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Reducing Thirty-Day Hospital Readmissions in Drug and Medication Poisoning: An Observational Study

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Reducing Thirty-Day Hospital Readmissions in Drug and Medication Poisoning: An

Observational Study

by

Jenna M. Evans, M.S.H.A.

Submitted in partial fulfillment of the requirements for the degree of
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Reducing Thirty-Day Hospital Readmissions in Drug and Medication Poisoning:
An Observational Study

By

Jenna M. Evans

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ABSTRACT

A common and costly occurrence in the United States is thirty-day hospital readmissions. Awareness of 30-day hospital readmissions is currently a national priority. To reduce avoidable readmissions, the Patient Protection and Affordable Care Act of 2010 established a "Hospital Readmission Reduction Program" implemented to provide possible solutions for preventable thirty-day readmissions. Part of this policy states that hospitals with higher than expected adjusted re-hospitalization rates have lower reimbursement rates. One specific area known to be a cause of thirty-day hospital readmissions is drug and medication poisoning. An observational study of data from the Nationwide Readmissions Database is being used to help identify contributing factors and provide suggestions for preventable thirty-day readmissions relative to drug and medication poisoning. Factors that include: gender; demographics; cost index; socio-economic, and hospital factors are identified to aid in the understanding of thirty-day hospital readmission of drug and medication poisoning. Finally, suggestions based on quantitative analyses contribute to the understanding of risk factors of thirty-day readmissions in drug and medication poisoning occurrences. Outcomes include statistical significance in gender and significance in the cost index of the individual patient; such as the ability to pay or not to pay for services rendered. Certain socio-economic factors whereas contributed, however, overall socioeconomic status was not significant along with hospital specific factors being insignificant. The study resulted in the identification of factors to aid in drug/medication episodic occurrences in a patient population experiencing thirty-day readmissions. Prevention strategy from both a clinical and practical application may be used to initiate cost saving applications. Future studies suggest expanding on drug and medication poisoning in certain sub-specific populations, further

identifying illegal vs. legal drug/medication differentiation, and conducting international

comparisons based on current findings.

Chapter I

INTRODUCTION

Background and Significance of the Problem

Early hospital readmissions have been recognized as a common and costly occurrence, particularly among the elderly and high-risk patients (Leppin et al., 2014). The Centers for Medicaid & Medicare Services (CMS) defined readmission within the Readmissions Reduction Program as an admission to a subsection hospital within 30 days of a discharge from the same or another subsection hospital (CMS, 2014). One in five Medicare beneficiaries who experience hospitalization are readmitted within thirty days at a cost of readmissions, over $26 billion per year in which both readmission and costs can be prevented (Jenks et al., 2009). Medicare spent over $174 billion on unplanned readmission over the last ten years (Jencks, Williams & Coleman, 2009). The Centers for Medicare & Medicaid Services implemented "all cause unplanned acute care readmission for thirty days' post discharge from inpatient rehabilitation facilities (IRFs)" as a quality measure in 2014 (Centers for Medicare & Medicaid Services, 2014). To encourage improvement in the quality of care and a reduction in unnecessary health expenses, policy makers and reimbursement strategists have made awareness of 30-day hospital readmissions a national priority (Joynt & Jha, 2013, Institute of Medicine 2006, Medicare Payment Advisory Committee, 2007). To reduce avoidable readmissions, the Patient Protection and Affordable Care Act established a "Hospital Readmission Reduction Program." (Zhang et al., 2009). Presently, according to this policy, hospitals with higher than expected adjusted re-hospitalization rates have a lower reimbursement rate (Zhang et al., 2009). Given this association of unplanned re-admission with morbidity and mortality along with negative economic impact

this has become a primary focus of health care quality improvement and overall health care reform (Kocher & Adashi, 2011).

Drug and Medication Poisoning

Drug and medication poisoning was the leading cause of injury death in the United States and continues to dominate the lead factor of both admissions and re-admissions by intentional and accidental injury (Warner; Chen; Makuc; Anderson& Minino, 2011). Drug and medication poisoning includes the harmful effects on the body due to excessive dosage of a drug or medication (Stedman, 2001). As directly cited, the medical definition of "poison" is a substance that, on inhalation, absorption, ingestion, injection, application or development within the body may cause structural or functional disturbance (Stedman, 2001). Pharmaceutical and illicit drugs and are the major cause of poisoning deaths, accounting for 90% of poisoning deaths in 2011 (Chen et al., 2014). Abuse and misuse of prescription drugs is responsible for much of the recent increase in drug-poisoning deaths (Paulozzi, 2012). The practical need to understand the number of unplanned re-admissions within this population of patients that have suffered drug and/or medication poisoning has several components. Primary re-admission diagnoses are needed to gain understanding to solve the re-admission problem in patients that were recently discharged after surviving drug/medication poisoning by identification of common incidences and re-admission diagnoses, therefore, aiding in future preventative measures. Prediction in trends in readmissions known to effect over-all cost factors is needed to understand past, current and anticipated future costs of re-admissions. Such cost factors further impact saving initiatives and strategy on the individual hospitals, health systems and on the governmental level. It is helpful to understand re-admissions for drug and medication poisoning within this population for measures in relation to short term and long-term patient care. It is important to understand current and

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future interventions that complement improving patient care and, in turn, producing better patient outcomes. It is also necessary to explore interventions in re-admission prevention for patients and providers respectfully. This topic has minimal information relative to nationally reported number of incidences; primary diagnoses upon re-admission, and associated costs. Most importantly, research in this area is promotion to inform cost saving strategy. Focus on thirty-day readmissions after drug and medication poisoning in the United States is an area that requires more research.

Drug and medication poisoning costs associated with thirty-day re-admissions is an area that requires more exploration (Ernst et al., 2015). Readmission costs due to drug and medication poisoning have varied dependent upon several factors. The type of drug/medication classifications; age of patients being re-admitted; sex of patients being re-admitted, and demographic regions are a few examples of the lack of available research on this topic (Ernst et al., 2015). Re-admission diagnoses, for example, multiple diagnoses of individual patients further complicate the availability of accurate cost identification if this topic. To be more specific, patients often are re-admitted due to a chief complaint and/or diagnosis when there are often co-morbidities present. An estimated one hundred thousand emergency department hospitalizations annually are caused by adverse drug and medication poisoning events within the age of seniors greater or equal to sixty-five (Budnitz et al., 2012). Based on the International Classification of Diseases, Ninth Revision (ICD-9) codes it is determined that hospital admission and re-admission rates are higher within this population for medication-related incidences than for younger individuals (Pellegrin et al., 2016). Both the senior population age greater or equal to sixty-five and non-senior population can be viewed to compare prevalence of drug and medication incidences. Much of drug and medication related events are preventable, contributing

to avoidable costs and decreased occurrences of morbidity and mortality (Leendertse et al., 2011). Drug and medication poisoning is an area that is included within the 30-day readmission rate however, based on the literature both illegal and legal drug vs. prescription/non-prescription medications are not differentiated. There is not a way to control illegal usage. Little evidence is available to identify high-risk patients for preventions and/or after discharge case management, especially for the target population in this study. There is lack of knowledge on how to prioritize the risk factors in terms of prioritizing interventions and cost savings. We only have record of information from certain demographic regions based on current studies within the United States.

The overarching purpose of the study is to explore risk factors to thirty-day readmissions related to the drug and medication poisoning. Such areas included in the study are drug and medication poisoning cost(s), the type of drug/medication classifications; age of patients being re-admitted; sex of patients being re-admitted, and demographic regions. The goal of the study is to identify contributing factors which can potentially aid in the decrease of hospital readmissions related to drug and medication poisoning. Additionally, study findings will help to identify cost saving initiatives for health care providers and the government respectfully. It is helpful to understand re-admissions for drug and medication poisoning within this population for preventative measures in relation to short term and long-term patient care. It is important to understand current and future interventions that complement improving patient care and, in turn, producing better patient outcomes. It is also necessary to explore interventions in re-admission prevention for patients and providers respectfully. Most importantly, increased research within this area is needed for cost saving strategy.

Based on this information, the following research questions are derived,

1. "Does Gender predict the number of readmissions within the drug/medication population?"

2. "Are socio-economic factors associated with thirty-day readmissions?"

3. "Are index hospitalization costs associated with thirty-day readmissions?"

4. Geographically, the urban/rural locations are predicted to have more incidences of drug and medication poisonings per year than other regions determining drug/medication readmission prevalence on different demographic region.

This study is based upon the following theoretical framework which emerges from the integration of historically recognized theories such as the theory of "Planned Behavior", "Lewin's Change Theory", and the "Trajectory Framework" (Ajzen, 1991: Corbin & Strauss, 1990: Lewin, 1951). Providers of care and patients must adopt care maintenance strategy to avoid drug and medication poisoned individuals being re-admitted. The two separate theories of Lewin's Change Theory and the Trajectory Framework outline a systematic, moving process surrounding the notion of chronic illness (Corbin & Strauss, 1990: Lewin, 1951). To summarize, Lewin's Change Theory basically states to un-freeze, change, then re-freeze an action or event (Lewin, 1951). For patients to avoid unnecessary readmissions within thirty days of their recent discharge, a continuous cycle must be interrupted. Providers must help patients realize their symptoms and understand their individual diagnosis, representing planned behavior (Ajzen, 1991). By doing so, this is un-freezing their current state (Lewin, 1951). Increased accountability, self-awareness, education, and literacy among other areas represents the change state (Lewin, 1951: Corbin & Strauss, 1990). This encouragement allows patients to understand their health, know their resources, and maintain this change for the better (Ajzen, 1991). Once the individual patient gains this understanding and adapts to change, the re-freezing state or

action that the patient takes to avoid hospital readmission occurs (Lewin, 1951). Relating change theory back to the identified problem, providers must ensure that patients are stable before discharging them to avoid any dis-equilibrium in the patients' individual health status (Lewin, 1951). Within this theory, patients go from a stable to acute phase (Lewin, 1951). The discharge plan of care involving these steps is suggested to be followed for avoidance of potential thirty-day readmissions (Corbin & Strauss, 1990).

The trajectory framework leads to the hypothesis that males overall have more hospital re-admissions for this diagnosis than females indicates a trend in drug/medication readmissions based on sex; socio-demographic factors are associated with 30-day readmissions; diagnostic complications are associated with 30-day readmissions; index hospitalization costs are associated with 30-day hospital readmissions, and geographically, the region of the north east has more incidences of drug and medication poisonings per year than other regions hypothesized to determine more or less drug/medication readmission prevalence based on different demographic regions (Corbin & Strauss, 1990). Planned behavior serves to hypothesize that the improvement in individual patient quality of life will occur through prevention measures to prevent thirty-day readmissions in recently discharged drug and medication poisoned patients (Ajzen, 1991). Further shaped by the theoretical framework, is the hypothesis that knowing and understanding diagnoses impacting both males and females of the population will aid in future identification of episodic cost containment identification strategy represented through the Lewin's change theory and the trajectory framework (Corbin & Strauss, 1990: Lewin, 1951). It is hypothesized that there is an existing trend in diagnoses and an increased episodic cost utilization upon re-admission among both males and females. Subsequently, derived through Lewin's change theory, is the hypothesis that the thirty-day readmission rates will decrease with the

implementation of a nationally accepted preventative strategy through predictor identification and prevention strategy presence (Lewin, 1951).

Reduction of thirty-day readmissions within the drug/medication population will be further explored providing a review of past and current literature surrounding thirty-day readmissions. This literature contains mortality data; thirty-day readmissions predictors; strategies and challenges; diseases/illness factors; age related factors, and interventions. The literature also includes governmental intervention and financial penalty of readmissions; most common conditions contributing to re-admissions; interventional approaches, and other contributing re-admission factors.

For the research methodology, the proposed study is an observational study of previously obtained national claims data. It is a cross-sectional quantitative patient-level study. Analysis of the data through multiple linear regression and binary logistic regression will be performed and discussed within the results chapter to answer both research questions and hypotheses. Several conclusions will be determined based on these analyses. This study is anticipated to help gain knowledge to address the identified factors surrounding the topic of thirty-day readmissions within individuals that have suffered drug/medication poisoning.

Chapter II

LITERATURE REVIEW

Governmental Intervention & Financial Penalty of Readmissions

Implemented in October 2012 by the Centers for Medicare and Medicaid Services (CMS), the Hospital Readmissions Reduction Program (HRRP) responded to rising readmission costs. CMS estimated in 2010 that the government could save five billion dollars by the end of the fiscal year in 2013, if there is a 20% reduction in hospital rates (Mor, Intrator, Feng, & Grabowski, 2010). The Hospital Readmissions Reduction Program, as part of the United States Patent Protection and Affordable Care Act is a policy enacted to financially hold hospitals responsible for excess readmissions (Zhang et al., 2016). Nearly a fifth of Medicare beneficiaries discharged from the hospital are readmitted within thirty days per the Medicare Payment Advisory Commission (MedPAC) (Gerardt, et al., 2013). The program especially focuses on readmission penalty for heart failure, acute myocardial infraction (AMI), and chronic obstructive pulmonary disease (COPD) (Zhang et al., 2016). Financially, it is important to understand that this policy penalizes hospitals that have high instances of re-admissions in patients suffering from these illnesses through diminishing reimbursements. Mentioned illnesses and diseases specific to thirty-day readmissions may or may not be preventable, as argued health care providers should be reimbursed for providing care regardless of the individual patient situation.

In the fiscal year of 2013: 2,217 nationwide hospitals cumulatively incurred more than $300 million in penalties (Fontanarosa & McNutt, 2013). The worst offenders incurred millions of dollars in penalties, while many incurred thousands (Zhang et al., 2016). In 2015, the maximum penalty was increased by 3% (Zhang et al., 2016). In 2015, this penalty affected 78%

of national hospitals, projecting a total of $428 million (Boccuti & Casillas, 2015). Hospitals perceive the HRRP as an immediate threat to enforce decisions concerning readmission reduction with trade-offs between cost and revenue drivers (Zhang et al., 2016). As directly cited within literature provided by Zhang et al., "If a non-negligible portion of the hospital's patients are covered under a pay-per-case insurance scheme, thirty-day readmissions may account for a non-negligible proportion of the hospitals' contribution margin" (Zhang et al., 2016). Process improvement costs, such as technology, are impacted as process changes often relate to increased costs in process changes (Zhang et al., 2016). Financial penalties for health care organizations with high readmission rates have intensified efforts to reduce re-hospitalization (Kripalani et al., 2015).

Public Reporting and Penalties

As previously mentioned, to reduce rates of hospital readmissions, the Centers for Medicare and Medicaid Services (CMS) has reported risk-standardized readmission rates for pneumonia, myocardial infarction, and acute heart failure since 2009 (U.S. Department of Health and Human Services, 2013). Beginning in 2013, readmission rates for total hip and/or total knee replacement and hospital-wide unplanned readmission rates were added (U.S. Department of Health and Human Services, 2013). An intense risk-adjustment methodology is used to control for differences in hospitals' patient population (Kripalini et al., 2015). However, these models, rely mainly on the presence of comorbid conditions, as determined from claims data, and do not account for other factors associated with a successful transition to home (Kripalini et al, 2015) Patient race, socioeconomic status, health literacy, social support, community resources, and practice patterns are examples of additional factors that impact successful transitions (Kripalini

et al., 2015). The ability to compare hospital performance solely based upon these factors is somewhat limited (Joynt et al., 2013).

In 2009, the cost of readmissions to the health care system accounted for an estimated $17.4 billion in spending annually by Medicare alone (Jenks et. al., 2009). As directly outlined as part of the policy, The Hospital Readmissions Reduction Program (HRRP), established in the Affordable Care Act, authorizes Medicare to reduce payment to hospitals with excess readmission rates (Patient Protection and Affordable Care Act, 2017).

Penalties are based on a calculation of the risk-standardized 30-day readmission rate for the preceding three years for Medicare beneficiaries hospitalized with heart failure, pneumonia, or acute myocardial infarction (Kripalani et al., 2015). Hospitals with higher than anticipated readmission rates are penalized a percentage of the total CMS reimbursement, beginning at 1% in year 1 of the program, up to 3% in the third year (Kripalini et al., 2015). Incentives are based on the notion that readmissions have a direct effect on the quality of care (Kripalini et al., 2015). CMS penalties are based on three-year performance evaluations. Even if hospitals successfully reduce their readmission rates, the financial benefit will not be immediate. The benefit will only be realized only if improvements are sustained exceeding a three-year time period (Kripanlini et al., 2015).

Supporters of the Hospital Readmissions Reduction Program (HRRP)

Supporters of the HRRP argue the program's effectiveness**.** In 2012, CMS reported that post-HRRP implementation reduced readmission rates in more than 239 out of the 309 hospital referral regions (Gerherdt et al., 2013). The Medicare Payment Advisory Commission supports the HRRP as there was a reported decrease in national thirty-day readmission rates immediately post-HRRP implementation (Zhang et al., 2016). National rates for all diseases dropped from

15:6% in 2009 to 15:3%, noting a small but significant decrease (HealthCare.gov 2011) (Zhang et al., 2016). Hospital accountability for post-discharge policies is argued as the purpose of the HRRP (Zhang et al., 2016). Quality of patient care is not directly affected by the policy (Zhang et al., 2016). This policy is a way to increase hospitals' communication with patients upon discharge. Poor communication, ineffective management of medication, and inadequate patient transitions are areas that supporters mention to be addressed by the HRRP enactment (Zhang et al., 2016).

Critics of the Readmissions Reduction Program (HRRP)

Critics argue that hospitals cannot control re-admissions as certain re-admissions may not be preventable. Health care systems funneling down to individual hospitals should not be held accountable for patients with adverse and/or chronic conditions requiring frequent hospitalization. Measures that hospitals use relevant to discharges may only be minimally effective in prevention of readmission. Critics feel that individual patient health status must be managed by the patient and/or patients care givers post-discharge. There exists minimal effort outside of the hospital to ensure appropriate patient care post-discharge. A study in 2011 by Joynt et al. concluded that was strong evidence patients that suffer from severe illness or are from socioeconomic disadvantaged areas are at a high risk for readmission (Zhang et al., 2016).

Most common conditions contributing to re-admissions

Within the Medicare population alone, 20% of chronic obstructive pulmonary disease (COPD) patients are readmitted for acute exacerbation (AECOPD) within 30 days of discharge (Guerrero, Crisafulli & Liapikou, 2016). Significance of early vs. later readmission within the first thirty days of discharge is not fully understood (Guerrero et al., 2016). A study by Guerrero et al., was performed to estimate the mortality risk associated with readmission for acute

exacerbation within 30 days of discharge. Currently, no studies have been conducted to evaluate readmission for AECOPD within 30 days as a prognostic factor in COPD patients (Guerrero et al., 2016). The goal of this study was to estimate, in both short and long-term follow-up periods, the risk of mortality due to all causes in patients presenting an acute exacerbation within 30 days of discharge including COPD patients requiring re-hospitalization (Guerrero, 2016). Data was collected and evaluated upon admission and during hospital stay, and mortality data was recorded at four-time points during follow-up (Guerrero et al., 2016). These time points were 30 days, 6 months, 1 year and 3 years (Guerrero et al., 2016). The results of the study indicated that patients readmitted within 30 days had worse dyspnea perception, poorer lung function, and higher clinical severity (Guerrero et al., 2016). As directly cited from the literature, mortality risk during the follow-up period showed a progressive increase in patients readmitted within 30 days in comparison to patients not readmitted; moreover, 30-day readmission was an independent risk factor for mortality at 1 year (Guerrero et al., 2016). In patients readmitted within 30 days, the estimated absolute increase in the mortality risk was 4% at 30 days; 17% at 6-months; 19% at 1-year; and 24% at 3 years (Guerrero et al., 2016). The conclusion of the study suggested that readmission for AECOPD within 30 days is associated with an increased, long-term risk of death (Guerrero et al., 2016).

Thirty-day mortality rates, thirty-day readmission rates and length of stay have not been previously compared between Medicare beneficiaries with heart failure with either reduced ejection fraction against patients with heart failure with preserved ejection fraction (Loop; Van Dyke; Chen; Brown; Durant, Safford & Levitan, 2016). A four-year study from 2007-2011 was performed to determine a relationship between length of stay, thirty-day mortality and thirty-day readmission rates among cardiac patients within the Medicare population (Loop et al., 2016). A

cohort of 19,477 Medicare beneficiaries admitted to the hospital and discharged alive with a primary discharge diagnosis of heart failure was aggregated within the given time frame (Loop et al., 2016). Poisson regression, Gamma regression, and Cox proportional hazard models with a competing risk for death were utilized to model length of stay, 30-day readmission rate, and 30-day mortality respectively (Loop et al., 2016). An adjustment for all models was made for heart failure severity, co-morbidities, nursing home residence, demographics, and calendar year of admission (Loop et al., 2016). Beneficiaries with heart failure with reduced ejection fraction had a length of stay 0.02 shorter than patients with heart failure including preserved ejection fraction (Loop et al., 2016). Both groups had almost identical 30-day readmission rates whereas there was a 10% lower mortality rate in patients with preserved ejection fraction opposed to reduced ejection fraction (Loop et al., 2016). Both groups did, however, have comparable hospital length of stay (Loop et al., 2016).

Heart failure is among the top causes of readmission in the Medicare population (Ketterer; Draus; McCord, Mossallam & Hudson, 2014). A study was performed to identify predictors in unplanned hospital readmissions within patients that are suffering from heart failure (Blum & Gottlieb, 2014). To take it a step further, the actual aim of the study was to determine the causes, incidence, and predictors of non-planned hospital readmissions after trans-catheter aortic valve replacement or (TAVR) within this population through tele-monitoring (Blum & Gottlieb, 2014). It is known that previous data and research concerning hospital readmissions in individuals after trans-catheter aortic valve replacement is scarce (Blum & Gottlieb, 2014). A total sample size of 720 consecutive patients undergoing TAVR at 2 centers who survived the procedure, were included in the study (Blum & Gottlieb, 2014). The results yielded 506 unplanned readmissions in 316 patients (43.9%) within the first year post-TAVR (Blum &

Gottlieb, 2014). Of these, early readmission (within the first 30 days) occurred in 105 patients (14.6%), and 118 patients (16.4%) had multiple (≥2) readmissions (Blum & Gottlieb, 2014). Readmissions were due to non-cardiac 59% and cardiac causes in 41% of cases (Blum & Gottlieb, 2104). Of the non-cardiac hospital readmissions included, in order of increasing frequency, bleeding events, infection, and respiratory were the main causes (Blum & Gottlieb, 2014). Arrhythmias and heart failure accounted for most cardiac readmissions (Blum & Gottlieb, 2014). As directly cited from the research, predictors of early readmission were peri-procedural major bleeding complications (p = 0.001), anemia (p = 0.019), lower left ventricular ejection fraction (p = 0.042), and the combined presence of antiplatelet and anticoagulation therapy at hospital discharge (p = 0.014) (Blum & Gottlieb, 2014). Upon conclusion, it was noted that the overall readmission burden after TAVR is high (Blum & Gottlieb, 2014). Nearly one-fifth of the patients were readmitted early (within the first 30 days of discharge) (Blum & Gottlieb, 2014). Reasons for readmission were half between cardiac and non-cardiac causes (Blum & Gottlieb, 2014). Respiratory causes and heart failure were the primary diagnoses within each group (Blum & Gottlieb, 2014). Early readmissions were primarily related to peri-procedural bleeding events (Blum & Gottlieb, 2104). These results convey the importance of and are provisional for the basis of implementing specific preventive measures to reduce early readmission rates after TAVR (Blum & Gottlieb, 2014).

A study attempting to cross-sectionally identify correlation in congestive heart failure patients between the number of past-year admissions compared to 30-day readmissions was conducted in 2014 (Ketterer et al., 2014). Both Medicare and Medicaid patients were included within the study. A questionnaire was administered to patients within both populations. Participants were recruited during hospitalization and participated in a semi-structured interview

concerning issues such as clinical/demographic questioning along with psychological instances such as depression and anxiety (Ketterer et al., 2014). The current results suggested that both cognitive impairment and psychiatric history are possible determinants of early readmission (Ketterer et al., 2014). Both geographic and demographic factors were not of main focus in the outcome.

The area of hospital quality is suggested a re-admission cause in certain geographic locations (Weeks; Lee; Wallace, West & Bagain, 2009). The Veterans Administration (VA) Hospital was involved in a study to determine whether rural veterans enrolled in the VA were subjected to increased, unplanned re-admission rates within thirty-days to non-VA or VA hospitals than urban veterans (Weeks et al., 2009). Within the methodology, a dataset from both the VA and Medicare was viewed to determine the number of readmissions that occurred and compare/contrast non-VA and VA re-admissions (Weeks et al., 2009). This study was conducted from 1997 to 2004, with a sample of 3,513,912 hospital admissions (Weeks et al., 2009). Findings reveal that following admission to a VA hospital, readmission was predicted to be more likely for rural veterans (Weeks et al., 2009). However, this determination is based on only slightly higher thirty-day readmission rates when compared to urban veterans (Weeks et al., 2009). For both urban and rural samples, thirty-day readmissions were more prevalent in those discharged from a VA hospital than non-VA hospital (Weeks et al., 2009). The results were 20.7% vs 16.8% for rural veterans, and 21.2% vs 16.1% for urban veterans (Weeks et al., 2009). Predictors of thirty-day re-admissions within the rural veteran sample, more so, than urban veterans back to a VA hospital included several illnesses upon initial admission (Weeks et al., 2009). In descending order, illnesses include: treatment of the nervous system; respiratory system; circulatory system; connective tissue or skin, and unspecified/unusual initial diagnosis

disorders (Weeks et al., 2009). Urban veterans were more susceptible than rural veterans with re-admission for endocrine system treatment; myeloproliferative disorder; mental health, or substance abuse (Weeks et al., 2009). The study suggests that VA hospitals take increased accountability in considering unplanned re-admissions (Weeks et al., 2009). It is suggested that rural veterans select non-VA hospitals that are higher performing than VA hospitals with respect to accessibility and hospital location (Weeks et al., 2009). This study suggests that there is a correlation between geographic and/or demographic location and readmissions.

Preventable readmissions involving interventional approaches

Historically, several approaches have been considered to reduce heart failure readmissions. The Joint Commission on Accreditation of Health Care Organizations (JCAHO) requires health care organizations to provide admitted heart failure patients with detailed discharge instructions that address 6 topics related to the management of their disease (Regalbuto et al., 2016). These topics include exercise; diet; weight monitoring; worsening symptom awareness; medications, and follow-up appointments (Regalbuto et al., 2014) However, it has yet to be tested whether patients' understanding of these instructions has effect on 30-day readmission rates (Regalbuto et al., 2014). A prospective cohort study was conducted in 2014 by Regalbuto et al., of patients admitted to the hospital for decompensated heart failure (Regalbuto; Maurer; Chapel, Mendez & Shaffer, 2014). Patients completed a general understanding survey including each area of the JCAHO topics immediately after given discharge instructions (Regalbuto et al., 2014). Out the 145-patient sample size, only 10% understood all areas of the discharge instructions. Patients comprehension of discharge instructions is both poor and inadequate (Regalbuto et al., 2014). Furthermore, heart failure patients who do not speak English as a primary language and possess a lack of education are more likely to have limited discharge

understanding indicating increased rates of 30-day readmissions (Regalbuto et al., 2014). Over-all, patients do not understand several aspects of their discharge instructions, most commonly medication (Regalbuto et al., 2014). Patients that had full discharge comprehension had fewer 30-day readmissions (Regalbuto et al., 2014). The study suggests that more comprehensive discharge interventions are necessary to reduce rates of 30-day readmissions (Regalbuto et al., 2014).

Prevalence of practices that have been adopted by health care organizations to help reduce the 30-day readmission rate. A study focusing on patients with heart failure or acute myocardial infarction (AMI) was conducted to determine the exact range and prevalence of practices resulting in the reduction of thirty-day readmissions (Bradley; Curry; Sipsma; Thompson, Elma & Krumholz, 2012). A web-based survey to generate a cross-sectional study of hospitals reported usage of such strategies was conducted involving 594 hospitals (Bradley et al., 2012). It is known that strategies are extremely limited when it comes to reducing the readmission rates between patients suffering from either condition (Bradley et al., 2012). Of the 594 hospitals, 537 completed the survey (Bradley et al., 2012). The focus of the survey included the key areas of 1) medication management efforts; 2) quality improvement resources and performance monitoring; and 3) discharge and follow-up processes (Bradley et al., 2012). Conclusions noted that although most hospitals do have a written objective to reduce preventable readmissions of patients with AMI and/or heart failure, the implementation of recommended practices varied (Bradley et al., 2012). Substantially more evidence in establishing the effectiveness of various practices is needed to produce viable results based on current research (Bradley et al., 2012).

There is a link between technological usage and practice in hospitals as attempt to increase documentation and address thirty-day readmissions as an integrated systems approach. Over the past decade, internet-based applications and mobile health technology have significantly advanced as both technologies have proved to be a highly effective platform for communication (Ketel, 2015). Simultaneously, the United States health care system has reached an overwhelming level of spending (Ketel, 2015). Per Ketel, 2015, this level of spending has arisen grossly from overall suboptimum communication along with ingrained system inefficiencies (Ketel, 2015). Internet based educational programs have been implemented to reduce hospital re-admissions with some positive results, specifically concerning heart failure patients (Ketel, 2015). However, it is uncertain the over-all impact of this technology intervention.

Other contributing factors to reduce readmissions

A study in 2016 was performed to identify variables in the Centers for Medicare & Medicaid Services (CMS) 30-day readmission risk standardization model for inpatient rehabilitation facilities full administrative medical record, primarily regarding physical function, that could help clinicians differentiate between patients who are and are not likely to be readmitted to an acute care hospital within 30 days of rehabilitation discharge (Fisher; Graham; Krishnan, & Ottenbacher, 2016). With the focus on potentially preventative measures relating to patients within a rehabilitation facility, functional recovery with physical functionality were considered contributable toward outcomes (Fisher et al., 2016). The study used an observational cohort with a 30-day follow-up of Medicare patients between 2010 and 2011 that had medically complex diagnoses and who were receiving post-acute inpatient rehabilitation (Fisher et al., 2016). Stratification of patients placed in groups based on rehabilitation impairment categories

aided clinicians to better identify patients that could be "high risk" or be re-admitted back into an acute care hospital opposed to "average risk" (Fisher et al., 2016). The results were that 34% of patients in the "high-risk" category were re-admitted within 30 days (Fisher et al., 2016). Rehabilitation length of stay and functional outcomes were considered the best predictors of 30-day re-hospitalization (Fisher et al., 2016). The study utilized information on functional status to draw conclusions about predicted hospital re-admissions within a 30-day period involving Medicare patients within rehabilitation settings (Fisher et al., 2016).

A study by Chiang et al., in 2015 aimed to identify factors associated with 30-day readmission in a cohort of older medical oncology patients including risk factors (Chiang; Liu; Flood; Carroll; Piccirillo, Stark & Wildes, 2015). The literature suggests a tool that can be utilized by clinicians to assess the instances of 30-day readmission rates within oncology patients. The participants within this study included patients age 65 and older hospitalized to an Oncology Acute Care for Elders Unit at Barnes-Jewish Hospital located in St. Louis, Missouri (Chiang et al., 2015). Initial patient screening including standardized geriatric testing; clinical care; clinical data, and determination of 30-day readmission status was obtained through individual patient medical record review (Chiang et al., 2015). Hospital readmission within 30 days was, in fact, more common and higher than previously reported rates in general medical populations (Chiang et al., 2015). Several previously unrecognized factors were identified and associated with the increased risk for readmission (Chiang et al., 2015). Of these factors included geriatric assessment parameters which aided to develop a practical tool that can be used by clinicians to assess risk of 30-day readmission (Chiang et al., 2015).

Early readmissions within 30 days of hospital discharge are common and clinicians cannot accurately predict these readmission occurrences (Lau; Padwal; Majumdar; Pederson,

Belga & Kahlon, 2016). Patients that do not feel ready to be discharged at the time of discharge

may be within a population that returns for readmission within thirty days of his/her discharge

(Lau et al., 2016). A study was performed by Lau et al. in 2016 to examine this notion and

determine whether patient feelings lead to readmission or even death within thirty days' post

discharge (Lau et al., 2016). The prospective cohort study included 495 patients from two

tertiary care hospitals (Lau et al., 2016). Data was collected between October 2013 and

November 2014 with patients utilizing an 11-point Likert scale for self-reporting measures

including subjective un-readiness scoring anything "7" or below (Lau et al., 2016). The score of

"7" or below indicates uncertainty in discharge perception. Any score ranging from "8-11"

confirms certainty in discharge readiness. Determined risk factors for being discharged without

readiness included low satisfaction with health care treatment/services; lower education;

cognitive impairment; depression; previous hospital admissions within 12 months, disability and

persistent symptoms (Lau et al., 2016). Within 30 days, readmission or death was the primary

outcome (Lau et al., 2016). Out of the entire sample size, 23% reported being not ready for

discharge. At 30 days, 17% had been readmitted or died (Lau et al., 2016). There was no

significance between patients who felt ready or not ready (18% vs 15%, adjusted odds ratio 0.84,

95% confidence interval 0.46-1.54, $P = .59$) (Lau et al., 2016). It was concluded that although

nearly 25% of hospitalized patients reported being not ready to be discharges, among this

sample, higher risk of readmission or death in the first 30 days after discharge was not

experienced, compared with patients who did feel ready for discharge (Lau et al., 2016).

Drug and medication poisoning

There were 2.5 million emergency department (ED) visits from drug abuse or misuse in

2011, more than 1.4 million of these incidences involved pharmaceuticals (Substance Abuse and

Mental Health Administration, 2011). There has been a continuing increase of emergency visits involving abuse and misuse of pharmaceutical drugs (Substance Abuse and Mental Health Administration, 2011). From 2004-2011 the number nearly tripled, being that in 2004 there were 626,470 visits and in 2011 1,428,145 visits (Substance Abuse and Mental Health Administration, 2011). Among these reported emergency department visits, the most common identified drugs and medications were narcotic pain killers, ant-anxiety medications, and insomnia medications (Rudd et al., 2016). Abuse and/or misuse of pharmaceuticals has increased from 2004-2011 to 114% including all emergency department visits (Substance Abuse and Mental Health Administration, 2011). Central nervous system stimulants increased from 2004-2011 at a rate of 292% (Substance Abuse and Mental Health Administration, 2011). Insomnia and anti-anxiety medication visits increased at a rate of 124% (Substance Abuse and Mental Health Administration, 2011).

One costly and preventable area of focus in thirty-day readmissions is adverse drug events (Willson, Greer & Weeks, 2014). There may be a link to the thirty-day re-hospitalization because of adverse drug events and medication regimen complexity (Willson et al., 2014). A study conducted by Wilson et al. in 2014 sought to identify this association between medication regimen complexity and hospital re-admissions (Willson et al., 2014). The study compared patients re-hospitalized within thirty days with the presence of an adverse drug event with patients re-hospitalized within thirty days with the absence of an adverse drug event (Willson et al., 2014). Both cohorts' admission and discharge medication regimen was taken account for within a retrospective parallel-group case-control design (Willson et al., 2014). There was a revisit and non-revisit cohort present. Patients included in the revisit cohort due to an adverse event accidental poisoning (coding) within thirty days were included from four urban, acute care

hospitals (Willson et al., 2014). Through random sampling, the non-revisit cohort was obtained with the same disease classification code however, with the absence of the thirty-day readmission (Willson et al., 2014). The medication complexity index (MRCI) was utilized to quantify the complexity of medication regimen(s) both upon initial admission and at discharge (Willson et al., 2014). A scoring methodology involving the MRCI scores, as found within this study through receiver operating characteristic curves, indicated that the cut off score of eight or higher shows that an increased risk for readmission caused by adverse drug events was present (Willson et al., 2014). Among the population, the non-revisit group consisted of 228 individuals and the revisit group had 92 (Willson et al., 2014). The revisit group, as hypothesized, had a significantly higher MRCI score (Willson et al., 2014). As result, the study findings suggest adverse drug events are predicted through complex medication regimens upon hospital re-admission (Willson et al., 2014). The study further suggests that interventions to decrease this re-admission risk should include medication regimen complexity as a primary contributor (Willson et al., 2014).

Within the past decade, a growing problem within the United States is the use of opioids for pain management (Gulur; Williams; Chaudhary; Koury & Jaff, 2014). This rapid increase in opioid prescription and over usage as a primary treatment for pain management has led to the development of opioid tolerance (Gulur et al., 2014). Opioid tolerance is a clinical indication for individuals requiring higher dosage of opioids to obtain initial effects, whereas the individual is called the "opioid tolerant" patient (Gulur et al., 2014). Acute care episodes in the opioid user patient population as well as continuous care for this population are both barriers and challenges for providers. Being that there is minimal literature surrounding the topic of opioid tolerance as a predictor of outcomes, a six-month study in 2013 was conducted to gain better insight viewing

in-patient hospital stays and readmissions prediction (Gulur et al., 2014). From January 2013 to June 2013 all admissions were reviewed in Massachusetts General Hospital to identify opioid tolerant patients (Gulur et al., 2014). Observed length of stay and readmission rates from the opioid tolerant group were compared to a non-opioid tolerant control group for outcomes measures (Gulur et al., 2014). To obtain the risk adjusted groups, both were placed into groups dependent upon anticipated length of stay; or example less than two days, two to five days, five to ten days, and greater than ten days (Gulur et al., 2014). Results revealed that the entire opioid tolerant patient group had a significantly longer length of stay than the non-opioid tolerant control group (Gulur et al., 2014). Furthermore, the opioid tolerant group had an increased thirty-day readmission rate for all cause (P<0.01) (Gulur et al., 2014). Opioid tolerance is an indicated risk for patients involving decreased patient outcomes and increased cost of care (Gulur et al., 2014). It is necessary to identify opportunities to better care for this population to avoid increased length of hospital stay and increased risk for thirty-day hospital readmissions (Gulur et al., 2014).

Readmissions in older adults, specifically geriatric, with medication-related hospitalizations is an area that requires attention (Pellegrin; Krenk; Oakes; Lynn; McInnis & Miyamura, 2016). In 2012, a model was originated to reduce preventable medication-related hospital care at the University of Hawaii with partnership through the Centers for Medicare and Medicaid Services Innovation Center (Pellegrin et al., 2016). This model, called the Pharm2Pharm utilizes interactions with pharmacists both from hospitals and the community participate in patient medication care and adherence post discharge for a period of one year (Pellegrin et al., 2016). Hospital in-patients are identified as "at risk" for medication problems including medication errors, accidental overdose risk, medication non-compliance, and history of

medication incidences during their stay (Pellegrin et al., 2016). Post discharge, patients from this "at risk" population are managed by local, community pharmacists (Pellegrin et al., 2016). The Pharm2Pharm model continues at the individual level for a term of one year from this post-discharge (Pellegrin et al., 2016). Patient engagement strategy through the model involves further working on the patient level to ensure and resolve any drug therapy issues (Pellegrin et al., 2016). This initiative helps to improve quality of life, medication adherence, and reduction of unnecessary re-admissions (Pellegrin et al., 2016). Additionally, this model helps encourage a more integrated patient care continuum through pharmacist interaction (Pellegrin et al., 2016). It was mentioned that the Pharm2Pharm model is especially valuable in demographic areas where physician shortage is a problem (Pellegrin et al., 2016).

Emergency department visits for drug and medication toxicity are often more prevalent in therapeutic levels of usage than in non-therapeutic drug and/or medication dosage (See; Shehab; Kegler, Laskar & Budnitz, 2013). The drug digoxin is commonly used therapeutically in cardiac patients, specifically in heart failure cases (See et al., 2013). There is a commonality between digoxin prescribing and adverse effects, however, recent data is lacking to provide management of digoxin solutions within the population of heart failure patients (See et al., 2013). A national study published by See et al., in 2013 determined to explore this association. Data obtained from the National Electronic Injury Surveillance System- Cooperative Adverse Drug Event Surveillance project along with the National Ambulatory and Hospital Ambulatory Medical Care Surveys was used to determine the number of emergency department visits for digoxin toxicity (See et al., 2013). National rates and numbers of visits were viewed in reports spanning from 2005 to 2010 across the United States (See et al., 2013). The results were that out of the 441 cases evaluated, more than 3/4 of the annual emergency department visits required

hospitalization out of the 5156 digoxin toxicity visits annually (See et al., 2013). Out of the annual number of digoxin toxicity patients requiring emergency department visits, serum digoxin levels were critically high for 95.8% (See et al., 2013). The study included age and sex as variables. Patients greater than or equal to age 85 accounted for double the outpatient prescription visits for digoxin than patients aged 40 to 84 years old, as per an annual rate of emergency department visits per 10,000 outpatient prescription visits (See et al., 2013). Men accounted for half the rate of women for prescription visits (See et al., 2013). There in an increasing trend; as patient age increases simultaneously digoxin toxicity accounts for a larger percentage of reported drug and medication events. Overall, digoxin toxicity was only equal to 1% of all adverse drug and medication events in patients greater than or equal to 40 years old requiring hospitalization (See et al., 2013). The rate is around 3.3% in the age range of 41-84 years old for emergency department visits, and 5.9% in the greater or equal than 85-year-old age range (See et al., 2013). Annual emergency department hospitalizations and visits were estimated to remain consistent from 2005 to 2010 (See et al., 2013). The results of the study indicated that the highest risk patients are age > = 85, compromised more of women than men (See et al., 2013). Outpatient digoxin prescribing is suggested to be more carefully monitored within this high-risk group to avoid unnecessary hospital admissions and, in turn, reduce morbidity associated with the drug (See et al., 2013).

A study involving health care costs associated with opioid therapy prescription practices for all causes from the emergency department was conducted by Ernst; Mills; Berner; House and Herndon in 2015 to explore the relationship between opioid prescribing in high-risk groups and costs (Ernst; Mills; Berner; House & Herndon, 2015). Through an observational study of emergency department visits from 2006-2010 data obtained from the linked Premier-Optum

database was queried (Ernst et al., 2015). Inclusion criteria cited patients receiving > = sixty

days' opioid supply within seventy days prior to his/her emergency room visit (Ernst et al.,

2015). Suboptimal prescribing practices were determined thorough individual patients'

absorption and metabolic indicators such as drug exposures and principal diagnosis with the

absence or presence of comorbidities was documented (Ernst et al., 2015). The study computed

ED readmission rates within seventy-two hours; < = 30days; < = 45 days; < = 60 & < = 90 days

(Ernst et al., 2015). Suboptimal medication practices prior to the index ED visit were found in

92.6% or 8,539 of the identified 9,214 patients with chronic pain (Ernst et al. 2015). Suboptimal

opioid use was identified in patients aged 50 +/- 13.5 years (Ernst et al., 2015). Hospital

admissions and emergency department visits occurred within 72 hours (73.6%) of the index visit

and within 30 days (70%) predominantly (Ernst et al., 2015). Of these identified patients,

females were predominant at 64.0% (Ernst et al, 2015). The most prevalent comorbid conditions

in ascending order included: drug abuse (15.6%); diabetes with the lack of chronic complications

(16.2%); depression (19.6%); chronic pulmonary disease (22.8%); electrolyte/fluid disorders

(32.7%), and hypertension (44.0%) (Ernst et al, 2015). The study also identified the principal

diagnoses of: diseases of the musculoskeletal system (13.2%), poisoning and injury (18.2%), and

signs and symptoms of ill-defined conditions (36.5%) as most prevalent (Ernst et al., 2015). To

address the purpose of the study, total adjusted cost factors were compared for all opioid use

patients versus patients that were non-users (Ernst et al., 2015). At every time frame except the

<=72-hour time interval; greater cost was observed in the opioid user group (Ernst et al., 2015).

Increases in mean costs at thirty days were $581 (Ernst et al., 2015). At all times, opioid use

exclusivity had a significant increase in mean costs for example, approximately $836 at thirty

days and $214 at seventy-two hours (Ernst et al., 2015). Suboptimal prescribing practices for

opioids was identified as the rate of both inpatient admissions and readmissions increased along

with associated costs (Ernst et al., 2015). It was suggested that improving patient care may rely

on the emergency department identifying and correcting prescribing practices (Ernst et al.,

2015). Through the reduction of beneficiary costs and resource usage, patient care can

additionally improve (Ernst et al., 2015).

Unintentional drug and medication poisoning was the third leading cause of youth and

young adults aged 15 to 24 and the number one leading cause of injury death in the United States

for adults, aged 25 to 64 from 2010-2014 (Centers for Disease Control, 2015). Opioids, primarily

prescription pain relievers and heroin, are the main drugs associated with overdose deaths (Rudd;

Aleshire, Zibbell & Gladden, 2016). In 2014, 61% of the reported 47,055 deaths from overdose

in the United States, exactly 28,647 were associated with a type of opioid in 2014 (Rudd et al.,

2016).

Drug and medication poisoning interventions

Interventions involving multiple components (e.g., medication reconciliation, patient

education, patient needs assessment, arranging timely outpatient appointments, and providing

telephone follow-up), have significantly reduced readmission rates for patients discharged home

(Kripalani, et al., 2015). The effect of interventions on readmission rates is related to the number

of components implemented, whereas single-component interventions are unlikely to reduce

readmissions significantly (Kripalani, et al., 2015). To help hospitals direct services to patients

with higher likelihood of readmission, risk stratification methods are available (Kripalani, et al.,

2015). Some methods convey that future work should better define the role of home-based

services, information technology, community partnerships, mental health care, caregiver support,

and new transitional care personnel (Kripalani, et al., 2015).

Care transitions are both a complex and compromising period in individual patient management. Patient safety, compliance with treatment, and outcomes are all affected by the quality of the transition from one provider or facility to the next. As our health system is fragmented into inpatient providers and outpatient providers, the need for well-orchestrated transitions of care becomes greater. The evidence, however, suggests that we are not transitioning patients successfully. Nearly 20% of all Medicare fee-for-service patients are readmitted within 30 days of a hospital discharge, and up to three-quarters of these readmissions may be avoidable (Jencks SF et al., 2009). Any interventions to reduce adverse events and readmissions in care transitions could save significant health care dollars, help bend the cost curve, and most importantly, improve patient care (Abrashkin et al., 2012).

The high readmission rates experienced in the American health care system are generally attributed to inadequate communication with the patient, communication among the patient's doctors at the time of discharge, and a failure of clinicians to follow up after a discharge (Epstein AM., 2009). This is evidenced by the fact that over half of patients who were re-hospitalized within 30 days did not visit a physician's office between the two admissions (Jenks et al., 2009). Although substandard quality of care during an initial hospitalization is often raised as a reason for repeated admissions, research is inconclusive about the relative risk contributed by this factor versus inadequate follow-up. A review of results from randomized trials found that patient assessments, education, and improved post-discharge care could reduce readmission rates by 12%–75% (Benbassat & Taragin, 2000).

An informational study conducted on the prevention of 30-day readmissions to hospitals assesses this topic as top priority in the era of health care reform. Due to payment guidelines, new regulations will be costly to health care facilities (Stevens, 2015). The most frequently

readmitted medical conditions are heart failure, acute myocardial infarction, and pneumonia (Stevens, 2015). The transitional period from the hospital to home has been classified as a vulnerable time for patients (Stevens, 2015). During transitional period, patients may reject to fully understand their individual discharge instructions (Stevens, 2015). Low health literacy, ineffective communication, and compliance issues mainly contribute to hospital readmissions (Stevens, 2015). From the literature, it was suggested that telehealth and the use of technology may be used to prevent some readmissions in vulnerable populations (Stevens, 2015).

One practice that has been adopted by many hospitals nationwide is clinician follow-up after patients depart the hospital setting. Although such interactions are not billable to payers, they have been recommended by industry experts as means to improve continuity of care and provide customer feedback to frontline staff (D'more et al., 2011). Clinician follow-up provides a vital opportunity to answer patient questions about medications and pain management while reinforcing the importance of physician follow-up outside the acute hospital setting. These activities help prevent adverse events after patients depart the hospital, and follow-up calls have been packaged as part of comprehensive discharge redesign that demonstrates reduced 30-day readmissions (Hand & Cunningham, 2013).

In a retrospective, observational study conducted by Harrison J.D. et al., on 5,507 patients, patients who received a call and completed the intervention were significantly less likely to be readmitted compared to those who did not. The intervention being, patients who received two telephone call attempts by a nurse within 72 hours of discharge. Nurses followed by a standard script to address issues associated with readmission.

A project was implemented by Miller & Schaper in 2015 which included the development and implementation of a follow-up telephone call within 72 hours of discharge,

targeting patients at high risk for readmission (Miller & Schaper, 2015). The goal of the project was to improve understanding of aftercare instructions to decrease readmissions (Miller & Schaper, 2015). Within the project, clinical nurse leaders provided an intervention in 66% of patient contacts (Miller & Schaper, 2015). This resulted in the readmission rate within the first week of discharge significantly lowered (P < .05) (Miller & Schaper, 2015). Additionally, the rate within 30 days of discharge was lower (P = .053), in the clinical nurse leader contact group than in patients who were not contacted via telephone follow up initiative (Miller & Schaper, 2015). The conclusion of this project shows positive progress in the usage of follow-up telephone intervention in high risk patients to reduce readmissions within thirty-days.

By exploring the literature surrounding thirty-day readmissions and understanding of contributing factors including but not limited to morbidities, co-morbidities; age; gender; geographic and/or demographic location will help further identify potential thirty-day readmission prevention measures. The focus of the literature is to gain insight on previous and current examples of thirty-day readmissions, the areas surrounding thirty-day readmissions, and outcomes from similar studies. The literature covers all relevant studies that are currently being utilized to address this national issue, to build on present knowledge and offer possible suggestions as to future prevention.

Theoretical Framework

From the theoretical perspective, recognized theories such as the theory of "Lewin's Change Theory", "Planned Behavior", and the "Trajectory Framework" can be used to provide a framework for understanding the causes leading to thirty-day readmissions and identifying factors to aid in prevention strategy (Ajzen, 1991: Corbin & Strauss, 1990: Lewin, 1951). Patients' must adopt an individually based care maintenance strategy to avoid the possibility of

drug and/or medication negligence. Health care providers including individuals that have direct patient care during a patients' hospital stay must address a care maintenance plan with patients to avoid patients' becoming drug and medication poisoned and being re-admitted within thirty-days post-discharge. Patients chronically being re-admitted is a sign of underlying chronic illness. The two separate theories of Lewin's Change Theory and the Trajectory Framework outline a systematic, moving process surrounding the notion of chronic illness (Corbin & Strauss, 1990: Lewin, 1951). Planned behavior constitutes the behavioral component and accountability and/or lack of accountability of the individual.

To summarize, Lewin's Change Theory states to un-freeze, change, then re-freeze an action or event (Lewin, 1951). This theory impacts reducing thirty-day readmissions because for patients specifically to avoid unnecessary readmissions within thirty days of their recent discharge, a continuous cycle must be interrupted. The cycle of re-admissions within thirty-days post-discharge has numerous components including sex of the patient, demographic region of re-admission, and clinical diagnosis. The theory speaks to the interruption of a cycle. Lewin's Change Theory lends a suggestion to break the cycle of readmissions however, the theory limits us to view impact on a level not including the individual patient (Lewin, 1947). This theory is accurate in the explanation thirty-day readmissions from the event itself.

Social psychologist Icek Ajzen developed the theory of planned behavior in the 1980s to try to predict and understand the relationship between human behavior and motivation (Ajzen, 2011). One component of the theory involves perceived behavioral control (Ajzen, 2011; Fishbein & Ajzen, 1977). The theory of planned behavior has been widely accepted by researchers studying health behavior (Fitzpatrick & McCarthy, 2014). Information is used by people along with reasoning to guide their behavior (Rush, 2014). The theory uses three sets of variables as predictors

for an individual's behavioral intention, which then is used to predict actual behavior (Ajzen, 1991; Fishbein & Ajzen, 1977). The three sets are normative beliefs, control beliefs and actual behavior control (Ajzen, 1991). These conclude that greater perceived control, positive attitudes, and stronger intention to perform a behavior are related to actual behavior performance (Ajzen, 1991; Fishbein & Ajzen, 1977). In the study of reducing thirty-day readmissions, the individual patient subjected to drug/medication poisoning may or may not have individual perception of the actual act of over usage of his/her medication regimen. In this theory, behavioral beliefs are the subjective beliefs of an individual that a given behavior will produce an expected outcome (Fishbein & Ajzen, 1977; Rush, 2014). Behavioral beliefs directly influence attitudes toward the behavior (Fishbein & Ajzen, 1977; Rush 2014). This means that the degree of positive or negative value that an individual has on the behavior also interacts and control beliefs and normative beliefs (Fishbein & Ajzen, 1977; Rush, 2014). Normative beliefs, relative to this theory, are defined as the behavioral expectations held by individual that is important to the individual (Ajzen, 2011; Fishbein & Ajzen, 1977). Normative beliefs have direct influence on individual subjective norm, which is the social pressure perceived by the individual to behave (Ajzen, 2011; Fishbein & Ajzen, 1977). This also influences and behavioral beliefs and control beliefs (Ajzen, 2011; Fishbein & Ajzen, 1977). Factors that may facilitate or impede an individual performing a behavior are controlled beliefs (Ajzen, 2011; Fishbein & Ajzen, 1977). Perceived power of these behaviors directly influences the individual's perceived behavioral control (Ajzen, 2011; Fishbein & Ajzen, 2010). Control beliefs also influence normative beliefs and behavioral beliefs (Ajzen, 2011; Fishbein & Ajzen, 1977). Perceived behavioral control also moderates the influence of intention in predicting behavior, specifically about behaviors that are difficult to execute (Manning et al., 2011). Actual behavioral control, the true extent to which an individual has the skills and resources to perform a

behavior (Ajzen, 2011; Fishbein & Ajzen, 1977). The theory of planned behavior has been used to predict many human behaviors, in the field of health behavior, where it has aided researchers in the explanation of behaviors such as compliance with medical advice (Glanz et al., 2008). Providers must help patients realize their symptoms and understand their individual diagnosis, representing planned behavior (Ajzen, 1991). Planned behavior is representative of un-freezing their current state as detailed within Lewin's change theory (Lewin, 1951).

Increased accountability, self-awareness, education, and literacy among other areas represents the change state (Lewin, 1951: Corbin & Strauss, 1990). Patients are encouraged to understand their own individual health, know their resources, and maintain this change for the better of their own health care (Ajzen, 1991). Once the individual patient gains this understanding and adapts to change, the re-freezing state or action that the patient takes to avoid hospital readmission occurs (Lewin, 1951). Providers must ensure that patients are stable before discharging them to avoid any dis-equilibrium in the patients' individual health status relating change theory back to the identified problem of thirty-day readmissions (Lewin, 1951). Within this theory, patients transform from a stable to acute phase (Lewin, 1951). The discharge plan of care involving these steps is suggested to be followed for avoidance of potential thirty-day readmissions (Corbin & Strauss, 1990). Further individual plan of care surrounding drug and medications that a patient is taking is needed for patient stability. The notion of stable vs. chronic can be better determined through the trajectory framework.

The basic principle of the Trajectory framework is the belief that chronic illness varies over time, i.e. it has a trajectory, and that its course, which can be divided into various sub-phases, is capable of being shaped and managed (Corbin & Strauss, 1985; Corbin & Strauss, 1988). The model focuses on the patient and affirms that his/her perceptions and beliefs about

what is and may be happening to him/her predict the nature of the trajectory (Corbin & Strauss, 1985; Corbin & Strauss, 1988). This model can be applied to research, policy changes, and care plans which aim to improve individual health (Woog, 1992). Corbin and Strauss convey that most chronic illness interventions have been very limited by the absence of an appropriate theoretical approach with which to underpin care. (Corbin & Strauss, 1985; Corbin & Strauss, 1988). Corbin and Strauss (1988) explained, "illness management must be examined in the context of that more encompassing life" (Corbin & Strauss, 1988). Corbin and Strauss (1988) identified four basic biographical processes that occur in the context of chronic illness: (a) contextualizing (i.e., making the illness part of ongoing life); (b) coming to terms with the illness, its consequences, and one's own mortality; (c) restructuring one's self-concept; and (d) recasting one's biography into the future (Corbin & Strauss, 1998). Illness should be recognized as having both a past and a future, which all need to be taken into account when planning present care (Corbin & Strauss, 1985; Corbin & Strauss, 1988). Based upon the experiences of individuals with chronic illness this model was developed (Corbin & Strauss, 1985; Corbin & Strauss, 1988). The trajectory framework can be used as an integration to guide practice as to the management of individuals with chronic illness returning to the hospital within thirty-days. The trajectory model can further plan interventions for patients with subsequent thirty-day readmissions.

Planned Behavior

Lewins Change Theory ←――――→ Trajectory Framework
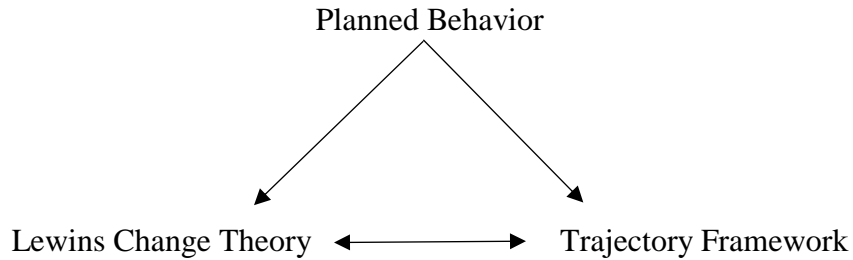
Figure 1. Theoretical Framework (Anjen, 1991; Corbin & Strauss, 1990; Lewin, 1951).

The trajectory framework leads to the hypothesis that males overall have more hospital re-admissions for this diagnosis than females indicates a trend in drug/medication readmissions based on sex; socio-demographic factors are associated with 30-day readmissions; diagnostic complications are associated with 30-day readmissions; index hospitalization costs are associated with 30-day hospital readmissions, and geographically, the region of the north east has more incidences of drug and medication poisonings per year than other regions hypothesized to determine more or less drug/medication readmission prevalence based on different demographic regions (Corbin & Strauss, 1990). Planned behavior serves to hypothesize that the improvement in individual patient quality of life will occur through prevention measures to prevent thirty-day readmissions in recently discharged drug and medication poisoned patients (Ajzen, 1991). Further shaped by the theoretical framework, is the hypothesis that knowing and understanding diagnoses impacting both males and females of the population will aid in future identification of episodic cost containment identification strategy represented through the Lewin's change theory and the trajectory framework (Corbin & Strauss, 1990: Lewin, 1951). It is hypothesized that there is an existing trend in diagnoses and an increased episodic cost utilization upon re-admission among both males and females. Subsequently, derived through Lewin's change theory, is the hypothesis that the thirty-day readmission rates will decrease with the implementation of a nationally accepted

preventative strategy through predictor identification and prevention strategy presence (Lewin, 1951).

Hypothetical Summation

Follow up care reduces the 30-day re-admission rate in patients with chronic conditions with follow up strategy being proved most effective (Joynt, Orav & Jha, 2011). Transition of care initiatives will help alleviate the gap between the direct provider and care within outpatient settings respectfully. Based on the research literature, suggestions including access to health care, follow up patient care, and increased accountability measures for both patient and provider will help alleviate this major problem. Additionally, both internal hospital policy and governance including current laws should be amended to prove change.

Thirty-day re-admission predictors, strategies and challenges

A 2016 mini-focus issue study by Krumholtz et al. sought to determine a specific model relative to 30-day readmission risk prediction including self-reporting measures via post discharged patients suffering heart failure (Krumholtz; Chaudhart; Spertus; Mattera, Hodshon & Herrin, 2016). Self-reporting measures included the areas of socioeconomic, health status, and overall health status disclosed from hospitalizations for heart failure (Krumholtz et al., 2016). The goal was to improve the 30-day readmission risk through assessment of this population via multiple self-reporting measures (Krumholtz et al., 2016). Minimal self-reporting measures of previous models included only demographic and clinical factors (Krumholtz et al., 2016). Such models are currently the standard in readmission risk models and may be improved to include patient self-reporting to influence positive outcomes (Krumholtz et al., 2016). A Telemonitoring to Improve Heart Failure Outcomes (Tele-HF) trial was executed in a sample size of 1,004 patients recently hospitalized for heart failure (Krumholtz et al., 2016). Medical record

abstraction was performed along with telephone interviews in all of the patients within two weeks of discharge (Krumholtz et al., 2016). Physiological, functional, and clinical information was obtained through both components of the trail (Krumholtz et al., 2016). Candidate risk factors were determined and categorized into two groups, making a total of 110 variables in the areas of clinical and demographic variables (Krumholtz et al., 2016). As a result, it was determined that self-reported socioeconomic, adherence, health status and psychosocial variables are not dominant factors in the prediction of readmission risk for heart failure patients (Krumholtz et al., 2016). Patient-reported information did however, improve model discrimination and extended the predicted ranges of readmission rates, but the model performance remained poor (Krumholtz et al., 2016).

Although telephone follow-up offers a low-cost strategy to reduce readmissions, several factors need to be considered while further implementing this intervention. The number of calls, timing, and call content should all be taken into consideration. A primary challenge for any follow-up program is contacting the entire target population due to high volume of discharged patients. Connectivity is impacted by the location to which a member is discharged. For example, if patients enter a rehabilitation facility or stay with a family member after leaving the hospital, it is not possible to reach them using their home phone number. Furthermore, wrong phone numbers and delayed notification of hospital discharges impedes the successful and timely delivery of calls to all discharged patients. Because nearly a third of readmissions occur within a week of discharge, the ability to reach a discharged patient quickly is paramount to the overall success of the intervention. Despite these challenges, this follow up model produced significant reductions in readmissions (Harrison et al., 2011).

Post-discharge intervention was performed in a 2013 by Costantino et al. to help reduce 30-day hospital readmissions in the Medicare population (Costantino; Frey, Hall & Painter, 2013). Several factors have been identified contributing to readmissions mainly including the failure to understand or follow physician discharge instructions, illness reoccurrence, and lack of follow up care initiatives (Costantino et al., 2013). The financial impact of this situation on both the United States government and health care organizations respectfully is predicted to get worse as more seniors become enrolled in Medicare. The authors determined whether a post-discharge intervention was an effective method to reduce this rate compared to a control population of matched participants (Costantino et al., 2013). Telephone calls were initiated post hospital discharge and readmissions were monitored through claims data analysis (Costantino et al., 2013). The study included 48,538 members (Costantino et al., 2013). Results were that of this group, 5598 or 11% of the control group was readmitted within 30 days and the experimental group 4,504 or 9.3% were readmitted within this same time frame (Costantino et al., 2013). The study also concluded the greater the reduction in number of readmissions was dependent upon the closer the initial intervention was to the date of discharge (Costantino et al., 2013). This suggests a time/admission correlation (Costantino et al., 2013). Other positive results indicated that visits to the emergency room were reduced within the experimental group as out-patient physician visits increased (Costantino et al., 2013). To detail cost factors, within the group that received the intervention, cost savings were $13,964,773 to the health care plan (Costantino et al., 2013). This type of telephone intervention clearly provides us with a reduction on 30-day readmission strategy along with cost saving initiatives (Costantino et al., 2013).

A collaborative pharmacist-hospital care transition program on the incidence of 30-day readmission was evaluated by Kirkham et al. in 2014 (Kirkham; Clark; Paynter, Lewis &

Duncan, 2014). Two acute care hospitals participated in this care transition program from

January 1, 2010- December 31, 2011 (Kirkham et al., 2014). A retrospective cohort study of a

care transition program involving key program components of bedside delivery (post-discharge

medications and follow-up contact two to three days after patient discharge) was conducted at

one acute care hospital (Kirkham et al., 2014). This program was absent from the other

participating acute care hospital (Kirkham et al., 2014). As directly cited results concluded

that19,659 unique patients had 26,781 qualifying index admissions, 2,523 of which resulted in a

readmission within 30 days of discharge (Kirkham et al., 2014). Patients that did not participate

in the program had almost two times the odds of readmission within 30 days (odds ratio [OR],

1.90; 95% confidence interval [CI], 1.35-2.67), in comparison to with the intervention group

(Kirkham et al., 2014). Directly cited results indicate that patients 65 years of age and older had a

six-fold increase in the odds of a 30-day readmission (OR, 6.05; 95% CI, 1.92-19.00) relative to

those in the intervention group (Kirkham et al, 2014). The presence of a care transition program

not only has an increased effect of patients 65 years and older, but is directly associated with a

lower instance of thirty-day readmissions (Kirkham et al., 2014).

We see a significant decrease in the 30-day readmission rates with the usage of follow up

care particularly in the form of phone calls however, skeptics argue several valid views

concerning the topic. The cost effectiveness factor is a major burden on the initiation of follow

up care (American Hospital Association, 2011). Reimbursement is currently not supported for

this type of post-discharge intervention. Opposing parties also raise the question of effectiveness

measured through the person providing follow up care. Some question whether a clinician vs. a

non-clinician has the same impact on the thirty-day readmission rate (American Hospital

Association, 2011). Others bring up the presence of variation in individual patients suffering

from chronic conditions/diseases. Some believe that follow up care may have to be tailored toward the individual patients(s) needs or health care goals. The opposing view point does recognize the fact that follow up care is effective in reducing the thirty-day readmission rate, but may or may not be equally as effective as administered both within and among populations consisting of Medicare patients with unplanned readmission related to the reason(s) for initial admission (American Hospital Association, 2011).

Summary

Overall the literature outlines current policy constituents within the Hospital Readmission Reduction Program as part of the Affordable Care Act; reported costs; analyses of the policy, and penalties that health care organizations are faced with. The policy may or may not suggest that individual hospitals' increase their accountability measures to account for the excess readmissions. There are both supporters and critics of this logic as both sides are viewed regarding topics including patient transition factors, socioeconomic factors, discharge, and continence of care post discharge. Both supporters and critics mentioned that there are specific diseases/illnesses that cannot be accounted for within this policy or within individual hospitals.

The literature explores main contributing factors of thirty-day hospital readmissions including studies surrounding both chronic and situational illnesses. Such studies cover several illnesses/diseases surrounding readmissions. Cardiovascular reasons determined as heart failure and acute myocardial infraction are most prevalent throughout the literature and have been identified as the top contributors. Respiratory illness including pneumonia, acute exacerbation and COPD are ranked high respectfully. Patients recently discharged to a rehabilitation facility were documented to be categorized within the "high risk" genre.

Most recently, the literature speaks to accidental drug and medication poisoning as an increasing trend in thirty-day readmissions. Literature on this topic reveals new reasons to consider this re-admission factor complex. Within this area includes patients, primarily adult, that may be re-admitted based not only on the drug/medication poisoning but on the patients' background of diseases/illnesses whether chronic or sudden along with drug/medication habits. As addressed, patients may be on therapeutic levels of a drug or have developed a tolerance. Opioid prescribing for pain management in the United States has reached new levels. Therapeutic drug/medication monitoring is often complicated and is mainly compromised by communication errors from provider to patient. Medication regimen adherence, specifically in the geriatric (Medicare) population, is an area that needs to be evaluated. Drug and/or medication poisoning is the topic of consideration whereas the literature describes this as a rising area that requires more research.

Costs to health providers' relative to the illnesses and re-admission prevalence is mentioned throughout the literature. Actual costs and suggestions to reduce costs are present. Cost-saving incentives are mentioned as strategy to address the re-occurring admissions. Patient classification was further introduced to better explain trends in thirty-day readmissions. Patient classification as "high risk" is operationally defined as a patient that possesses the listed chronic/situational diseases or illnesses predicting a thirty-day readmission. Classifications were commonly found within the literature dependent upon the main contributors. Interventions like prevalence of patient self-reporting measures, and survey-based patient reporting measures are administered via internet-based applications and paper forms. Interventions are suggested to address and number of issues such as patient care post-discharge and health provider responsibilities surrounding discharges, and care transitions. A study addressing hospital quality

in urban and rural settings was used to reinforce overall consideration for demographics. Within the category of intervention, follow-up telephone calls and pharmacy-to-patient continuous communication dominated. Patient predictors were referenced to discharge instruction comprehension, and patient illness comprehension being among the top sub-categories detailed.

The issue at hand is to identify thirty-day readmissions and contributing factors that could potentially aid in the reduction of occurrence. Through the literature review, identification of areas that are suggested to be contributing factors include: gender; socioeconomic factors; diagnoses; predictors and trends. Other factors of interest include age, patient income status, and patient location. The diagnosis of drug/medication poisoning is the focus. The individual patient will be the unit of analysis to gain understanding of the various factors which may or may not impact reducing thirty-day readmissions within the drug/medication poisoning population.

Chapter III

METHODS

Design and Data Source

The research utilizes a quantitative design. This is a cross-sectional, quantitative patient-level study, observational study. This is an observational review study of previously collected data from the Agency for Healthcare Cost and Utilization Project (HCUP). Data was accessed by the HCUP Nationwide Readmissions Database (NRD) for the year 2013 and published for availability in November 2015. Quantitative design was selected because only observational data can provide a large number of patients' representative of the national landscape. The NRD is a publicly available federal claims database consisting of all-payer hospital inpatient stays (Healthcare Cost and Utilization Project, 2013). The NRD collected both condition- specific and all- cause readmissions (Healthcare Cost and Utilization Project, 2013). This database was created to address a gap in national health care data that accounts for readmissions for all types of payors & the uninsured (Healthcare Cost and Utilization Project, 2013). The purpose of the NRD is to support decision making through national readmission rate analyses for administrators, public health professionals, policy makers, and clinicians (Healthcare Cost and Utilization Project, 2013).

The source- aggregation, initial collection, utilization, and disbursement of the data is a four-fold. The Agency for Healthcare Research and Quality (AHRQ) sponsored the Healthcare Cost and Utilization Project (HCUP) which collected and stored data within the Nationwide Readmissions Database (NRD). The NRD is derived from State Inpatient Databases (SID), twenty-one representing the twenty-one participating states in the project (HCUP, 2013). The SID is used to track a person across hospitals within a state using verified, reliable patient

linkage numbers (HCUP, 2013). The NRD and SID are like hospital administrative databases

that are "discharge-level" files, representing one discharge abstract from an inpatient stay

(HCUP, 2013).

Unweighted, the NRD contains data from 14 million yearly discharges, within the United

States, and weighted an estimate of 36 million yearly discharges (HCUP, 2013). Accounting for

49.1% of all United States hospitalizations in 2013 and 49.3% of the total United States

population, there are twenty-one states that partnered with the HCUP (HCUP, 2013). These

states include: Arkansas; California; Florida; Georgia; Hawaii; Iowa; Louisiana; Massachusetts;

Missouri; Nebraska; New Mexico; Nevada; New York; South Carolina; South Dakota;

Tennessee; Utah; Virginia; Vermont; Washington, and Wisconsin. Within each participating

state, HCUP data sources were identified as partners participating in the 2013 NRD (HCUP,

2013). For geographical demonstration purposes, the participating states were classified into four

categories: West; Midwest; Northeast, and South (HCUP, 2013).

Validity and Reliability of the Nationwide Readmissions Database (NRD)

Weighting and stratification methods were used to determine national estimates of the

Nationwide Readmissions Database (NRD) data based on all-cause and condition-specific

readmissions (NRD, 2015). The actual sample frame needed to balance the databases ability to

determine readmissions including chronic illnesses and common conditions while also

maintaining the ability to estimate rare diseases (NRD, 2015). For discharge weights, there was a

need for post-stratification for weighting the sampling frame against the target population (NRD,

2015). Using the target population as standard, discharge weights for national estimates were

developed (NRD, 2015). To better explain post-stratification for weighting, this allowed the data

collection to compensate for all discharges from hospitals within the Nationwide Readmissions

Database (NRD) sample, with respect to the target population distribution of the American

Hospital Association data (NRD, 2015). Based on patient and hospital characteristics, post-

stratification was performed by the NRD (NRD, 2015). This corresponded with the known

National Inpatient Sample (NIS) design, as directly cited, "that follows hospital characteristics

explained by significant differences in inpatient outcomes: census region, urban/rural location,

hospital teaching status, size of the hospital defined by the number of beds, and hospital control"

(NRD, 2015). The Nationwide Readmissions Database (NRD) was also post-stratified by five

age groups including (0, 1-17, 18-44, 45-64, and 65 and older) along with sex of the patients

(male, female) (NRD, 2015). The data collection method, previous comparison to the National

Inpatient Sample design, and post-stratification all contribute to the validity and reliability of the

data. To further enforce the reliability, based on calculations, nationally weighted estimates were

used at the discharge level using weighed statistics from the United States based community

hospitals (NRD, 2015). The validity is further determined for researchers to calculate

measurement precision for national estimates taken account for in both the sampling design and

form of statistical analysis used (NRD, 2015). Statistical software for weighted variances have

been used for index events and readmission rates reported reliable (NRD, 2015). As part of the

Healthcare Cost and Utilization Project (HCUP), the Nationwide Readmissions Database (NRD)

is further defined to give specific examples of how readmission rates are exactly calculated

(HCUP.gov). Other readmission rates based on the Nationwide Readmissions Database (NRD)

are reported on the HCUPNET website, to display continuous relatability of the dataset. As

directly reported from the HCUPNET website source, an example of such elements being used:

"NRD data elements might be used to define an index event, 7- and 30-day readmission, and
readmission rates. Other types of readmission analyses are possible with the NRD; this is just
one of many possible applications:

For the readmission rates on HCUPnet, we defined an index event as follows:

- *Patient was discharged between January and November (1 <= DMONTH <= 11).*
- *Patient was discharged alive (DIED = 0).*
- *Length of stay was non-missing (LOS >= 0).*
- *Discharge was for patient aged 1 year or older (AGE > 0).*
- *Patient may be a nonresident of the State (any value of RESIDENT).*
- *A patient is allowed to have multiple index events, regardless of how far apart.*

For example, if a patient was discharged alive with a non-missing length of stay on January 10, January 20, January 26, and March 30, all four discharges would qualify as index admissions.

For the readmission rates on HCUPnet, we defined readmissions as follows:

- *The first discharge for a patient was within 7 or 30 days of an index event.*
- *Discharge occurred between January and December (1 <= DMONTH <= 12).*
- *Discharge may be to the same or a different hospital (HOSP_NRD) and may result in a death.*

On HCUPnet, we defined the readmission rates as the percentage of index admissions that had at least one readmission within 7 or 30 days.

- *Numerator = total number of index events that had at least one subsequent hospital admission within 7 or 30 days.*
- *Denominator = total number of index events between January and November.*
- *Rate = numerator / denominator * 100.*

Rates were not risk adjusted.

Consider an example of the 30-day, all-cause readmission rate for any diagnosis for a patient discharged alive on January 10, January 20, January 26, and March 30. Each admission is considered an index.

- *January 10 is the first index admission.*
- *January 20 qualifies as a 30-day readmission for the January 10th index. It is also an index admission.*
- *January 26 qualifies as a 30-day readmission for the January 20th index. It is also an index admission.*
- *March 30 is an index admission, but it does not qualify as a readmission because it does not fall within 30 days of another index.*

The 30-day readmission rate is 50 percent, because there are two 30-day readmissions for the four index admissions.

HCUPnet can be used to query 7- and 30-day readmission rates by the following:

- *Any diagnosis (no specific selection criteria on diagnosis or procedure)*
- *Principal diagnosis using CCS (using the HCUP data element DXCCS1)*
- *All-listed external cause of injury CCS (using the HCUP data elements E_CCSn)*
- *All-listed major operating room procedures using CCS (using the HCUP data elements PRCCSn with the corresponding PCLASSn = 3 or 4)*
- *MDC (using the HCUP data element MDC)*
- *DRG (using the HCUP data element DRGnoPOA that does not consider the present on admission indicator for assignment).*

HCUPnet reports readmission counts, rates and costs stratified by the following characteristics of the index stay:

- *Age group is based on the HCUP data element AGE.*
- *Sex is based on the HCUP data element FEMALE.*
- *Payer is assigned using the primary and secondary expected payer (HCUP data elements PAY1 and PAY2). If the primary or secondary expected payer indicates Medicare, then the payer category is assigned to Medicare. This categorization includes patients who are dually-eligible for Medicare and Medicaid under Medicare. If not Medicare and the primary or secondary expected payer indicates Medicaid, then the payer category is Medicaid. If not Medicare or Medicaid and the primary or secondary expected payer indicates private insurance, then the payer category is Private. If not Medicare, Medicaid, or Private and the primary expected payer indicates self-pay or no charge, then the payer category is Uninsured. Stays for other types of payers are not reported on HCUPnet because this is a mixed payer group with small numbers. The expected secondary payer data element PAY2 is not available on the NRD.*
- *Income level is based on the HCUP data element ZIPINC_QRTL for the national quartile of the median household income for the patient's ZIP Code.*
- *Location is based on the HCUP data element PL_UR_CAT4 for the location of the patient's residence according to the Urban Influence Code (UIC) designation. Urban includes large and small metropolitan areas with all other areas categorized as rural. The data element PL_UR_CAT4 is not available on the NRD. The data element on the NRD for patient location is PL_NCHS, a six-category urban-rural classification scheme for U.S. counties developed by the National Center for Health Statistics (NCHS)"* (HCUPNET, 2015).

The data source has been used in the past to develop national benchmarks for hospital

readmissions to target high patient specific populations that are more prone to readmissions in

effort to improve efforts (Barrett et al., 2015). Policymakers have utilized this source to monitor

the progress associated with reducing readmissions relative to individual state and nationwide

benchmarks (Barrett et al., 2015). Previous research has been published using this data source by

health care analysts, policymakers, and researchers for various reasons Such publications include

all-cause readmissions by payer and age dated from 2009-2013 (Barrett et al., 2015) and current

strategies and future directions involving 2009-2013 payers vs. uninsured to compare

readmission rates per 100 admissions (Kripalani et al., 2015).

Study Population

The study population is comprised of patients discharged for drug/medication poisoning from

any of the mentioned state specific, demographic areas as included in the Healthcare Cost and

Utilization Project (HCUP) Nationwide Readmissions Database (NRD) for the year 2013.

Patients that have been readmitted to the hospital within thirty days of initial discharge are

included. Sampling strategy, parameters, and outcomes collected have been previously reported.

IRB approval was obtained through participating health systems within the Healthcare Cost and

Utilization Project (HCUP).

IRB approval has been obtained from Seton Hall University for those involved with this

observational study. Submission of relevant information of the data was required to obtain and

view the data. The study population consists of individuals being readmitted within thirty-days

post-discharge with the chief diagnosis of drug/medication overdose. The inclusion criteria of

this population is reflective of the inclusion criteria utilized within the Nationwide Readmissions

Data (NRD) with the difference of study focus on drug/medication poisoning readmissions.

Inclusion criteria includes the target population limited to inpatient discharges treated in United

States community hospitals, not LTAC or rehab facilities in the year 2013 from the listed

demographic regions (HCUP, 2013). Community hospitals as defined by the American Hospital

Association (AHA) are "all non-Federal, short-term, general, and other specialty hospitals,

excluding hospital units of institutions (American Hospital Association, 2015). The target

population is limited to inpatient discharges treated in United States community hospitals not LTAC or rehab facilities (HCUP, 2013). Academic medical centers and public hospitals were included (HCUP, 2013). The American Hospital Association(AHA) states that specialty hospitals are defined as "ear-nose throat, obstetrics-gynecology, orthopedic, short-term rehabilitation, pediatric institutions, and long-term acute care (LTAC) facilities (HCUP, 2013). Exclusion criteria concludes that the data is only from community hospitals and not from long term acute care (LTAC) or rehab facilities (HCUP, 2013). Mentioned non-community hospitals are excluded because of data capturing inconsistencies across states (HCUP, 2013). Exclusion criteria is relevant to patient-specific information of patients discharged that were readmitted after thirty days of his/her discharge (HCUP, 2013). Relating back to the NRD data, unverified patient linkage numbers and missing records were omitted from the NRD (HCUP, 2013). Verification of patient linkage numbers was necessary, and questionable discharge data was omitted (HCUP, 2013). NRD exclusion criteria for omission of patient data was mainly due to individual patient tracking discrepancies within the year (HCUP, 2013). One reason for these exclusions was extraordinary utilization in the year, as defined as twenty or more admissions within the year (HCUP, 2013). Another reason was multiple discharges for the same identifier citing the patient expired in on admission and re-admitted later within the year (HCUP, 2013). Overlapping hospitalizations for the exact patient linkage number at different or the same hospitals was another exclusion (HCUP, 2013). The sample size of poisoning by other medications and drugs is exactly 27,934.

Data Storage and Security

Data obtained from the Healthcare Cost and Utilization Project (HCUP) will be stored on removable discs and only accessed by the chief researcher and chairman of the chief researcher's

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dissertation committee. Both individuals have passed requirements for HIPPA training in the

form of an HCUP certification and have obtained permission in the form of a data use agreement

with HCUP. Upon completion of the study, the discs storing data will be kept within a safety

deposit box located in Haddon Heights, New Jersey for a total of three years. After this time

terminates, the discs will be destroyed.

Sampling Selection

All discharges included within the time frame of one calendar year in 2013 were included

in the NRD dataset. Only patients discharged home to return to the hospital within thirty-day

post discharge are included (HCUP, 2013). Inclusion criteria included the target population

limited to inpatient discharges treated in United States community hospitals, not LTAC or rehab

facilities in the year 2013 from the listed demographic regions (HCUP, 2013). Community

hospitals as defined by the American Hospital Association (AHA) are "all non-Federal, short-

term, general, and other specialty hospitals, excluding hospital units of institutions (American

Hospital Association, 2015). Patient transfers were included in this sample as well (HCUP,

2013). Academic medical centers and public hospitals were included (HCUP, 2013). The

American Hospital Association(AHA) states that specialty hospitals are defined as "ear-nose

throat, obstetrics-gynecology, orthopedic, short-term rehabilitation, pediatric institutions, and

long-term acute care (LTAC) facilities (HCUP, 2013).

Relating back to the NRD data, unverified patient linkage numbers and missing records

were omitted from the NRD (HCUP, 2013). Verification of patient linkage numbers was

necessary, and questionable discharge data was omitted (HCUP, 2013). NRD exclusion criteria

for omission of patient data was mainly due to individual patient tracking discrepancies within

the year (HCUP, 2013). One reason for these exclusions was extraordinary utilization in the year,

as defined as twenty or more admissions within the year (HCUP, 2013). Another reason was multiple discharges for the same identifier citing the patient expired in on admission and re-admitted later within the year (HCUP, 2013). Overlapping hospitalizations for the exact patient linkage number at different or the same hospitals was another exclusion (HCUP, 2013).

Variables

The unit of analysis is the patient. The dependent variable is thirty-day hospital readmissions. The time of readmissions after index hospitalization is taken into consideration for example the instance of readmission within thirty-days post-discharge in individuals suffering drug/medication poisoning. The independent variables are: gender (male or female); age; socio-economic status; type of case (including index hospitalization costs "cost index" defined as the financial responsibility of the patient); length of stay; clinical diagnosis; geographical location(s), and hospital status.

Measurement

The NRD weighting method consisted of national estimates was created through a weighting and stratification method application of the sampling frame (HCUP, 2013). Weighting and sampling strategy performed on the target population required a post-stratification method (HCUP, 2013). The term "post-stratification" is used because stratification was required after sampling to calculate discharge-level weights for the NRD (HCUP, 2013). Post-stratification allowed for weighting the sampling frame to the target population distribution and allowed compensation for any over-or-under represented types of discharges or hospitals in the sampling frame (HCUP, 2013). Therefore, the NRD was post-stratified both by patient hospital characteristics (HCUP, 2013). This model is representative of the National (Nationwide)

Inpatient Sample(NIS) design (HCUP, 2013). The NIS design allows for certain hospital

characteristics to explain differences in in-patient outcomes (Changes in the NIS Sampling and

Weighting Strategy for 1998, 2002).

Statistical Analysis

The statistical analysis used within this study was binary logistic regression (*Equation*

1.), for thirty- day hospital readmissions measured as a dichotomous variable, and multiple linear

regression (*Equation 2.*) Chi-square was used to determine a relationship between each of the

indicated variables and thirty-day hospital readmissions as thirty-day hospital readmissions was

measured as a continuous variable. Hypothesis testing is based on the model fit and statistical

significances of regression coefficients and odds ratios.

Regression models are used as a technique that uses one or more predictor variables

(independent variables) to explain an outcome (dependent variable) (Fields, 2013). We use

regression to predict an outcome variable from a predictor variable and a parameter associated

with the predictor variable that quantifies the relationship with the outcome variable (Fields,

2013). This represents an unstandardized measure of relationship (Fields, 2013). There are two

types of regression: simple and multiple. Simple regression involves one independent variable

predicting one dependent variable (Fields, 2013). Multiple regression or multiple correlation uses

two or more independent variables to predict one dependent variable (Fields, 2013). When we

are trying to predict membership of two categorical outcomes binary logistic regression is used

(Fields, 2013). Binary logistic regression is the reverse process of using categorical variables to

predict continuous outcomes (Fields, 2013). Using the following equations outcomes can be

drawn:

$$\log\left(\frac{p(y_i = 1)}{1 - p(y_i = 1)}\right)$$

$$= \beta_0 + \beta_1 male_i + \beta_2 disgnosis_i + \beta_3 cost\ index_i + \beta_4 northest_i$$

$$+ \sum_{k=5}^{8} \beta_k socio - demographics_{k,i} + \varepsilon_i$$

Equation 1. Binary logistic regression

$$E(y_i) = \beta_0 + \beta_1 male_i + \beta_2 diagnosis_i + \beta_3 cost\ index_i + \beta_4 northest_i$$

$$+ \sum_{k=5}^{8} \beta_k socio - demographics_{k,i} + \varepsilon_i$$

Equation 2. Multiple linear regression

Methods for Hypotheses

Utilizing SPSS statistical software models will be built based on the following hypotheses:

H1: Males overall have more hospital re-admissions for this diagnosis than females indicating a trend in drug/medication readmissions based on sex.

Using the software accessing selection ANALYZE, Regression --.>Binary Logistic

Since the patient is the unit of analysis and the dependent variable is the time. Categorical predictors, in this hypothesis, SEX (MALE, FEMALE) will be entered in SPSS Indicator option.

H2: Socio-demographic factors are associated with 30-day readmissions.

The categorical predictor entered in SPSS will be "Socio-demographic" abbreviated as "SOCIO".

H3: Index hospitalization costs are associated with 30-day hospital readmissions.

The same method will be utilized only the categorical predictor entered in SPSS will be "INDEX".

H4: Geographically, urban/rural location more incidences of drug and medication poisonings per year than other regions hypothesized to determine drug/medication readmission prevalence based on different demographic regions.

The same method will be utilized only the categorical predictor entered in SPSS will be "H_CONTROL" – Control/Ownership of hospital

"HOSP_BEDSIZE" – Size of hospital based on the number of beds

"HOSP_UR_TEACH" – Teaching status of hospital

"HOSP_URCAT4" – Hospital urban-rural location

Ethical Considerations

The online HCUP Data Use Agreement Training Tool must be completed by all HCUP data users including purchasers and collaborators (HCUP, 2013). Additionally, the HCUP data use agreement must be signed as proof of training completion submission must be documented by the HCUP Central Distributor to view or access the data (HCUP, 2013). In agreement with the training tool and user agreement, users comply to the terms that: data will not be released to unauthorized users; data will not be used for any purpose other than research or aggregate

statistical reporting; website or public re-distribution of HCUP data will not occur; all

individuals included will not be attempted to be identified or identified including usage of

penetration testing or vulnerability analysis as direct or indirect individual identification is

prohibited; individual establishments will not be attempted to contact nor will information that

can identify establishments be published; data will not be used for competitive or commercial

usage relating to individual establishments and this data is not to be used to determine benefits,

rights, or privileges, and potential reversal of engineer propriety with the software through

propriety severity software packages (HCUP, 2013). To further ethical considerations, within the

data use agreement, users agree to acknowledge that the data is derived from the HCUP- citing

specific database names when used for analyses (HCUP, 2013). Users also agree to acknowledge

an individual risk of identification when the number of observations are less than for equal to ten

(HCUP, 2013).

Limitations

Limitations present were on studying pediatric readmissions (HCUP, 2013). Patients

equal or less than 1 year old were included in only nine of the reported twenty-one states in 2013

(HCUP, 2013). Limitations from only using one year, 2013, of discharge data (HCUP, 2013).

There were also limitations from using state specific identifiers and other state specific

restrictions. Certain states restrict the release of data elements due to confidentiality laws.

Specific samples from individual states and regions could not be drawn. Certain specific medical

conditions such as HIV/AIDS may have been omitted (HCUP, 2013). The study was limited to

the sample size of 27,934 poisoning of medications and/or drugs represented within the

Nationwide Readmissions Data source.

Chapter IV

RESULTS

Background

There were twenty-one states that partnered with the HCUP in 2013 (HCUP, 2013). The patient sample size n= 34,441 was obtained through the NRD 918 which specified drug/medication poisoning within the population. Discharge weight was taken account within this population to determine patients re-admitted within a thirty-day period.

Age was determined, of the five age groups included within the yearly discharge data summary (0, 1-17, 18-44, 45-64, and 65 and older), only three age groups were included within this population (18-44, 45-64, and 65 and older) due to the fact that the first two age groups (0, 1-17) were not present within the derived sample. Gender of the patients (male, female) was included within the population (NRD, 2015). Patient Location was included based on the location of the patient's residence according to the Urban Influence Code (UIC) designation (NRD, 2013). Urban includes large and small metropolitan areas with all other areas categorized as rural (NRD, 2013). Patient location includes a six-category urban-rural classification scheme for U.S. counties developed by the National Center for Health Statistics (NCHS)" (HCUPNET, 2015).

Table 1

Frequency Table of Categorical Variables

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	14972	42.4	44.2	44.2
	Female	18885	53.5	55.8	100.0
	Total	33857	95.9	100.0	
Missing	System	584	4.1		
Total		34441	100.0		

Patient Location

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Central Cos >1M Pop	10273	29.1	30.3	30.3
	Fringe Cos >1M Pop	7316	20.7	21.6	52.0
	250K-1M Co Pop	7245	20.5	21.4	73.3
	50K-250K Co Pop	3660	10.4	10.8	84.2
	Micropolitan Co	3417	9.7	10.1	94.3
	Non-Metro/Micropolitan Co	1946	5.5	5.7	100.0
	Total	33857	95.9	100.0	
Missing	System	584	4.1		
Total		34441	100.0		

Income Quartile For ZIP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1st Quartile	11425	32.3	33.7	33.7
	2nd Quartile	9053	25.6	26.7	60.5
	3rd Quartile	7799	22.1	23.0	83.5
	4th Quartile	5580	15.8	16.5	100.0
	Total	33857	95.9	100.0	
Missing	System	584	4.1		
Total		34441	100.0		

Type of Case

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Medicaid OR No Charge	9322	26.4	27.5	27.5
	Financially Responsible Patient	24535	69.5	72.5	100.0
	Total	33857	95.9	100.0	
Missing	System	584	4.1		
Total		34441	100.0		

Hospital Control

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Government/Public	5335	15.1	15.8	15.8
	Private/Non-Profit	21772	61.6	64.3	80.1
	Private/For-Profit	6750	19.1	19.9	100.0
	Total	33857	95.9	100.0	
Missing	System	584	4.1		
Total		34441	100.0		

Hospital Size

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Small	3827	10.8	11.3	11.3
	Medium	8917	25.2	26.3	37.6
	Large	21113	59.8	62.4	100.0
	Total	33857	95.9	100.0	
Missing	System	584	4.1		
Total		34441	100.0		

Hospital Teaching Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Metropolitan Non-Teaching	13793	39.1	40.7	40.7
	Metropolitan Teaching	16124	45.7	47.6	88.4
	Non-Metropolitan	3940	11.2	11.6	100.0
	Total	33857	95.9	100.0	

| Missing | System | 584 | 4.1 | | |
| Total | | 34441 | 100.0 | | |

Hospital Teaching Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Metropolitan Non-Teaching	13793	39.1	40.7	40.7
	Metropolitan Teaching	16124	45.7	47.6	88.4
	Non-Metropolitan	3940	11.2	11.6	100.0
	Total	33857	95.9	100.0	
Missing	System	584	4.1		
Total		34441	100.0		

Hospital Location

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Large Metro Areas >1M Pop	17827	50.5	52.7	52.7
	Small Metro Areas <1M Pop	12090	34.2	35.7	88.4
	Micropolitan Areas	3046	8.6	9.0	97.4
	Not Metro nor Micropolitan	894	2.5	2.6	100.0
	Total	33857	95.9	100.0	
Missing	System	584	4.1		
Total		34441	100.0		

Table 1 shows frequencies of categorical variables: Gender; Patient Location; Income Quartile for Zip; Type of Case; Hospital Control; Hospital Size; Hospital Teaching Status, and Hospital Location.

Table 2

Descriptive Table for Continuous Variables: Patient Age, Length of Stay, and Total Hospital Charges

	Patient Age	Length of Stay	Total Hospital Charges
N	34441	34441	34441
Mean	42.91	2.41	19618.78
Std. Deviation	19.662	3.185	35873.035
Minimum	0	0	115
Maximum	90	284	3660597

Descriptive statistics table for continuous variables including Patient Age, Length of Stay, and Total Hospital Charges. The mean patient age for hospital readmissions is 43 and the mean length of stay for hospital readmissions is 2.4 days. The mean total hospital charges are $19,619.

Income quartile for ZIP represents the national quartile of median household income for the patient's ZIP Code. Length of Stay indicates patients discharged and re-admitted within thirty-days post initial discharge. Hospital Charges; hospital control; hospital size; hospital teaching status, and hospital location are included with the geographical location of community hospitals. Socioeconomic is further classified as the income quartile for zip is the income level based on the national quartile of the median household income for the patient's ZIP Code. Index hospitalization including type of case is Medicaid "No Charge", and the primary or secondary expected payer indicates private insurance, self-pay, or "other" (NRD, 2013). Characteristics included in the population were determined after analysis was applied to the derived population for study feasibility. Absence of any specific characteristic within this given population was omitted.

Research Question 1. Is Gender associated with the number of readmissions within the

drug/medication population?

Table 3

Chi-Square Gender vs. Hospital Readmissions

	Value	df	Asymptotic Significance (2-sided)	p-value (2-sided)	p-value (1-sided)
Pearson Chi-Square	11.63	1	.001	.000	.000

For the sample used in this study, Figures 1 and 2 reveal that the hospital readmission rates were

.013 (202/15,201) for males and .009 (181/19,240) for females. Although Table 3. shows that

there was a statistically significant difference between the hospital readmission rates for males

and females with males having a higher readmission rate than females ($\chi^2(1) = 11.63$, p = .001 <

.05, Ø = .02), this difference may not be clinically significant as evidenced by the minimal effect
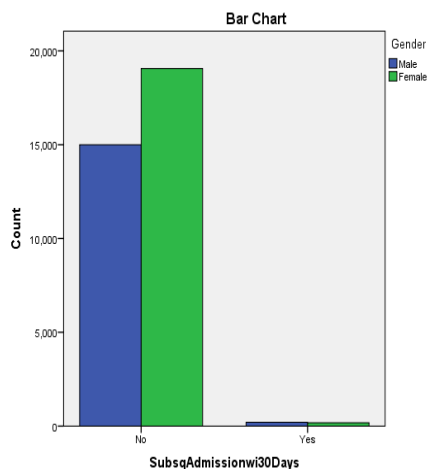
size of Ø = .02.

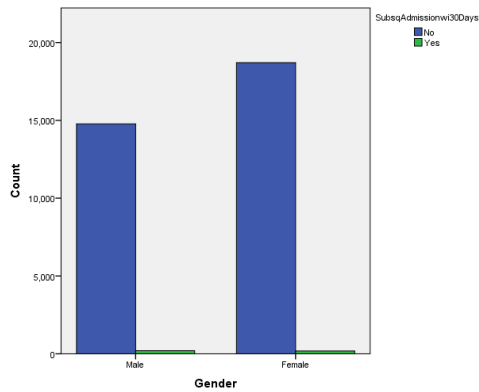*Figure 2.* Gender vs. Hospital Readmissions Bar Chart

Figure 3. Gender vs. Hospital Readmissions Bar Chart

 The sample includes 15,201 Males and19,240 Females.
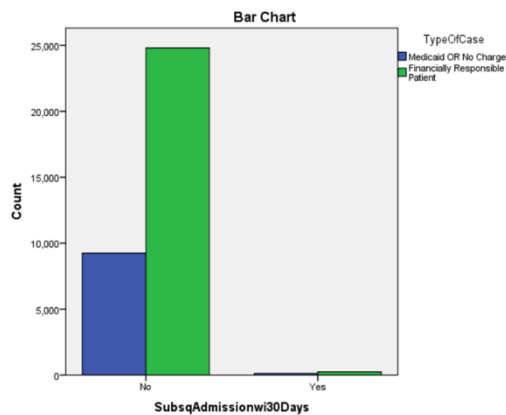
Figure 4. Financial Status of Patient vs. Hospital Readmissions

Research Question 2. Are socio-economic factors associated with thirty-day readmissions?

Research Question 2 considers the impact of the following socio-economic factors on hospital

readmission rates: patient location and income quartile for zip code. There were six patient

location categories: (1) > = 1 million population; (2) "Fringe" counties of metro areas of 250,000

– 999,999 population; (3) Counties in metro areas of 50,000 – 249,999 population; (5)

Micropolitan counties, and (6) Not metropolitan or micropolitan counties (NRD, 2013).

Additionally, there were four income quartiles for zip code: (1) $1 - $37,999; (2) $38,000 -

$47,000; (3) $48,000 - $63,999; and (4) $64,000 or more (NRD, 2013). Chi square analyses were used to view patient location and income quartile per zip code.

Table 4

Chi-Square Patient Location vs. Hospital Readmissions

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.654	5	.018
Likelihood Ratio	13.293	5	.021
Linear-by-Linear Association	3.713	1	.054
N of Valid Cases	34,441		

Table 4 explains the relationship between patient location and hospital readmissions ($\chi^2(1) = 13.654$, p = .02 < .05, Ø = .02) as a weak relationship.

Table 5

Chi-Square Tests Income Quartile for Zip Code vs. Hospital Readmissions

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.613[a]	3	.085
Likelihood Ratio	6.448	3	.092
Linear-by-Linear Association	4.878	1	.027
N of Valid Cases	34441		

Table 5 displays chi-square Income Quartile per Zip Code not significant ($\chi^2(1) = 11.63$, p = .085 > .05. Income Quartile per Zip is not statistically significant and, in turn, not clinically

significant. Income Quartile per Zip is not a factor in identifying thirty-day readmissions in the drug/medication population.

Research Question 3. Are index hospitalization costs associated with thirty-day readmissions?

Index hospitalization denotes the patient financial responsibility status: either Medicaid/ No Charge or Financially Responsible Patient. Medicaid/No Charge patients had a .014 hospital readmission rate (135/9,387), while financially responsible patients had a .010 readmission rate (248/25,054). A chi square analysis was used to determine whether there was a significant relationship between the index hospitalization status for hospital readmission rate or whether there was not a significant relationship between the index hospitalization status and the hospital readmission rate.

Table 6

Chi-Square Patient Financial Responsibility Status vs. Hospital Readmissions

Value	df	Asymptotic Significance (2-sided)	p-value (2-sided)	p-value (2Sided)
12.48	1	.000	.001	.000

Table 6 shows that there was a statistically significant relationship between these two variables ($\chi^2(1) = 12.48$, p = .001 < .05, Ø = .02) with Medicaid/No Charge patients having

higher readmission rates than financially responsible patients. However, this result may not be

clinically significant as evidenced by the minimal effect size of $\varnothing = .02$.

Research Question 4. Geographically, the urban/rural locations are predicted to have more

incidences of drug and medication poisonings per year than other regions determining

drug/medication readmission prevalence based on different demographic regions.

For this model chi-square test and regression were used. A binary logistic regression

model was used to answer this research question. While this logistic regression model utilized

the same output variable (hospital readmission rate) along with the same six predictor variables

as the model used to answer Research question 2, this model also included the following control

variables: Length of Stay; Total Hospital Charges; Hospital Control; Hospital Size; Hospital

Teaching Status, and Hospital Location.

Table 7

Chi-Square Tests Urban/Rural vs. Hospital Readmissions

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.050	5	.023

Table 7 shows the relationship of the two variables ($\chi^2(1) = 13.05$, $p = .023 < 0.05$, $\varnothing = .02$)

Urban/Rural locations and thirty-day readmissions. However, this result may not be overall

significant as evidenced by the minimal effect size of $\varnothing = .02$ as seen below

Table 8

Variables in the Equation

		B	S.E.	Wald	df	p-value	Exp(B)
Step 1[a]	Patient Age	.003	.003	1.12	1	.290	1.00
	Gender	-.313	.104	8.99	1	.003	.73
	Patient Location			4.66	5	.459	
	Patient Location(1)	.183	.350	.27	1	.600	1.20
	Patient Location(2)	-.114	.360	.10	1	.752	.89
	Patient Location(3)	-.086	.284	.09	1	.761	.92
	Patient Location(4)	.092	.303	.09	1	.763	1.10
	Patient Location(5)	.060	.285	.04	1	.834	1.06
	Income Quartile per ZIP			3.09	3	.378	
	Income Quartile per ZIP(1)	.225	.170	1.76	1	.185	1.25
	Income Quartile per ZIP(2)	.027	.180	.02	1	.882	1.03
	Income Quartile per ZIP(3)	.066	.180	.14	1	.712	1.07
	Type of Case	-.343	.115	8.83	1	.003	.710
	Length of Stay	-.005	.02	.07	1	.792	.10
	Total Hospital Charges	.000	.00	.01	1	.929	1.00
	Hospital Control	-.071	.09	.62	1	.432	.93
	Hospital Size	.008	.08	.01	1	.922	1.01
	Hospital Teaching Status	.034	.12	.09	1	.765	1.04
	Hospital Location	-.076	.16	.24	1	.623	.93
	Constant	-4.124	.55	55.84	1	.000	.02

a. Variable(s) entered on step 1: Patient Age, Gender, Patient Location, Income Quartile For ZIP, Type of Case, Length of Stay, Total Hospital Charges, Hospital Control, Hospital Size, Hospital Teaching Status, Hospital Location.

Overall analysis explains the effect of each independent variable on dependent variable thirty-day readmissions. The patient age $p = .24 > .05$ indicates no statistical and, in turn, clinical

significance on the prediction of readmissions. Patient Gender, $p = .003 < .05$ shows statistical significance. Odds ratios were determined in significant outcomes of the independent variables. The odds ratio of the variable model is .73 suggesting that the odds of females to be readmitted is 73% the odds of the males being readmitted. Patient location, $p = .49 > .05$ has overall no statistical significance, however, as further explained, certain areas within socioeconomic factors are significant. The Income Quartile per Zip, $p = .06 > .05$ indicates no statistical significance. The Type of Case, $p = .003 < .05$ does have statistical significance. Odds ratio was determined for the Type of Case, coding included 0 = Medicaid/No Charge, 1 = Financially responsible patient. The odds ratio of the type of case model is .71 suggesting that the odds of the financially responsible patient to be readmitted is 71% the odds of the non-financially responsible patient being readmitted. Length of Stay is not statistically significant, $p = .76 > .05$. No overall statistical significance exists of both geographic and hospital information including the Total Hospital Charges, $p = .97 > .05$; Hospital Control $p = .44 > .05$; Hospital Size $p = .87 > .05$; Hospital Teaching Status $p = .37 > .05$, and Hospital Location $p = .57 > .05$. None of these mentioned independent hospital variables have any statistical significance within this regression model.

Table 9

Hypotheses Summary

RQ1 H0: Males overall have more re-admissions within the drug/medication population than females. Ha: Males overall have less re-admissions within the drug/medication population than females.	Reject H0
RQ2 H0: There is increased re-admissions among both males and females from rural areas. Ha: There is a decrease in re-admissions among both males and females from rural areas.	Fail to Reject H0
RQ3 H0: Financially responsible patients have less readmissions. Ha: Financially responsible patients have more readmissions.	Reject H0
RQ4 H0: Hospital location is not a factor determining readmissions. Ha: Hospital location is a factor in determining readmissions.	Fail to Reject H0

Gender is significant in the fact that males are more likely to be readmitted within thirty days than females. Type of case; meaning the financially responsible patient vs. the non-financially responsible patient (Medicaid) indicates that the financially responsible patient is less likely to become readmitted within thirty-days than the non-financially responsible patient. Overall socioeconomic factors are no indication on thirty-day readmissions. There is no relationship between age and readmissions. Hospital information including geographic location and hospital specific characteristics such as teaching hospital, hospital size, etc. are not relative to thirty-day readmissions within this population. Therefore, gender and type of case are the only clear, significant indicators of thirty-day readmissions within this study.

Chapter V

CONCLUSION

The study sought to address the national debate of reducing thirty-day readmissions specifically within the drug/medication poisoning population. The application of readmission specific factors included within this study were used based on pre-existing characteristics of this known population to determine a relationship of these factors relative to thirty-day readmissions. The drug/medication poisoning population is determined as high risk. Thematic application of planned behavior is relative in the findings based on the notion that preventative care is necessary to reduce readmissions in high-risk populations. This study included such high-risk populations as seen within the identified independent variable including individuals that have been subsequently readmitted to the hospital within thirty days with drug and medication poisoning. To support the practical need for individuals to recognize preventative measures and providers to support individual readmissions relates back to the theory of planned behavior. Planned behavior is representative of individual accountability by increasing prevention practices in such high-risk populations to change the state of the patient is further understood through Lewin's Change Theory application. Chronic illness and, in turn, high-risk behavior leading to thirty-day readmissions is a systematic cycle. This study relied upon variables related solely to the diagnosis of drug and medication poisoning. More variables within this study were found compared to other diagnoses, as this study is different from previously published studies having one individually specific diagnosis code. In likelihood of readmissions, the theory of planned behavior is applied as an indicator for individual patient accountability for actions. Several of the variables within this study also are reliant on patient accountability specifically socio-demographic, type of case, and hospital location. Mentioned variables are dependent upon individual patients' lifestyle and individual life choices. Through this study, factors accurately contributed to the understanding of preventative areas needed to achieve the future goal of

patient care and readmission prevention strategy. This study did give more attention to the national trend in readmissions.

Sufficient findings included gender and type of case, better described as the financially vs. non-financially responsible patient being statistically significantly associated with thirty-day readmissions. Restated, Patient Gender, $p = .003 < .05$ and Type of Case, $p = .003 < .05$ show statistical significance. The outcomes additionally support the trajectory framework and hypothesis in stating that males do have more readmissions than females. Gender does play a role in readmissions. Previous studies were evaluated to notice a trend in results of this current study. Relating back to the literature, a four-year study from 2007-2011 was performed to determine a relationship between length of stay, thirty-day mortality and thirty-day readmission rates among cardiac patients within the Medicare population (Loop et al., 2016). This study was conducted particularly on a patient population age greater or equal than sixty-five. The study evaluated using the Medicare population vs. non-Medicare and/or financially responsible population. Similar results are included within this study, indicating that there is significance in the Medicare population being readmitted more than the financially responsible patient. Another study attempting to cross-sectionally identify correlation in congestive heart failure patients between the number of past-year admissions compared to thirty-day readmissions was conducted in 2014 (Ketterer et al., 2014). Both Medicare and Medicaid patients were included within the study. A post-discharge intervention was performed in a 2013 by Costantino et al. to help reduce thirty-day hospital readmissions in the Medicare population (Costantino; Frey, Hall & Painter, 2013). This study is another example of the Medicare, non-financially responsible patient being in subject. These previous studies mentioned are in support of the findings that type of case has a

similar direction and similar impact on readmissions from the current study of reducing thirty-day readmissions in the drug/medication poisoning population.

Index hospitalization including the financially responsible vs. non-financially responsible patient, referred to as the patient financial responsibility within the results was accounted for, meaning the financially responsible patient is less likely to be readmitted than the non-financially responsible patient including Medicaid reliant patients. Socioeconomic factors overall were predicted to play a role in thirty-day readmissions, but contrary to the hypothesis did not have overall significance in prediction. Geographic regions along with several other non-relevant factors, as previously outlined and determined within the analyses, were not significant in predicting readmissions. A previous study of hospital quality suggested re-admission cause was prevalent in certain geographic locations (Weeks; Lee; Wallace, West & Bagain, 2009). Not in support of the current study findings, this previous study suggested that there is a correlation between geographic and/or demographic location and readmissions. This national study of observational data was very useful in helping to initiate the identification of predictors to be expanded upon for future research.

There were limitations upon the conclusion of the study. Although patient age was limited to individuals 18 years old and over, omitting pediatric readmissions, age was not determined significant. The study was limited to a reported number of patients from only twenty-one states in the year 2013 (HCUP, 2013). The study only had access to discharge data from these twenty-one states. Included to further this limitation was that a specific number of patients were not given per state or even per region for confidentiality reasons. State-specific or region-specific samples could not be obtained. Another limitation of the study is that it is only taken in account one year of readmissions within one year of drug/medication poisoned patients. As

previously mentioned, limitations from using state specific identifiers and other state specific

restrictions were present as certain states restrict the release of data elements due to

confidentiality laws. The conclusion of the study is limited to a patient population omitting any

co-morbidities. Only one diagnosis code was used to determine this population from the given

data set. Certain specific medical conditions such as HIV/AIDS may have been omitted as a

major limitation of the available data and study findings in the absence of co-morbidities

(HCUP, 2013). The study was limited to the sample size of 34,441 poisoning of medications

and/or drugs represented within the Nationwide Readmissions Data source.

Future research

This study was undertaken because there is no previous research on reducing thirty-day hospital

readmissions in the United States within the drug/medication poisoned population with no

comorbidities present. There is a lack of research surrounding the topic of drug/medication

poisoning on a national level; excluding individuals affected with comorbidities. There does

however, exist research on illicit, illegal drugs which may or may not be reliable as such findings

are subject to numerous external factors. Such factors include demographic regions, behavioral,

and psychological influences. There is a gap in the literature surrounding specifics pertaining to

types of drugs/medications along with efforts to reduce thirty-day readmissions in certain

populations. This study is a convenience sample that included a non-restricted population from

the United States. Future research in thirty-day readmissions internationally may be helpful to

better understand national impact of the topic. Although hospital payment and reimbursement

structure is different on the international level, it would certainly be insightful to gain access to

such data. Conclusions can be drawn such as whether thirty-day readmissions are expected

internationally based upon factors not influenced by individual hospital payment and

reimbursement. Additional research to include more demographic areas and even state specific

studies would be beneficial to increase the understanding of demographic influence on thirty-day

readmissions. An area that suggests future research is specific comorbidities influence or lack of

influence on thirty-day readmissions. Illegal drugs and non-prescribed medications is a major

area for future research in non- restricted populations. Non-restricted populations would include

all ages, gender, income, demographic region, etc. Conducting research on multiple readmissions

and discharges within thirty days within this population off illegal drug and medication users

could be helpful to develop prevention strategy and cost saving initiatives. From a national view

point and health system view point, such as study could help to develop a plan to help

individuals within this population overcome their illegal/non-prescription drug use and also

determine presence of addiction. Minority studies on reducing thirty-day readmissions would be

beneficial to view if this topic is more or less prevalent in minorities than non-minorities. This

same study can be executed on sub-populations, such as geriatric, within certain areas to

determine if certain populations are more susceptible than others. Other factors that could have

been included in this study and/or subsequently explored in the future are: physician perspective;

race; international comparisons; individual level of education; illegal vs. legal medication and

drug differentiation; co-morbidities; specific populations such as pre-diagnosed physically and/or

mentally ill, literacy, and specific age categories.

Conclusion

Major findings in the study were that an increased number of factors not previously discovered

as contributors to thirty-day readmissions in drug/medication population were determined. These

factors that impact the thirty-day readmission status of those patients being readmitted for drug

and poising can be beneficial in prevention of episodic occurrences. Based upon the notion of

prevention strategy, this study was executed to determine factors which clearly can be used to develop future prevention strategies for health care facilities including hospitals, ambulatory care centers, acute care centers and nursing/long term care facilities. The goal was to contribute to much needed research in this area being that there exists no one exact cause of thirty-day readmissions. Through factor identification, increased prevention strategy will continue. Included outcomes were in the areas of: patient age; gender; patient location; income quartile for zip code; type of case; length of stay; total hospital charges; hospital control; hospital size; hospital teaching status, and hospital location. Past and current literature supported all utilization of variables within the study for the contribution, intervention, and strategy surrounding the reduction of thirty-day readmissions within this drug/medication poisoning population. This study was, in fact, observational based on data obtained to only view the number of thirty-day readmissions; omitting other influences. Contributing factors which can aid in the decrease of hospital readmissions related to drug and medication poisoning were determined. By identifying the true contributors significant to readmissions, both current, and future studies can use this information to include and/or omit irrelevant factors. In support of the hypotheses: reduction of readmission rates will increase cost savings in individual hospitals, health care organizations, and the government. Patient quality of life will be improved through readmission reductions. Identification of future episodic costs in males and females will be understood through existing trends as preventative strategy through predictor identification is present.

This observational study included a large population which aided in the methodological contribution. Originally, this was a preliminary, retrospective since data stored within each individual patients' electronic health record stored in individual hospitals then aggregated to provide this population for the NRD. Making this a perspective, longitudinal, or cross-sectional

study could have been beneficial as well, however, observational was preferred given the size of the data set and time frame that other methods would have incurred. Tools used in similar studies included surveys, patient interviews, and utilization of the Lickert scale to evaluate pain. Patient populations in similar studies focused on one or more diagnosis. Patient populations in other studies included specifications within a specific sample of the target population, for example, senior oncology patients greater or equal than sixty-five, or patients restricted to rehabilitation facilities. The patient population within this study had limited restrictions and patients were evaluated only on the presence of the diagnosis code indicating "drug/medication poisoning" presented more than once within a thirty-day period.

There is suggestion that results from this study could aid in policy contribution. As previously mentioned one in five Medicare beneficiaries who experience hospitalization are readmitted within thirty days at a cost of readmissions (Jenks et al., 2009). Results from the type of case, including the Medicaid/Medicare or the financially responsible patient model, display a positive association between accountability for readmissions within the financially responsible patient population. As historically established, to reduce avoidable readmissions, the Patient Protection and Affordable Care Act established the "Hospital Readmission Reduction Program." (Zhang et al., 2009). As stated within this policy, hospitals with higher than expected adjusted re-hospitalization rates have a lower reimbursement rate (Zhang et al., 2009). Outcomes of this study infer that such policies be maintained to prevent unnecessary readmissions, at the cost of the health care provider. Specific, significant areas of the study such as type of case, and gender can aid policy makers in taking additional factors into account. As part of cost saving strategy, it is suggested that policy makers could attempt to aim toward individual patient accountability in addition to health system penalization to help reduce thirty-day readmissions.

The theoretical contribution, using the three theories was necessary to explain all areas of the study as each theory contributed a unique resource to coming all together to form a full understanding of theory application. Planned behavior, Lewin's change theory, and the trajectory framework are three separate theories describing components of the study. It is necessary to have the three theories to better describe the functionality aspect of diagnosis itself, set apart from the patient role in this study. Both Lewin's change theory and the Trajectory framework reference chronic illness. The theory of planned behavior is relevant to individual patient accountability due to the fact that readmissions from accidental drug/medication poisoning are highly preventable. The three theories are additionally needed to expand on the interaction of factors determined within the study.

From a practical/clinical point of view, broad generalizations can indicate to clinicians that certain patients may become more or less prone to being readmitted within thirty-days post discharge with this diagnosis. Clinicians may choose to separate patients that display certain factors that have been identified as contributing factors to thirty-day readmissions for preventative measures. The practical application of the findings may be useful in providing patients with education, education for the general public, to appeal in increased patient accountability.

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APPENDIX A

Seton Hall IRB Approval Letter

SETON HALL ⛪ UNIVERSITY.
1 8 5 6

May 4, 2017

Jenna Evans

██████████████████

Dear Ms. Evans,

The Seton Hall University Institutional Review Board has reviewed the information you have submitted addressing the concerns for your proposal entitled "Reducing Thirty-Day Hospital Readmissions in Drug and Medication Poisoning: An Observational Study." Your research protocol is hereby accepted as completed and is categorized as exempt.

Please note that, <u>where applicable</u>, subjects must sign and must be given a copy of the Seton Hall University current stamped Letter of Solicitation or Consent Form before the subjects' participation. All data, as well as the investigator's copies of the signed Consent Forms, must be retained by the principal investigator for a period of at least three years following the termination of the project.

Should you wish to make changes to the IRB approved procedures, the following materials must be submitted for IRB review and be approved by the IRB prior to being instituted:

- Description of proposed revisions;
- *If applicable*, any new or revised materials, such as recruitment fliers, letters to subjects, or consent documents; and
- *If applicable*, updated letters of approval from cooperating institutions and IRBs.

At the present time, there is no need for further action on your part with the IRB.

In harmony with federal regulations, none of the investigators or research staff involved in the study took part in the final decision.

Sincerely,

Mary J. Ruzicka, Ph.D.

Mary F. Ruzicka, Ph.D.
Professor
Director, Institutional Review Board

cc: Dr. Ning Zhang

Office of Institutional Review Board
Presidents Hall · 400 South Orange Avenue · South Orange, New Jersey 07079 · Tel: 973.313.6314 · Fax: 973.275.2361 · *www.shu.edu*

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