members of the cardiac quality team prior to changes being made. The PM provided staff and provider education as new materials were rolled out. The discharging provider secured follow-up appointments for patients within 14 days of surgery. Post-change audits were conducted on all patients who had CABG surgery over a three-month period and compared to pre-change audits. These audits were done by the PM with the assistance
of the current quality data coordinator. Areas of evaluation included compliance in
prescription of aspirin, ACEI/ARB, BB, and statin use, follow-up appointment within two
weeks after CABG surgery, and whether the patient received any discharge planning or
if standardized educational material. These data were correlated with the pre- and post-
intervention 30-day hospital readmission rate. It was the intent of this EBP project
manager to implement the best practice methods recommended by the evidence to
decrease risks associated with CABG in an attempt to affect outcomes and 30-day
readmission rates positively for adult patients after CABG surgery.
CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

The U.S. government is in search of ways to increase the quality of health care and decrease spending. High readmission rates have been linked to suboptimal quality of care or coordination of care. New reimbursement structures and penalties for excessive unplanned readmissions are forcing hospitals and health care providers to make system changes. Reduction of preventable 30-day hospital readmissions, following adult CABG surgery, can be a portion of the solution to decrease escalating healthcare costs in the U.S. By implementing evidence-based best practice methods, enhancement of quality and reduction of readmissions can be achieved.

Participants and Setting

The convenience sample for this project included all adult patients who had isolated CABG surgery in a Midwestern Michigan hospital during a 3-month period of time. Two groups, the pre-intervention group of sixty-five patients and the post intervention group of 62 patients fit this criteria. The facility for the project is part of a large health network. This network includes over 113,000 associates in 15 states and the District of Columbia. It has 17,928 available beds, 67 general acute care hospitals, two long-term acute care hospitals, three rehabilitation hospitals, five home health care agencies and four dedicated psychiatric hospitals. The city in which it is located is home to approximately 250,331 people. The racial makeup of the city includes 81.7% Caucasian, 10.9% African American, 2 Asian, and 4% Hispanic. The unemployment rate is 11% compared to the national 9% rate. The median income is 35,000 dollars a year (United States Census Bureau, 2013).

This hospital provides care in more than 120 locations in 15 southern Michigan cities. It was founded in 1889 by catholic nuns. The mission and values of the hospital
originated from its Catholic foundation. The mission reflects its commitment to providing holistic, spiritually centered care while striving to improve the health of individuals in communities it serves with special attention to the poor and vulnerable. This mission is displayed through its commitment to caring for people no matter what their ability to pay. It provides care regardless of race, faith, gender, origin or handicap. Additionally, the hospital participates in state and federal programs designed for the indigent and elderly where reimbursements are less than cost. Community health promotions and outreach programs are also provided to assist those in need. The hospital participates in The Joint Commission's accreditation process. This process is designed to help hospitals provide safe, quality health care, and treatment by discovering evidence-based improvement opportunities. It is accredited in stroke, heart failure, and knee and hip replacement care.

The cardiac surgeons at the EBP facility performed 340 cardiac surgeries in 2013. Of those procedures, 230 were isolated CABG surgeries. With the growth of the cardiac surgery program those numbers have grown in 2014.

**Outcomes**

The four outcomes measured in this EBP project as a result of the evidence-based intervention included: (a) an increase in the compliance in the use of cardio protective medications, (b) an increase in referrals to case-management for discharge planning, (c) securing 14 day follow-up visits, (d) use of standardized patient education material, and (e) a reduction in 30-day readmission rates for adult post CABG surgery patients.

**Intervention and Planning**

The PM conducted an extensive review of the hospital's current practices, protocols, order sets and educational material. Based on these findings, EBP recommendations were sought. Gaps between hospital practice and evidence-based
recommendations were identified. These differences prompted an initiation of practice change.

The EBP project intervention was based on a thorough review of current literature. Recommendations for practice originate from both the ACC/AHA Guideline for Coronary Artery Bypass Graft Surgery and the STS 2013 Quality Performance Measurement Guidelines. These recommendations are made based on graded peer reviewed published data and are classified based on levels of evidence supporting a particular intervention. Other recommendations originate from published information which focuses specifically on reduction of readmissions post CABG surgery.

Based on this information, adjustments in current practice were made. These changes included updating the pre-operative CABG admission order sets to implement early use of aspirin, ACEI or ARB, BB and statin therapy (see Appendix A) as well as providing the cardiac surgery patient information education booklet (see Appendix B). The transfer orders from the cardiac surgical unit (CSU) to the step down floor were rewritten to include continuation of cardio protective medication, and referrals to care managers for discharge planning (see Appendix C). A follow up appointment with a provider was secured at the office of cardiothoracic surgery prior to the patient’s discharge. A provider discharge order form was also developed to act as a form of discharge check list for providers (see Appendix D). This order form includes verification that early post discharge appointments have been arranged, that cardio protective medications have been prescribed, that the appropriate post discharge referrals have been secured and that smoking cessation has been discussed with the patient. The cardiac surgery patient information education booklet was last updated in 2007 and was revised to include the most current recommendations for this patient population. The key points that were highlighted in this material included: medication reconciliation, follow up appointments, activity restrictions, incision care, daily monitoring of weight, temperature,
and blood pressure, diet recommendations, smoking cessation, and the value of cardiac rehabilitation. A new patient education video system was approved for use to promote a multimedia approach to patient education to be given at intervals (see Appendix E).

It was primarily the PM's responsibility to make the mentioned changes, however, to use a multidisciplinary approach, input was sought from the cardiac surgery division team members. Prior to the roll out of the new materials, staff education took place. Education strategies for the three staff members in the office of cardiothoracic surgery followed the Kurt Lewin’s model. Education was done by the PM in a series of staff meetings. Feedback was encouraged to identify any barriers to seeing the patients for follow up in the office within 14 days post hospital discharge. The hospital staff education strategy also followed the Lewin’s model. Sessions were held at staff meetings by both the PM and the unit and floor educators. Poster boards, with visual aids, were posted in education rooms, and email updates about the changes and roll out were sent to staff.

The PM presented the EBP project proposal to the cardiac division team members as well as the director of nursing. The current outcomes data were presented. ACC/AHA guidelines and STS performance measures were reviewed. Literature review was summarized for the audience. The team believed that this effort to improve quality and reduce 30 day readmissions was a priority for the cardiac program and approval was received to move forward with the EBP project.

Recruiting participants

For the pre-intervention data, a convenience group of participants from the medical records of adult patients, who had undergone CABG surgery from this hospital, over a one quarter period of time, was used. For the post intervention data the medical records from a convenience group of adult patients who underwent CABG surgery from this hospital was used. The same calendar quarter was studied in both the control and
intervention group. The rational for this was to illuminate other time variables. CABG surgery patients were identified based on the International Classification of Disease, 10th Revision, Clinical Modifications (ICD-10) procedure code designating CABG. To create a standardized cohort, patients undergoing concurrent or combined procedures were excluded.

Data

Measures and their reliability and validity. The two participant groups were pooled into pre- and post-intervention groups. The pre-intervention group received routine hospital practices. The post intervention group included current evidence-based practices. Thirty-day readmission rates, prescription of cardio protective medications at discharge, referral to case-management, secured follow up appointments within 14 days of surgery, and use of standardized education material were measured in both groups. Both groups were measured on these dependent variables to determine whether the different intervention produced a different effect. Additional data such as referrals to cardiac rehabilitation, smoking cessation instruction and follow-up visits were retrieved from the electronic medical record (EMR) in the post-intervention group.

Collection. After approval from the Institution Review Board (IRB) from both the hospital and Valparaiso University, a comprehensive chart review began. In an effort to maintain patient confidentiality and adhere to health insurance portability and accountability act (HIPPA), a patient reference number was used to identify the patients. Collection of data was completed through both the cardiac surgery data collection specialist and thorough chart review conducted by the PM. The list of participants audited originated from the cardiac surgery quality department and was based on patients that received isolated CABG surgery at this institution. A coded list of variables was created to be used in data collection of both groups. Pre-intervention data were
gathered from both EMR and paper medical records. Post intervention data were both
gathered at the time of hospitalization and from the EMR.

**Management and analysis.** This project used an independent $t$-test and chi-
square test to evaluate variable data between the pre- and post-intervention groups. A
Chi-square test was used to compare the readmission outcomes of the two groups. Data
were analyzed through the use of SPSS descriptive statistics software by this PM.

Predictors and trends associated with 30-day readmissions were examined for patterns.

**Protection of human subjects**

Prior to beginning this project the PM completed the web-based computer course
on protecting human research participants. This course was required by the university
and the hospital review boards. The IRB for both the university and the hospital reviewed
the proposed project. This project included chart reviews of two cohorts of patients who
underwent CABG surgery; no direct patient contact was made. This EBP project was
focused on revision of practice tools and care provider education. The goal was to
improve patient outcomes by providing consistent evidence-based care. All data
gathered from the audits were kept private and locked in secure quarters. This ensured
that the only the PM had access to the data.
CHAPTER 4

FINDINGS

The purpose of this EBP project was to answer the question: In adult patients, following CABG surgery, does the implementation and adherence to best practice methods decrease 30-readmission rates? To answer this question the records of patients who underwent CABG surgery between September 2014 and December 2014 were accessed and compared to those of patients who had undergone CABG surgery during the same quarter of 2012. The aim of this project was to see if consistent use of evidence-based medications at discharge, comprehensive discharge planning, early post-operative follow up appointments secured at discharge, and use of standardized patient education reduced 30-day readmission rates. The outcomes were analyzed using Predictive Analytics Software (PASW) version 21.

Participant Characteristics

Descriptive statistics were used to describe and summarize the data, to simplify occurrences and to identify associations. The purpose of using descriptive statistics was to take large bits of unorganized data and categorize it into small usable data sets. Used as a reasoning tool, descriptive statistics aided in the inference and predictive characteristics of one data set on that of another (Melnyk & Fineout-Overholt, 2005). The EBP participant characteristics are summarized in the following descriptive statistics.

Size and characteristics. The EBP project took place in a Midwestern Michigan hospital. The convenience group of participants included all adult patients who had isolated CABG surgery during a three-month period of time two years apart. Two groups, the pre-intervention group of 65 patients and the post-intervention group of 62 patients have fit these criteria (see Table 4.1) The mean age in the pre-intervention group was 65.35 years ($SD = 10.617$) and was 64.47 years ($SD = 9.310$) in the post-intervention
group; these two groups were not statistically different for age \((t = .499, p = .327)\). The majority of participants in both groups were male, pre-intervention \((n = 51, 78.5\%)\) and post-intervention \((n = 52, 83.9\%)\). The pre intervention group had slightly more women \((n = 14, 21.5\%)\) than the post-intervention group \((n = 10, 16.1\%)\). The gender groups did not differ statistically \((X^2(1) = .606, p = .436)\). For race the pre-intervention group included 61 Caucasians \((93.8\%)\), one Black \((1.5\%)\), two Hispanics \((3.2\%)\), and one who indicated other race \((1.5\%)\), while the post-intervention group included \((n = 58, 93.5\%)\) Caucasian, \((n = 2, 3.1\%)\) Black \((n = 2, 3.2\%)\) Hispanic, and \((n = 1, 1.5\%)\) other race the two groups did not differ significantly on race \((X^2(3) = 1.339, p = .720)\). The LOS for the pre-intervention group was 7.22 days \((SD = 5.492)\) and was not significantly greater than the post-intervention group at 6.06 \((SD = 2.709)\) \((t = 1.952, p = .015)\). The majority of LOS days was between four and seven days.

There were 40 urgent cases \((61.5\%)\) in the pre-intervention group compared to 35 \((56.5\%)\) in the post-intervention group. The pre-intervention group had 25 \((38.5\%)\) elective cases while the post-intervention group also had 25 \((40.3\%)\) elective cases. There were no emergent cases in the pre-intervention group while the post-intervention group had two \((3.2\%)\). There were 20 \((30.8\%)\) participants that never smoked in the pre-intervention group and 13 \((21\%)\) in the post-intervention group. There were 30 \((46.2\%)\) smokers who had quit in the pre-intervention group while there were 32 \((51.6\%)\) in the post intervention group. Current smokers were 15 \((23.1\%)\) in the pre-intervention group and there were 17 \((53.1\%)\) in the post-intervention group. The most common secondary diagnoses were combinations of HTN and DLP as well as a combination of HTN, DLP, and DM. Each group had the same combination ratio with the pre-intervention group containing 28 \((43.1\%)\) and the post-intervention group containing 26 \((41.9\%)\).
Table 4.1

**Characteristics of Groups.**

<table>
<thead>
<tr>
<th>Characteristics of Group</th>
<th>Pre-intervention Group</th>
<th>Post-intervention Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>65.35</td>
<td>10.617</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>51</td>
<td>78.5</td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>21.5</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>61</td>
<td>93.8</td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2</td>
<td>3.2</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Length of Stay</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of Stay</td>
<td>7.55</td>
<td>5.492</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>25</td>
<td>38.5</td>
</tr>
<tr>
<td>Urgent</td>
<td>40</td>
<td>61.5</td>
</tr>
<tr>
<td>Emergent</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Smoker</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>20</td>
<td>30.8</td>
</tr>
<tr>
<td>Quit</td>
<td>30</td>
<td>46.2</td>
</tr>
<tr>
<td>Current</td>
<td>15</td>
<td>23.1</td>
</tr>
<tr>
<td><strong>Secondary diagnosis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTN + DLP</td>
<td>28</td>
<td>43.1</td>
</tr>
<tr>
<td>HTN + DLP + DM,</td>
<td>28</td>
<td>43.1</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>15.0</td>
</tr>
</tbody>
</table>

**Best practice measures.** The compliance rate for prescribing cardio-protective medications at time of discharge was broken down by drug class (see Table 4.2). A chi-square test of independence was calculated comparing the prescription rate of cardio-protective medications at discharge in the pre-intervention group and the post intervention group. No significant differences were found between the pre- and post-interventions groups for use of BB ($X^2(1) = 2.884, p = .089$) and statins ($X^2(1) = .148, p = .701$). Thus there were no statistical difference in the use of these cardio protective
medications; however, there were statistical differences between pre- and post
intervention groups for the use of aspirin ($X^2(1) = 3.877, p = .049$) and ACEI/ARB ($X^2(2)$
$= 24.419, p = .000$).

**Table 4.2**

*Best Practice Measures of Groups*

<table>
<thead>
<tr>
<th>Best Practice Measure</th>
<th>Pre-intervention Group</th>
<th>Post-intervention Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$%$</td>
</tr>
<tr>
<td>Cardio protective medications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspirin</td>
<td>61</td>
<td>93.8</td>
</tr>
<tr>
<td>BB</td>
<td>62</td>
<td>95.4</td>
</tr>
<tr>
<td>Statin</td>
<td>62</td>
<td>95.4</td>
</tr>
<tr>
<td>ACEI/ARB</td>
<td>46</td>
<td>85.4</td>
</tr>
<tr>
<td>Discharge planning referrals</td>
<td>57</td>
<td>87.7</td>
</tr>
<tr>
<td>Home health care referrals</td>
<td>53</td>
<td>81.5</td>
</tr>
<tr>
<td>Cardiac rehabilitation referrals</td>
<td>55</td>
<td>84.6</td>
</tr>
<tr>
<td>Standardized education booklet</td>
<td>14</td>
<td>26.4</td>
</tr>
<tr>
<td>Cardiac diet education</td>
<td>43</td>
<td>66.2</td>
</tr>
<tr>
<td>Smoking cessation education</td>
<td>25</td>
<td>38.5</td>
</tr>
<tr>
<td>Follow up within 14 days</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

A chi-square test of independence was calculated comparing the frequency of
referrals to care-management, homecare and cardiac rehabilitation in the pre- and post-
intervention groups (see Table 4.2). Statistical differences were found when comparing
the two groups for referrals to care management ($X^2(1) = 8.144, p = .004$), homecare ($X^2$
$(1) = 13.901, p = .000$), and cardiac rehabilitation ($X^2(1) = 10.194, p = .001$).
A standardized cardiac surgery education booklet was revised for this EBP project to deliver current evidence-based education to patients. A new video education system was approved just prior to the beginning of this EBP project, this video was not available for use in the pre-intervention group but was available for the post-intervention group (see Table 4.2). A chi-square test of independence was calculated comparing the frequency of each of these interventions in the pre- and post-intervention groups, rate of use of the cardiac surgery education booklet education ($\chi^2 (1) = 69.034, p = .000$) specific to cardiac diet ($\chi^2 (1) = 25.014, p = .000$) and education specific to smoking cessation ($\chi^2 (1) = 54.998, p = .000$) all increased significantly in the post intervention group.

A chi-square test of independence was calculated comparing frequency of the securing of follow-up appointments made within 14 days of discharge in the pre- and post intervention groups. In the pre-intervention group follow up appointments, within 14 days of discharge, were not made. The appointments that were secured at time of discharge were made for four to six weeks after surgery. A significant difference was found when comparing the two groups($\chi^2 (1) = 126.000, p = .000$).

**Changes in Outcomes**

**Statistical testing and significance**

To answer the PICOT question, the rate of readmissions were calculated. The 30-day readmission rate was 16.9% ($n = 11$) for the pre-intervention group. Of these readmissions, one was from fluid over load, three from respiratory issues, two from arrhythmia, two from wound infections, and two for other reasons (see Figure 4.1) The post intervention group had a 4.9% ($n = 3$) 30-day readmission rate with one from fluid overload, one from chest pain, and one from a respiratory issue (see Figure 4.2). One of the 30-day readmissions was a patient that left the hospital against medical advice and returned to the hospital several hours after leaving. Another was admitted to the hospital
directly from the post-operative office visit when the provider identified a hydro-
pneumothorax. The third 30-day readmission was on the 27th day after discharge, who
presented with chest pain do to an MI. In the pre-intervention group, 91% (n = 10) of its
readmitted participants had readmissions that took place less than 14 days from
discharge. The post-intervention group had 66% (n = 3) of its readmitted participant
readmitted within 14 days of discharge (see Figure 4.3). A chi-square test of
independence was calculated comparing the frequency of 30-day readmissions in the
pre-and post-intervention groups. A significant decrease in readmissions was found in
the post-intervention group (p = .000) (see Figure 4.4).

Figure 4.1 Pre-intervention Group Reasons for Readmission
Figure 4.2 Post-intervention Group Reasons for Readmission

Post-intervention Group Reasons for Readmission

Figure 4.3 Days from Discharge to Readmission

Days from Discharge to Readmission

- Pre-intervention group
- Post-intervention group

2

1 1 1
1 1 1
Figure 4.4 30-day Readmission Rates

30-day Readmission Rates

16.9%

4.8%
CHAPTER 5

DISCUSSION

The purpose of this EBP project was to determine if the implementation and adherence to best practice methods would decrease 30-day readmission rates in adult patients following CABG surgery. Best practice methods were determined through critique and synthesis of current evidence-based literature. Significant evidence provided recommendations for practice change. Interventions to decrease 30-day readmissions included use of cardio protective medications, comprehensive discharge planning, follow-up appointments within 14 days of discharge to ensure early post-operative surveillance, and use of standardized patient education. This EBP project was implemented utilizing a convenience group of participants from a cardiothoracic surgery department in Southwestern Michigan. The outcomes of this EBP project demonstrated that through implementation and adherence to the recommended best practice methods, 30-day readmissions were significantly reduced. The findings and their implications will be discussed in this chapter.

Explanation of Findings

Descriptive statistics were used to show or summarize data in a meaningful way such that patterns might emerge. The data collected included sample size, group characteristics, interventions and 30-day readmission rates. Characteristic data were collected from the two groups to compare for differences. Significant differences between groups could impact the application of the outcomes.

**Group characteristics.** The sample size for the pre-intervention and post intervention group was similar. The mean age of the pre-intervention group \((M = 65.35)\) and the post-intervention group \((M = 64.47)\) were similar; however, the mean age found in the literature was slightly higher at 67.8 years of age (D'Agostino et al., 1999; Fasken
et al., 2001; Frederick et al., 2010; Hannan et al., 2003; Manier et al., 2013; Price et al., 2013; Tsai et al, 2013). The gender make up of the two groups was not significantly different with 51 men and 14 women in the pre-intervention group compared to 52 men and 10 women in the post-intervention group. These findings were consistent in the ratio of males to females as was found in the literature (D'Agostino et al., 1999, Fasken et al., 2001, Frederick et al., 2010, Hannan et al., 2003, Manier et al., 2013, Price et al., 2013).

For race, the groups were similar and nearly all were Caucasian. These statistics are consistent with the current literature. Fasken et al. (2001) reported that ethnically diverse populations are less likely than Caucasian to undergo CABG surgery which is largely due to socioeconomic factors.

The LOS was 7.22 days in the pre-intervention group and 6.06 in the post-intervention group. Although this comparison was not found to be significantly different when analyzed, the literature indicates that even one additional day in the length of stay can increase the risks of 30-day readmissions (D'Agostino et al., 1999; Hannan et al., 2003; Manier et al., 2013) Fasken et al. (2001) reported that having a LOS >7 days had a 52% higher risk of readmission than patients having a LOS <5 days. The groups were similar in regards to timing of the surgery. There were more urgent cases than elective cases in both groups. In the post-intervention group, there were two emergent cases. A systemic review by Fasken et al., (2001) listed urgent/emergent surgeries as a risk factor for readmission following cardiac surgery. Patients smoking status was similar between groups. There were fewer patients that had never smoked in the post-intervention group but almost identical statistics in the two groups when measuring those that had quit and those currently smoking. The literature supports that quitting smoking following CABG surgery significantly improves post operative outcomes (Arora et al. 2006). DM was equally prevalent in both the pre and post-intervention groups. DM is one of the leading co-morbidites linked to readmissions following CABG surgery (Arora et al., 2006, Fasken
et al., 2001, Hannan et al., 2003, Hannan et al., 2011, Tsai et al., 2013). The complication most often associated with diabetes is wound infections. Wound infections are in the top 3 reasons for 30-day hospital readmissions following CABG surgery (AHA, 2013).

**Best practice interventions.** Prescribing cardio protective medications at discharge varied between pre and post intervention. BB and statin drugs were prescribed more often than aspirin and ACEI/ARB. The pre-intervention group had less consistent use of aspirin (93.8%), BB (95.4%), statin (95.4%), and ACEI/ARB (84%). The AHA (2013) guidelines recommend that all patients following CABG surgery be prescribed aspirin, BB, statin, and ACEI/ARB medications at discharge unless contraindicated. These prescribing patterns were not consistent with the 2011 ACCF/AHA guidelines (AHA, 2013). This variation in the prescribing of cardio protective medications at discharge can be attributed to several factors. First, there was a pool of providers who were discharging patients during the pre-intervention group. The staff were subcontracted, some worked week-ends and some worked days. None of the staff attended the cardiac division meetings and they were not informed about post-operative outcomes. Unfortunately, there was no initiative in place to keep these providers current on the evidence-based recommendation for patients following CABG surgery. Secondly, there was no method in place to ensure that these medications were being consistently initiated during the hospital stay or prescribed at time of discharge, therefore prescribing of some of these medications were simply overlooked. Lastly, ACEI/ARB recommendations were not consistent. "ACEI/ARB should be initiated and continued indefinitely in patients following CABG who have a LVEF < 40%, HTN, DM, or CKD, unless contraindicated. It is reasonable to initiate ACEI/ARB and continued it indefinitely in patients following CABG who are considered low risk (normal LVEF") (AHA 2013, p.e681). This variation could account for the lower rate of compliance in the pre-
intervention group as it requires increased knowledge of the patients’ medical history. This variation also leaves the recommendation open for interpretation.

In the post-intervention group adherence to prescribing cardio protective medications at discharge was 100% in all recommended medication. This improvement can be attributed to having providers that were directly associated with the cardiothoracic surgery program. These providers saw the patient from consult, through hospitalization, discharge, to follow-up in the office thus enhancing continuity of care and knowledge of the patient's medical history. These providers attended regular quality meetings and were held accountable for the outcomes of the program. Integration of best practice recommendations into order sets and the development of a discharge check eliminated provider oversight in the prescribing of these medications.

There were also significant differences found between the two groups in regards to referrals to care management for discharge planning. The pre-intervention group had a referral rate of 87.7% compared to the post-intervention group which was 100%. From these referrals came subsequent referrals to homecare or skilled nursing inpatient facilities for rehabilitation. Discharge planning was highly recommended in the literature to provide continuity of care transitions and provide early post operative surveillance (D'Agostino et al., 1999; Fasken et al., 2001; Fredericks & DeSilva, 2010; Hannan et al, 2011; Manier et al., 2013; Theobald & McMurray, 2003). Therefore, new practices were put into place to ensure referrals were consistently made to the care management team. Order sets were written to include referral orders, as was a check list reminder for providers to be used at time of discharge which eliminated missed referral opportunities.

Referrals to cardiac rehabilitation were at 84.6% in the pre-intervention group. This was found to be suboptimal based on current recommendations. The 2011 ACCF/AHA guidelines recommend all eligible patients after CABG attend a cardiac
rehabilitation education and exercise program (AHA, 2013). Again changes were made in order sets and in the form of a provider check list to ensure that referrals were made. Due to these changes the referral rate of cardiac rehabilitation was 100% in the post intervention group.

Consistent standardized patient education is vital to the recovery of patients after CABG surgery (Frederick et al., 2009). In the pre-intervention group only 26.4% of patients had documentation to support the use of standardized education materials. Rates were slightly higher when teaching specific to cardiac diet and smoking cessation analyzed on an individual bases. Again these findings were well below the literature recommendations. All smokers should receive in-hospital education on smoking cessation (AHA 2103). Because of these strong recommendations several new practices were put into place. A new cardiac surgery education booklet was developed which provides education that takes the patient through the continuum of their CABG surgical experience. The booklet also includes evidence-based recommendations specific to cardio protective medications, activity restrictions, incision care, daily health monitoring, cardiac diet smoking cessation, and the benefits of cardiac rehabilitation. Staff and provider education was conducted by the PM to introduce these changes and to teach them the importance of providing patients with a comprehensive education individualized to meet their unique needs. The new order sets were written to include referrals to cardiac rehabilitation and the check list also prompted the provider to make certain that the patient was referred. Based on these changes the rates for providing the cardiac surgery education booklet and cardiac rehabilitation referrals was found to be 100% following EBP implementation.

During the implementation of this EBP project, a video education system was introduced. The new system was reviewed and approved for use by the PM in the planning phase of this EBP project. The rational for this was to provide a multimedia
approach to education. During the course of this project, the documentation to support compliance of use of this system was poor. Several issues were found when rationale for this result was assessed. First, many of the staff said they didn't really know how to use the system. Others said they used it but didn't document specifically to reflect that the video was provided. Others stated that they had offered it to the patients but the patients declined as they thought it might be too graphic. This finding supports a need for continued staff education on both use of the video system and proper documentation.

**Outcomes.** The outcome being evaluated in this EBP project was 30-day readmissions following CABG surgery and if those readmissions were decreased with the implementation and adherence to best practice measures. A chi-squared test of independence was calculated comparing the two readmission groups and to find trends that could help in decreasing 30-day readmission rates.

Implementation of the EBP changes, resulted in significantly lower 30-day readmission rates in the post-intervention group. Validity of this finding was supported by the fact that the pre-intervention group and the post-intervention group did not differ significantly on nearly all characteristics. The pre-intervention readmitted patients were predominately Caucasian, their mean age was 63.9 years, they were equally distributed men and women, most of the cases were done urgently, they had multiple co-morbidities, half of which were DM. The majority were either current or previous smokers (75%). In the post-intervention group, the characteristics were similar for race, age, gender, timing of surgery, smoking history, and co-morbidities. The only significant difference in characteristics of the two groups was the LOS. The average LOS for the pre-intervention group was 7.09 days compared to 6.33 days in the post-intervention group. Of the 11 readmissions in the pre-intervention group, there were three patients that had LOS at seven days and three with LOS 10-30 days. Data supports that patients
who have a prolonged hospital stay become more debilitated and have a higher readmission rate due to complications (Fasken et al., 2001).

Significant differences were found in all of the best practice measures with the exception of prescribing BB and stain at discharge. Use of cardio protective medications, referrals to case management, providing standardized education and securing follow-up appointments within 14 days of discharge all drastically improved. These findings were attributed to the change in practice.

The trends in the studies identify that following CABG surgery, the majority of hospital readmissions occur within the first 14 days after discharge. These readmissions were found to often be preventable (D'Agostino et al., 1999; Fasken et al., 2001; Manier et al., 2013; Price et al., 2014). Based on these recommendations, all follow-up appointments with the surgery provider were arranged at time of discharge and made within 14 days of discharge. Previously, patient follow-up with the surgeon was 30 days after discharge. In the pre-intervention group, the majority of the patients (90%) were readmitted within 14 days of discharge and in the post-intervention group (66.6%) of the readmissions took place within the first 14 days after discharge.

Primary reasons for readmissions in both the pre and post-intervention groups varied. There was no one reason that occurred significantly more often than another. The top four reasons for readmissions in both groups was heart failure/fluid overload, arrhythmias, respiratory, or wound. These are the same trends found in the literature (D'Agostino et al., 1999; Fasken et al., 2001; Fredericks & DaSilva, 2010; Hannan et al., 2003; Hanaan et al., 2011; Manier et al., 2013; Price, et al., 2013).

There were no studies available that implemented all of the best practice methods concurrently in an effort to decrease 30-day readmission rates following CABG surgery. This EBP project was developed to determine if adherence to best practices could decrease 30-day readmissions; therefore, all of the current best practice
recommendations were implemented for this project. The literature supported use of cardio protective medications at discharge, referrals to care management, standardized education, and follow up visits within 14 days. The results of this EBP project showed that the pre-intervention group had a 30-day readmission rate of (16.9%) which was much higher than in the post-intervention group rate of (4.8%). The use of these evidence-based recommendations made a significant reduction in 30-day readmission rates following CABG surgery.

**Evaluation of Applicability of the Theoretical Framework**

The Kurt Lewin Change theory was used to help direct the change process. The three step approach worked well with the staff and providers during this EBP project. In the first or "unfreezing" stage of this theory, staff and providers were made aware of the organizations data and the upcoming reimbursement changes. This information helped them understand the problem and make them more open to change. In the second stage, "transition" support, training and coaching were provided to help staff and providers implement the change. In the final stage, "re-freezing", reinforcement and commending were done for utilizing a new practice. Staff took ownership in the change. Lewin's theory provided framework to change practice patterns.

The strength of this theory was that it promoted transparency to encourage openness and understanding of the problem. It supported ongoing education and encouraged feedback and re-evaluation (Kritsonis, 2005).

The weakness with this theory was that some may have believed that the "re-freezing" phase was a permanent one with no option of further change. However when Lewin wrote his theory he suggested that re-evaluation dates be added into the original plan to encourage ongoing evaluation (Kritsonis, 2005). Therefore, following the EBP project cardiac surgery division meetings will occur monthly to allow for re-evaluation and ongoing change needs.
Applicability of the EBP Framework

The Iowa Model of Evidence-Based Practice served as the model for this EBP project. This model was a good fit for this project because it provided several steps which helped identify problems, promote development of solutions and provide ongoing feedback. The seven steps of the Iowa Model were used to guide clinical decision making and to implement EBP change. The model provided an algorithm to follow though the EBP process (Doody & Doody, 2011). First the problem of high readmission rates was identified. Once management was made aware of the depth and repercussions of the problem a team was formed to develop a solution to the problem. Next, evidence was gathered and graded to find causes and solutions for the problem. Based on the evidence a new EBP standard was developed and implemented.

Evaluation of the change and its outcomes is an ongoing process.

The strength of the Iowa model was that it incorporated a team approach (Melnyk & Fineout-Overholt, 2005). So often changes are made at a management level and those that are expected to carry out the change either don't understand the need for the change and/or are not on board with it. By using representatives from nursing, care managers, operating room staff, data collectors, providers, and physicians, everyone's perspective was brought to the table. This involvement provided knowledge and acceptance from all the stakeholders involved. This involvement also made for a smooth implementation process because staff knew the rationale behind what they were doing, and they were more engaged in promoting change. Another strength would be the ongoing evaluation process. By continually evaluating the process and including feedback loops, new opportunities in the change process were addressed. By seeking feedback from staff they felt more empowered and desired to be a part of the ongoing process.
The largest weakness to The Iowa model were time limitations in the workplace. In some cases the proposed change was viewed as constraints on time or seen as added work. From the perspective of the PM, there were many extra hours spent doing staff education to help them understand the problem and a need for a change. Additional time was spent explaining expectations of implementing new practices. Staff need to have time to learn and understand evidence-based practice. Another weakness was that this model required strong leadership to promote and support change (Melnyk & Fineout-Overholt, 2005). Expectations need to be made clear and staff need to be held accountable for their actions. The momentum needs to be kept high during the change process so complacency does not occur.

During the course of implementing the EBP project the organization in which the project took place converted from paper medical records to EMR. This conversion required that all the new order sets and the discharge check list, which had just been written for this project, be re-written in the computer system. This change took countless meetings and revisions until the EMR order sets and check list were completed. These changes also required additional education sessions for use by the staff and providers. Once these were up and running some changes still had to be made. Mechanisms were built into the system that wouldn’t allow the provider to move to the next order screen until the EBP measures were ordered or rationale was provided for not placing the order. We also were able to prevent the discharge orders from being signed until each area of the check list had been addressed. Ultimately the EMR was found to be well worth the time and efforts.

**Strengths of the EBP Project**

From the beginning, leadership in the organization understood the magnitude of the escalating readmission rates. When the PM provided research and appraisal of the literature, leadership gained a better understanding of the consequences of not taking
action and what changes required implementation. The leaders of the organization were supportive and allowed the PM to direct the project. A collaborative, team with each member having input, promoted a multidisciplinary approach to the solving the problem.

Implementation of the EBP project was not met by any significant challenges. The providers were willing to make changes in their practice in an effort to improve patient outcomes. The physicians encouraged the PM to implement changes to practice. One of the physicians offered not only his input, he provided educational classes for staff to help them better understand the rationale behind the changes in practice. Once the staff understood the problems associated with high readmission rates as well as the foundation for the EBP project, they were willing and compliant with making changes.

Once it was learned that the EMR system would be initiated during the EBP project, the physician computer adviser was willing to meet with the team during various intervals of the EBP process. He and his team assisted in development of the computer-based order sets, check list, and the computerized discharge process. The recommendations for built in mechanisms which prevent the provider from not addressing best-practice measures were so well received that these mechanisms have been written into other order sets such as, CVA, HF and joint replacement.

Having two advanced practice providers in the cardiac surgery group was a key piece of the success of this EBP project. One of the physicians initially was not supportive of pulling one of the providers out of the hospital to enable the provider follow-up clinic time. These follow-up visits are not billable and therefore were thought to be a waste of resources. During the follow up visit, the providers were able to give additional education, offer reassurance, and identify early warning signs of post-operative complication. During the EBP project, all but one of the identified complications were handled on an out-patient bases and readmission differed. One of the three readmissions in the post-intervention group was actually initiated during a follow-up visit.
and was determined an unpreventable re-admission as the patient required additional surgery.

The results of the EBP project included decreased 30-day readmission rates and improved outcomes for patients following CABG surgery. Because of these results the cardiac surgery department, within the organization where the EBP project was carried out, has adopted all of the interventions implemented in this EBP project.

**Weaknesses of the EBP Project**

One of the limitations of this EBP project was that it was restricted to one practice. Though both the pre-intervention and the post-intervention group characteristics were not significantly different, they represented a Caucasian population from a rural area. It is unclear if the outcomes would have been the same in a different setting with a different population. To determine this, an additional project would need to take place to include an urban, multiracial population.

Time constraints and number of participants were also limitations in this EBP project. More time would have provided a larger population. This would also provide more time to assess the role that co-morbidities play in readmissions rates.

**Implications for the Future**

In agreement with the Affordable Care Act, CMS legislation mandates financial penalties for high 30-day readmission rates. Although penalties currently apply to only certain diagnoses, this list has been assured to expand to procedures as well as diagnosis. It is projected that 30-day readmissions following CABG surgery penalties will take effect in 2017 (CMS, 2013). The implementation of this EBP project supports the value of consistent use of best practice methods in the care of patients following CABG surgery.

**Practice.** Healthcare reimbursement is undergoing significant changes. Providers need to be actively involved in the development of techniques to improve
patient outcomes and decrease 30-day hospital readmissions. Focus needs to be placed on evidence-based recommendations. The measures that were found in the literature and supported adoption into practice included the adherence to the prescribing of cardio protective medications at time of discharge. These medications were found to decrease disease progression, improve cardiac function and offer survival benefit following CABG surgery (Arora et al.; 2006, Fillion et al., 2008; Hanaan et al., 2003; Tsai et al., 2013). Standardize patient education given to meet the patients individual education needs supported a better understanding of what to do and what to expect. Referrals to care management for discharge planning improved transitions from hospital to home. Follow-up appointments within the first 14 days after surgery provided early post-operative surveillance. The combination of all of these best practice recommendations, done collectively, has not been well studied. Future EBP projects with this combination of interventions is recommended.

The NP can play a vital role in these best practice interventions. The NP has the knowledge and authority to consistently prescribe the appropriate cardio protective medications. Education is a strong skill possessed by the NP and can easily be delivered in a manner that is individualized to the patients needs. The NP is a collaborator and can facilitate multidisciplinary referrals through good communication skills. Lastly, the most significant change made between the pre- and post-intervention groups was implementing an NP led outpatient clinic to see patients within 14 days of discharge. An NP is able to assess the patient, order additional testing when required, make diagnoses, develop a treatment plan, and prescribe. The use of a NP is more affordable than that of a physician. For these reasons the NP is a perfect fit to run an out-patient clinic.

**Theory.** In today's shifting healthcare environment, implementing a new change in practice can be met with resistance. This resistance can be caused by many factors
such as apprehension about the unknown or time constraints due to heavy workload. Lewin's change theory was an ideal fit to guide the implementation of this EBP project. This theory helped promote commitment from the providers and staff by involving them through the continuum of the change process. The role of an APN as the director of the change proved to be a good choice. The APN was able to see from both the perspective of a nurse and provider. There was an understanding that often changes are made on a higher level without seeking input from the frontline staff. Having this viewpoint was helpful in identifying restraining forces to implementing new practices. By providing transparency through education, driving forces were created to promote change. Lewin's model can provide a structured approach to facilitate evidence-based change based on nursing research. There are many theories available to nursing and APN practice, these theories should be evaluated to determine their applicability to the project and those involved in it.

Research. The findings of this EBP project suggest that there are key elements of care that are needed to improve outcomes and decrease readmissions following CABG surgery. The effect of the implementation of these evidence-based changes heightened awareness from hospital administration about both EBP and the NP role. The hospital administration has not only adopted these recommendations into practice but has requested that the recommendations provided in this EBP project be shared with other practices within the hospital in an effort to decrease readmissions house wide.

The cardiac surgery team is currently meeting to decide on the next phase of this project. Recommendations have been made to further evaluate disease processes and post-operative complications, such as atrial fibrillation and their role in 30-day readmissions. Another step that could be taken with this EBP project would be to perform regression testing to determine if any one of the interventions made a larger impact on the outcome than another. The implementation of all of the interventions use
in this EBP project have not been studied in whole. Larger scale research is needed to further test the package used in this EBP project. The implementation of this EBP project has led to a paradigm shift and opened the door to future change.

**Education.** Studies have shown that standardized education, delivered to patients in a manner that is suited for them, given in intervals is the most effective (Fasken et al., 2001; Fredericks et al. 2009; Hanaan et al., 2011; Manier et al. 2013; Price et al. 2013). This EBP project not only supported these recommendation for patients but it also provided insight into education of staff and providers. One of the issues discovered during this project, that impeded proper patient education, was lack of knowledge on the part of the staff who were expected to educate the patients. When these discoveries were made, focus was placed on better equipping staff. Education classes were held by both the PM and one of the surgeons in the practice. Once learning took place the staff had a better understanding of the rationale behind the best-practice recommendations. Providing additional education on the teaching materials also made the patient education process much smoother. Overall this EBP project led to better education of staff which led to improved patient education.

**Conclusion**

In summary, the findings in this EBP project correlated with the current literature (AHA, 2013, Arora et al., 2006; D'Agostino et al., 1999; Fasken et al., 2001; Fillion et al. 2008; Fredericks & DaSilva, 2010; Hannan et al., 2003; Hanaan et al., 2011; Manier et al., 2013; Price, et al., 2013; Theobald et al, 2003; Tsai et al., 2013). Implementation of best practices for patients following CABG which included prescribing cardio protective medications at discharge, referral to discharge planning to ensure smooth post-hospitalization transitions, standardized patient education, and follow-up visits within 14 days. These best practices led to significant decreases in 30-day readmission rates following CABG surgery. The implementation of this EBP project supports the value of
consistent use of best practice methods in the care of patients following CABG surgery. These evidence-based recommendations have been adopted and put into practice in the organization where the EBP project took place. The EBP project PICOT question was successfully answered and has prompted further studies.
REFERENCES


Symposium conducted at the American Association for Thoracic Surgery, Minneapolis, MN.


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BIOGRAPHICAL MATERIAL

Ms. Kline graduated from Kalamazoo Valley Community College with an Associate Degree in Applied Science in nursing in 1991. She began her nursing career in cardiothoracic surgery. Ms. Kline left her cardiothoracic surgery position when called upon to help develop a cardiovascular program for the hospital's homecare agency. During this time, Linda earned 3 Superstar Awards for her excellence in patient care. In 2004, she received the Outstanding Achievements Merit Award for her consistent high quality care. Linda received her BSN from Goshen College in 2005 and was inducted into Sigma Theta Tau. Following graduation, she assumed a supervisory role functioning as cardiac and educator and was responsible for fiscal oversight of the cardiac program. Linda became certified as an OASIS Specialist which enhanced delivery of patient care within the agency. Through her participation in a telehealth study and her role in development of the telehealth program, Linda earned the 2007 Service Excellence Award from the hospital for her work in reducing re-hospitalization rates and improving outcomes in the cardiac patient population. Linda was guest lecturer in informatics for the Western Michigan University BSN program. She returned to Goshen College, earning her MSN with certification through AANP as a Family Nurse Practitioner in 2010. After completion of her FNP certification, she assumed the position of Clinical Nurse Specialist and Nurse Practitioner in the Heart Failure Program. She earned her Heart Failure Nurse certification from the AAHFN in 2011. In 2012 Linda's efforts earned her the Service Excellence Award and the hospital the Gold Seal of Approval for Heart care by the Joint Commission. Stemming from her work in the Heart Failure program she was asked to return to the cardiothoracic surgery team as a Nurse Practitioner and assist in reducing re-hospitalization rate and outcome improvement efforts. Linda's efforts have contributed to her institution being listed as top 15 heart surgery hospitals by Consumer reports and top 50 heart hospitals by Health grades. She is currently attending Valporaiso University to earn a DNP in spring of 2015.
ACRONYM LIST

ACA: Affordable Care Act
ACEI: angiotensin converting enzyme
AGREE: appraisal of guidelines for research and evaluation
AHA: American Heart Association
AMI: acute myocardial infarction
APN: advanced practice nurse
ARB: angiotensin II receptor blockers
BB: betablocker
BMI: body mass index
CABG: coronary artery bypass graft
CAD: coronary artery disease
CASP: critical appraisal skills programme
CDC: Centers for Disease Control
CHF: congestive heart failure
CMS: Center for Medicare and Medicaid Services
COPD: chronic obstructive pulmonary disease
CVA: cerebrovascular accident
DLP: dyslipidemia
DM: diabetes mellitus
EBP: evidence based practice
EMR: electronic medical record
ES: effect size
HF: heart failure
HHS Health and Human Services
HIPPA: Health Insurance Portability and Accountability Act
THE EFFECTS OF IMPLEMENTING BEST PRACTICES

HRPR: Hospital Readmission Reduction Program

HTN: hypertension

ICD-10: The International Classification of Diseases, 10th Revision

IRB: institutional review board

JBI: Joanna Briggs Institute

LOS: length of stay

LVEF: left ventricular ejection fraction

MI: myocardial infarction

MSTCVS: Michigan Society of Thoracic and Cardiovascular Surgeons

NNT: number needed to treat

NP: nurse practitioner

PASW: Predictive Analytics Software

PM: project manager

PN: pneumonia

SPSS: Statistical Package for the Social Sciences

STS: Society of Thoracic Surgeons

US: United States
Appendix A
Pre-operative Orders

1. Glycemic Management:
   - Use the Perioperative Glycemic Management Clinical Protocol.
   - DO NOT use the Perioperative Glycemic Management Clinical Protocol.
   
2. Admit to Inpatient Cardiac Monitoring Bed:
   - Service of Dr.

3. Consult:
   - Cardiology: Dr.
   - Pulmonary/Critical Care: Dr.
   - Hospitalist: Dr.

4. Allergies:

5. Record:
   - Height________  - Weight________  - BP Right arm________  - BP Left arm________

6. Vital Signs every 8 hours and PRN

7. Activity:
   - Up Ad Lib
   - Bed rest per surgeon's guidelines

8. Diet:
   - Cardiac
   - Diabetic
   - Calorie ADA

9. Labs:
   - CBC  - BMP  - CMP  - PT/INR  - PTT  - Urinalysis and culture and sensitivity if greater than 5 WBC
   - POCS  - Hgb/AIC  - Type & Screen  - Type & Cross

10. Imaging:
    - PA & Lateral CXR, Symptom:
    - Port Upright CXR, Symptom:
    - CT Thorax:
      - With contrast: Indication:
      - w/o contrast: Indication:

PHYSICIAN'S SIGNATURE: ___________________________ DATE/TIME: __________/________/____
ADMIT FOR OPEN HEART SURGERY – PRE-OP ORDERS

11. Studies:
   - [ ] 12 lead EKG
   - [ ] Carotid Dopplers (Pre-op CABG)
   - [ ] GSV mapping and marking
   - [ ] Bedside pulmonary function test
   - [ ] Transesophageal Echocardiogram to be read by 

12. Respiratory:
   - [ ] Incentive spirometer; instructions for use
   - [ ] Nasal cannula O₂ Titrate to SpO₂ greater than or equal to ___%.

13. Pre-op Preparation:
   - [ ] Initiate KAPC Guidelines (Kalamazoo Anesthesia, PC) for pre-anesthesia screening (for 5C and PAS nurses only)
   - [ ] Initiate Pre-op Surgical / Procedural Patient Nursing Protocol (for 5C and PAS nurses only)
   - [ ] NPO after midnight
   - [ ] Brush teeth at bedtime and in the AM pre-op
   - [ ] Hibiclens shower at bedtime and in AM
   - [ ] Hair clipping in pre-op holding
   - [ ] Void on call to OR
   - [ ] Pre-op teaching and video
   - [ ] Consent for: ____________________________

   By Dr. ____________________________

PHARMACY

14. [ ] Aspirin 81 mg by mouth daily. (Discontinue Aspirin 325 mg if ordered previously)

15. Antibiotic:
   - [ ] Cefazolin (Ancef):
     - 2 grams slow IV Push once if less than 120 kg (264 lbs)
     - 3 grams IV Piggyback once if greater than or equal to 120 kg (264 lbs)
     - REPEAT dose once in 4 hours if patient is still in surgery

   IF (box must be checked) [ ] Beta-lactam allergy [ ] Positive MRSA screen [ ] History of MRSA

   [ ] Vancomycin 15 mg/kg IV Piggyback once
     - Pharmacy to round to nearest 250 mg increment (Maximum dose 2000 mg)
   - [ ] DO NOT repeat intra-operatively

PHYSICIAN’S SIGNATURE: ____________________________
DATE/TIME: ____________________________
THE EFFECTS OF IMPLEMENTING BEST PRACTICES

BORGESS
Medical Center

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ADMIT FOR OPEN HEART SURGERY – PRE-OP ORDERS

PHARMACY CONTINUED:

16. CABG Patients: Beta Blocker within 24 hours preceding surgery:
   (hold for SBP less than 100 mmHg; heart rate less than 60 bpm)
   □ See medication reconciliation form (patient is on a Beta Blocker)
   □ If patient is not on a Beta Blocker then give:
     □ Metoprolol (Lopressor) 12.5 mg by mouth twice daily
     □ Metoprolol (Lopressor) 25 mg by mouth twice daily
     □ Other: ___________________________
   □ Beta Blocker therapy contraindicated due to: ___________________________

17. Other Medications: (Please also see Medication Reconciliation Record)
   □ Mupirocin (Bactroban) ointment to both nares twice daily
   □ Nitroglycerin 0.4 mg sublingual every 3 – 5 minutes PRN chest pain.
     □ Call Cardiovascular Surgeon if no relief after 3 tablets.
   □ Acetaminophen (Tylenol) 325 mg by mouth every 3 hours PRN for mild pain.
   □ Docusate (Colace) 100 mg by mouth twice daily.
   □ Zolpidem (Ambien) 5 mg by mouth at bedtime PRN for sleep.
   □ Milk of magnesia 30 mL every 6 hours by mouth PRN for constipation.
   □ Other: ___________________________

   • Discontinue Clopidogrel (Plavix) / Prasugrel (Effient) / Ticagrelor (Brilinta)
   • Discontinue IV Heparin on call to OR
   • Discontinue SQ Heparin, Enoxaparin (Lovenox) at midnight prior to OR
   • Discontinue Dabigatran (Pradaxa) / Rivaroxaban (Xarelto) / Apixaban (Eliquis)

PHYSICIAN’S SIGNATURE: ___________________________   DATE/TIME: ___________________________  9/13
Appendix B

Cardiac Surgery Patient Education

Before Your Surgery
In the Hospital
Going Home
During Your Recovery at Home
Diet and Cardiovascular Disease
Activity
Risk Factor Reduction
Medication
Cardiac Rehabilitation
Additional Resources
Appendix C

Transfer Orders

CV SURGERY TRANSFER ORDERS TO 4N: CARDIAC MONITOR

* Bulleted items are to be initialed on all patients. Boxed items should only be initialed if checked.

1. Surgeon:
   - [ ] Dr. Martin
   - [ ] Dr. Pratt
   - [ ] Other:

2. Diagnosis:

3. Date of Surgery:

4. Cardiologist:
   - [ ]

5. Consult:
   - [ ] Consult Pulmonology
   - [ ] Consult Inpatient Services
   - [ ] Physical Therapy Eval/Tx Adult
   - [ ] Occupational Therapy Eval/Tx Adult
   - [ ] Consult Dietitian Adult
   - [ ] Speech Bedside Swallow Eval/Tx Adult
   - [ ] Case Manager Consult
   - [ ] Consult Cardiac Rehabilitation
   - [ ] Other:

6. CODE STATUS:
   - [ ] Full Resuscitation
   - [ ] No Resuscitation
   - [ ]

7. Activity:
   - [ ] Up ad lib with assist
   - [ ] Up to chair
   - [ ] TID meals
   - [ ] Assist with ambulation in hallway TID and PRN
   - [ ] Shower daily starting today or tomorrow
   - [ ] Keep foot of bed elevated at all times.
   - * Cardiac Monitor

PHYSICIAN'S SIGNATURE

DATE/TIME
CV SURGERY TRANSFER ORDERS TO 4N: CARDIAC MONITOR

8. Diet Order:
   - Regular
   - Cardiac
   - Renal
   - Diabetic (please call ADA)
   - Fluid Restriction: 1500 mL/day

9. Vital Signs:
   - Vital signs every 4 hours
   - Pulse Oximetry recording every shift

10. Intake and Output:
    - Every shift
    - Every 4 hours
    - Daily weights at 0800 (standing)

11. Pulmonary Hygiene:
    - Cough and deep breathing every 1 hour while awake
    - Incentive Spirometer every 1 hour while awake

12. Labs:
    - CBC with Diff + BHA*, BMP in AM
    - Prothrombin Time with INR daily
    - Blood Sugar’s per Diabetes Mellitus Protocol
    - Daily

13. Xrays and Imaging:
    - XR Chest 1 View Portable on:
    - XR Chest 2 Views on:
    - CT Chest w/ Contrast on: (Thoracic Aortic Patients)
    - Echo Transthoracic on:

14. EKG:
    - In AM
    - Every AM times 3 days
CV SURGERY TRANSFER ORDERS TO 4N: CARDIAC MONITOR

15. Medications:

Allergies:
- NKDA
- 

* See Transfer MAR. In addition:

Antiplatelets:
- Aspirin 81 mg orally daily
- Aspirin 325 mg orally daily
- Clopidogrel (Plavix) 75 mg orally daily
- Other:

Lipid Lowering Agent:
- Simvastatin (Zocor) 40 mg orally at bedtime
- Atorvastatin (Lipitor) 20 mg orally at bedtime
- Other:

Beta Blocker:
- Metoprolol (Toprol)
  - 12.5 mg orally BID
  - 25 mg orally BID
  - 
  - Carvedilol (Coreg)
  - 3.125 mg orally BID
  - 6.25 mg orally BID
  - Other:

* NOTE: Hold beta blocker for: systolic blood pressure less than or equal to ______ OR heart rate less than or equal to ______.

ACE Inhibitors
- Lisinopril 5 mg orally daily
- Lisinopril 10 mg orally daily
- Enalapril 5 mg orally daily
- Enalapril 10 mg orally daily
- Other:

Nitrates
- Isosorbide Mononitrate (Imdur) 10 mg orally daily
- Other:

PHYSICIAN'S SIGNATURE    DATE/TIME

9/13
CV SURGERY TRANSFER ORDERS TO 4N: CARDIAC MONITOR

**Antiarhythmics**
- Diltiazem (Cardizem) 30 mg orally every 8 hours
- Amiodarone

**Diuretics**
- Furosemide (Lasix)
- Other:

**Electrolytes**
- Potassium Chloride

**IV:**
- Discontinue Saline lock in 48 hours

**Respiratory Treatments:**
- Albuterol 2.5 mg nebulization every 4 hours, RT may adjust per Bronchial Hygiene Protocol

**DVT Prophylaxis:**
- Implement DVT Prophylaxis Order Set
- Heparin 5000 units sub Q every 8 hours

**Diabetes Management:**
- Continue Insulin Infusion Order Set
- Implement Subcutaneous Insulin Order Set
- Implement Diabetic Mellitus Protocol

**PRN Medications:**

**Antipyretics**
- Acetaminophen 650 mg orally every 4 hours PRN temperature greater than or equal to 38 degrees Celsius
  (maximum of 4000 mg of acetaminophen a day)

**Pain Medications**
- Acetaminophen 650 mg orally every 4 hours PRN mild pain (maximum of 4000 mg of acetaminophen a day)
- Tramadol (Ultram) 50 mg orally every 4 hours mild pain (1-3/10 pain scale) (if Acetaminophen is ineffective)

**Pain Medications Continued:**
- Hydrocodone/Acetaminophen (Norco) 5/325 1 – 2 orally every 4 hours PRN moderate pain (4-6/10 pain scale)
  (maximum of 4000 mg of acetaminophen a day) **OR**
- Hydrocodone/Acetaminophen (Norco) 10/325 1 – 2 orally every 4 hours PRN moderate pain (4-6/10 pain scale)
  (maximum of 4000 mg of acetaminophen a day)
- Morphine 1 – 4 mg IV every 3 hours PRN severe pain (greater than 6/10 pain scale)
THE EFFECTS OF IMPLEMENTING BEST PRACTICES

CV SURGERY TRANSFER ORDERS TO 4N: CARDIAC MONITOR

**Antiemetics/Nausea/Dyspepsia**
- Ondansetron (Zofran) 4 mg IV every 8 hours PRN nausea
- Prochlorperazine 5 mg IV every 6 hours PRN vomiting
- Metoclopramide (Reglan) 10 mg IV every 8 hours PRN nausea
- Milk of Magnesia 30 mL orally daily PRN constipation
- Miralax 17 g orally daily PRN constipation
- Magnesium Citrate 150 mL orally once PRN if no BM by day 3
- Docusate Sodium (Colace) 100 mg orally BID
- Senna 8.6 mg 2 tablets orally BID PRN constipation
- Dulcolax 10 mg suppository rectally PRN constipation
- Matox 10 mL orally every 6 hours PRN dyspepsia

**Insomnia**
- Zolpidem (Ambien) 5 mg orally at bedtime PRN Insomnia

**10. Notify MD or Midlevel IF:**
- Temperature greater than or equal to 101.5 degrees Fahrenheit
- Systolic Blood Pressure greater than ___________ or less than ___________.
- Heart rate greater than ___________.
- Heart rate less than ___________.
- Any significant arrhythmias
- Respiratory rate greater than 30
- Respiratory rate less than 10
- Urinary output less than ___________ mL / shift or no voiding by ___________.
- SpO2 less than ___________.
- Altered mental status
- Respiratory Insufficiency
- Hgb less than 7.0
- Potassium less than 3.5
- INR greater than 3.0
- Blood sugar greater than 352
Appendix D

Discharge Orders

BORJES
Medical Center
CARDIAC SURGERY MD DISCHARGE ORDERS
Discharge Date:

1) Follow up appointment: Surgeon
Primary Care/Cardiologist

2) Diet: □ Low Fat, Low Cholesterol □ ADA, Low Fat, Low Cholesterol
□ 2 Gm Sodium □ 3 Gm sodium

3) Activity: □ Routine post sternotomy □ Other

4) Medications: □ Patient had valve replacement only, medication not applicable
Beta Blocker (Post CABG, Afib prophylaxis): □ Not indicated □ Noted on MedRec
Contraindicated: □ Heart block □ Symptomatic bradycardia □ Symptomatic hypotension □ Reactive Airway Disease
□ Allergy
ACEI/ARB (EF< 40%, post MI, HTN with Diabetes, ACS): □ Not indicated □ Noted on MedRec
OR Contraindicated: □ CKD □ Allergy to BOTH □ Pregnancy □ Hyperkalemia □ Symptomatic hypotension

ASA (Post CABG): □ Not indicated □ Noted on MedRec
OR Contraindicated: □ Allergy □ Bleeding risk □ History PUD

Statin (Post CABG): □ Not indicated □ Noted on MedRec
OR Contraindicated: □ Intolerance □ Liver disease □ Pregnancy □ Elevated serum transaminases

Nitroglycerin: □ Not indicated □ Noted on MedRec

Pain Medications: □ Not indicated □ Noted on MedRec

Coumadin follow-up: □ HCE □ BCG □ Other
Appointment on:

7) No smoking □ Referral □ Provide written materials

8) Cardiac Rehab Phase 2

9) Home Health Nursing Referral and □ PT □ OT □ MSW

10) Labs: ___________________________

Physician Signature ___________________________

While Copy – Chart Yellow Copy – Physician Office
Appendix E

Video Education Library

Design Education Plan for:

Location: [All]  Category: [All]  Title: cardiac

Curriculum  Video  Quiz  Survey

No items found.

Patient Education Plan (Drag items from the top into the patient’s Education plan.)

New Admit Queue
- Patient Safety: Stay Safe While you are in the Hospital
- Pain Management: It’s Your Right
- Advance Directives: Taking Control

Video: Cardiac Rehab: Training Your Heart for Life
Video: Heart Surgery: First Days of Recovery
Video: Heart Surgery: Preparing for Discharge
Video: Leaving the Hospital After Heart Surgery
Video: Heart Surgery: First Days of Your Recovery

Save  Cancel

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