

A RETROSPECTIVE REVIEW OF 30-DAY PATIENT READMISSIONS IN A
SMALL COMMUNITY HOSPITAL TO DETERMINE APPROPRIATE
INTERVENTIONS FOR IMPROVING READMISSION RATES

by

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A professional project submitted in partial fulfillment
of the requirements for the degree

of

Master

of

Nursing

MONTANA STATE UNIVERSITY
Bozeman, Montana

November 2012

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November 2012

ACKNOWLEDGEMENTS

This paper was written in partial conjunction with Matthew Lovejoy, a graduate student in the College of Engineering, Mechanical and Industrial Engineering Department at Montana State University, Bozeman, Montana. Similarities with Lovejoy's unpublished paper, titled Predictive Models for 30-Day Patient Readmissions in a Small Community Hospital dated November 2012, will remain throughout this project due to the interdisciplinary collaboration that took place to enhance the quality and validity of this project. Gratitude is extended to Lovejoy for his ongoing support, collaboration, and time spent on this project to ensure its success.

Bozeman Deaconess Health Services permitted this retrospective analysis. This organization also supplied resources in the form of people, time and computer access. Special thanks to Vickie Groeneweg, CNO for advising on this project and for compiling readmission data, de-identifying and assisting in writing of the application for the Institutional Review Board at MSU. Additional special thanks to Eric Nelson and Julie Kindred from the information systems department.

Dr. Elizabeth Kinion, Dr. Linda Torma, and Dr. David Claudio have also been critical to the success of this project either by serving as a member of this committee or by providing guidance throughout this project. Special thanks to Dr. Elizabeth Kinion for serving as my advisor and for offering her continual collaboration during the analysis and writing phase of this project. Another special thanks to Dr. David Claudio for fostering an interdisciplinary relationship between nursing and industrial engineering to enhance the quality of this project.

TABLE OF CONTENTS

1. INTRODUCTION	1
Background Knowledge.....	1
Local Problem.....	3
Intended Improvement	6
Literature Search.....	8
Study Question.....	11
2. METHODS	13
Ethical Issues	13
Setting	14
Planning the Intervention.....	19
3. RESULTS	24
Planning the Study of the Intervention	24
Outcomes	25
Interpretation.....	26
4. DISCUSSION	28
Summary.....	28
Limitations	29
Conclusion	30
REFERENCES CITED.....	34

LIST OF TABLES

Table	Page
1. Hospital Compare Data.....	6

LIST OF FIGURES

Figure	Page
1. Process Flow Chart	16
2. Five P's Clinical Care Environment Assessment	18

ABSTRACT

Nationally, healthcare is in a state of substantial reformation. Quality and cost effectiveness of care provided, as well as evaluation of patient outcomes have become high priorities for healthcare organizations. Presently, national healthcare initiatives have a strong emphasis on improving quality of patient care through reduction in patient readmissions. Not only are hospital readmissions negatively impacting the quality of life for the patients being readmitted, but they are also costly to healthcare organizations and the federal government. This project is an effort to align practices at Bozeman Deaconess Health Services (BDHS), a small community hospital, to meet the current and upcoming federal regulations created through the Patient Protection and Affordable Care Act (PPACA), which aims to improve patient quality of care through reduced readmissions (Stone & Hoffman, 2010). This legislation mandates decreased reimbursement for services if a facility has high 30-day patient readmissions related to the three core measures of Congestive Heart Failure (CHF), Acute Myocardial Infarction and Pneumonia (PNM). A thorough assessment of the patient population at BDHS took place in the form of a retrospective review of patient readmission data from January 2009 through December 2010. Literature suggests common contributors to patient readmissions are poor communication, patients not following their care instructions, inadequate follow-up care and the location to which patients are discharged (Stone & Hoffman, 2010). Assessing the retrospective patient readmission population data for any trends and patterns, will better allow for appropriate intervention selection based on current available evidence for standards of care that reduce readmission rates. This project proposes policy and care process recommendations to incorporate the standard of care into nursing practice at BDHS in an effort to comply with federal regulations, decrease risk for financial penalties and most importantly to improve the quality of patient life by reducing 30-day readmission rates.

CHAPTER ONE

INTRODUCTION

Background Knowledge

Reducing healthcare costs and improving the quality of care has recently been on the agendas of multiple government and private sector advisory board meetings. The Institute of Medicine (IOM) has published multiple reports calling for improved quality of patient care. *To err is human* was published by the IOM in 1999, revealing statistics on medical errors and the lives they have cost this country. From 1999 forward, healthcare providers and administrators have not had the luxury of pushing these issues under the rug. Providers and administrators have been charged with the enormous task of improving the delivery of care to ensure it is cost effective, safe and evidence based.

Financial health is crucial for organizations wanting to improve patient care delivery. In order for healthcare costs to enhance and not inhibit progress for improving the quality of care, there must be an understanding that either overall healthcare costs will increase or expenditures will need to decrease (Pappas, 2009). Pappas (2009) explains that healthcare facilities are reimbursed by three major payers which include insurance companies, employers, and the government. Of these three, she states that the government makes up the largest percentage, being reported at 46 % (Pappas, 2009). Pappas (2009) also informs readers that it is the hospitals who receive the largest percentage of healthcare payments from the Centers for Medicare and Medicaid Services (CMS).

President Obama signed into law, in March of 2010, comprehensive health care reform legislation, which is referred to as the Patient Protection and Affordable Care Act (PPACA), as amended by the Health Care and Education Reconciliation Act (HCERA) (Stone & Hoffman, 2010). This legislation contains a number of provisions that change Medicare reimbursement in an effort to cut costs for the federal government. Among those provisions that change Medicare reimbursement is the reduction in overall costs associated with high readmission rates for the three core measures, which are acute myocardial infarction (AMI), pneumonia (PNM) and heart failure or congestive heart failure (CHF).

Financial health and quality care are intricately linked (Penner, 2004). Without quality care being delivered, according to evidence based standards to promote the best patient outcomes, healthcare costs will continue to skyrocket. If the healthcare organizations follow the PPACA and focus on performance improvement and effective resource management, by creating systems that promote desirable patient outcomes, the healthcare system will be able to provide quality care to the members of its community and will in turn reduce the burden of its costs as well.

CHF is one of three core measures being monitored for readmissions through the PPACA that accounts for the most expensive healthcare costs. According to the Agency for Healthcare Research and Quality (AHRQ) (2011) CHF creates a substantial economic burden on this country. In 2006 it was estimated that costs, including managing, admitting and readmitting patients with CHF, totaled \$23 billion for hospitals alone (Anderson et al., 2006). CHF is not only a substantial economic burden, it is also the

leading cause of hospitalization among older adults. The AHRQ (2011) reports that almost one-third of CHF patients are readmitted within 30-days after having been discharged. The progressive nature of CHF often results in adverse outcomes for patients, decreasing their quality of life and increasing morbidity and mortality rates.

Although financial incentives may be driving many of the changes associated with managing the patient with CHF, it is important to keep in mind the true reason why it is critical to prevent and manage CHF, which is the need to promote health and wellbeing in local communities. With 4.8 million Americans being currently affected by CHF and 400,000 new-onset cases per year, decreasing this prevalence will help to increase community health and decrease morbidity and mortality associated with this condition (Wheeler & Plowfield, 2004). According to Healthy People 2020 (2012), heart disease is the leading cause of death in the United States. To reduce the prevalence and increase the management of patients with CHF, through the introduction of patient population specific interventions, will likely result in a reduction of not only mortality associated with this disease but will also likely reduce the 30-day readmission rates at a small community hospital.

Local Problem

Bozeman is a small rural community located in the southwestern region of Montana. This community's healthcare needs are currently met by the not-for-profit Bozeman Deaconess Health Services (BDHS), the only non-critical-access acute care hospital for almost 100 miles. BDHS has a licensed bed-size of less than 100. Bozeman is located within Gallatin County. Bozeman's population in 2010 was 37,280, which was a

35.5% increase in the total population since 2000 (City-Data, 2012). Median household income for Gallatin county residents in 2009 was \$38,507, with a median resident age of 27.2 years (City-Data, 2012). Primarily, Gallatin County is comprised of a non-Hispanic white population reported at 91.8% in 2009 (City-Data, 2012).

Gallatin County's mortality rate associated with heart disease is 96.3 per 100,000 (Overview of Nationwide Inpatient Sample, 2012). When compared with the state average of 198 per 100,000, it is a little less than half that of the Montana state average. After reading this information, one might conclude that Gallatin County is doing something right, but after further investigation, it is noted that people aged 65 and older comprises only 7.9% of males and 9.6% of females in Gallatin County compared to the state percentages of 12.8% and 15.6% respectively. The remaining population is less than 65 years of age and therefore is at a lower risk for having CHF and heart disease (Overview of Nationwide Inpatient Sample, 2012).

More information is required to further determine if a need for improved care of patients with CHF is necessary. The Department of Public Health and Human Services (DPHHS) website provides the Montana Hospital Discharge Data System (MHDDS) from the Office of Epidemiology and Scientific Support (DPHHS, 2012). Data includes measures from 2000-2009. Identified on this website are fourteen prevention quality indicators (PQI), which are defined as a set of measures that can be used with hospital inpatient discharge data to identify quality of care for ambulatory care-sensitive conditions. CHF is one of the fourteen PQI's. The MHDDS receives its information from the Montana Hospital Association (MHA) voluntary hospital reporting system. Using the

AHRQ's calculation algorithm to compute hospital admission rates MHDDS concluded from the Montana hospital data that the total charges for adult PQI's in 2009 were \$139 million; 27% of these costs were billed to private insurance companies and the other 63% of costs were billed to government programs like CMS. The most expensive conditions included bacterial pneumonia, low birth weights, CHF (\$22.9 million) and chronic obstructive pulmonary disease (DPHHS, 2012).

Regardless of the county's lower rate for mortality associated with heart disease, in Gallatin County, it is known that CHF is among the most expensive conditions paid for by insurance and government organizations. This information alone should help to increase the urgency and need for reducing the prevalence of CHF and improving the management of CHF in this community. Other information that helps to determine the importance of improving management of patients with CHF is the data that shows the prevalence of modifiable risk factors for developing this condition. According to Healthy People 2020 (2012), modifiable risk factors for developing CHF include hypertension, hyperlipidemia, smoking tobacco, poor diet, inadequate exercise, and being overweight or obese. In Gallatin county 75.8% consume inadequate fruit and vegetables, 13.2% report taking zero leisure time for physical activity, 11.6% are obese, 32.0% are overweight and 14.8% smoke tobacco. The epidemiological data supports a need for improving the management of CHF due to the potential for the development of CHF in Gallatin County (DPHHS, 2012).

It is evident that the county is in need of interventions that improve the management of CHF, however it is necessary to further evaluate the patient population to

determine if the national 30-day readmission rates for CHF are similar to the readmission rates for this condition at BDHS. On the Hospital Compare website (2012), readmissions and death rates at BDHS for the three core measures of AMI, PNM, and CHF were no different than U.S. national rates. Table 1 notes the actual percentages of comparative readmission and death rate data.

Table 1. Hospital Compare Data 2012

	BDHS	Montana Average	US National Rate
Rate of Readmission for Heart Attack Patients	No Different than U.S. National Rate	Not Available	19.7%
Death Rate for Heart Attack Patients	No Different than U.S. National Rate	Not Available	15.5%
Rate of Readmission for Heart Failure Patients	No Different than U.S. National Rate	Not Available	24.7%
Death Rate for Heart Failure Patients	No Different than U.S. National Rate	Not Available	11.6%
Rate of Readmission for Pneumonia Patients	No Different than U.S. National Rate	Not Available	18.5%
Death Rate for Pneumonia Patients	No Different than U.S. National Rate	Not Available	12%
Rate of Readmission for Heart Attack Patients	No Different than U.S. National Rate	Not Available	19.7%
Death Rate for Heart Attack Patients	No Different than U.S. National Rate	Not Available	15.5%

Intended Improvement

The aim of this project is to improve the 30-day readmission rates of AMI, PNM, and CHF at BDHS. The evaluation or assessment process begins with initial hospital admission and ends with patient discharge of the readmission within 30-days from initial discharge. By retrospectively assessing the 30-day readmission patient population data, the goal will be to determine appropriate evidence-based interventions for reducing

readmission rates so that the core measure readmission rates are less than the U.S. national rate.

The primary champion at BDHS, of this intended improvement, is the Chief Nursing Officer (CNO), Vickie Groeneweg MBA, MSN, RN. This project is accompanied by considerable support from all of the Chief Officers (CFO, CEO, CMO) and Vice-Presidents of BDHS, as well as the departmental managers. Finally, support is also present from the BDHS Research Council, members including Montana State University Professors, Dr. David Claudio of the College of Engineering, Industrial Engineering Department and Dr. Elizabeth Kinion of the College of Nursing.

The reason for focusing on the improvement of this problem at BDHS, and nationally, has a two-fold answer. The first being that the majority of healthcare organizations strive for continual improvement in the delivery of patient care and BDHS has a strong emphasis on this objective. Therefore, the triggering of this intended improvement is partially caused by the advancement for continual support in BDHS's mission which is "to improve community health and quality of life" (Bozeman Deaconess Hospital, 2012). Additionally, the recent emphasis in healthcare legislature on reducing 30-day patient readmissions was a paramount objective for all facilities and is the second reason for a needed investigation. The PPACA legislation was the main organizational prompt for the immediate review of readmissions at BDHS, acting as the primary trigger for this work with an urgent focus. The federal monitoring of 30-day readmissions was initiated in October 2012, stemming from the PPACA legislation, there was an

instantaneous and invigorating push for readmissions to be evaluated, a project already proposed in the strategic goals at BDHS.

Literature Search

After assessing and identifying the need for improving the management of CHF in Gallatin County, the literature was searched to locate evidence based guidelines and protocols for improvement strategies. Many studies (Bradke and Brinker, 2011, Jacobs, 2011, & Wheeler and Plowfield, 2004) have been conducted on testing interventions for improving the management of patients with CHF to reduce the rate of admissions and readmissions for this condition. Randomized controlled trials and descriptive studies were located along with guidelines, protocols and systematic reviews using CINAHL, PubMed, Cochrane Library, and Medline. Search terms included “heart failure”, “congestive heart failure”, “readmission rates”, “readmissions”, “30 day readmission rates”, “30-day readmission rates”, “reducing readmission rates”, “predicting readmissions”, “readmission predictive models”, “readmission risk assessment” and “LACE tool”.

The literature revealed multiple causes for general patient readmissions in addition to interventions and strategies for reducing their prevalence. Although CHF is among the top diagnoses for readmissions nationally, multiple diagnoses contribute to the prevalence of readmissions. Multiple diagnoses factors that influence patient readmission rates include the availability and usage of disease management programs and the bed supply of the local health care systems (Fisher, Wennberg, Stukel & Sharp, 1994).

A study comparing multiple diagnoses readmission rates for Medicare beneficiaries in Boston, Massachusetts and New Haven, Connecticut showed that these rates were consistently higher in Boston. The researchers found no evidence that this was due to initial causes of hospitalization or severity of illness. The authors concluded that the difference in readmission is likely to be dependent upon the care delivery system characteristics, in this case the influence of hospital-bed availability on decisions to admit patients (Fisher, Wennberg, Stukel & Sharp, 1994). The above mentioned study conducted for CMS showed significant reduction in patient readmission rates after implementing the “Care Transitions Intervention” model which focuses on assigning a “coach” to patients that were about to be discharged (Atlantic Information Services, Inc., 2008). Coached patients were found to be 50% less likely to be readmitted compared to un-coached patients, at two months following discharge (Atlantic Information Services, Inc., 2008). Several other studies, including Naylor et al. (2004), Rich, et al. (1995), and Phillips, et al. (1995), also demonstrated the effects of discharge and follow-up interventions or programs delivered by nurses on reducing the rates of readmission, especially for older patients. In the report presented by the Congressional Research Service on Medicare Hospital Readmissions, the authors found seven factors as the most likely causes of patient readmissions based on collective opinions of policy researchers and healthcare practitioners (Stone & Hoffman, 2011). These include an inadequate relay of information by hospital discharge planners to patients, caregivers, and post-acute care providers; poor patient compliance with care instructions; inadequate follow-up care from post-acute and long-term care providers; variation in hospital bed supply; insufficient

reliance on family caregivers; the deterioration of a patient's clinical condition; and medical errors (Stone & Hoffman, 2011).

One of the most forward thinking evidence based interventions includes utilizing a readmission risk assessment prediction tool. Jenks, Williams & Coleman (2009) state that "although the care that prevents rehospitalizations occurs largely outside hospitals, it starts in hospitals" and therefore needs to be addressed within the hospital stay. Walraven et al. (2010) developed a readmission assessment tool called the LACE index. Two previous readmission tools (Novotny and Anderson, 2008 and Hasan et al., 2009) had been published and Walraven et al. (2010) took these existing tools into consideration before designing a new tool but found that the other tools were impractical to actual clinicians. The previously published tools used patient characteristic variables that weren't readily available in the patient record and therefore the clinician would have to spend time locating information to perform an accurate readmission risk assessment. Walraven et al. (2010) used a large sample size of over 5000 patients, during a six year period, from eleven hospitals. The authors determined the statistically significant variables, according to a 95% confidence interval for assessing readmission risk, included length of stay, acute emergent admission, comorbidity and number of previous emergency room visits in the past six months. Walraven et al. (2010) pride themselves on finding a tool that is easy-to-use and accurately predicts those patients who are at high risk for being readmitted.

The goal of reducing readmissions includes trying to reduce the burden of healthcare costs on our nation (Jenks, Williams and Coleman, 2009). Therefore, it is

crucial as a clinician to keep financial stewardship in the forefront when determining best practices through searching the literature. The idea of determining patients who are at greater risk for being readmitted prior to discharge, through an assessment utilizing a specialized tool (Walraven et al., 2010), will help to identify or determine the patient population that truly needs further interventions. By narrowing down the patient population, one can ensure that funds are directed in a responsible manner. It generally seems helpful to apply an intervention to the entire patient population with the hope of capturing those at high risk for readmission; however with the economic state of healthcare and reformation, it seems responsible to not waste resources on patients who are not likely to be readmitted within 30 days. Financial stewardship was the reason why it was best to propose implementing the use of a risk assessment tool to identify the population at highest risk for readmission and then determine subsequent interventions to be applied to that particular population and not the entire acute care inpatient population at BDHS.

Study Question

Melnyk and Fineout-Overholt (2011) state that focusing a study question, aids in finding the appropriate evidence for supporting or disputing the introduction of a specific intervention. They also state that a well-articulated question is the first step in beginning the evidence based practice process. Melnyk and Fineout-Overholt (2011) suggest the use of the PICOT format. The authors believe the PICOT format will help to develop a focused study question. PICOT stands for (P) patient population, (I) intervention or issue

of interest, (C) the comparison, (O) the desired outcome and (T) time involved. Using this format, a specific study question was derived for this project. In adults older than 18 years of age who are admitted to BDHS, an inpatient acute care hospital, can they be identified as being a high or low risk for readmission utilizing an electronic predictive model prior to their being discharged?

A secondary study question was also identified after developing the primary study question. BDHS is a small community hospital with less than 100 beds, the validity of using a pre-existing tool was questioned. Can a tool that has been proven successful in one large study with eleven hospitals suffice for the patient population at BDHS?

Additionally, another secondary question was formulated. Does the electronic health record at BDHS support pulling the patient variables from the LACE tool (Walraven et al. 2010) to automatically calculate a risk score or will the LACE tool prove to be impractical to the clinical practices at BDHS?

CHAPTER TWO

METHODS

Ethical Issues

Prior to beginning any project involving human subjects, it is necessary to consider ethical issues. One ethical issue related to this project included privacy concerns for patient health information and the potential to violate the Health Insurance Portability and Accountability Act (HIPAA). Another ethical concern included the potential to harm or threaten the participating patients' physical well-being. An additional ethical concern was that during this project there was a potential for conflicts of interest to arise.

To address these ethical concerns, researchers and project participants have signed HIPAA agreements through Montana State University and through BDHS; researchers were certified in human subject participation; and patient data was de-identified prior to use for the project data to protect identity and privacy. Participants were further protected because the researchers submitted an application and multiple addendums to an Institutional Review Board (IRB) through Montana State University and were granted permission and application acceptance by the IRB before they engaged in any human subject research. Conflicts of interest were avoided by ensuring that there are not any financial or promotional benefits to the researchers or participants.

Setting

Healthcare organizations are macrosystems made up of many microsystems. Gaining a better understanding of the macrosystem or clinical care environment will allow for a deeper understanding of the elements that could pose as facilitators and/or barriers to practice change. One method for assessing clinical care environments includes using the five P's (Nelson, Batalden & Godfrey, 2007). The five P's are purpose, patients, professionals, processes and patterns. While defining the five P's of a clinical care environment, the assessor/s can determine any trends, further define intended goals and aims, as well as maintain focusing the project on the specific needs of the clinical care environment.

The purpose of BDHS as a whole is well defined in its organizational mission and vision. The mission has been previously stated in this document. The vision of BDHS includes being “a collaborative group of health professionals delivering highly reliable, coordinated, exceptional care” (Bozeman Deaconess Hospital, 2012). By reducing the readmission rates, through utilizing and implementing evidence based practices, BDHS will contribute to the continuous effort of remaining true to its mission and vision.

The patient population in this project was adults who were admitted to BDHS in the years of 2009 through 2011. All patient admissions and readmission were evaluated for characteristic trends to determine variables that contribute to their likelihood of being readmitted. Patients readmitted to BDHS within 30 days of being discharged was the primary population for this project. The population was broken further down into persons

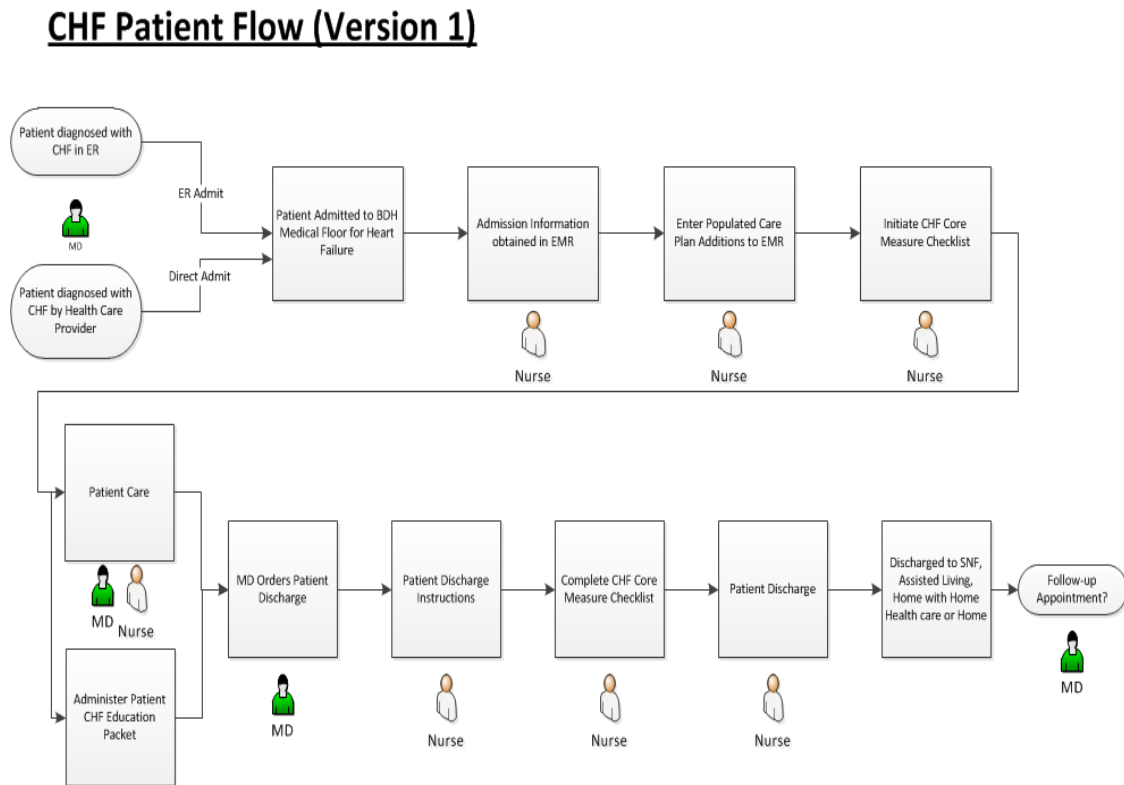
who were readmitted for a diagnosis that was a current core measure defined by CMS.

Core measure diagnoses for this project were CHF, AMI and PNM.

Professionals who were intimately connected to this process change included many healthcare professionals. Of those involved in the care of this patient population it was determined that the primary nurse, admitting nurse, discharging nurse, case manager, hospital physician and the primary care provider were persons who made the largest impact on patient care. These professionals were assessed and evaluated for their contribution to or lack thereof in caring for patients at BDHS and recommendations for future research.

There are multiple processes and sub-processes involved with caring for an acutely ill patient admitted to BDHS. A key process that impacts the patient's risk for readmission is the discharge process. Because this process includes many sub-processes such as patient education, discharge disposition determination, social support and assessment of patient's discharge needs, it required mapping of the multiple processes and sub-processes to identify current practices so that any problems and areas requiring attention could be discovered. Figure 1 provides an example of one process flowchart about the admission through discharge process at BDHS's medical unit for a patient with CHF. After mapping this process it was evident that there were problems, including patient education, discharge disposition and follow-up care, within this process. These identified problem areas directed this project in determining appropriate interventions to improve readmission rates.

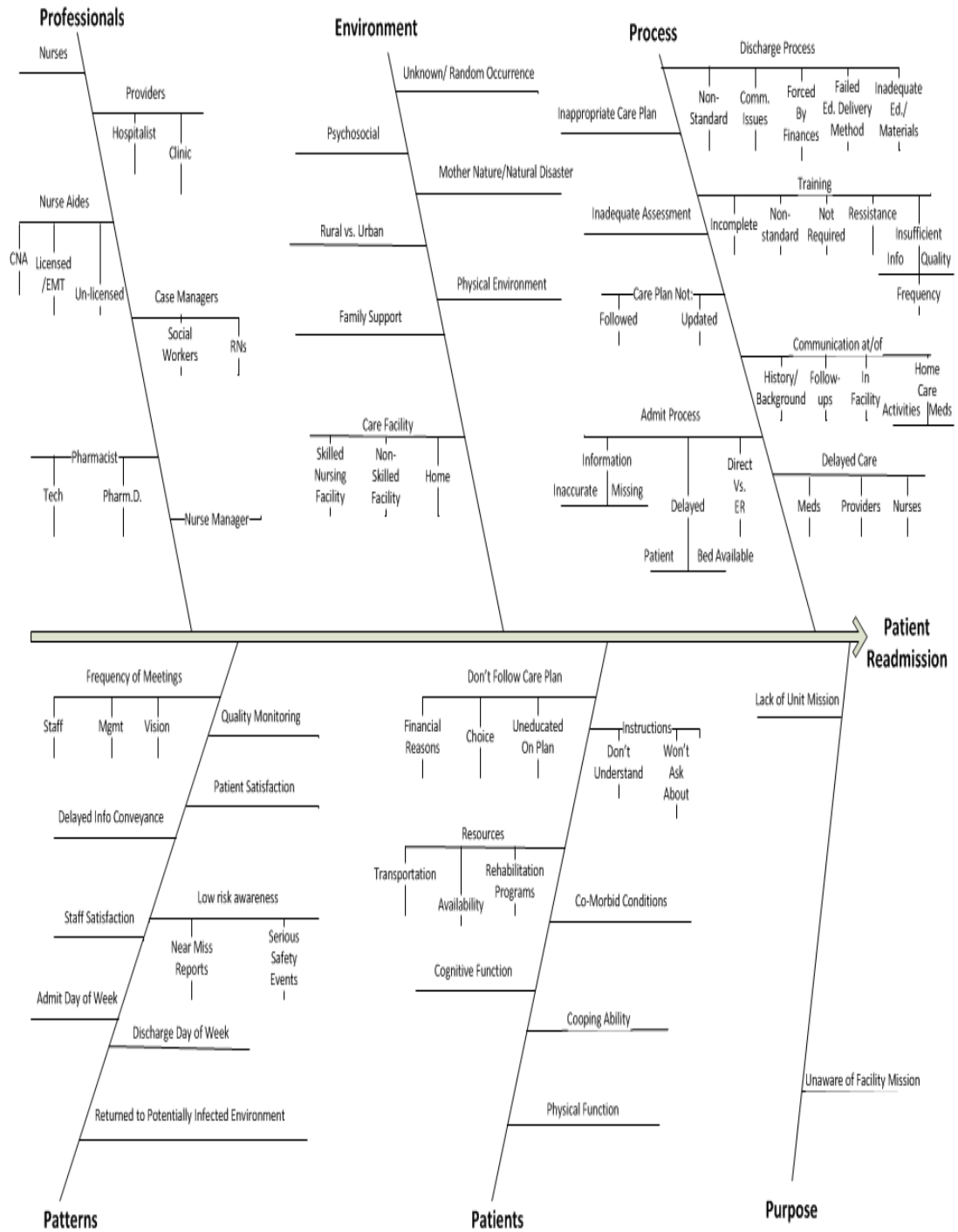
Figure 1. Process Flow Chart



Patterns are present in all microsystems. Assessing and defining patterns in a clinical care environment allowed the assessor to determine metrics that proved to be crucial in the evaluation of the implemented process changes. Defining a specific pattern can also further help to direct the aim of the necessary practice change. One pattern assessed nationally in this type of clinical care environment is that approximately one-third of patients with CHF are readmitted within 30 days (AHRQ, 2011). This pattern is not only a financial burden on this country but it also creates a great amount of financial, physical and emotional stress on the patient who is being admitted as well as their family and supporting care givers.

Healthcare providers are very competent in assessing, diagnosing and treating patients, however when it comes to mapping processes and sub-processes of a clinical care environment, it seems they are less competent, and the author observed this through personal clinical experience. Just as it is important to assess, diagnose and treat patients, so too is it important to assess and ensure the health of a clinical care environment so that it will be conducive to providing safe, effective, and quality patient care. Using the five P's assessment allows the healthcare professional to become more competent with assessing clinical care environments. A thorough assessment of the clinical setting provided direction for ensuring alignment with goals and the aim of this project. Assessment of the five P's on a medical unit at BDHS is depicted in Figure 2. The comprehensive five P's assessment was thoroughly assessed and presented in the form of a fishbone diagram for clear visualization and categorization.

Figure 2. Five P's Clinical Care Environment Assessment



Planning The Intervention

Before determining appropriate interventions, a thorough assessment of the problem is essential. Jenks, Williams, and Coleman (2009) noted that we have little information about frequency and patterns of readmissions and these should be further studied before resources are expended to determine and implement interventions for reducing readmission rates. To thoroughly assess the problem of readmission rates, a retrospective study was performed on patient data from 2009 through 2010 at BDHS. The data were compiled and revealed patterns that facilitated choosing the most appropriate interventions. In order for an intervention to be successful, it must first be deemed appropriate for meeting the identified patient populations' needs. An in-depth assessment more effectively determined the most appropriate intervention for the population that was being readmitted at BDHS.

The intervention that was determined to be the most cost effective included determining if a predictive model would assess patient's individualized readmission risk as high or low for every patient at BDHS prior to their discharge. By identifying the patient population most-at-risk, financial stewardship was exercised in the form of applying readmission reduction interventions to a specific high-risk population, rather than wasting precious readmission-reducing resources on patients who are not at high risk.

When comparing the LACE tool, a previously described predictive model for assessing readmission risk, it was determined that a portion of data, necessary for the completion of the LACE tool, could not be generated electronically from the patient's

medical record and therefore was deemed impractical for actual clinician use at the bedside. More specifically, the Charleston comorbidity index, a component of the LACE tool, was not part of the current electronic health record at BDHS and therefore made the LACE tool irrelevant and unusable for electronically and automatically assessing patient readmission risk prior to discharge. Because the Charleston Index had not been coded in the electronic record and was not going to be feasibly be coded within the current electronic health record at BDHS, it was determined that a new predictive model could be developed using available BDHS population-specific data. The method for determining a successful population-specific predictive model will be important to share with healthcare professions and therefore this project is being considered for publication or dissemination as a manuscript. The potential for each healthcare facility to determine a predictive model following the steps outlined in this project specific to their patient population and the availability of electronic patient information, could result in a nation-wide reduction in readmission rates and could potentially decrease the overall national healthcare costs and improve quality of life.

Improved coordinated discharge was another identified intervention from the literature for reducing readmissions. One study conducted in 2010 used a quasi-experimental approach, the authors concluded that “to reduce readmissions and length of stay in hospitals, nurses need to take an increased lead with the multidisciplinary team in helping to safely discharge patients” (Williams, Akroyd, & Burke, 2010, p. 1406). In another systematic review of the literature, it was noted that a way to decrease the risk of subsequent readmissions occurred during patient discharge. This provided a basis for

individualized discharge planning to meet the patient's individual needs and provided appropriate community resources to prevent the patient from making an unplanned return to the hospital (Anderson et al., 2006).

Improving patient education, regarding condition management, through using a “teach back” method has shown at multiple healthcare organizations to reduce readmissions. In Allentown, PA, Lehigh Valley Hospital saw a 12% reduction in readmission rates, while the University of California San Francisco Medical Center reduced readmission rates for patients over age 65 by nearly one-third (Bradke & Brinker, 2011). Using a teach-back method allowed the patient the opportunity to repeat the instructions in the patients' own words; this method swiftly assesses patients' understanding and allows for rephrasing the message when gaps in education are identified (Bradke & Brinker, 2011). At Lehigh Valley Hospital, when an order-set is entered into the electronic medical record it generates an education prompter for the nurse. This teach back educational intervention requires that education be given over three days during the patient's stay and not just at the end during discharge when material can be rushed.

In a guideline provided through the AHRQ website, elements of the previously described evidence-based interventions were included in this plan for reducing readmissions. The AHRQ's website offerings included innovations and tools to improve quality and reduce disparities. The specific guideline that pertains most accurately to the goal of reducing readmissions of patients with CHF is titled “Transition Home Program Reduced Readmissions for Heart Failure Patients” (AHRQ, 2011). This guideline was

developed using the Transition Home for Patients with Heart Failure Program at St. Luke's Hospital in Cedar Rapids, IA in March of 2006. The authors developed this "innovation, in conjunction with Transforming Care at the Bedside, a joint project of the Robert Wood Johnson Foundation and the Institute for Healthcare Improvement" (AHRQ, 2011). This project emphasized "early and ongoing assessment of the patient's needs at discharge and incorporates enhanced education and caregiver communication processes" (AHRQ, 2011). Several key elements including enhanced admission assessment for post-discharge needs, thorough education for patients and caregivers, patient-centered handoff communication and post acute care follow-up were noted. St. Luke's found that by using this program they were able to cut their readmission rates in half within one year (AHRQ, 2011).

The above mentioned interventions, subtracting the risk assessment predictive model, were important to use with the patient population that was identified at high risk for readmission. The focus of this project at this time, due to time constraints, was to develop the predictive model. Future evaluation of the other suggested interventions will need be applied and evaluated on the high risk for readmission population. Although many interventions have been determined successful, it was the intent of this project to remain financially conservative. Therefore a tool has been created that identifies those patients most at risk for readmission so that resources would be focused on a specific high-risk population.

This project was conducted in conjunction with Matthew Lovejoy, a graduate student in the College of Engineering at MSU. Matt provided the logistical and statistical

analysis of the patient data for the development of a prediction model for assessing the patients' risk for readmission at BDHS. This author has provided the clinical expertise as a Clinical Nurse Leader, masters in nursing candidate for the College of Nursing at Montana State University. This author also served as a liaison between this project and BDHS as a current employee for BDHS and member of the BDHS Research Council. Among this author's responsibilities were determining the appropriate patient characteristic variables associated with readmissions, determined by the literature as well as through the author's background as a proficient clinician in the acute care setting and a current graduate student in nursing. The partnership between industrial engineering and nursing has proven to be an effective method for completing this project to achieve the desired aim of developing a plan for reducing readmission rates at BDHS. Having project members with engineering and nursing backgrounds, complimented each other and provided the successful completion and implementation of this project. Without a clinical nursing expert's support, this project would have been difficult for an engineer to implement in a clinical nurse-driven setting. It is also true that without an engineer's contribution, statistical analysis to determine validity of the prediction model would have been difficult if not impossible for a clinical nurse to complete. It has been observed throughout this project that the two backgrounds and theories associated with these professions complement each other in a way that has made this project successful. Refer to Lovejoy (2012) for further information about the statistical analysis of the predictive model.

CHAPTER THREE

RESULTS

Planning The Study of The Intervention

Variables that contribute to the patient's risk for readmission have been suggested in multiple studies. Hasan et al. (2009) examined the literature and grouped patient variables that have been shown to contribute to the risk of readmission. Using the variables in this study and also comparing them to the variables used in the LACE model study conducted by Walraven et al. (2010), a list of variables was derived. The variables were then compared to the available electronic health record information present during a patient's current admission at BDHS. The variables were provided to the Information Systems Department at BDHS and two computer programmers, Eric Nelson and Julie Kindred the programmers, assisted in writing codes that pulled these variables from the electronic health record. Parameters for the dates of January 2009 through December 2010 were put as a filter and an Excel spreadsheet was generated with identifiable data. Prior to use by the author, the identifiable data was then converted to de-identified data to comply with the IRB approved application, and the agreements with BDHS, and to also protect patient health information and privacy.

The data that were finally generated after setting multiple parameters were analyzed to determine patterns and trends for selecting appropriate interventions. These data were used by Lovejoy to create a prediction model for assessing the patient's risk for readmission prior to discharge at BDHS. Specialized, individualized, readmission risk

assessment tools are a statistically proven way to determine patients at higher risk for readmission (Walraven et al. 2010, Hasan et al. 2009, & Kansagara et al. 2011). Once a prediction model for assessing patients at greatest risk for readmission at BDHS is available, resources for reducing the prevalence of readmissions can be efficiently and fiscally responsibly directed to those patients who are identified as being at the greatest risk for readmission. To create a prediction model, Lovejoy needed to take all patient data variables and test the statistical significance for each variable in association with increasing the patient's risk for readmission using highly sophisticated software programs. This tool will need to be tested on other retrospective patient data, and data other than the PPR data, to establish reliability. After validating reliability of the model, it can be used at BDHS on future patient populations. During this process, graphs of the patient data were created and data were trended to identify emerging patterns.

Outcomes

The electronically generated retrospective data were trended for emerging patterns to determine if interventions for select populations could be established. Jenks, Williams and Coleman (2009) explicitly stated that planning practice changes for improving the delivery of care and reducing readmissions can only be effective if information about the readmitted population can be trended for patterns. After all the parameters were established and selected, multiple patterns were found in the BDHS patient data. Patterns that were hypothesized and those that were not, as well as the insignificance of that previously thought to be significant were noted in the data.

Interpretation

Data indicated that the patient population being readmitted at BDHS was consistently readmitted most frequently within the first week after having been initially discharged for the top three diagnoses of alcohol induce mental disorders, CHF and tied for third PNM and disorders of the function of the stomach. This is a significant finding because, as noted in Novotny and Anderson (2008), the earlier patients are readmitted following discharge increases probability that the readmission could have been prevented. The data identifies that the majority of patients at BDHS are readmitted within the first week is a finding that is encouraging, and with Novotny & Anderson's (2008) statement could be a significant portion of the BDHS readmission population that could potentially be prevented or eliminated all together. A reduction in readmission rates at BDHS by almost sixty percent would be a substantial improvement (Novotny and Anderson, 2008).

Multiple factors have been suggested to contribute to the risk of the patient being readmitted. These factors were only made available because of the retrospective study on the patient data from 2009 through 2010. Lovejoy ran these variables through statistical analysis software to determine if each variable was a true predictor of the risk for readmission by comparing readmission data to data of those patients who were not readmitted within 30 days during the same time period. The proportion of patients with the same characteristics in the population who were not readmitted, in relation to each variable studied in the patient population, compared to those patients who were readmitted was the deciphering factor for determining variables as being statistically

significant in predicting readmissions at BDHS or not. The variables, that are statistically significant in predicting the likelihood of readmissions at BDHS, were compiled and made into the predictive tool and were weighted according to their significance. The tool can then further be created for healthcare professionals utilizing the electronic health record in real time to generate a score that signifies the patient's risk prior to being discharged. Lovejoy is confident that his tool is accurate and reliable because he created the predictive model using an error rate of 0.05, therefore ensuring that 95% of the time his tool predicts correctly. In the mean time, interventions specific to the diagnoses that were found to be most frequently readmitted, need to be selected and implemented throughout BDHS. These selected interventions should be used or incorporated into the plan of follow up care prior to discharge mostly on those patients who are at the greatest risk for being readmitted, in order to conserve resources that are already limited and could potentially become more limited in the future with healthcare reform. These data and literature review were shared with the physicians and members of the Transitions in Care Physician Committee at BDHS. The team is using this information to accurately select the most appropriate interventions for their practices. The Transitions in Care Physician Committee is a cooperative effort including family physicians employed by BDHS, family physicians not employed by BDHS, surgeons and geriatricians as well as many non-physician members.

CHAPTER FOUR

DISCUSSION

Summary

To select the most appropriate interventions for reducing readmissions at BDHS, the patient population needed to be identified. To successfully identify the patient population at BDHS, a report was created and generated from the electronic medical record. Parameters were set to include only data of readmissions that are suggested as potentially preventable according to multiple literature sources. The condensed data were trended and analyzed for patterns associated with readmissions. Data were presented to the Transitions in Care Physician Committee at BDHS so that informed choices for intervention selection could take place at a future date.

The data were also utilized in creating a population-specific predictive model for assessing and identifying those patients who are at the greatest risk for readmission. This tool will be practical for the direct care clinician due to its ability to generate a score automatically using information from the patient's electronic medical record prior to discharge. This will not increase the workload or cognitive workload on the direct care clinician due to its automatic generating properties and therefore is much more valuable than utilizing an available tool that cannot automatically electronically generate a risk score. By identifying those patients who are at greatest risk for readmission, financial stewardship can be practiced by potentially only utilizing reduction interventions on those patients who are at greatest risk. This is important because of the current healthcare

reformation that has begun. This reformation expects healthcare organizations to become more efficient and to improve the quality of care to reduce the burden of financing healthcare on this country, and one way to achieve this will be to reduce the readmission rates at BDHS.

Finally, the data generated from this project will serve as a foundation for many future studies that help to prevent and reduce the risk of patient readmissions. Students from the department of Mechanical and Industrial Engineering as well as the College of Nursing, will be able to utilize these data to further analyze and trend for future projects. Not only will the data be useful for BDHS, but it will also be a potential baseline for other small community hospitals in Montana for which to compare and develop readmission reduction strategies throughout the state and other rural areas. Nationwide, readmission reduction studies are being conducted, and because of this, in the future more information may be available regarding reduction efforts. The data will help to contribute to that composite of readmission information and literature.

Limitations

The single most limiting factor of this project has been the element of time. This project was initiated in March of 2012 and the data were not able to be generated or analyzed until June of 2012 due to logistical and ethical concerns and measures being taken to protect the privacy of patient information. Had the data been available sooner, the project could have evaluated the reliability of the predictive model and could have selected population specific interventions as well as tested the interventions for

effectiveness as evidence by the patient outcomes, which in this case would have been a positive or negative reduction in readmission rates.

Another limiting factor included interdisciplinary collaboration. Although this relationship was mostly a facilitator, it too was a limiter due to there not being a common language established between nurses and engineers. Had there been a common language established between the two, the project could have come to fruition more quickly. A lot of time was spent educating each other to understand one another's approach. By the end of this project a common language associated with readmissions between the two disciplines had been established, which was a benefit of this project overall, however this was not present in the beginning of project initiation and proved to be a limiting factor.

Finally, the complexity of patient care, the inconsistency of care delivery from clinicians and the involvement of multiple processes in the admission, discharge and readmission of patients were and still are extremely limiting factors. These are being suggested as major limitations and could be the reasons why the readmission problem has not yet been solved nationally. Patient characteristics vary greatly and interventions must be tailored to meet the needs of the diverse patient population, making this a significant limitation to the success of this project.

Conclusion

Healthcare reformation is taking place to improve the quality of care delivery and cost effectiveness. The evaluation of patient outcomes has become a high priority for healthcare organizations because of this current reformation, which bases financial

reimbursement on patient outcomes data. Reducing readmissions is one way the federal government is trying to presently improve the quality of patient care and reduce costs simultaneously, and is one outcome being monitored currently. Not only are hospital readmissions costly to the healthcare organizations and to the federal government, but they also substantially reduce the quality of life for the patients and the families of the patients being readmitted which is why this problem must be reduced or eliminated.

Readmissions were identified at BDHS as a concern, according to data supplied by the Hospital Compare Website (2012) that states BDHS rates are no different than the national rates for the three core measures of CHF, AMI and PNM. To successfully reduce these rates, a retrospective review of patient data over two years has taken place to identify the population that was readmitted. The data identified the readmission population at BDHS and was compiled, analyzed and compared to determine an electronic predictive model that can assess the patients' risk for being readmitted prior to discharge. This tool accomplished this by pulling retrospective data that is available in real-time, from the patient's electronic health record. Lovejoy, an engineering graduate student is creating a linear regression model to predict readmission risk at BDHS through generating a risk score based on weighted patient characteristics. Utilizing a predictive model or a risk assessment tool has been proven as an effective way to determine a patient's risk for readmission and can in turn help to reduce readmission rates through its ability to accurately identify those that are at risk and in need of further interventions (Kansagara, et al., 2011). Financial stewardship was exercised in a time of limited resource availability by using the predictive tool to identify those patients who are at

greatest risk of being readmitted and then determining specific interventions for that population alone rather than spending limited resources on interventions for all patients.

Other predictive tools have been created and studied and are in use currently. However the data required to use these tools was not electronically available in the health record at BDHS and therefore would be impractical for the clinicians involved in direct patient care and is the reason a new predictive tool specific to BDHS is necessary. Multiple interventions are available and have been proven to be successful through studies conducted at multiple healthcare organizations. Analyzing the patient population has allowed for a better intervention selection process. A team of physicians and other non-physician clinicians, called the Transitions in Care Committee, will utilize the patient characteristic data from this project and the suggested interventions to develop a plan for reducing the rates of readmissions at BDHS.

The implementation of the risk predictive model as well as any selected interventions will be an area for future research. Measuring pre and post outcomes data will be essential for determining the success of the interventions. After measuring outcomes has taken place, it will be important to share this information with the entire healthcare community on whether it positively or negatively affected readmission rates. Sharing this information will assist in the nationwide reduction of readmission rates to improve the quality of patient care delivery, increase the quality of life for these patients and reduce the costs associated with financing healthcare.

This project has been successful due to the interdisciplinary collaboration that took place between engineering and nursing. The success of this project validates the

importance of introducing multiple perspectives and specialized knowledge for improving complicated healthcare systems and processes. Additional interdisciplinary projects are necessary between engineering and nursing to prove the relationship is invaluable and this is a suggested area for future research. Measures need to be taken to improve the communication between these two professions so that a common language can be established to foster better collaboration for successful project completion. This project is one of many first steps towards improving the communication and common language development between these two professions. The successful development and implementation of a predictive model for assessing readmission risk will not only be substantial in the collaborative efforts between nursing and engineering but it will also be significant in the reformation of healthcare to improve the quality of care delivery by reducing readmission rates overall.

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