DEFINING CLINICAL EVENTS FOR HEART FAILURE PATIENTS

by

Janay Rachell Young

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As members of the DNP Project Committee, we certify that we have read the DNP Project prepared by Janay Rachell Young entitled “Defining Clinical Events for Heart Failure Patients” and recommend that it be accepted as fulfilling the DNP Project requirement for the Degree of Doctor of Nursing Practice.

____Date: April 12, 2017
Jane M. Carrington, PhD, RN

____Date: April 12, 2017
Christy Pacheco, DNP, FNP-BC

____Date: April 12, 2017
Rene Love, PhD, DNP, RN

Final approval and acceptance of this DNP Project is contingent upon the candidate’s submission of the final copies of the DNP Project to the Graduate College.

I hereby certify that I have read this DNP Project prepared under my direction and recommend that it be accepted as fulfilling the DNP Project requirement.

____Date: April 12, 2017
DNP Project Director: Jane M. Carrington, PhD, RN

STATEMENT BY AUTHOR

SIGNED: Janay Rachell Young

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DEDICATION

This project is dedicated to my children Alexandra and Brevin Young. To Alexandra whose intelligence, tenacity, and altruism are a daily inspiration to seek knowledge and understanding and apply it in a loving and practical manner. To Brevin whose wit, humor, and resilience provide inspiration to persevere, to learn from adversity, and to love without ceasing. It has been a blessing beyond measure to be their mother.

TABLE OF CONTENTS

TABLE OF CONTENTS – *Continued*

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Heart failure (HF) is a serious, life limiting chronic illness and is the most common cause of <30-day hospital readmission, which is costly both in its profound negative impact on patient mortality and quality of life, and in economics. Limited access to care in rural communities increases the prevalence of hospitalizations for heart disease in rural areas.

The aims of this project using data mined from Arizona Health Sciences Center Clinical Research Data Warehouse, are to define clinical events (fever, pain, changes in respiratory status, change in level of consciousness, changes in output, bleeding, and suicide ideation) for patients with heart failure, and determine what assessment values are for chronically ill patients and compare to "normal" assessment values for non-chronically ill patients. A literature review was completed to determine how to define clinical events for chronically ill patients with HF, and how decision making is used at home to manage chronic illness. Assessment value data was mined from the clinical research data warehouse and compared to "normal" assessment values, with identification of associations between clinical events and action taken in the hospital.

The project results support that there are differences in "normal" assessment values for fever, pain, and change in respiratory status between chronically ill patients with HF, and non-chronically ill patients; there was insufficient data to define bleeding, change in output, or suicide ideation. Impacts to care include earlier recognition of worsening HF symptoms that could result in an earlier call or visit to primary care provider forestalling the need for emergent care and hospital readmission. Application of the mined clinical may inform development of evidenced-based algorithm to guide decision-making at home, and it may also provide the foundation for the development of a tool for patient use to prevent <30-day hospital readmission.

INTRODUCTION

In 2011, nearly 3.3 million patients were readmitted to the hospital from home in less than 30 days after discharge in costing the United States (US) healthcare system $41.3 billion (Hines et al., 2014). Studies of Medicare patients' 30-day hospital readmission rates reveal readmission rates that range from 8% to 21% with an estimated cost to the American public of $24 billion each year (Hines et al., 2014). Pathologies with high predictability toward <30 day readmission rates include: heart failure (HF), which is the most common cause of readmission accounting for 25% of Medicare readmissions, followed by schizophrenia, renal failure, and pneumonia (Elixhauser & Steiner, 2013). The <30-day readmission rate is costly in economics and its profound negative impact on patient mortality and quality of life (Dilworth, Higgins, & Parker, 2012; Kaboli et al., 2012). The US Congress sought to reduce <30-day readmission rates by passing legislation allowing the Centers for Medicare & Medicaid Services (CMS) to fine hospitals for <30-day readmission of their patients (Hines et al., 2014). In addition, federal hospital reimbursement for readmissions for Medicare and Medicaid patients is decreased secondary to the implementation of the Affordable Care Act (Readmission Reduction Program, 2014). At the core of these recommendations to reduce readmission rates include enhanced care at transitional points, enhanced patient education and self-management support, and multidisciplinary management (Boutwell & Hwu, 2009).

Background Knowledge

Heart failure (HF) is a serious, life limiting chronic illness and is defined as a "condition in which cardiac output is insufficient to meet the body's demands" (Keller et al., 2015, p. 470). Causes of HF include infection, anemia, systemic hypertension, myocardial infarction, pregnancy, rheumatic heart disease, and physical, environmental, dietary, or emotional stress (Keller et al., 2015). According to the Centers for Disease Control and Prevention (CDC), 5.7 million adults in the United States have HF; half of individuals with HF die within five years of being diagnosed (2016). In addition to being the most common discharge diagnosis in adults age 65 and over (Keller et al., 2015), it is also one of the most expensive costing the US in excess of $30.7 billion each year (CDC, 2016). The poor management of risk factors that lead to HF including hypertension and diabetes, combined with the limited access to care in rural communities increase the prevalence of hospitalizations for heart disease in rural areas (Rimando, Warren, & Smalley, 2014).

The <30-day hospital readmission rates have been attributed to multiple, complex factors including; inadequate discharge teaching, distressing symptoms, progression of the disease that was unavoidable, psychosocial factors, self-care and medication adherence, and health system failure (Retrum et al., 2013). The current hospital discharge process does not adequately equip patients with the individualized knowledge and skill to manage their health conditions at home (Boutwel et al., 2009); 50% of patients report they do not understand what they have been told after having a conversation with their provider during a clinic visit (Atreja, Bellam & Levy, 2005). Patient understanding of their condition and necessary treatments (Atreja, Bellam & Levy, 2005), and self-care and medication adherence is positively affected by communication with health care providers (Retrum et al., 2013).

Self-care is defined by the World Health Organization (WHO), as “what people do for themselves to establish and maintain health, prevent, and deal with illness” and is a concept that encompasses: hygiene, nutrition, lifestyle, environmental factors, socioeconomic factors, and self-medication (WHO, 1998, p. 2). Attempts to improve patient outcomes must involve good patient-provider communication and “direct enhancement of illness self-management behaviors” (Aikens, Bingham, & Piette, 2005, p. 683). Transitioning from an inpatient to an outpatient setting is an especially vulnerable time for older adults with complex multimorbidities. Competent self-management which includes recognition of symptoms that indicate change in health status, is important during this time (Bowman & Flood, 2015). Symptoms that indicate a change in health status, or condition, for this project are clinical events (CEs). Building on the works of Carrington (2008), Carrington and Effken (2011), and Carrington, Surdeanu, and Forbes (2015), CEs are sudden and unexpected changes in patient condition and present as; fever, pain, changes in respiratory status, changes in level of consciousness, changes in output, or bleeding. CEs are associated with negative outcomes in acute care and may contribute to increased <30-day readmission rates (Carrington, Surdeanu, & Forbes, 2015). A seventh CE, suicidal ideation, will be added based on the high prevalence of comorbid depression in HF and increased risk of mortality with comorbid HF and depression (Moraska et al., 2013). Teaching patients to recognize clinical events as a component of chronic illness self-management that originates outside of the hospital may provide a framework for enhanced patient functioning and reduced readmission (Carrington, Surdeanu, & Forbes, 2015; Bowman & Flood, 2015).

Major depressive disorder is a common co-morbid condition in patients with HF (Holzapfel et al., 2009; O'Connor et al., 2010; Yancy et al., 2013). Prevalence of depression in patients with HF is estimated to be between 11-25% in outpatients and is a significant contributing factor to poor outcomes (Holzapfel et al., 2009; O'Connor et al., 2010; Yancy et al., 2013). Patients with HF and depressive symptoms have poorer self-care, worse clinical outcomes, and increased use of healthcare services (Holzapfel et al., 2009). Depression is also associated with an increased risk of death after hospitalization (Moraska et al., 2013).

Self-care and patient-provider communication are independent determinants of the health status of a patient with a chronic condition (Aikens, Bingham, & Piette, 2005). Increasing patient adherence to treatment regimen may be accomplished by tailoring communication to patient's health literacy level, using open-ended questions, and using the teach-back method (Atreja, Bellam, & Levy, 2005). Little research has been conducted to investigate the impact of recognition of clinical events to decrease hospital readmission in rural areas.

Local Problem

In 2010 17% of the US population lived in rural areas and experienced disparities including poverty, low health literacy rates, and decreased access to health care (Hall & Owings, 2014). In southern Arizona, a level one academic teaching hospital in Tucson provides acute care to many residents of rural communities. Often, chronically ill adults in rural communities in southern Arizona do not have access to primary care and seek treatment for chronic illness management from hospitals in urban areas up to 70 miles away. Santa Cruz is a rural county in southern Arizona whose residents may seek hospital care in Tucson due to the serious gaps that exist in the county's health care system capacity, as it contains only one general hospital, three community clinics and has a ratio of one primary care provider to 3,154 patients (Clegg & Associates, 2010). Santa Cruz County has a total of 125 registered nurses, 10 nurse practitioners, one physician assistant, 24 primary care physicians, 144 emergency medical transport personnel, and no psychiatrists or mental health providers (Clegg & Associates, 2010). Contributing to rural health disparities in Santa Cruz County are high levels of poverty as 20% of families live in poverty and have lower levels of education than the state average (Clegg & Associates, 2010). Additionally, 80% of families living in Santa Cruz County are Hispanic and are primarily Spanish speakers (Clegg & Associates, 2010). Non-English speakers who have lower educational levels have more difficulty navigating the US healthcare system and understanding the complex self-care requirements of managing a chronic illness.

Purpose

The purpose of this DNP quality improvement project is to increase effective provider-patient communication through improved home decision-making of the chronically ill patient in the rural setting. This will be accomplished by defining clinical events (CEs) for patients with heart failure after discharge. CEs are changes in patient condition consisting of fever, pain, changes in respiratory status, change in level of consciousness, changes in output, and bleeding (Carrington, 2008). This project will add a seventh CE, suicidal ideation. Building on the work of Carrington (2008), this project will consist of defining CEs according to the “norms” of heart failure patients after discharge from acute care setting. I will seek to define the CEs experienced by heart failure patient, while in acute care; to then inform the later development of a decision-making tool designed to reduce the <30-day readmission rate for these patients. The following will guide this project:

1. Do the CE “norms” for heart failure differ from those patients who are not chronically ill or accepted adult within normal limits?
2. Using data from the clinical data warehouse, what are the “normal” assessment values for fever, pain, bleeding, change in respiratory status, levels of consciousness, output, and suicide ideation and suicide ideation for the chronic heart failure patient?

This project then seeks to define the “normal” values for elements of the CEs for heart failure patients to then understand appropriate decision-making for these patients at home to reduce the <30-day readmission rate. Once in the patient home, this decision-making tool will assist towards providing individualized patient-provider communication to decrease <30-day readmission rates.

Home visit interventions that target patients with HF after discharge, have inconsistent evidence that reduction in readmission rates is achieved in the absence of larger multidisciplinary coordinated efforts (Kripalani, Theobald, Anctil, & Vasilevskis, 2014; Linertová et al., 2011). The argument can be made that a chronically ill patient who is recently discharged from the hospital has a higher acuity at home than a patient who has not been recently hospitalized. These patients have historically been viewed through outpatient or well patient perspective despite their higher acuity. This project will view acute patient data to define CEs for patients with HF at home. Defining CEs for patients at home based on acute care data, takes into consideration the complexity of managing a chronic illness at home in a rural setting and will provide a relevant foundation to construct a tool to guide decision-making. The project aims to decrease <30-day hospital readmission rates for chronically ill adults with heart failure, by mining data from the clinical data warehouse (CDW) provider communication based on identification of CEs, and support in home decision-making by patients.

Key stakeholders include government officials who make decisions about healthcare and influence healthcare financial provisions, local health care providers, the Promotoras program, which has established a link between the local health care system and local Spanish-speaking families (Clegg & Associates, 2010), and the patients themselves. In addition, southern Arizona health care providers and hospitals have a vested interest in decreasing hospital readmission in Santa Cruz County.

Project Aims

1. Determine if CE "norms" for heart failure differ from those patients who are not chronically ill.
2. Using data from the clinical data warehouse, determine the "normal" assessment values for fever, pain, bleeding, change in respiratory status, levels of consciousness, output, and suicide ideation for the chronic heart failure patient.

FRAMEWORK AND SYNTHESIS OF EVIDENCE

Theoretical Framework

A phenomenon of interest may be conceptualized in multiple ways, and a theoretical framework provides an orderly way to view the phenomenon and provides a perspective basis for interdisciplinary collaboration in research and practice (Moran, Burson, & Conrad, 2014; Reed & Shearer, 2011). The Effective Nurse-to-Nurse Communication Framework and the Naturalistic Decision Making (NDM) framework will be used to guide this DNP project. Carrington's Effective Nurse-to-Nurse Communication Framework depicts communication as a process that begins with a stimulus, or message (Carrington, 2012). The message is a clinical event or a change in patient condition (fever, pain, changes in respiratory status, change in level of consciousness, changes in output, and bleeding), that may be a precursor to a failure to rescue or death (Carrington, 2012). The framework applies three concepts of mind, self, and society to describe how a person "interprets events as influenced by his/her environment, his/her affiliations, and peers" and takes into account the experience and characteristics of the sender and receiver (Carrington, 2012, p. 295).

Concepts in the Effective Nurse-to-Nurse Communication Framework are the stimulus (clinical event), responder analysis, spectrum of effective communication, receiver analysis, and stimulus outcome (Carrington, 2012). The stimulus is the CE; the responder analysis of the CE includes the perception of the CE and the verbal and written communication, as well as the personal characteristics of the responding nurse (Carrington, 2012). The spectrum of effective communication includes system characteristics of both verbal and electronic communication (Carrington, 2012). The receiver analysis includes the personal characteristics of the receiving nurse and their perception of the both the CE, and of the verbal and written communication (Carrington, 2012). The stimulus outcome is the safety of the patient which may lead to resolving, rescuing, or transferring the patient (Carrington, 2012). This framework aligns with the nursing paradigm as patient (CE), nurse (responding and receiving nurse), health (CE outcome), and environment (communication system) (Carrington, 2012).

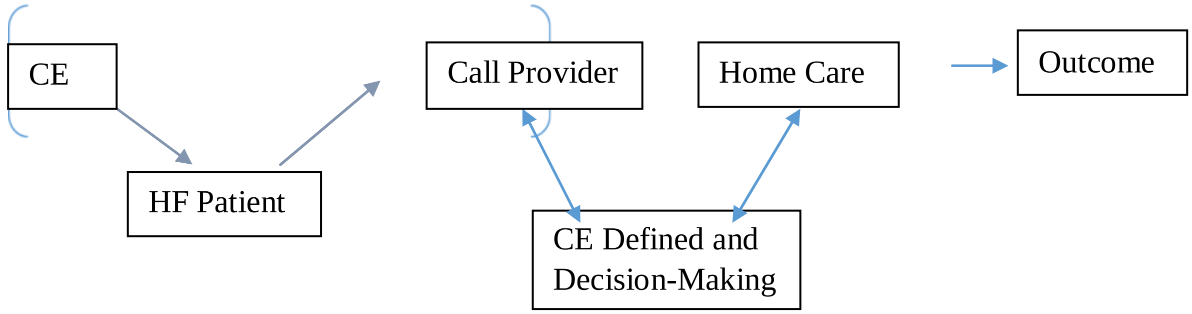

FIGURE 1. Effective Nurse-to-Nurse Communication Framework. (Adapted from Carrington, 2012).

NDM was initiated in 1989 by psychology researchers and sponsored by the Army Research Institute in an effort to better understand how practitioners make decisions in the real world, under difficult conditions, in order to help them do a better job (Lipshitz, Klein, Orasanu, & Salas, 2001). NDM seeks to understand how people use their experience to make decisions in the context of the real world where problems are often ill-structured, uncertain, occur in dynamic environments, have time constraints, have shifting and ill-defined goals, and have high stakes (Lipshitz et al., 2001; Schraagen, 2008). This framework is relevant for guiding this project because of the complex and uncertain nature that exists for patients with chronic illnesses when they make decisions in their home. If the decision making process that occurs in a complex home environment is better understood, clinicians can provide interventions that enhance decision making, so that patients can identify and know what to do when a clinical event is detected at home. This will lead to improved health outcomes and decreased hospital readmission.

In NDM, decisions are not always rational and rely heavily on intuition (Lipshitz et al., 2001). NDM views intuition as an expression of experiences that guides decision making; people build on their intuition as patterns are established that allow them to quickly size up a situation and make rapid decisions without having to compare options (Klien, 2015). This view led to the development of the Recognition- Primed Decision Making (RPD) model, which was originally designed to improve understanding of how experienced firefighter commanders handled uncertainty and time pressure (Lipshitz et al., 2001). According to RPD, people with experience rarely consider multiple courses of action; rather, they use their intuition to identify an effective option as the first option considered (Klien, 2015). Proficient decision makers perform reasonably well even under the uncertainty or stress that often accompanies important decisions made in the real world (Lipshitz et al., 2001). Uncertainty may be a result of inadequate understanding, lack of information, or conflicted alternatives (Lipshitz et al., 2001). According to the tenants of NDM, coping with uncertainty may be enhanced by reducing uncertainty (collecting additional information); using assumption-based reasoning (making assumptions to filling in knowledge gaps); weighing pros and cons; forestalling (develop appropriate response to anticipate undesirable contingencies); and/or suppressing uncertainty (ignoring it) (Lipshitz et al., 2001).

The NDM approach to strengthen intuition, which strengthens decision making in the inexperienced decision makers, is to build experiences that quickly result in acquiring tacit knowledge (knowledge that is gained from experience and improves judgment versus written or spoken knowledge) (Klein, 2015). Instead of teaching decision strategies, NDM seeks to help people make sense of complex situations by use of a broader knowledge and conceptual base to make decisions using intuitive judgments (Klein, 2015). The Effective Nurse-to-Nurse Communication framework and NDM are pertinent frameworks for guiding researchers to understanding how chronically ill patients detect a clinical event and decide what to do, and may direct development of a quality improvement project to develop a decision making algorithm to guide patient provider communication. Using both NDM and the Nurse-to-Nurse Communication Framework provides a pertinent framework to guide clinical scholarship seeking to improve patient-provider communication in the rural setting.

Concepts

Major concepts include decision-making, communication, and self-care management in chronically ill adult patients. Decision-making in health care involves complex diagnostic and therapeutic uncertainties, patient values and preferences, and costs: this complexity makes decision-making complicated (Hunink et al., 2014). The core of current models of chronic disease management is patients who are empowered and activated to make decisions about lifestyle changes, symptom monitoring, and treatment adherence (Peek, Drum, & Cooper, 2014). This requires patient engagement to participate in decisions about the care they receive and the self-management they perform at home (Peek, Drum, & Cooper, 2014). Chronic diseases such as diabetes and hypertension have higher ratings of self-reported health, increased use of preventative care, and shorter hospitalizations when shared decision making is used (Bodenheimer, Lorig, Holman, & Grumbach, 2002; Lorig et al., 2000).

Patient-provider communication that is patient-centered provides care that is congruent with that patient's needs, values and preferences, and it allows for patient input and active participation in the decisions regarding their health and health care (Epstein et al., 2005). Patient-centered communication includes "four communication domains: the patient's perspective, the psychosocial context, shared understanding, and sharing power and responsibility" (Epstein et al., 2005, p 1516). Effective communication serves to gather and exchange health related information and to create an environment that is based on respect, understanding, and trust by using bidirectional communication, and constant feedback (Jolles, Clark, & Braam, 2012). Effective communication can be described in three phases: comprehension and acceptance which incorporates shared-decision making; translation into action; and long-term retention (Jolles, Clark, & Braam, 2012). Patient–provider communication in chronic disease self-management has been associated with positive health outcomes including lifestyle modifications and medication adherence in diabetes, asthma and cardiovascular disease (Adams, Smith, & Ruffin, 2001; Lorig et al., 2000; Peek, Drum, & Cooper, 2014).

Self-management is a term used to describe the process in which individuals engage in to manage a chronic illness on a daily basis (Lorig & Holman, 2003). It refers to an individual’s ability to manage symptoms, treatments, and lifestyle changes in conjunction with their family, community and health care professionals to maintain a satisfactory quality of life (Richard & Shea, 2011). Self-management differs from self-care, in that self-care describes healthy lifestyle behaviors which promote optimal growth, development and health maintenance (Richard & Shea, 2011). A qualitative metasynthesis identified three categories of self-management: focusing on illness needs, activating resources, and living with a chronic condition (Schulman-Green et al., 2012).

Synthesis of Evidence

The problem of <30 day readmissions have been well described in the literature (Hines et al., 2014). Researchers have studied causes of readmission, effects of readmission, and means to reduce readmission (Hines et al., 2014). There is ample evidence in the scientific literature that speaks to the problem of hospital readmission in the United States (Hines et al., 2014), and evidence that supporting patient capacity for self-management reduces the risk of early rehospitalization (Leppin et al., 2014). There is limited evidence that decision-making relates to improving self-management for patients with a chronic condition in a rural setting (Simmons et al., 2012). The health issues that low-income residents of rural communities’ face are substantial with 90% of families reporting at least one family member being diagnosed with a chronic condition, and 18% of families managing nine or more chronic conditions (Simmons et al., 2012). Enhanced patient education and self-management support are identified as key to reducing readmission (Boutwell & Hwu, 2009); however, there is no literature available which defines CEs for patients with HF, and there is limited literature available on the impact that effective decision-making has on patients with a chronic illness. The current state of the science is lacking evidence to define clinical events for HF patients at home in the rural setting.

An extensive literature search which utilized PubMed, CINHAL, EMbase, and Google Scholar was conducted using the search terms: patient-provider communication, decision-making, hospital readmission, chronic illness, rural health, data mining, and clinical events. Inclusion criteria included: published within the last six years, English language, adult population (defined as >21 years old), and human species. Thousands of studies were found; however, only 21 relevant studies were identified that addressed key terms. Articles were excluded if they did not relate to key terms. Ten relevant articles were retained for use in this DNP project. The literature synthesis includes four systematic reviews; one randomized-control trial, two qualitative studies; and two mixed methods studies. All articles were peer reviewed.

Features of effective interventions were implemented to reduce early hospital readmissions (Leppin et al., 2013; Retrum at el., 2012). The most effective interventions had many components, involved more individuals in care delivery, supported patient capacity for self-care in the transition from hospital to home, and integrated patient input (Leppin et al., 2013; Retrum et al., 2012). All interventions examined prevented early readmission; however, since hospital-initiated transitional care strategies varied widely, no conclusion could be reached on the most effective means to prevent adverse events post-discharge (Leppin et al., 2013; Renneke et al., 2013). Additionally, the extreme state of physiologic and psychological vulnerability after recently being discharged from the hospital, may lead to poor outcomes if burdensome demands are placed on patients (Leppin et al., 2013; Retrum et al., 2012). Since the efficacy of hospital implemented strategies for reducing early readmission remains unclear, the authors recommend that primary care providers and medical homes may be best positioned to detect and prevent adverse events that lead to hospital readmission (Renneke et al., 2013).

Other studies found in the literature review identified and explored concepts related to complex decision-making (Dy & Purnell, 2011); identified variations and deficits in medical decision-making (Zikmund-Fisher et al., 2010); and determined the effectiveness of decision coaching to improve decision making (Stacey et al., 2011). Key concepts identified included provider and patient competence, quality of information and communication, and patient involvement in decision-making (Dy & Purnell, 2011; Zikmund-Fisher et al., 2010). Shared decision-making that takes into account patient preferences and discusses pros and cons has a positive association with patient satisfaction and adherence (Zikmund-Fisher et al., 2010; Stacey et al., 20011). The wide variations and incomplete decision-making discussions with providers, illustrate the need for further research (Zikmund-Fisher et al., 2010). Additionally, the generalizability of each of these studies' results is limited, as it was not studied in a rural setting or in languages other than English. Due to variability of results and small number of trials, further research is needed to determine the effectiveness of decision coaching (Stacey et al., 2012).

In 2013, the American College of Cardiology Foundation and American Heart Association Task Force on Practice Guidelines published the *Guideline for the Management of Heart Failure* which is a Clinical Practice Guideline in the Agency for Healthcare Research and Quality database (Yancy et al., 2013). The guideline recommends a multidisciplinary HF disease-management program to decrease readmission risk that addresses barriers to behavior change (Yancey et al., 2013). The guideline also recommends written patient education that contains information about monitoring signs and symptoms of worsening condition; however, there is no standardized tool to use to communicate this information to patients and their families (Yancy et al., 2013).

In a study by Vijayakrishnan et al. (2014), the prevalence of heart failure signs and symptoms were identified in a large primary care population using text and data mining of the electronic health record. Although this study aimed to identify patients with HF symptoms before the actual diagnosis, the data mining methodology can also be used to determine sensitivity of the decision-making tool using a large data set from a clinical data warehouse by defining what the “normal” assessment values for temperature, output, respiratory status, level of consciousness, pain, and bleeding for the chronic heart failure patient. To date, there have been limited studies using data warehouses to develop decision-making tools for patient education.

Simmons and colleagues identified two themes in the health issues faced by rural families: lack of engagement in managing overall health and ineffective utilization of health care (2012). Caldwell, Peters and Dracup (2005), found that a simplified education program, versus the typical resource-intensive programs at urban centers, does improve knowledge, self-care behavior, and disease severity in heart failure patients in rural settings. The intervention focused on symptom recognition and management of fluid weight, since worsening symptoms caused by fluid overload are the primary reason for hospital readmission (Caldwell, Peters, & Dracup, 2005).

The strengths discovered in the literature review include several systematic reviews of multiple studies which are a high level of evidence and have a low risk of bias (Polit & Beck, 2012). Weaknesses include the small sample size of qualitative studies which limits generalizability of findings in the studies conducted by Simmons et al. (2012) and Retrum et al. (2012). In addition, self-reported data of sensitive nature may cause bias in reporting which may be present in the studies conducted by Zikmund-Fisher et al. (2010) and Simmons et al. (2012). Studies that did not include rural populations and non-English speakers also limit generalizability. Lastly, the variability in intervention effect necessitates further research in discharge reduction interventions. Due to the novel nature of this DNP project, gaps in the literature exist that include how to define clinical events for chronically ill patients with heart failure, how decision making is used at home to manage chronic illness, and how an algorithm to guide patient-provider communication and patient decision-making can reduce hospital readmissions for rural communities. The paucity of research on this subject indicates a need for additional research on this topic.

METHODS

Design

The purpose of this project was to define the CEs experienced by heart failure patient, while in acute care; to then inform the later development of a decision-making tool designed to reduce the <30-day readmission rate for these patients. The following questions guided this project:

1. Do the CE “norms” for heart failure differ from those patients who are not chronically ill or accepted adult within normal limits?

2. Using data from the clinical data warehouse, what are the “normal” assessment values for fever, pain, bleeding, change in respiratory status, levels of consciousness, output, and suicide ideation and suicide ideation for the chronic heart failure patient?

Ethical Considerations

The relevant ethical principles that apply when studying or conducting research on human subjects are respect for persons, beneficence, and justice (U.S. Department of Health and Human Services [USDHHS], 1979). This project incorporated these components to ensure that the treatment of all participants was ethical, respectful, and safe. This project listed did not require oversight by the University of Arizona because the project does not meet the definition of 'research' and/or 'human subject' and therefore human subjects review was not required.

Respect for Persons

Respect for persons includes ensuring participant autonomy and protecting those who have diminished autonomy (USDHHS, 1979). In this project, clinical data will be accessed and analyzed from a clinical data warehouse. Researchers and clinicians involved in quality improvement have an interest in the secondary use of clinical data from the electronic health record (Coiera, 2015). Patient records that are used will be anonymized and de-identified so that patient identifiers are removed from the data set and cannot be linked to an individual (Coiera, 2015). De-identification of the data set will be in accordance of the US Healthcare Insurance Portability and Accountability Act (HIPPA); this ensures that 16 of the 18 defined private health information elements are removed (Chen & Sarker, 2014). Data security will be maintained through use of a secure server that requires log in with a secure username and password.

Health information exchanges are networks that are designed to allow patient data to be shared with multiple clinical information systems; this also allows for clinical data to be used for research purposes (Coiera, 2015). Clinical data is not available for direct access, rather, a request is made through an intermediating system and a governance process controls how data is released (Coiera, 2015). A form of consent is usually stored on the clinical side, often as consent to treatment, and this determines if the data is available for use (Coiera, 2015). The process of a formal request, presence of consent, anonymization and de-identification of data will ensure respect for participant autonomy.

Beneficence

The ethical principle of beneficence is described as maximizing benefits while minimizing harm (USDHHS, 1979). The purpose of the project should be focused on changes or interventions that are most likely to result in improved outcomes, while decreasing the risk of harm (Polit & Beck, 2012). The information that I gather may be used to improve outcomes for chronically ill patients to improve decision making when managing a complex health condition at home. Benefits may be directly experienced by the patient and has the potential to positively impact other patients who also have limited access to primary care in rural communities.

There is no physical harm that participants will encounter from participation in this project. The project will involve only retrospective electronic health record review and no patients, family members, or providers will be recruited.

Justice

The ethical principle of justice ensures that researchers allow for all participants to have equal treatment and privacy during the project (Polit & Beck, 2012). In addition, justice means keeping all participant information confidential and private (Polit & Beck, 2012). Data included in the study will include all eligible EHR regardless of sex, race, primary language or socioeconomic status.

Setting

The study's setting will be on a secure computer connected to a secure server. The data analysis will be conducted in a home office setting.

Participants

Data will be mined from the University of Arizona, Clinical Research Data Warehouse (CRDW) managed within the Center for Biomedical Informatics and Biostatistics. The CRDW contains data from the hospital affiliated with the University of Arizona, including and specific to adults with a heart failure classified by the presence of certain International Classification of Diseases (ICD) 10 (tenth revision) codes with a recent hospital admission (Appendix B). Data from approximately 500 participants will meet the following criteria for inclusion: (a) participants must have a diagnosis of heart failure; (b) be 50 years of age or older; (c) have been hospitalized; and, (d) speak English or Spanish. The cohort inclusion criteria will be applied and be limited to a specific time period of January 1, 2016 to June 30, 2016.

Data Collection

The large amount of data generated by healthcare institutions would be too time consuming to process using manual techniques compared to an automatic or programmatic method to extract data (Milovic & Milovic, 2012). Data mining is the process of extracting data from large datasets and discovering emergent patterns and formulating predictive models (Zaki & Meira, 2014). The knowledge gained from data mining can be used to inform and enhance the decision-making process to improve patient outcomes (Milovic & Milovic, 2012). Data collection began after permission was obtained from the University of Arizona institutional review board. Materials needed for the project include access to the data warehouse and computer software for analysis (Microsoft Excel). Both “structured” and “unstructured” data will be requested from databases housed in a clinical data warehouse and will be selected, preprocessed, transformed, mined, and evaluated to identify clinical events and action (Chen & Sarker, 2014).

Common structured data are discrete elements that are associated with codes and are computer understandable and will include: demographics, billing diagnosis in the form of ICD-10 codes, problems, procedures and vital signs (Chen & Sarker, 2014). Unstructured by comparison, are those that include notes or free text messaged entered by clinicians. Unstructured data was sought to better understand the nuance of caring for these patients to increase my understanding of the clinical “norms” for these patients. Normal assessment values will be defined as values that do not result in an intervention, and/or values that are consistent with normal variants in adult health.

A request for the required data was given to the data warehouse technician. The technician then extracted the requested data onto a DVD that was password protected. Next, the data was uploaded to a Microsoft excel spreadsheet for data processing. The data was de-identified.

Data Analysis

Data cleaning, or improving data quality by addressing incomplete or inconsistent data, will involve reviewing the data to ensure completeness, correctness, concordance, plausibility, and currency (Chen & Sarker. 2014). Over one million data points were extracted from the CDW and supplied by the technician, which was organized onto Microsoft Excel flowsheets. Data was excluded if it did not meet inclusion criteria, if it was incomplete, or if it was not during the requested timeframe. Specifically, data was excluded if the cell contained the word “NULL,” which indicated an invalid value. Descriptive statistics was used to determine the following (Table 1). After analyzing the data from the CDW, published accepted “norms” were added to the table below to then compare patient norm for CEs. Accepted normal value for clinical events are: fever temperature >100.4 degrees Fahrenheit (°F) (Uphold, 2013); absence of pain; urine output of >30 millimeters per hour (ml/hr) (McCance, Huether, Brashers, & Rote, 2014); respiratory rate of 8-16 breaths per minute and (McCance et al., 2014) and pulse oximetry (SpO2) >89% (Fahy, Lareau, & Sockrider, 2011); fully alert and oriented; no episodes of bleeding; and no suicide ideation.

TABLE 1. *Guide to Defining Clinical Events in Discharged Heart Failure Patients*

Clinical Event	**Defined Norm for non-Acute or Chronic Patients**	**Defined Norm for Chronic Heart Failure Patients**
Fever	<100.4°F	
Pain	No pain	
Bleeding	No bleeding	
Respiratory Status	8-16 breaths per minute SpO_2>89%	
Level of Consciousness	Fully alert and oriented	
Output	UO >30 ml/hour	
Suicidal Ideation	No suicide ideation	

RESULTS

The results of the project with answers to the questions that guided this project will be shown in this section. The purpose of this project was to define the CEs experienced by heart failure patient, while in acute care; to then inform the later development of a decision-making tool designed to reduce the <30-day readmission rate for these patients. The following will guide this project:

1. Do the CE "norms" for heart failure differ from those patients who are not chronically ill or accepted adult within normal limits?
2. Using data from the clinical data warehouse, what are the "normal" assessment values for fever, pain, bleeding, change in respiratory status, levels of consciousness, output, and suicide ideation and suicide ideation for the chronic heart failure patient?

De-identified patient data was received from the Clinical Research Data Warehouse. Data for 550 patients and 550 encounters was reviewed and categorized. Of this data, 281 included outpatient encounters or a nursing unit not considered acute care medical/surgical. These were eliminated resulting in a total sample analyzed N=269. Of these, 71 experienced a clinical event, or 26.3% of the sample, and a total of 4674 clinical events were identified.

Demographics

The average age of the study population was 75.3 years old, with 171 males and 98 females. The majority of patients, 80.6%, were white/Caucasian, 30.8% identified as Hispanic or Latino, 8.9% as American Indian, and 4.4% as African American. Of note, 20% of patients identified as both Caucasian and Hispanic.

Clinical Events

After cleaning and preparing the data for analysis, data was then organized according to the seven clinical events of interest: fever, pain, bleeding, changes in respiratory status, level of consciousness, output, and suicide ideation. Data will be presented according to the seven clinical events.

Fever

A total of eight patients experienced a temperature ≥ 99°F. The mean temperature for the population was 98°F, with a range of 95-99°F, and a mode of 99°F. In the hospital setting, the standard inpatient order set includes an order to notify the provider if temperature is ≥ 100.5°F. Of the 14 temperature events, five patients received an intervention including antibiotics, blood cultures and a normal saline bolus.

Pain

A total of 30 patients had 465 pain events with values of 1-10 as rated on the Numerical Rating Scale (NRS) for pain. NRS provides a numeric value to quantify severity of pain; mild pain is considered between 1 and 4, moderate pain between 5-6, and severe pain 7 and above (Williamsom & Hoggart, 2005). One percent of patients had a pain level of 1; 5.6% reported a pain level of 2; 8% reported a pain level of 3; 9.9% reported a pain level of 4; 12.7% reported a pain level of 5; 10.9% reported a pain level of 6; 14.4% reported a pain level of 7; 17.2% reported a pain level of 8; 7.7% reported a pain level of 9; and 11.4% reported a pain level of 10 (Table 2). A total of 50.6% patients reported severe pain. The mean NRS pain value was 6 with a range of 1-10 and a mode of 8. Interventions for pain included opioid and non-opioid analgesics, labs, and procedures. Pharmacologic interventions were acetaminophen, morphine, tramadol, oxycodone, hydromorphone, and nitroglycerine. Non-pharmacologic interventions included 12-lead electrocardiogram (ECG), x-rays, labs including troponin and blood cultures, application of ice to affected area, oxygen and specialist consult. The threshold for intervention was a pain NRS of 7.

TABLE 2. *Pain Rating per Patient*

Pain Level	Number of Patients	Percentage of Population
1	9	1
2	26	5.6
3	38	8
4	46	9.9
5	59	12.7
6	51	10.9
7	67	14.4
8	80	17.2
9	36	7.7
10	53	11.4

Bleeding

Ninety-eight patients had 603 documented blood output levels of zero. No bleeding events were present in this data.

Change in Respiratory Status

For this clinical event, data from respiratory rate (RR) and pulse oximetry (SpO_2) was analyzed. There were 1,232 RRs recorded for 22 patients; there were 113 instances of RR>20 breaths per minute. Both the mean RR and mode RR was 18 breaths per minute with a range of 10-35. The threshold for intervention was RR of 20. Interventions for RR included administration of diuretics, inhaled beta-2 agonists and anticholinergics, labs, procedures, additional monitoring and nursing care. Pharmacologic interventions included loop, thiazide and potassium sparing diuretics with furosemide (the most common diuretic ordered), nebulizer treatment with albuterol, nitroglycerine, and antibiotics. Non-pharmacologic interventions consisted of oxygen, labs including brain natriuretic peptide, troponin, venous and arterial blood gases, 12-lead ECG, chest x-ray, incentive spirometry, and continuous pulse oximetry.

For this project, SpO_2 values of 92% were selected to begin searching for interventions. At the hospital where data was collected, the admission order set contains parameters to notify providers if $SpO_2 \leq 88\%$. SpO_2 values were obtained for 42 patients and 331 values were identified. The average SpO_2 value was 90%, the mode was 92% and the range was 18-92%; 90.6% of values were ≥90%. The threshold for intervention was 91% with interventions similar to increased RR and included administration of diuretics, inhaled beta-2 agonists and anticholinergics, labs, procedures, additional monitoring and nursing care. Nebulizer breathing treatments with albuterol and oxygen administration were the most common interventions.

Level of Consciousness

Level of consciousness data was obtained from the Hendrich Fall Risk assessment in which a score of 4 is assigned to patients if the risk factor of confusion or disorientation was present. The data for 53 patients revealed that seven patients (13%), had a documented Hendrich Fall Risk assessment with the presence of a confusion episode. The presence of confusion/disorientation prompted a multitude of interventions including: antibiotics, laxatives, dextrose 50%, arterial blood gas, glucose check, pain assessment, imaging studies, incentive spirometry, and bladder scans. The threshold for an intervention was the presence of confusion/disorientation.

Change in Output

Emesis and urine output were used to search for clinical events related to change in output. There were two documented episodes of emesis; neither event had a new intervention although antiemetic’s were ordered on the previous day. The standard monitoring for UO in in-patient acute care is to monitor and document every 12 hours. UO <30milliters (ml) per hour is the parameter for notifying the provider for decreased urine output so for the purpose of this project, search for an intervention began with UO≤ 360 ml per 12 hours. A total of 68 patients experienced 1899 documented events for urine output (UO) ≤360 ml in 12 hours. The mean UO for the population was 263 ml, with a mode of 0 ml, and a range of 0-360 ml. Interestingly, 24% of the population had no urine output. Interventions for decreased urine output were most often diuretics including loop, thiazide and potassium sparing diuretics, hemodialysis, and strict intake/output monitoring. The threshold for intervention was UO<350ml in 12 hours.

Suicide Ideation

A nursing hospital admission assessment includes assessment of suicide ideation (SI) and past suicide attempt. No data was present for this patient population indicating admission assessment for SI was completed.

In summary, seven clinical events were examined in the clinical research data warehouse. The clinical research data warehouse provided a demographic representation of the population of the final subset of N=269 including age, race, sex, orders, and assessment values. The final subset data identified the threshold for intervention for five of the seven clinical events. The threshold for fever, pain, changes in respiratory status, level of conscious, and output was able to be extrapolated from the data subset. Data for the clinical events of bleeding and suicide was insufficient to determine the threshold for hospital intervention.

TABLE 3. *Results Summary Table*

Clinical Event	Number of Patients	Number of Events	Mean	Mode	Range	Threshold for Intervention
Fever	8	14	98	99	95-99	99
Pain	30	465	6	8	1-10	7
Bleeding	0	0	0	0	0	n/a
Change in Respiratory Status	RR=22 SpO_2=42	RR=113 SpO_2=331	RR=18 SpO_2=90	RR=18 SpO_2=92	10-35 18-92	RR=20 SpO_2=91
Level of Consciousness	7	50				Confusion
Output	Emesis=2 UO=68	Emesis=2 UO=1899	UO=263	UO=0	UO=0-360	Emesis=n/a UO=350ml
Suicide Ideation	0	0	0	0	0	n/a

In the previous methods sections (Table 1), the CE definitions were introduced. Based on the above, the following table (Table 4) contains the definition of clinical events for this population to be applied in rural communities.

TABLE 4. *Defined Clinical Events for Heart Failure*

Clinical Event	Defined Norm for non-Acute or Chronic Patients	Defined Norm for Chronic Heart Failure Patients
Fever	≤100.4°F	≤99°F
Pain	No pain, NRS=0	Mild to moderate pain, NRS≤6
Bleeding	No bleeding	No bleeding
Changes in Respiratory Status	8-16 breaths per minute $SpO_2 \geq 89\%$	<20 breaths per minute $SpO_2 \geq 90\%$
Changes in Level of Consciousness	Fully alert and oriented	Fully alert and oriented
Changes in Output	UO >360 ml/12 hours	UO >350 ml/12 hours
Suicidal Ideation	No suicide ideation	No suicide ideation

Based on results presented in Table 4, the following emerged from the data: interventions for fever and change in respiratory status occurred sooner compared to non-chronically ill patients, and interventions for pain and change in output occurred later compared to non-chronically ill patients. Interventions for change in level of consciousness occurred the same for non-chronic and chronically ill patients. The threshold for intervention for bleeding and suicidal ideation could not be determined from the data. Impacts to care include earlier recognition of infection and/or fluid overload resulting in fever or change in respiratory status, and later intervention for treating pain. Earlier recognition of infection or fluid overload in the out-patient setting could result in an earlier call or visit to primary care provider forestalling the need for emergent care and hospital readmission. Provider knowledge of the increased threshold for pain and decrease threshold for fever and respiratory status could facilitate improved patient-provider communication about clinical events and precisely when to seek care.

DISCUSSION

A literature review of the scientific literature revealed that the most effective interventions to reduce <30-day hospital readmission rates for HF patients had many components, involved more individuals in care delivery, supported patient capacity for self-care in the transition from hospital to home, and integrated patient input (Leppin et al., 2013; Retrum et al., 2012). In addition, primary care providers and medical homes may be best positioned to detect and prevent adverse events that lead to hospital readmission (Renneke et al., 2013), by using high-quality information and communication, and involving the patient in shared decision-making (Dy & Purnell, 2011; Zikmund-Fisher et al., 2010). The American College of Cardiology Foundation and American Heart Association Task Force on Practice Guidelines, *Guideline for the Management of Heart Failure*, recommends written patient education information about monitoring signs and symptoms of worsening condition; however, there is no standardized tool to use to communicate this information to patients and their families (Yancy et al., 2013). This issue is compounded for patients in rural communities, as rural patients often lack engagement in managing overall health and ineffectively utilize health care (Simmons et al., 2012). For patients in rural communities, a simplified education program focused on symptom recognition and management of fluid weight improved knowledge, self-care behavior, and disease severity in heart failure (Caldwell, Peters, & Dracup, 2005).

Summary of Framework

Ineffective patient-provider communication and decision-making contribute towards <30-day hospital readmission for patients with HF. This DNP project sought to improve patient-provider communication and decision making by defining clinical events for HF patients with the ultimate goal of reducing hospital readmissions for HF patients in rural communities. This project adapted Carrington's Effective Nurse-to-Nurse Communication Framework to reflect patient-provider communication in a rural setting, and the Naturalistic Decision Making (NDM) approach to strengthen intuition by building on experiential knowledge to improve decision-making. Since chronically ill patients with HF do not fit into the classic assessment norms as demonstrated by this project, use of the Nurse-to-Nurse Communication Framework may help to improve consistent communication about CEs recognition, resulting in decreased <30-day hospital readmission; and use of NDM may improve understanding of decision-making for patients with complex chronic health conditions. Using both NDM and the Nurse-to-Nurse Communication Framework provides a pertinent framework to guide clinical scholarship seeking to improve patient-provider communication in the rural setting.

The purpose of this DNP quality improvement project was to define the Clinical Events (CEs) experienced by heart failure patient, while in acute care; to then inform the later development of a decision-making tool designed to reduce the <30-day readmission rate for these patients. This project sought to answer two questions: 1) Do the CE "norms" for heart failure differ from those patients who are not chronically ill?; and, 2) What are the "normal" assessment values for fever, pain, bleeding, change in respiratory status, levels of consciousness, output, and suicide ideation? The six CEs, plus an additional seventh, suicidal ideation, was examined for HF patients in the hospital setting through data from the clinical research data warehouse. To answer both question one and two, the seven clinical events were examined in the clinical research data warehouse and compared to "normal" assessment values (Table 4).

To answer question 1) Do the CE "norms" for heart failure differ from those patients who are not chronically ill? The clinical research data warehouse provided a demographic representation of the population of the final subset of N=269 and revealed that clinical events correlated with an intervention in the in-patient setting; this indicated that the CE "norms" for heart failure do indeed differ from those patients who are not chronically ill for the clinical events of fever, pain, and change in respiratory status. The final subset data identified the threshold for intervention for five of the seven clinical events. The threshold for fever, pain, changes in respiratory status, level of conscious, and output was able to be extrapolated from the data subset. Data for the clinical events of bleeding and suicide was insufficient to determine the threshold for hospital intervention.

To answer question 2) What are the "normal" assessment values for fever, pain, bleeding, change in respiratory status, levels of consciousness, output, and suicide ideation? The data was analyzed to determine the threshold for hospital intervention, to determine "normal" assessment values for CEs. The threshold for intervention for fever was 99°F, which is 1.4°F less than a defined fever in a "normal" non-chronically ill patient. Many factors could contribute to this lower threshold for fever tolerance in the hospital setting including decreased cardiac output with hemodynamic instability, older age, co-existing pain, or risk for dehydration. In patients with cardiac disease or chronic debilitating disorders, the side effect of a fever may be harmful (Uphold, 2013). This project data indicated treatment with acetaminophen most commonly, as non-steroidal anti-inflammatory drugs are inappropriate for patients with renal insufficiency, which is a common condition in older adults and patients with HF (Uphold, 2013).

The threshold for intervention for pain was a Numerical Rating Scale (NRS) of 7, which correlates to moderate-severe pain, and is higher than the "normal" threshold for pain intervention of mild-moderate pain, or NRS of 4. For this project, it was not known where the pain was located or any pain descriptions. Since pain in the older adult often goes unrecognized by providers and is complicated by comorbid disease (Uphold, 2013), it is not surprising that hospitalized older adults may report moderate to severe levels of pain. The project data shows that typical pain levels throughout hospitalization for older adults with HF, is a pain NSR of 6; common interventions for pain included non-opioid analgesics and laboratory tests.

Change in output, respiratory status and level of consciousness may all relate to cardiac output and fluid volume status in the HF patient. Decreased urine output may worsen symptoms of dyspnea and cause altered mentation. The data findings in this subset do not give a clear indication of change in urine output due to the sample containing an unknown number of patients with impaired renal function and on hemodialysis. Further investigation is required to determine accurate change in output based on weight measurement versus urine measurement in ml. It appears that HF patients at baseline have some degree of tachypnea and have lower SpO_2 values. It is unknown in this sample how many patients have comorbid acute or chronic lung disease.

The data subset did not contain any episodes of bleeding or any documentation of suicide ideation. Due to the common use of anticoagulant and antiplatelet medications in HF patients, any episode of bleeding should be promptly evaluation by a provider. A hospital admission history should consist of assessment of suicide risk, especially in the HF population due to the high prevalence of depression (Yancy et al., 2013). Despite a thorough and repeated examination of the data, no assessment value was located. Further investigation to determine if this assessment data is located in the clinical research data warehouse may be warranted.

The results from this project support providing intervention for fever and change in respiratory status earlier than for non-chronically ill patients, and providing interventions for pain and change in output occurred later compared to non-chronically ill patients. Interventions for change in level of consciousness occurred the same for non-chronic and chronically ill patients. The threshold for intervention for bleeding and suicidal ideation could not be determined from the data. Impacts to care include earlier recognition of infection and/or fluid overload resulting in fever of change in respiratory status, and later intervention for treating pain. Earlier recognition of infection or fluid overload in the out-patient setting could result in an earlier call or visit to primary care provider forestalling the need for emergent care and hospital readmission. Provider knowledge of the increased threshold for pain and decrease threshold for fever and respiratory status could facilitate improved patient-provider communication about clinical events and give patients and their families precise instructions about when to seek care.

Limitations of Project

The data mine of the subset population N=269, did not identify the kidney function or need for hemodialysis; it was beyond the scope of this project to investigate. Since the primary reason for hospital readmission for HF patients is worsening symptoms caused by fluid overload (Caldwell, Peters, & Dracup, 2005), change in output is an important CE to understand. This project did not use weight as a CE measure due to the ambiguous value for weight in the data, and the lack of a baseline weight to make a comparison. For patients in the outpatient setting, monitoring daily weight and reporting weight gain is a cornerstone of effective HF management. Measuring urine output at home may be difficult for patients and less practical than monitoring weight gain. Also, because many patients do not use pulse oximetry at home, this may present a barrier to home monitoring of change in respiratory status.

In addition, the sample N=269 was 63.7% male which may not accurately reflect the presentation of CEs in female patients with HF. Lastly, the data from the clinical data warehouse was not complete. For the sample, there was not corresponding data for each patient’s temperature, respiratory rate, pulse oximetry, urine output, weight, level of conscious or presence suicide ideation.

Strengths of Project

After completing and extensive review of the literature, this project was the first of its kind to use data from a clinical research data warehouse to examine CEs for heart failure patients. Using large datasets to explore patient characteristics is an innovative and cost effective means to discover emergent patterns and formulate predictive models (Zaki & Meira, 2014), which can then be used to inform and enhance the decision-making process to improve patient outcomes (Milovic & Milovic, 2012). This project detected patterns of CEs in HF patients for fever, pain, change in respiratory status, and change in level of consciousness. This project also detected the threshold for an intervention in the hospital setting for fever, pain, and change in respiratory status.

Implications for Practice

The data obtained from the clinical research data warehouse examined the threshold for intervention for CEs for HF patients in the in-patient setting and may be used to develop a home decision-making algorithm to guide both patient-provider communication to reduce <30-day readmission rates for patients in the rural community. The algorithm may be used in primary care to educate patients on CE and differentiate when to manage symptoms at home, when to contact primary care provider, or when to seek emergent care. Knowledge of CEs and how to manage them may serve to reduce hospital readmission and inappropriate use of health care services. In addition, further investigation using the Effective Nurse-to-Nurse Communication Framework (Carrington, 2012) may define CEs for other chronically ill populations.

Future Work

Future quality improvement plans are to develop an electronic algorithm decision-making tool that can be used in the outpatient setting to guide patient-provider communication when educating patients about HF symptom management. This algorithm can also be printed and provided to patients with the goal of reducing hospital readmission. Although this project has informed future goals, analyzing a sample of patient data where kidney function is known and distinct weight is included in data is needed to more fully understand the clinical event of change in output in HF patients.

Conclusion

There is an urgent need to assist older adults in management of their chronic health conditions in rural communities. These individuals are at a higher risk for hospitalization and subsequent readmission, which increases mortality and decreases quality of life (Dilworth, Higgins, & Parker, 2012; Kaboli et al., 2012). The Nurse-to-Nurse Communication Framework was adapted to reflect patient-provider communication in a rural setting, and the Naturalistic Decision Making approach was used to describing the decision-making process used by practitioners in the real world setting to strengthen intuition which improves decision-making. Using both frameworks provided a pertinent framework to guide a quality improvement project seeking to improve patient-provider communication in the rural setting.

The project results support that there are differences in “normal” assessment values for fever, pain, and change in respiratory status between chronically ill patients with HF, and non-chronically ill patients; there was insufficient data to define bleeding, change in output, or suicide ideation. Impacts to care include earlier recognition of worsening HF symptoms that could result in an earlier call or visit to primary care provider forestalling the need for emergent care and hospital readmission. The information gained from this project will inform health care professionals of the differences in CEs in “normal” between patients with heart failure and those without chronic illness. This information may be used to inform development of evidenced-based algorithm to guide decision-making at home, and it may also provide the foundation for the development of a tool for patient use to prevent <30-day hospital readmission.

OTHER INFORMATION

Projected Budget

The researcher anticipates costs for computer hardware for statistical analysis (Appendix C).

APPENDIX A:

LITERATURE SYNTHESIS

Author / Article	Qual: Concepts or phenomena Quan: Key Variables Hypothesis Research Question	Design	Sample (N)	Data Collection (Instruments/tools)	Findings
Caldwell, Peters & Dracup, 2005. A simplified education program improves knowledge, self-care behavior, and disease severity in heart failure patients in rural settings.	Focus on a single component of disease management could improve knowledge, self-care behavior, and HF severity in a rural setting.	Randomized control trial.	n=36 older English speaking adult HF (NYHA class II-IV) patients (n=11 control, n=14 intervention). 69% male, 31% female. 94% white. **Setting:** Rural Northern California; outpatient clinic and patient's home.	Intervention group received individualized "simple individualized education" and counseling session with focus on symptom recognition and fluid weight management, and phone call 1 month later for reinforcement. Control group received usual care and written information. 25 question HF knowledge questionnaire (adapted from REACT study), self-reported self-care behavioral questionnaire (European HF Self-Care Behavioral Scale), and B-natriuretic peptide (BNP) measurement to measure HF severity.	Baseline HF knowledge, self-care behaviors and BNP no differences between groups. Post intervention, the intervention group had improved knowledge (*P*=.01) and self-care behaviors (*P*=.03). No statistical difference in BNP.
Dy & Purnell, 2011. Key concepts relevant to quality of complex and shared decision-making in health care: A literature review	Identify concepts and components relevant to complex shared decision-making.	Qualitative literature review of studies from 1996-2009;	n=29 studies **Setting:** International	Reviewers conducted data base search, abstracted key concepts and information, applied concepts to factors related to shared medical decision making and outcomes.	7 key concepts: provider competence, trustworthiness, and cultural competence; patient/surrogate competence; quality of information and communication; and decision-making roles and involvement.
Leppin et al, 2014. Preventing 30-day hospital readmissions a systematic review and meta-analysis of randomized control trials	Synthesize current evidence of efficacy of interventions to reduce hospital readmissions and impact on patient capacity to enact post discharge care.	Systematic review & meta-analysis. Database search of from 1990-2013 of clinical trials that assessed effect of intervention on 30 day readmission.	n= 42 randomized trials of adults hospitalized for medical or surgical cause.	Reviewers coded according to a standardized form how closely intervention was likely to affect patient workload and capacity for self care. Used random-effects meta-analysis that estimated pooled risk ratios and 95% confidence intervals for early readmission.	Complex discharge interventions involving more individuals (interaction *P*=.05), more components (interaction *P*=.001) that supported capacity for self care (interaction *P*=.04) were 1.4, 1.3, & 1.3 times more effective that other interventions. Tested interventions prevented early readmission ([95% CI, 0.73-0.91]; *P*<.001).

Author / Article	Qual: Concepts or phenomena Quan: Key Variables Hypothesis Research Question	Design	Sample (N)	Data Collection (Instruments/tools)	Findings
Rennke at al., 2013. Hospital-initiated care interventions as a patients safety strategy a systematic review	Examined effectiveness of hospital-initiated transitional care strategies that aimed to prevent adverse events, ED visits, and readmission after discharge.	Systematic review. Database search of literature from 1990-2012 of RCTs and non-randomized control trials that evaluated effect of transitional care strategies pre and post hospital discharge on ED use or readmission rates.	n=47 trials (28 RCTs and 19 controlled clinical trials) of general medical patients.	Reviewers extracted data on 6 domains (study design, methodological quality, study setting, participants, details of intervention components, and outcomes).	Use of bridging that incorporates pre and post hospital patient contact and dedicated transition provider moderately reduced ED visit and readmission rates. Evidence on effective strategies to prevent adverse events at home post discharge are scant. *Primary care providers and medical home may be best positioned to detect and prevent adverse events.*
Retrum at al., 2012. Patient-identified factors related to heart failure readmission.	Little is known about the root cause of hospital readmission for patients with heart failure (HF). Interviews examined patient perspective concerning HF readmission.	Qualitative descriptive	n=28 patient with HF that experienced a hospital readmission ages 29-88 from 2010-2011. 36% females;64% males **Setting:** United States Hospital room	In-depth semi-structured interviews, chart review to gather demographic data. Analysis of interview organized and coded in qualitative software.	Readmission reasons are complex (distressing symptoms, progression of illness, psychosocial factors, and health system failures) and rarely stem from a single cause. Interventions should be systemic, multifaceted, and integrate patient input.
Simmons et al., 2012. Mixed methods study of management of health conditions in rural low-income families: implications for health care policy in the USA	Examine health issues and health management strategies used by rural low-income women and their families.	Mixed method study triangulated quantitative and qualitative data	n=271 rural low-income women with sub-sample of 44. Mean age 32 years. 66% white, 21% Latina, 7% black, and 6% other. **Setting:** 16 states in the United States	Quantitative data generated frequencies (using SPSS) of number of chronic conditions, presence of health insurance, and adherence to prescription medication. 44 interviews conducted to obtain qualitative data to generate themes reviewed and coded by 3 researches.	Rural families have multiple healthcare needs: 90% of families have at least one member with a chronic condition (18% manage 9 or more conditions). 30% report not filling or delaying prescription medication. Themes discovered in qualitative analysis were lack of engagement in managing overall health and ineffective utilization of health care.

Author / Article	Qual: Concepts or phenomena Quan: Key Variables Hypothesis Research Question	Design	Sample (N)	Data Collection (Instruments/tools)	Findings
Stacey et al., 2012. Decision coaching to prepare patients for making health decisions: A systematic review of decision coaching in trials of patient decision aids	Determine effectiveness and explore characteristics of decision coaching within trials of patient decision aids for health decisions.	Systematic review of trials from 1997-2009; subanalysis of 2011 Cochrane Review of Decision Aids for People Facing Health Treatment or Screening Decisions.	n=10 trials; mean number of participants per trial was 242.	Reviewers independently screened, extracted data, and appraised quality of trial. Data synthesis reported descriptively. Compared effectiveness of decision coaching with another intervention and/or usual care.	Decision coaching improved knowledge, although effect was similar to using decision aid. Variable results for participation in decision making, values-choice agreement, and satisfaction. Unable to determine if coaching improves decision making; more research required.
Vijayakrishnan, et al. 2014. Prevalence of heart failure signs and symptoms in a large primary care population identified through the use of text and data mining of the electronic health record.	Use of a text-and data-mining tool to identify documentation of signs and symptoms of HF the electronic health record, in the years before its diagnosis, in primary care.	Case-control study using a retrospectively identified cohort	n=~400,000 primary care patients; n=4,644 incident HF cases with n=45,981 group-matched control subjects **Setting:** 41 community practice clinics in Pennsylvania	An Natural Language Processing software application (developed and validated) identified (using clinical notes) affirmations and denials of 14 of the 17 Framingham criteria for HF. Variables reported as mean or median; comparisons were made with chi-square tests or t tests. Analyses were performed with R software.	HF signs and symptoms are documented in a primary care population; it can be identified through automated text and data mining of EHRs. 85% of patients who developed HF had ≥1 criterion ≤1 year before their HF diagnosis. Prevalence of individual HF signs and symptoms were variable in case and control subjects.
Yancy et al., 2013. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines.	Clinical practice guideline to assist in clinical decision making, acceptable approaches to the diagnosis, management, and prevention of heart failure.	Systematic review of evidence	>900 relevant articles reviewed by national experts. Recommendations made for US.		

Author / Article	Qual: Concepts or phenomena Quan: Key Variables Hypothesis Research Question	Design	Sample (N)	Data Collection (Instruments/tools)	Findings
Zikmund-Fisher et al., 2010. Deficits and Variations in patients' experience with making 9 common medical decisions: The DECISIONS survey	Identify variations and deficits related to making common medical decisions (to take medication for hypertension, hypercholesterolemia, or depression; to have cancer screening for breast, prostate, or colon; or to have elective surgery for cataract removal, hip/knee replacement, or low back pain) and identify factors associated with confidence in decisions.	Cross-sectional survey	n=2473 English-speaking adults 40 years and older, who made a medical decision from 2006-2007. 61% females; 39% males **Setting:** United States	Nationwide telephone survey of US adults identified by random digit dialing who reported making at least 1 medical decision within the past 2 years. Patients reported who initiated discussions and made final decision, how much decision pro and con was discussed, whether they were asked about preferences, and their confidence in their decision. Estimated population means, 95% CI, significance of differences using STATA (calculated *F* statistic), and ordered logistic regression analysis.	Patient –driven discussions varied significantly (16-48%), Providers most often recommend medical intervention (78-85%) and less frequently asked about patient preferences or discussed reasons not to take action (34-80%). Decision confidence highest in patients who made decision themselves (OR =14.6 $P< .001$) or had been asked for their preference (OR=1.32, $P<.01$). Survey data shows association (not relationship) of how patients experience process of their medical care.

APPENDIX B:

HEART FAILURE ICD-10 CODES

Heart Failure ICD-10 Codes

I50	Heart failure
I50.9	Heart failure, unspecified
I50.1	Left ventricular failure
I50.20	Unspecified systolic (congestive) heart failure
I50.22	Chronic systolic (congestive) heart failure
I50.23	Acute on chronic systolic (congestive) heart failure
I50.32	Chronic diastolic (congestive) heart failure
I50.33	Acute on chronic diastolic (congestive) heart failure
I50.42	Chronic combined systolic (congestive) and diastolic (congestive) heart failure
I50.43	Acute on chronic combined systolic (congestive) and diastolic (congestive) heart failure

(American College of Cardiology Foundation, 2016)

APPENDIX C:

PROJECTED BUDGET

Projected Budget

Expense Items	**Requested Amount**
Operations	
Equipment (DVD Writer)	$50.00
Other	$40.00
Total	**$90.00**

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