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## Factors Associated with Rapid Readmission Among Nevada State Pyschiatric Hospital Patients

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**FACTORS ASSOCIATED WITH RAPID READMISSION AMONG NEVADA  
STATE PSYCHIATRIC HOSPITAL PATIENTS**

**By**

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**A thesis submitted in partial fulfillment  
of the:**

**Master of Public Health**

**Department of Environmental and Occupational Health  
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The Graduate College**

**University of Nevada, Las Vegas  
December 2014**

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We recommend the thesis prepared under our supervision by

**Christopher Owen Moore**

entitled

**Factors Associated with Rapid Readmission Among Nevada State Psychiatric Hospital Patients**

is approved in partial fulfillment of the requirements for the degree of

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## **Abstract**

Rapid readmission (RR) of psychiatric patients within 30 days of discharge places a costly burden on state psychiatric facilities and may be an indicator of suboptimal service provision. Several studies have previously considered RR to inpatient facilities, but there is a lack of information available about the variables associated with RR of psychiatric patients to state-operated inpatient facilities in Nevada. This study attempts to identify factors associated with RR at a southern Nevada state psychiatric hospital. Participants included 7,177 patients admitted between May 1, 2012 and April 30, 2014. All 12,068 admissions, including 2,220 RR, were reviewed, and rapid readmits were compared to their counterparts who were not readmitted within 30 days in a multivariate model using logistic regression. Multinomial logistic regression was utilized to determine if risk factors varied based on the number of RR, and to ascertain whether or not previous length of stay (LOS) had an impact on time to readmission. Whenever possible, analyses were run separately including all admissions and each patient's first admission only.

Results from multiple logistic regression consistently demonstrated that those aged 35-44, never married, divorced, and living in a homeless shelter or other residential or institutional setting are at increased risk for RR; in contrast, females, persons not receiving social security disability, and those over 55 years of age were at reduced risk. Significant factors associated with RR also included a history of legal problems, medication noncompliance, lack of stable housing, and diagnosis with a psychotic or substance use disorder. Persons living in a homeless shelter and having a history of legal issues were more likely to be in the group most often rapidly readmitted (four or more

times), and those that did not receive social security disability were less likely to be included in this high risk group. Previous LOS did not contribute significantly in multivariate modelling of time to readmission.

Nevada currently suffers from budget cuts in mental health care spending, which were a result of the recent economic crisis, and a severe lack of bed space in southern Nevada. This study demonstrates that it may be possible to reduce rates of costly RR by focusing on those with a history of rapid readmission and modifiable factors including social and financial supports and housing.

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## **Chapter 1 Introduction**

As a result of the recent spate of violent events perpetrated by those with documented or perceived mental illness, citizens have become increasingly aware and wary of the burden cuts in mental health spending due to the recent economic downturn have had on the public. The media have exacerbated concerns over inadequate mental health care by focusing the spotlight on recent mass shootings, including those at Sandy Hook Elementary School in Connecticut, the movie theatre in Aurora, Colorado, and at Fort Hood, Texas to name just a few. In addition, there has been increased government and media attention on the continuity of care from inpatient to outpatient psychiatric services.

This issue is demonstrated acutely in the state of Nevada. Recent allegations of patient dumping by Rawson-Neal Psychiatric Hospital (RNPH) have catapulted Southern Nevada Adult Mental Health Services (SNAMHS) into the national spotlight, and have led to increased scrutiny by regulatory agencies such as the Centers for Medicare and Medicaid Services (CMS) and The Joint Commission (TJC). SNAMHS received several citations in 2013 as a result of the increased scrutiny, and special attention was paid to the area of discharge planning. Providing better discharge plans has led to increased lengths of stay and has had a negative impact on available bed space, which, in turn, has contributed to a backup of patients in local emergency rooms, numbering up to 180 patients across the Las Vegas valley at any given time (SNAMHS, unpublished data). It has become imperative that the state of Nevada look for opportunities to free up the limited bed space available and to limit costs incurred as a result of hospitalization in order to more effectively utilize the limited financial resources available. This has led

administrators at the Division of Public and Behavioral Health (DPBH) to look more closely at super-utilizers of mental health services in an effort to curb overutilization of inpatient services and to provide more appropriate, lower cost outpatient services such as medication clinics, outpatient counseling, service coordination, and housing. Rapid readmits, those that are readmitted to a hospital within 30 days of discharge, present a huge financial cost to psychiatric hospitals, take up much needed bed space, may be representative of poor care or lack of appropriate service provision, and most importantly, may be preventable.

There is much to learn by exploring the history of mental health care in southern Nevada, which began in the 1960's with the opening of the first psychiatric outpatient clinics and reflected growing demand for community-based care as opposed to institutionalization (Landreth & Brandenburg, 2006). In 1979, four years after the first public psychiatric hospital was established in southern Nevada, Pillard noted that mental health services were marked by three significant problems: absence of long-term planning, lack of independent professional review or public oversight of mental health programs, and significant fluctuations in service capacity (Pillard, 1979). Since 1983, when funds were initially cut to deal with state budget shortfalls, the budget for mental health care has cycled repeatedly through phases of budget increases and reductions (Landreth & Brandenburg, 2006). The most recent cuts occurred in 2011 following economic recession. Budget cuts ultimately have the effect of reducing capacity to serve our mentally ill population, which has grown along with our rapidly expanding population. As seen above, psychiatric service delivery is monitored by CMS and TJC; however, it was only following the most recent crisis in 2013 that the governor

established the Governor's Behavioral Health and Wellness Council by executive order (Executive Order 2013-26, 2013). The council membership is composed of a multidisciplinary team of behavioral health experts and is tasked with identifying and closing gaps in behavioral health service delivery in Nevada (Executive Order 2013-26, 2013). This council, thus, addresses the issues of long-term planning and public oversight.

Bed capacity has been an ongoing concern with Clark County declaring a state of emergency in July 2004 when emergency rooms (ERs) were overflowing with psychiatric patients, who filled approximately one-third of available beds (Landreth & Brandenburg, 2006). As of 2014, individual hospitals are declaring short-term internal disasters due to high numbers of psychiatric patients waiting in ERs and are rerouting ambulances to other community hospitals (Amaro, 2014). This situation is largely a result of policies that require patients to be medically-cleared prior to being admitted to state-run psychiatric facilities, which results in diversion of psychiatric patients to local emergency rooms for clearance. Those patients with insurance or Medicare/Medicaid benefits may be admitted to private psychiatric facilities; however, those patients without benefits or who have exhausted their benefits end up waiting for beds to become available at Rawson Neal Psychiatric Hospital, a process that may take several days and may result in a patient being stabilized and released from the ER rather than receiving inpatient care.

The objectives of this study are to identify specific factors associated with rapid readmission at a southern Nevada state psychiatric hospital, to determine if the factors associated with rapid readmission differ based on number of rapid readmissions, and to understand the relationship between length of stay and ensuing readmission.

Several studies have previously considered RR to inpatient facilities, but there is a lack of information available about the variables associated with RR of psychiatric patients to state-operated inpatient facilities in Nevada. Given the mental health care crisis Nevada is currently experiencing, it is critical that the state better understand our patients who are high utilizers of psychiatric services. Rapid readmission is a potential indicator of high service utilization and also suggests suboptimal service provision. This research may provide helpful evidence to the state as it attempts to improve service delivery in mental health. It is also anticipated that this research will be able to contribute to what is currently a limited, and often contradictory, body of knowledge on the factors associated with rapid readmission.

### Background and Significance

According to the Mental Health Surveillance Survey conducted in 2012, an estimated 43.7 million adults in the United States had been affected by a mental illness in the previous year and accounted for 18.6 percent of the total U.S. population over the age of eighteen (Substance Abuse and Mental Health Services Administration [SAMHSA], 2013). This number includes all individuals who had a diagnosable mental, emotional or behavioral disorder, excluding substance use and developmental disorders, lasting long enough to satisfy diagnostic criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association [APA], 1994). In the same year, it was estimated that 9.6 million adults in the U.S., or 4.1 percent of the adult population, had a serious mental illness (SMI) in the past year (SAMHSA, 2013). SMI, as defined by SAMHSA, includes the above criteria for mental illness and meets the diagnostic criteria specified in the DSM-IV (APA, 1994), but also requires that the

mental illness causes serious functional impairment that interferes with at least one major life activity (SAMHSA, 2013).

The DPBH psychiatric inpatient hospitals provide acute care for persons with SMI. Out of 2.6 million residents in Nevada, 89,000 adults, or 3.4 percent of the total population, are estimated to be affected by SMI (Holzer & Nguyen, n.d.). Given the large numbers of persons with SMI coupled with budget considerations and limited bed space, the DPBH and psychiatric hospitals nationwide, have become concerned with repeat admissions and extended lengths of stay (LOS). Between 1995 and 2002, the average LOS for SMI patients decreased from 12.8 to 9.7 days (Watanabe-Galloway & Zhang, 2007). A more recent study found the average LOS to be 8.0 days for patients with mental illness (Stranges, Levit, Stocks, & Santora, 2011).

A study conducted in Hyderabad, India between September 16, 2003 and March 15, 2004 looked at readmission rates for 499 patients (Vasudeva, Narendra Kumar, & Chandra Sekhar, 2009). Within these six months, 17 percent of those whose first admission was seven days or less were readmitted in comparison to just 9 percent of those with an LOS of 8 to 14 days and 3 percent of those who had an LOS of 15 to 30 days, indicating that shorter length of stay is associated with a shorter time to readmission (Vasudeva, Narendra Kumar, & Chandra Sekhar, 2009). Despite this finding, the trend toward shorter LOS is likely to continue in the age of deinstitutionalization and limited funding; therefore, it is necessary to identify additional risk factors for readmission and to find alternative treatment options. It should be noted that although several studies corroborate this finding (Appleby, Desai, Luchins, Gibbons, & Hedeker, 1993; Gruber, 1992; Rosenheck, Massari, & Astrachan, 1990; Swett, 1995) other studies found it to be

insignificant in rates of readmission (Haywood et al., 1995; Knights, Hirsch, & Platt, 1980; Lyons et al., 1997; Swigger, Astrachan, Levine, Mayfield, & Radovich, 1991).

It has been postulated that the findings have been mixed concerning the association between LOS and recidivism, because the issue may not actually be due to poor inpatient treatment, but lack of outpatient follow-up care (Lyons et al., 1997). To this end, a study by Nelson, Maruish, & Axler (2000) looked at the association between discharge planning that included the scheduling of an outpatient appointment and readmission rates at intervals of 90, 180, 270, and 365 days. This study was especially critical given the shift from reliance on inpatient care to treatment within the community. According to Nelson et al. (2000), a readmission rate of less than 15 percent within 30 days is the industry standard for quality of care; however, the authors of this study evaluated readmission rates for periods up to one full year after discharge to determine the long-term impact of discharge planning. In this study, 542 out of 3,113 patients, or 17.4 percent, were readmitted within one year of discharge (Nelson, Maruish, & Axler, 2000). The readmission rate for those that kept at least one appointment was 11 percent in comparison to 22 percent of those who did not keep an appointment (Nelson, Maruish, & Axler, 2000). The authors of this study recommend aggressive outreach for patients who fail to be compliant with discharge planning (Nelson, Maruish, & Axler, 2000). Several other studies have also found non-compliance with outpatient treatment to be a risk factor for readmission (Casper, Romo, & Fasnacht, 1991; Colenda & Hamer, 1989; Haywood et al., 1995; Marken et al., 1992; Polk-Walker, Chan, Meltzer, Goldapp, & Williams, 1993).

In addition to the studies mentioned above, many other studies have been completed that have found associations between readmission and a wide variety of



demographic and illness-related variables. Demographic variables associated with readmissions include being male (Appleby et al., 1996; Casper & Donaldson, 1990; Colenda & Hamer, 1989; Kastrup, 1987a; Tansella, Micciolo, Biggeri, Bisoffi, & Balestrieri, 1995), younger age (Casper & Donaldson, 1990; Colenda & Hamer, 1989; Kastrup, 1987a; Lewis & Joyce, 1990), marital status (Kastrup, 1987a), unemployment (Tansella et al., 1995), lower education levels (Stickney, Hall, & Gardner, 1980), and living in urban areas (Kastrup, 1987b; Sullivan, Wells, Morgenstern, & Leake, 1995). Factors related to the psychiatric illness include diagnosis and substance use comorbidities (Appleby et al., 1996; Kastrup, 1987a; Lewis & Joyce, 1990; Tansella et al., 1995), previous hospital admissions (Green, 1988; Postrado & Lehman, 1995), duration (Vogel & Huguelet, 1997) and onset of illness (Appleby et al., 1996), and illness severity at the time of discharge (Mojtabai, Nicholson, & Neesmith, 1997).

A study in Malaysia found significant bivariate associations between readmission within six months and patients with past episodes, prior admissions, psychotic disorders, non-compliance, and use of antipsychotics. Ng, Loh, Yee, & Zainal (2012) also found an association between readmission in six months and higher scores on a rapid clinical assessment instrument that measures symptoms for persons with major psychotic disorders at discharge. However, multivariate analyses found medication compliance to be the only significant risk factor for readmission (Ng et al., 2012).

Although the research has proven to be contradictory in many cases, readmission of psychiatric patients has been reasonably well-studied and is considered par for the course for many psychiatric illnesses. On the other hand, studies of rapid readmission are relatively rare in the scientific literature, though this is often used as a quality indicator.

The National Health Service of Scotland routinely audits rapid readmissions as a quality measure of community psychiatric services (Chakraborty & Aryiku, 2008). A study was conducted that looked at readmissions to the adult psychiatry wards of three Scottish hospitals between May 1, 2004 and June 30, 2005. Variables considered included sociodemographic characteristics, diagnosis, medications and adherence, number of prior admissions, reason for readmission, referral source, time of admission, discharge details, and details about the time spent in the community between the two admissions. Ninety-eight readmissions were recorded for a total of 58 patients (Chakraborty & Aryiku, 2008). The study found that most readmissions occurred within 10 days of discharge, with suicidal intent accounting for the majority of readmissions (Chakraborty & Aryiku, 2008). Other important factors included substance use, outpatient service utilization, and acute social and relationship problems (Chakraborty & Aryiku, 2008).

### Research Objectives

Declining funding for state mental health agency budgets and limited bed space have contributed to what many consider to be a mental health crisis in the United States. In order to alleviate the burden readmission of patients with mental illness has on hospital budgets and space allocation, many studies have endeavored to determine the relevant risk factors for readmission. Studies have specifically focused on aspects of the inpatient episode and appropriateness of treatment, discharge planning, outpatient aftercare and medication compliance, and personal crises that the patient may experience. Most of these studies have focused on intensive and time-consuming chart reviews for a limited number of participants.

The primary goal of this study is to identify the factors associated with rapid readmission to a psychiatric inpatient facility in the state of Nevada. This study, which utilizes a retrospective cohort study design, focuses on rapid readmits as these individuals are often high utilizers of services and require an inordinate amount of financial resources. Additionally, rapid readmission may indicate failure at some point along the continuum of care that could be corrected by provision of a more appropriate level of services. This study will not seek to identify whether there is a failure of care during the inpatient stay, but will attempt to determine if more cost-effective and less restrictive outpatient services and supports should be provided to reduce recidivism among these high utilizers.

As a secondary goal, this study will determine whether differences in factors associated with rapid readmission exist based on number of rapid readmissions. This has the added benefit of differentiating between levels of service utilization and targeting specific interventions at these different levels. A third goal will be to understand the relationship between length of stay and time to readmission. This is critical for the state of Nevada, which has experienced lengths of stay significantly higher than the national average since the allegations of patient dumping in 2013.

### Research Questions

**Research Question #1:** What factors are significantly associated with rapid readmission?

*Hypothesis #1:*

$H_0$  = There are no factors associated with rapid readmission

$H_A$  = There is at least one factor associated with rapid readmission

*Expected Outcome:*

It is expected that at least one variable will be identified as significantly associated with rapid readmission.

**Research Question #2:** Do factors associated with rapid readmission change as frequency of rapid readmission increases?

*Hypothesis #2:*

$H_0$ = Factors associated with rapid readmission do not change as frequency of rapid readmission increases

$H_A$ = There is at least one change in factors associated with rapid readmission as frequency of rapid readmission increases

*Expected Outcome:*

It is expected that at least one variable will demonstrate significant differences as frequency of rapid readmission increases.

**Research Question #3:** Does length of stay have an impact on time to readmission?

*Hypothesis #3:*

$H_0$ = Length of stay does not have an impact on time to readmission

$H_A$ = Length of stay does have an impact on time to readmission

*Expected Outcome*

It is expected that length of stay will have an impact on time to readmission.

## Chapter 2 Methods

### Participants

The study population was composed of all adult patients over the age of eighteen who were admitted to an acute inpatient psychiatric unit at Rawson-Neal Psychiatric Hospital in Las Vegas, NV during the period beginning May 1, 2012 and ending April 30, 2014. During this time Rawson-Neal Psychiatric Hospital, located in Clark County, which is the most populous county in Nevada, had 12,068 admissions. This study was inclusive of all admissions for a two year period, which was expected to minimize problems presented by selection bias. The large sample size was expected to increase the odds that the sample being studied was truly representative of the population admitted to Rawson-Neal over time.

### Measurement

Rapid readmission was utilized as the primary outcome variable in this study. Rapid readmission is defined as an unplanned readmission that takes place within 30 days of discharge from the index admission. A readmission could then serve as an index admission for a later readmission. For the purposes of this study, each readmission was only tied to the immediately preceding admission regardless of the number of admissions that took place within any 30 day period. Analyses were completed using two different criteria: the first set of analyses included all admissions, and the second set of analyses only included each patient's index admission, which was a patient's first admission during the study period, thereby giving equal weight to each patient rather than each admission.

Approximately 25 variables were identified, based on the literature review and ease of access in the electronic medical record used by RNPH, for inclusion in this study and are summarized in Table 1. Data on age, number of rapid readmissions, previous length of stay, and number of days to readmission were collected as continuous variables and later recoded into nominal variables to facilitate between group comparisons in multivariate analyses. All other variables were categorical.

<b>Table1. Study Variables</b>			
<i>Variable</i>	<i>Scale</i>	<i>Type</i>	<i>Categorical Options/Measurement</i>
Sex	Nominal	Categorical	"Male," "Female," "Missing"
Veteran Status	Nominal	Categorical	"Yes" or "No," "Missing"
SSI/SSDI	Nominal	Categorical	"Yes" or "No," "Missing"
Medicaid/Medicare	Nominal	Categorical	"Yes" or "No," "Missing"
Employment	Nominal	Categorical	"Yes" or "No," "Missing"
Medication Compliance	Nominal	Categorical	"Strength," "Weakness," "Missing"
Support System	Nominal	Categorical	"Yes" or "No," "Missing"
Substance Use Diagnosis	Nominal	Categorical	"Yes" or "No," "Missing"
Financial Resources	Nominal	Categorical	"Yes" or "No," "Missing"
Legal History	Nominal	Categorical	"Yes" or "No," "Missing"
Marital Status	Nominal	Categorical	"Single," "Married," "Divorced," "Separated," "Widowed," "Missing"
Race	Nominal	Categorical	"White," "Black," "Other," "Missing"
Ethnicity	Nominal	Categorical	"Hispanic," "Not Hispanic," or "Unknown"
Axis I Diagnosis	Nominal	Categorical	By disorder type: "Psychotic," "Bipolar," "Mood," "Substance Use," "Other," "Missing"
Axis II Diagnosis	Nominal	Categorical	By disorder type: "Personality," "Cognitive/Developmental," "Other," "None/Deferred/Unknown," "Missing"
Homeless Status	Nominal	Categorical	"On the streets," "In a homeless shelter," "Not homeless," "Other/Unknown/Missing"
Current Living Situation	Nominal	Categorical	"With Relatives," "With non-relatives," "Alone," "Foster Care," "Missing"
Discharge Living Arrangement	Nominal	Categorical	"Homeless Shelter," "Private Residence/Household," "Other Agency Arranged," "Other Residential/Institutional Setting," "On the street," "Jail/Correctional Facility," "Missing"
Financial Needs at Time of Admission	Nominal	Categorical	"Yes" or "No," "Missing"
Financial/Housing Needs	Nominal	Categorical	"Yes" or "No," "Missing"
Age	Nominal	Categorical	"17-24," "25-34," "35-44," "45-54," "55 and above," "Missing"
Sexual Orientation	Nominal	Categorical	"Heterosexual," "Homosexual," "Other," "Missing"
Stable Housing	Nominal	Categorical	"Strength," "Weakness," "Missing"
Financial Stability	Nominal	Categorical	"Strength," "Weakness," "Missing"
Total Number of Rapid Readmissions During Study Period	Nominal	Categorical	"0," "1," "2-3," "4 or more"
Previous Length of Stay	Nominal	Categorical	"0-3 days," "4-10 days," "11-30 days," "31 or more days"
Number of Days Until Readmission	Nominal	Categorical	"0-7 days," "8-30 days," "31-90 days," "90 or more days"

All data on admissions, demographic variables, and potential risk factors for rapid readmissions, were extracted from Avatar, the electronic medical record system utilized by the DPBH, using Crystal Reports, a data consolidation program that has the capacity to extract data from a wide variety of sources. An Information Technology Professional (ITP) from the DPBH was identified to aid in data extraction and upload into an Excel spreadsheet. Data were de-identified to protect patient confidentiality. SPSS software version 22 was utilized to conduct all inferential analyses.

Every effort was made to reduce potential sources of error. In order to decrease the odds of data entry error, a random selection of five percent of all admissions was compared to the medical record and evaluated for data entry consistency. In the event errors were found in the data extracted via Crystal Reports, the ITP was asked to run the report again with parameters clarified to ensure data accuracy. Only one ITP was utilized in order to reduce any inconsistencies in parameter definition when creating Crystal Reports.

An additional source of error concerns data entry. Human error and failure to enter demographic information may have presented a problem for some of the admissions records.

### Data Analysis

Analysis of the data required a few different approaches. This project was both descriptive and inferential in nature. Descriptive statistics included frequency distributions for the independent demographic variables in relation to the binary dependent variable, rapid readmission. Variables were assessed for multicollinearity



using the Variance Inflation Factor (VIF) and Tolerance diagnostics, and did not reveal any significant collinearity issues between any of the variables.

Bivariate analyses, completed via simple logistic regression, were utilized to determine whether or not there was a significant association between the numerous predictor variables and rapid readmission. A multivariate model, using multiple logistic regression, was built with those variables found to have significant associations with rapid readmission in bivariate analyses. The cut off for inclusion in the multivariate model was  $p < 0.05$  in bivariate analyses.

Determining the factors associated with number of rapid readmissions required a somewhat different approach due to non-normal distribution of data. Number of rapid readmissions, the dependent variable in the second research question, was divided into four groups and measured on an ordinal scale. The dependent variable could not be linearized via transformation; therefore, non-parametric Kruskal-Wallis tests were performed to determine if between group differences existed among independent variables with three or more categories. Differences between two groups were similarly assessed using the Mann-Whitney U test. Results were reported using the Chi-square statistic, which approximates the value of the H-statistic, and p-values to determine significance. The cut off for inclusion in multivariate models was  $p < 0.05$  except for variables that included more than four groups. Those variables with more than four groups were then subject to Bonferroni correction and checked for significance. Logic suggests that ordinal regression would be an appropriate method of analysis; however, the proportional odds assumption was violated, and multinomial logistic regression was substituted for multivariate analyses. Multiple logistic regression was the deemed the

most appropriate choice of analysis as it allows comparison of multiple levels of the dependent variable and does not require that the assumption of normality is met. Potential outliers were maintained in the final analysis as they are not generally regarded as a serious problem in multinomial logistic regression. Furthermore, the large sample size, under Central Limit Theorem, is expected to assume an approximately normal distribution.

Determining whether or not previous length of stay was associated with time to readmission required an approach similar to the one utilized in answering the second research question. Previous length of stay, the primary independent variable, exhibited a non-normal distribution and could not be linearized via weighting or transformation; as a result, analyses were conducted using Kruskal-Wallis tests with post-hoc testing and Bonferroni correction, as appropriate. Once again, ordinal regression was attempted, but the proportional odds assumption was violated and multinomial logistic regression was substituted for multivariate analysis.

### Human Subjects

Approval was obtained from the UNLV Institutional Review Board for all research activities conducted throughout the duration of the study. Furthermore, all researchers had completed CITI Human Subjects Protections training prior to engaging in any research activities.

Minimal risk to subjects was expected as data were collected retrospectively from existing medical records. Admissions data were de-identified prior to analysis as a

measure of protection of patient privacy and confidentiality. Informed consents were not collected as all records were stripped of patient identifiers prior to analysis.

## Chapter 3 Results

### Demographics

Data extracted from Rawson Neal Psychiatric Hospital's electronic medical records identified a total of 7,177 admitted patients for a total of 12,068 episodes over a two year period beginning May 1, 2012 and ending in April 30, 2014. Of the 7,177 patients admitted during the study period, 1,043 patients had at least one rapid readmission and amounted to 14.5 percent of the total population. These 1,043 rapidly readmitted patients accounted for a total of 2,220 admissions, or 18.4 percent of all admissions. Demographic data for all patients can be seen in Appendix A, Table 2.

Those patients included in this study were predominantly male, white, and not of Hispanic or Latino ethnic origin. Males accounted for 60.7 percent of all rapidly readmitted patients in comparison to 56.1 percent of patients who did not have a rapid readmission. Females accounted for 39.2 percent of rapid readmits, slightly less than their non-rapid readmit counterparts, which totaled 43.7 percent of all non-rapid readmits. The majority of patients were white (RR=55.4%, Non-RR=52.1%), with blacks constituting the largest minority group (RR=23.4%, Non-RR=19.7%). Admitted patients were overwhelmingly non-Hispanic or Latino, and this group was disproportionately represented among rapid readmissions (RR=83.3%, Non-RR=73.4). Most patients were between the ages of 25 and 54, and were fairly evenly represented among rapid readmits and non-rapid readmits. The majority of patients had never been married, and this group demonstrated a higher proportion among rapid readmissions (RR=60.0%, Non-RR=53.1%); conversely, married patients were not as likely to be rapid readmits

(RR=6.5%, Non-RR=10.6%). Less than five percent of patients were veterans, and the vast majority of patients identified as heterosexual. Patients with a history of legal troubles represented 50.9 percent of non-rapid readmits, but constituted an even higher proportion of rapid readmits at 61.3 percent. The majority of patients experienced periods of medication non-compliance and were represented at a higher proportion among patients who were rapidly readmitted (RR=72.9%, Non-RR=62.7%).

The most common Axis I diagnoses by disorder type were psychotic disorders (RR=39.2%, Non-RR=28.2%) and mood disorders (RR=30.0%, Non-RR=34.5%). The majority of patients did not have an Axis II diagnosis, the diagnosis was deferred, or it was unknown. Of those with known Axis II diagnoses, the most prevalent were personality disorders. Patients were more likely to have an Axis I substance use diagnosis than not (RR=59.9%, Non-RR=54.2%). Substance use was considered separately from other Axis I diagnoses as it is more often a secondary Axis I diagnosis, and analysis only allowed for inclusion of the primary Axis I diagnosis.

Financial and social supports were also considered in relation to rapid readmission. Most patients reported having financial resources of some sort (RR=57.8%, Non-RR=56.2%). Most patients did not report having social security disability insurance (SSI/SSDI) or access to Medicare/Medicaid benefits, but those that did were disproportionately represented among rapid readmits (SSI/SSDI RR=33.0%, Non-RR=19.6%; Medicaid/Medicare RR=19.9%, Non-RR=10.8%). Despite the fact that most patients had some access to financial resources, many still had financial needs (RR=42.4%, Non-RR=38.2%) or a combination of financial and housing needs (RR=59.6%, Non-RR=53.1%). Patients who lived with family were less likely to be rapid

readmits (RR=13.6%, Non-RR=18.9%), while patients that lived alone were more likely to have been rapidly readmitted (RR=23.4%, Non-RR=18.7%). Likewise, patients with a home (RR=42.2%, Non-RR=48.8%) or private residence (RR=60.9%, Non-RR=67.6%) were less likely to have been rapidly readmitted than those living in homeless shelters (Homeless Indicator RR=12.3%, Non-RR=6.8%; Living Arrangement RR=18.7%, Non-RR=10.1%). Those without a support system in place were also more likely to be rapid readmits (RR=25.2%, Non-RR=16.9%). Finally, those patients who were currently employed at the time of admission were less likely to be rapid readmits (RR=6.8%, Non-RR=12.9%).

#### Factors Associated with Rapid Readmission (Research Question #1)

Twenty four risk factors for rapid readmission were identified, and bivariate analyses were performed using simple logistic regression. Analyses were performed separately for all admissions, results of which can be seen in Appendix A, Table 3, and for the first admission only, which is shown in Appendix A, Table 4. Bivariate analyses of risk factors on all admissions demonstrated significance for all factors except veteran status and sexual orientation. Bivariate analyses that included the first admission only also failed to find a significant relationship between sexual orientation and veteran status in addition to non-significant findings for financial stability, financial need, and financial/housing needs

The picture was somewhat different when the variables that were significant in bivariate analyses were included in multivariate analysis controlling for other covariates and including all admissions using multiple logistic regression. In analyses including all admissions, those persons at higher risk for rapid readmission during the study period

included individuals who were aged 35-44 (OR=1.194, CI=1.005, 1.418), never married (OR=1.405, CI=1.110, 1.795) or divorced (OR=1.370, CI=1.059, 1.772), living in a homeless shelter (OR=1.441, CI=1.180, 1.760) or other residential or institutional setting (OR=1.279, CI=1.082, 1.510), had history of legal problems (OR=1.283, CI=1.142, 1.442), were non-compliant with medications (OR=1.339, CI=1.144, 1.567), lacked stable housing (OR=1.408, CI=1.240, 1.599), or had a substance use (OR=1.171, CI=1.046, 1.311) or psychotic disorder diagnosis (OR=1.172, CI=1.030, 1.334). In contrast, females, persons 55 years of age and above (OR=0.701, CI=0.543, 0.904), those on SSI or SSDI (OR=0.688, CI=0.571, 0.830), and persons without a specified Axis II diagnosis (OR=0.624, CI=0.550, 0.708) were at reduced risk for rapid readmission.

The final regression model, according to Nagelkerke's R-square value, was able to explain 17.3 percent of the variability for rapid readmission. Results of multivariate analysis including all admissions can be seen in Appendix A, Table 5.

The final model of rapid readmission, including the first admission for each patient only, was only able to explain 10.0 percent of the variability in the dependent variable as opposed to 17.3 percent when all admissions were included. Similar to the analysis of all admissions, never having been married (OR=1.346, CI=1.018, 1.780), living in a homeless shelter (OR=1.594, CI=1.189, 2.137), having a history of legal issues (OR=1.264, CI=1.090, 1.466), and having an Axis I psychotic disorder (OR=1.281, CI=1.020, 1.610) were significant risk factors for rapid readmission; conversely, receiving SSI/SSDI (OR=0.641, CI=0.500, 0.822) was protective against rapid readmission. A few additional risk factors were found to be significant when only the first admission was included in the analysis: living with non-relatives (OR=1.387,

CI=1.058, 1.820) or alone (OR=1.478, CI=1.157, 1.887), lack of a support system (OR=1.260, CI=1.046, 1.517), and diagnosis with a bipolar disorder (OR=1.281, CI=1.020, 1.610) increased risk for rapid readmission. Individuals with Axis I diagnoses other than substance use, psychotic, mood, or bipolar disorders (OR=0.604, CI=0.441, 0.828) were less likely to be rapidly readmitted. Sex, age, medication compliance, housing stability, and Axis II diagnoses, though significant when all admissions were included, did not reach significance when analysis was limited to each patient's first admission. Results of multivariate analysis including the first admission only can be seen in Table 6.



**Table 6. Multivariate Analysis of Factors Associated with Rapid Readmission Among Rawson Neal Psychiatric Hospital Patients, Index Admission Only May 2012-April 2014 (N=7,177)**

<b>Characteristic</b>	<b>OR</b>	<b>CI</b>
<b>Ethnicity (Referent: not Hispanic/Latino)</b>		
Hispanic/Latino	0.891	(0.730, 1.086)
<b>Age (Referent: 17-24)</b>		
25-34	1.173	(0.946, 1.453)
35-44	1.123	(0.888, 1.421)
45-54	0.931	(0.723, 1.198)
55 and above	0.756	(0.541, 1.056)
<b>Marital Status (Referent: married)</b>		
Never Married	1.346	(1.018, 1.780)
Divorced	1.127	(0.830, 1.530)
Separated	1.431	(0.988, 2.072)
Widowed	1.193	(0.698, 2.038)
<b>Living Situation (Referent: with relatives)</b>		
With non-relatives	1.387	(1.058, 1.820)
Alone	1.478	(1.157, 1.887)
Foster Care	2.010	(0.210, 19.215)
<b>Homeless Indicator (Referent: not homeless)</b>		
On the streets	0.889	(0.358, 2.207)
In a Homeless Shelter	0.932	(0.653, 1.329)
Other/Unknown/Missing	1.190	(0.930, 1.523)
<b>Living Arrangement (Referent: private residence/household)</b>		
Homeless Shelter	1.594	(1.189, 2.137)
Other Agency Arranged	1.410	(0.878, 2.266)
Other Residential/Institutional Setting	1.018	(0.779, 1.331)
On the street	2.563	(0.927, 7.084)
Jail/Correctional Facility	0.789	(0.227, 2.748)
<b>Employment (Reference: no)</b>		
Yes	1.323	(0.975, 1.796)
<b>SSI/SSDI (Referent: yes)</b>		
Yes	0.641	(0.500, 0.822)
<b>Medicaid/Medicare (Referent: yes)</b>		
No	0.899	(0.667, 1.211)
<b>Legal History (Referent: denied)</b>		
Yes	1.264	(1.090, 1.466)
<b>Medication Compliance (Referent: strength)</b>		
Weakness	1.168	(0.955, 1.428)
<b>Support System (Reference: yes)</b>		
No	1.260	(1.046, 1.517)
<b>Stable Housing (Referent: strength)</b>		
Weakness	0.925	(0.783, 1.094)
<b>Substance Use Diagnosis (Referent: no)</b>		
Yes	1.140	(0.978, 1.329)
<b>Axis I Diagnosis (Referent: mood)</b>		
Psychotic	1.312	(1.101, 1.563)
Bipolar	1.281	(1.020, 1.610)
Substance Use	1.116	(0.872, 1.430)
Other	0.604	(0.441, 0.828)
<b>Axis II Diagnosis (Referent: personality)</b>		
Cognitive/Developmental	1.327	(0.809, 2.175)
Other	0.491	(0.203, 1.186)
None/Deferred/Unknown	0.917	(0.751, 1.121)

Factors Associated with Frequency of Rapid Readmission (Research Question #2)

Between group differences were demonstrated for at least two groups in analyses using Kruskal-Wallis tests of all admissions for all 25 variables of interest. Results are shown in Table 7. Likewise, between group differences were also demonstrated for all independent variables except for length of stay and sexual orientation in analyses of each patient's first admission only. Age was also found to be a non-significant contributor to number of rapid readmissions (Chi-square=14.863, p=0.011) following Bonferroni correction, which indicated a required significance level of p<0.0083. Results are reported in Table 8.

<b>Table 7. Kruskal-Wallis Tests of Between Group Differences in Factors Associated with Frequency of Rapid Readmission Among Patients Admitted to Rawson Neal Psychiatric Hospital, All Admissions May 2012- April 2014 (N=12,068)</b>		
<b>Characteristic</b>	<b>Chi-Square</b>	<b>P-value</b>
Sex	79.746	<0.001
Race	213.668	<0.001
Ethnicity	311.528	<0.001
Age	11.371	<0.001
Veteran Status	47.254	<0.001
Marital Status	200.088	<0.001
Sexual Orientation	77.198	<0.001
Living Situation	140.149	<0.001
Homeless Indicator	185.683	<0.001
Living Arrangement	436.664	<0.001
Employment	206.434	<0.001
Financial Resources	60.782	<0.001
SSI/SSDI	519.011	<0.001
Medicaid/Medicare	554.510	<0.001
Legal History	391.561	<0.001
Medication Compliance	410.372	<0.001
Support System	318.979	<0.001
Stable Housing	199.057	<0.001
Financially Stable	102.278	<0.001
Financial Needs	574.327	<0.001
Financial/Housing Needs	268.995	<0.001
Substance Use Diagnosis	71.917	<0.001
Axis I Diagnosis	273.961	<0.001
Axis II Diagnosis	221.739	<0.001
Length of Stay	16.626	0.001

<b>Table 8. Kruskal-Wallis Tests of Between Group Differences in Factors Associated with Frequency of Rapid Readmission Among Patients Admitted to Rawson Neal Psychiatric Hospital, Index Admission Only May 2012- April 2014 (N=7,177)</b>		
<b>Characteristic</b>	<b>Chi-Square</b>	<b>P-value</b>
Sex	9.295	0.010
Race	50.855	<0.001
Ethnicity	75.905	<0.001
Age	14.863	0.011
Veteran Status	21.799	<0.001
Marital Status	29.328	<0.001
Sexual Orientation	0.480	0.985
Living Situation	32.816	<0.001
Homeless Indicator	41.614	<0.001
Living Arrangement	93.673	<0.001
Employment	32.840	<0.001
Financial Resources	15.214	<0.001
SSI/SSDI	104.833	<0.001
Medicaid/Medicare	85.358	<0.001
Legal History	41.617	<0.001
Medication Compliance	42.630	<0.001
Support System	53.628	<0.001
Stable Housing	19.944	<0.001
Financially Stable	40.173	<0.001
Financial Needs	10.888	0.004
Financial/Housing Needs	27.742	<0.001
Substance Use Diagnosis	12.747	<0.001
Axis I Diagnosis	92.519	<0.001
Axis II Diagnosis	28.277	<0.001
Length of Stay	4.505	0.212

Several factors were shown to be associated with frequency of rapid readmission when all admissions were included in multivariate analyses using multinomial logistic regression. The final frequency of rapid readmission model including data on all admissions was able to account for 27.7 percent of the variability in the dependent variable according to the Nagelkerke R-square value. Multivariate analyses performed on all admissions using multinomial regression are shown in Appendix A, Table 9.

Factors significantly associated with number of rapid admissions include: being aged 25-34 (One RR OR=1.205, CI=1.018, 1.426; 2 to 3 RR OR=1.370, CI= 1.190,

1.691; 4 or more RR= 1.229, CI=1.005, 1.503) or 35-44 (2 to 3 RR OR=1.508, CI= 1.204, 1.888; 4 or more RR= 1.370, CI=1.103, 1.701), having never married (One RR OR=1.339, CI=1.059, 1.694; 4 or more RR= 2.319, CI=1.573, 3.418), being divorced (4 or more RR=2.135, CI=1.425, 3.197) or separated (One RR OR=1.947, CI=1.1.460, 2.598; 4 or more RR= 1.822, CI=1.151, 2.885), living with non-relatives (4 or more RR= 1.502, CI=1.151, 1.960) or alone (2 to 3 RR OR=1.408, CI= 1.125, 1.760; 4 or more RR= 1.776, CI=1.382, 2.281), residing in a homeless shelter (2 to 3 RR OR=1.816, CI= 1.396, 2.361; 4 or more RR= 2.188, CI=1.716, 2.788) a residential or institutional setting (2 to 3 RR OR=1.626, CI= 1.328, 1.992), or on the street (2 to 3 RR OR=2.595, CI= 1.019, 6.609), having a history of legal problems (One RR OR=1.235, CI=1.094, 1.393; 2 to 3 RR OR=1.431, CI= 1.240, 1.651; 4 or more RR= 1.877, CI=1.602, 2.199), being medication non-compliant (One RR OR=1.345, CI=1.143, 1.582; 2 to 3 RR OR=1.539, CI= 1.268, 1.868; 4 or more RR= 1.933, CI=1.549, 2.412), lacking a support system (2 to 3 RR OR=1.254, CI= 1.069, 1.472), stable housing as a weakness (4 or more RR= 1.735, CI=1.473, 2.043), demonstrating financial needs (One RR OR=1.259, CI=1.050, 1.510), or having a psychotic (One RR OR=1.352, CI=1.175, 1.556; 2 to 3 RR OR=1.504, CI= 1.277, 1.771; 4 or more RR= 1.267 , CI=1.075, 1.493) or substance use diagnosis (One RR OR=1.227, CI=1.086, 1.387; 4 or more RR= 1.373, CI=1.186, 1.590).

Recipients of SSI/SSDI (One RR OR=0.613, CI=0.507, 0.742; 4 or more RR= 0.368, CI=0.288, 0.470) and Medicaid/Medicare (2 to 3 RR OR=0.493, CI= 0.332, 0.559) demonstrate reduced risk at various levels of rapid readmission. Individuals who have an Axis I diagnosis besides mood, psychotic, or substance use disorder (One RR OR=0.623, CI=1.480, 0.810) or do not have a specific Axis II diagnosis (One RR OR=0.814,

CI=0.699, 0.948; 2 to 3 RR OR=0.627, CI= 0.533, 0.739; 4 or more RR OR= 0.508, CI=0.433, 0.597) also experience reduced risk depending on number of readmissions. Persons aged 45 to 54 (OR=0.752, CI=0.591, 0.956) or 55 and above (OR=0.285, CI=0.193, 0.422) are at increased odds of having four or more rapid readmissions.

A combination of reduced and increased odds are demonstrated at various levels of rapid readmission or the following individuals: females (One RR OR=1.139, CI=1.017, 1.277; 2 to 3 RR OR=0.797, CI= 0.697, 0.912; 4 or more RR= 0.754, CI=0.657, 0.866), widowed persons (2 to 3 RR OR=1.756, CI= 1.144, 2.695; 4 or more RR= 0.343, CI=0.128, 0.990) and those diagnosed with bipolar disorders (One RR OR=1.206, CI=1.004, 1.448; 4 or more RR OR=0.627, CI=0.485, 0.812).

Multivariate analyses limited to the index admission only for each patient demonstrated fewer significant findings and also explained far less of the variability in number of rapid readmissions (Nagelkerke R-square=0.101). Table 10 shows results from multinomial logistic regression on the index admission only. Persons living with non-relatives (OR=1.494, CI=1.083, 1.062) or alone (OR=1.443, CI=1.078, 1.931), in a homeless shelter (OR=1.569, CI=1.224, 2.012), or having an Axis I psychotic disorder (OR=1.273, CI=1.029, 1.576) were at increased odds of having one admission during the study period; in contrast, persons over 55 years of age (OR=0.671, CI=0.458, 0.984) not having SSI/SSDI benefits (OR=0.669, CI=0.505, 0.886), and individuals with an Axis I primary diagnosis other than a mood, psychotic, bipolar, or substance use (OR=0.501, CI=0.334, 0.751) were at reduced odds.

Increased odds of having two to three rapid readmissions were noted for persons living on the street (OR=4.517, CI= 1.425, 14.318); having a history of legal problems (OR=1.472, CI= 1.129, 1.919), lacking a support system (OR=1.601, CI= 1.180, 2.712), or a psychiatric disorder (OR=1.366, CI= 1.000, 1.868), while decreased odds were found for those who did not have a specific Axis II disorder (OR=0.671, CI=0.483, 0.933).

Individuals living in a homeless shelter (OR= 1.646, CI=1.047, 2.587), having a history of legal troubles (OR= 2.159, CI=1.462, 3.188); having an Axis II cognitive or developmental disorder (OR= 2.252, CI=1.014, 5.000), or having Medicare/Medicaid benefits (OR=2.029, CI=0.999, 4.121) were at increased odds of having four or more rapid readmits. Persons over 55 years of age (OR=0.193, CI=0.056, 0.668) or having SSI/SSDI benefits (OR=0.245, CI=0.136, 0.440) were at reduced risk of being in the highest level of rapid readmissions.

Although they were significantly associated with number of rapid readmissions when all admissions were included, sex, marital status, medication non-compliance, housing stability, financial needs, and substance use were not significantly associated when just the first patient admission was included.

**Table 10. Multivariate Analysis of Factors Associated with Frequency of Rapid Readmission Among Patients Admitted to Rawson Neal Psychiatric Hospital, First Admission Only May 2012- April 2014 (N=7,177)**

Characteristic	1.0		2.0		3.0	
	OR	CI	OR	CI	OR	CI
<b>Ethnicity (Referent: not Hispanic/Latino)</b>						
Hispanic/Latino	0.839	(0.654, 1.075)	0.971	(0.683, 1.382)	0.865	(0.528, 1.416)
<b>Age (Referent: 17-24)</b>						
25-34	1.088	(0.840, 1.408)	1.147	(0.768, 1.714)	1.266	(0.743, 2.155)
35-44	0.931	(0.705, 1.228)	1.182	(0.780, 1.791)	1.238	(0.711, 2.154)
45-54	0.838	(0.629, 1.117)	0.933	(0.601, 1.448)	0.710	(0.383, 1.316)
55 and above	0.671	(0.458, 0.984)	0.903	(0.524, 1.558)	0.193	(0.056, 0.668)
<b>Living Situation (Referent: with relatives)</b>						
With non-relatives	1.494	(1.083, 2.062)	1.066	(0.638, 1.784)	1.721	(0.804, 3.686)
Alone	1.443	(1.078, 1.931)	1.449	(0.933, 2.248)	1.882	(0.942, 3.759)
Foster Care	3.250	(0.335, 31.493)	-	-	-	-
<b>Living Arrangement (Referent: private residence/household)</b>						
Homeless Shelter	1.569	(1.224, 2.012)	1.355	(0.938, 1.958)	1.646	(1.047, 2.587)
Other Agency Arranged	1.356	(0.751, 2.449)	1.978	(0.955, 4.098)	0.705	(0.166, 2.998)
Other Residential/Institutional Setting	1.016	(0.727, 1.419)	1.109	(0.686, 1.792)	0.995	(0.531, 1.864)
On the street	2.175	(0.702, 6.734)	4.517	(1.425, 14.318)	-	(0.176, 11.164)
Jail/Correctional Facility	0.954	(0.217, 4.194)	-	-	1.401	11.164)
<b>SSI/SSDI (Referent: yes)</b>						
No	0.669	(0.505, 0.886)	0.737	(0.498, 1.092)	0.245	(0.136, 0.440)
<b>Medicaid/Medicare (Referent: yes)</b>						
No	0.983	(0.690, 1.398)	0.665	(0.404, 1.096)	2.029	(0.999, 4.121)
<b>Legal History (Referent: denied)</b>						
Yes	1.157	(0.970, 1.381)	1.472	(1.129, 1.919)	2.159	(1.462, 3.188)
<b>Support System (Reference: yes)</b>						
No	1.148	(0.919, 1.434)	1.601	(1.180, 2.172)	1.205	(0.800, 1.815)
<b>Axis I Diagnosis (Referent: mood)</b>						
Psychotic	1.273	(1.029, 1.576)	1.366	(1.000, 1.868)	1.533	(0.998, 2.353)
Bipolar	1.298	(0.982, 1.715)	1.358	(0.905, 2.037)	1.203	(0.658, 2.199)
Substance Use	1.127	(0.837, 1.518)	1.032	(0.658, 1.619)	1.500	(0.840, 2.680)
Other	0.501	(0.334, 0.751)	0.697	(0.402, 1.209)	0.674	(0.295, 1.541)
<b>Axis II Diagnosis (Referent: personality)</b>						
Cognitive/Developmental	1.254	(0.650, 2.417)	0.540	(0.185, 1.574)	2.252	(1.014, 5.000)
Other	0.676	(0.235, 1.944)	0.508	(0.118, 2.184)	-	-
None/Deferred/Unknown	1.154	(0.886, 1.505)	0.671	(0.483, 1.209)	0.643	(0.412, 1.004)

The Impact of Length of Stay on Time to Readmission (Research Question #3)

The relationship between previous length of stay and number of days until readmission was evaluated using Kruskal-Wallis tests and multinomial logistic

regression. Kruskal-Wallis tests demonstrated differences between at least two length of stay groups (Chi-square=12.042,  $p=0.007$ ). Post-hoc analyses revealed significant differences between the following groups: patients who were hospitalized for three days or less and those with stays of 11 to 30 days (Chi-square=7.079,  $p=0.008$ ); and patients who were hospitalized for 4 to 10 days differed from those hospitalized for 11 to 30 days (Chi-square=7.135,  $p=0.008$ ) and those hospitalized for over 30 days (Chi-square=4.730,  $p=0.030$ ). Kruskal-Wallis tests also demonstrated that sex, veteran status, living situation, homeless status, having a support system, financial and housing stability, financial and/or housing needs, primary Axis I diagnosis, and number of rapid readmissions may have an impact on time to readmission following discharge. Results are shown in Table 11.



<b>Table 11. Kruskal-Wallis Tests of Between Group Differences in Factors Associated with Time to Readmission Among Patients Admitted Two or More Times to Rawson Neal Psychiatric Hospital, May 2012- April 2014 (N=4,943)</b>		
	<b>Chi-Square</b>	<b>P-value</b>
Sex	10.302	0.006
Race	5.722	0.126
Ethnicity	1.322	0.516
Age	8.296	0.081
Veteran Status	15.037	0.001
Marital Status	4.873	0.432
Sexual Orientation	0.796	0.850
Living Situation	20.929	<0.001
Homeless Status	36.096	<0.001
Living Arrangement	9.821	0.132
Employment	5.589	0.153
Financial Resources	0.895	0.639
SSI/SSDI	3.037	0.219
Medicaid/Medicare	3.430	0.180
Legal History	0.727	0.695
Medication Compliance	2.654	0.265
Support System	6.133	<0.001
Stable Housing	18.178	<0.001
Financially Stable	14.810	0.001
Financial Needs	15.611	<0.001
Financial/Housing Needs	6.255	0.044
Substance Use Diagnosis	0.306	0.580
Axis I Diagnosis	12.774	0.026
Axis II Diagnosis	6.973	0.137
Length of Stay	12.042	0.007
Number of Rapid Readmissions	1450.502	<0.001

In addition to previous length of stay, four additional variables were included in a final multivariate model: homeless status, number of rapid readmissions, and financial and housing stability. Although length of stay did not significantly contribute to the final model, those with lengths of stay between four and ten days were 28.3 percent less likely than their counterparts with shorter stays to be readmitted over 90 days following discharge. Persons who were living on the streets at the time of admission were 40.7 percent less likely than non-homeless persons to be readmitted more than 90 days after discharge. Persons who were not financially stable were less likely to be rehospitalized more than 30 days after discharge (31-90 days OR=0.746, CI=0.600, 0.927; 91 or more

days OR=0.76, CI=0.608, 0.951). The single most important factor in time to readmission, and accounting for most of the variability explained by the model, was number of rapid readmissions (Nagelkerke R-square=0.357). Persons with a single rapid readmission during the study period were significantly less likely to be readmitted more than 31 days after discharge (31 to 90 days OR=0.026, CI=0.014, 0.049; 91 or more days OR=0.019, CI=0.010, 0.035), as were those with 2 or 3 rapid readmissions (31 to 90 days OR=0.025, CI=0.013, 0.047; 91 or more days OR=0.013, CI=0.007, 0.024). Those with four or more rapid readmissions were less likely to be readmitted in over 8 days than those who were not rapidly readmitted (8 to 30 days OR=0.468, CI=0.237, 0.924; 31 to 90 days OR=0.017, CI=0.009, 0.032; 91 or more days OR=0.005, CI=0.003, 0.009). Results are shown in Table 12.

<b>Table 12. Multivariate Analysis of Factors Associated with Time to Readmission Among Patients Admitted Two or More Times to Rawson Neal Psychiatric Hospital, May 2012- April 2014 (N=4,943)</b>						
<b>Characteristic</b>	<b>8 to 30 Days</b>		<b>31 to 90 Days</b>		<b>91 or More Days</b>	
	<b>OR</b>	<b>CI</b>	<b>OR</b>	<b>CI</b>	<b>OR</b>	<b>CI</b>
<b>Length of Stay</b>						
4 to 10 days	0.873	(0.674, 1.130)	0.753	(0.564, 1.006)	0.717	(0.531, 0.967)
11 to 30 days	1.133	(0.906, 1.416)	1.061	(0.832, 1.352)	1.112	(0.868, 1.426)
31 or more days	1.128	(0.795, 1.602)	1.061	(0.726, 1.552)	1.084	(0.734, 1.600)
<b>Homeless Status</b>						
On the streets	0.962	(0.405, 2.286)	0.845	(0.314, 2.274)	0.593	(0.419, 0.657)
In a homeless shelter	1.057	(0.799, 1.399)	1.071	(0.788, 1.456)	0.813	(0.590, 1.121)
<b>Stable Housing</b>						
Weakness	0.913	(0.748, 1.114)	0.875	(0.704, 1.087)	0.833	(0.666, 1.041)
<b>Financially Stable</b>						
Weakness	0.879	(0.720, 1.073)	0.746	(0.600, 0.927)	0.760	(0.608, 0.951)
<b>Number of Rapid Readmissions</b>						
1	0.542	(0.273, 1.076)	0.026	(0.014, 0.049)	0.019	(0.010, 0.035)
2 to 3	0.541	(0.272, 1.074)	0.025	(0.013, 0.047)	0.013	(0.007, 0.024)
4 or more	0.468	(0.237, 0.924)	0.017	(0.009, 0.032)	0.005	(0.003, 0.009)

## Chapter 4 Discussion

The principal goals of this study were to determine: (1) which factors available in the patient's electronic medical record are associated with rapid readmission, (2) whether or not differences existed between patients based on number of rapid readmissions, and (3) if length of stay has an impact on time to readmission. The null hypotheses for all three research questions were rejected when subject to multivariate analyses. Significant differences existed between patients who had been rapidly readmitted at least once during the study period in comparison to those who had not for twelve variables when all admissions were included and seven variables when inclusion was limited to each patient's index admission.

Significant differences in factors associated with rapid readmission were also found when patients were categorized by number of rapid admissions. Those who had only been rapidly readmitted once differed significantly in multivariate analyses including all admissions from those who had not been rapidly readmitted in ten categories. Individuals who had been rapidly readmitted two or three times demonstrated significant differences in eleven of the independent variables, and patients with four or more rapid readmissions exhibited significant differences in thirteen variables. Limiting inclusion to the index admission resulted in fewer significant findings in all groups.

Previous length of stay was also found to contribute significantly to time to readmission in multivariate analyses; however, previous LOS was not a significant contributor to the overall final model.

Analyses of factors associated with rapid readmission were run with all admissions included and separately for the first admission only. The decision to run the analyses both ways warrants further discussion as it is a direct result of the challenges inherent in studying psychiatric patients. At the outset, it seemed reasonable to only include each patient one time, so that patients with high numbers of readmissions, rapid or not, would not exert additional influence on the outcome variable; however, many of the possible factors associated with rapid readmission are quite fluid in this community. For example, a patient might be homeless during the first admission, return to living with their family the next, and living in a homeless shelter on their third admit. Bias may be introduced in both methods of analysis; however, it was felt that similar findings would provide additional support for the assertion that significant factors are truly associated with rapid readmission.

The most important factors positively associated with rapid readmission in both analyses were having never been married, living in a homeless shelter, having a history of legal problems, and being diagnosed with a psychotic disorder. Many of these findings are consistent with previous studies, which have found significant associations between rapid readmission and being single (Fennig et al., 1999) or unmarried (Sanguinetti, Samuel, Schwartz, & Robeson, 1996), homeless (Irmiter, McCarthy, Barry, Soliman, & Blow, 2007), or having a diagnosis of schizophrenia or psychosis (Thornicroft, Gooch, & Dayson, 1992; Sanguinetti et al., 1996; Bernardo & Forchuk, 2001; Cuffel, Held, & Goldman, 2002; Thompson, Neighbors, Munday, & Trierweiler, 2003).

Of those factors that were found significant in both rapid readmission models, living in a homeless shelter is the only factor that is possibly modifiable; however, it

should be noted that living in a residential/institutional setting was also associated with rapid readmission when all admissions were included. Placement in group housing is the likely alternative to living in a homeless shelter, and this calls into question whether or not provision of housing would have the desired effect of reducing readmission.

Although marital status is not considered a modifiable factor, ensuring that patients have access to a case manager may provide an alternative support system that is critical to reducing rapid readmission. Data including all admissions demonstrate that lack of stable housing increases the odds of being rapidly readmitted, and when the first admission only is included, living alone and lacking a support system places patients at higher odds of rapid readmission. This is consistent with previous studies that identify lack of social and family supports (Cuffel, Held, & Goldman, 2002) and inadequate community supports (Klinkenberg & Calsyn, 1996) as risk factors for rapid readmission. Provision of social support may have an important impact on keeping psychiatric patients in the community for longer periods of time and, thus, reduce rates of rapid readmission.

Patients who did not receive supplemental security income or social security disability income (SSI/SSDI) benefits demonstrated reduced risk for rapid readmission in both analyses. Evidence from at least one other study supports this conclusion (Moran, Doerfler, Scherz, & Lish, 2000). Although it would seem logical that access to financial supports and the increased stability it affords would be helpful in preventing rapid readmission, it may be that those individuals on SSI/SSDI actually tend to suffer from more severe psychiatric illness and experience acute episodes more often than those who do not have access to these benefits.

Although the authors of one study call for usage of the more compassionate terms of “frequent users” or “high frequency users,” patients with multiple admissions are often referred to as “revolving-door patients” in the literature (Oyffe, Kurs, Gelkopf, Melamed, & Bleich, 2009). At least two studies have found that a large proportion of psychiatric admissions can be accounted for by a small population of so-called “revolving-door” patients, which lends credence to the idea that results including all admissions may introduce bias into results, and supports the need to conduct analyses with both all admissions and index admission only (Dietzen & Bond, 1993; Korkeila et al., 1995). This also highlights the need to conduct studies that focus on various levels of rapid readmission. Relatively few studies have considered factors associated with frequency of readmission; however, as discussed below, the results of previous studies did validate several findings in this study.

The findings for frequency of readmission were quite similar to the results of analyses on rapid readmission in general. In comparison to those who were not rapidly readmitted, patients with four or more admissions, the highest risk group, were more likely to live in a homeless shelter and to have a history of legal problems; they were less likely to lack SSI/SSDI benefits or be over 55 years of age. Younger age has been associated with frequent readmission in several previous studies (Rosca et al., 2006; Webb, Yaguez, & Langdon, 2007; Martinez-Ortega, et al., 2012). Patients with two to three rapid readmissions were significantly more likely than those who were not rapid readmits to live on the streets, to lack a support system, be diagnosed with a psychotic disorder, and have a history of legal problems. Among those with one rapid readmission, those with an Axis I psychotic disorder diagnosis were at increased risk for readmission

within 30 days; in contrast, those without SSI/SSDI benefits and lacking a known diagnosis on Axis II in comparison to those with personality disorder diagnoses were at reduced risk for rapid readmission. Previous studies have similarly identified those with psychotic and personality disorders as being at higher risk of frequent hospitalization (Kastrup, 1987a; Havasy & Hopkin, 1989; Lewis & Joyce, 1990; Martinez-Ortega et al., 2012).

History of previous and frequent admission was the factor most consistently demonstrated as significantly associated with readmission. (Thornicroft, Gooch, & Dayson, 1992; Cuffel et al., 2002; Thompson et al., 2003; Durbin, Lin, Layne, & Teed, 2007; Zhang, Harvey, & Andrew, 2011; Moss et al., 2014). In this particular study, total number of rapid readmissions explained far more of the variability in rapid readmission than any other variable in simple logistic regression (Nagelkerke R-square=.078), and an early multivariate model including number of rapid readmissions explained 59.7 percent of the variability in rapid readmission. However, it was decided not to include number of rapid readmissions as it tended to drown out all other variables in the multivariate model.

Interestingly, some patterns in the analysis of number of rapid readmissions lend support to the idea that inclusion of all admissions may be inordinately influenced by those with high numbers of rapid readmission. As an example, females were 13.9 percent more likely than males to have one rapid readmission, but were 21.3 percent less likely than males to have two or three rapid readmissions, and 24.6 percent less likely to have four or more rapid readmissions. Logistic regression of all admissions found females to be 12.7 percent less likely to be rapid readmits than males despite the fact that females were more likely to have one rapid readmission than males. This finding corresponds

with the results of other studies that have demonstrated that males are at higher risk for readmission (Thornicroft, Gooch, & Dayson, 1992; Sanguinetti et al., 1996; Bernardo & Forchuk, 2001).

Another interesting pattern in the data concerns medication non-compliance. Patients were increasingly more likely to not adhere to their prescribed medication regimen as the number of rapid readmissions increased. This finding is in alignment with at least one other study that found medication non-adherence to be strongly associated with admission frequency (Haywood et al., 1995). This is important from a clinical perspective as those with higher numbers of admissions should be reviewed for medication compliance issues and considered for placement in more intensive programming, such as Assisted Outpatient Treatment, an outpatient civil commitment program which mandates treatment with psychiatric medications and can be helpful in reducing recidivism rates by providing less restrictive care within the community (Munetz, Grande, Kleist, & Peterson, 1996).

Patients whose previous length of stay was between four and ten days, were less likely than those with shorter stays to be readmitted more than 90 days after discharge. Vasudeva, Nayendra Kumar, & Sekhar (2009), in their study of the relationship between duration of first admission and recidivism, also found that individuals with shorter stays were likely to be readmitted sooner than those with longer initial stays. Furthermore, De Francisco, Anderson, Pantano, & Kline's (1980) study determined that a 55 percent reduction in rates of readmission could be achieved by increasing LOS from nine to 26 days. Other studies have failed to find a significant association between readmission rates and discharge that is premature (Herz, Endicott, & Spitzer, 1975; Lyons et al., 1997).



Despite this significant finding, length of stay did not contribute significantly to the final model of time to readmission in this study, and little can be gleaned in regard to the impact length of stay has on number of days to readmission. At this time, length of stay continues to be one of the least understood factors associated with readmission given the number of conflicting results in the literature.

Number of rapid readmissions demonstrated the largest impact on time to readmission as evidenced by its contribution to the overall model. When number of rapid readmissions was excluded from the model, the explanatory power dropped from 35.7 percent to just 5.2 percent according to the Nagelkerke R-square statistic. Patients who had been rapidly readmitted between one and three times were less likely to be readmitted more than 30 days after discharge than those who had not been rapidly readmitted. Patients who had four or more rapid readmissions were less likely to be readmitted in eight days or more. This seems to suggest that rapid readmits are more likely to be readmitted closer to discharge, while patients without rapid readmissions are more likely to be readmitted much later. Time to readmission has also been demonstrated to be significantly shorter among high frequency users in previous studies (Oyffe, Kurs, Gelkopf, Melamed, & Bleich, 2009; Moss et al., 2014).

The results of these analyses indicate opportunities for integration among public health and clinical staff working in mental health. As indicated above, many of the factors associated with rapid readmission are potentially modifiable, and should be considered in efforts to reduce rates of rapid readmission and maintain individuals with psychiatric diagnoses in the community for longer periods of time between acute episodes. Providing supportive services such as case management and stable housing may

have an impact on successful community living as evidenced by the results of the analyses included in this study. Furthermore, rates of readmission may be reduced by the cumulative effect of multiple financial and social supports, and should be considered in future studies of rapid readmission. Medication non-compliance can also be addressed via multiple avenues. Case managers can help ensure that clients make it to outpatient appointments, which may help increase compliance. Another option is the use of new Nevada legislation that requires mandatory outpatient treatment with psychiatric medications for patients that meet minimum requirements. Facilitating family involvement may also help reduce rates of rapid readmission. Those living alone, who are not married, or living in places other than private residences are at increased odds of being rapidly readmitted. This suggests that having a stable home with familial support can provide a positive impact on psychiatric patient stability.

### Strengths and Limitations

The size of the population included in this study, 7,177 patients accounting for 12,068 total admissions over a two year study period, is one of the principal strengths of the study design. Previous studies have often included much smaller populations. To give a few examples, six studies included between 178 and 758 patients (Thornicroft, Gooch, & Dayson, 1992; Oyffe et al., 2009; Vasudeva, Kumar, & Sekhar, 2009; Zhang, Harvey, & Andrew, 2011; Ng et al., 2012, Moss et al., 2014), and three more included between 1,481 and 2,571 patients (Nelson, Maruish, & Axler, 2000; Thompson et al., 2003; Rosca et al., 2006). Persons with mental illnesses may experience periods with multiple admissions over several months and then not have an admission for a year at a time.

Instituting a two year study period ensures that many of these patients who experience stretches without acute episodes are included in the analysis.

This study is further strengthened by running multiple analyses that include all admissions and the index admission only for each patient. Differences in findings were not unexpected as persons with multiple admissions may have had additional influence when all admissions were included. Likewise, results may have been affected by the inclusion of the index admission only as a result of the reduced sample size. Additionally, inclusion of the index admission only restricts consideration of changes in patient circumstances across multiple admissions over the course of the two year study period. Both of these strategies may invite some bias into the study; however, significant findings in both analyses suggest that associations are real and not purely the result of study bias.

Although this study has yielded useful knowledge for the state of Nevada and will be a useful addition to the existing public health body of knowledge on rapid readmission, this study is not without limitations. This study is limited by the fact that it focuses on variables that can be easily extracted from the electronic medical record, which is useful and practical from the perspective of a public health agency that has limited time and staffing, but fails to rule out alternative explanations of the results that may be gleaned from a thorough record review. Furthermore, it must be noted that the analyses accounted for a small part of the variability in rapid readmission. This reflects the multifactorial nature of rapid readmission and is not easily overcome without flooding models with the countless factors that may be associated with rapid readmission.

Random and systematic error may present a problem in terms of diagnosis. Medical staff tends to ascribe different diagnoses to the same patient at each admission, and some diagnoses are likely to be avoided altogether because they fail to meet admission criteria. The former, a source of random error, was largely resolved by categorizing diagnoses into disorder types. While prescribers vary in actual diagnosis ascribed to patients, the diagnoses generally fall into the same disorder type. The latter, which may be a systematic error, was difficult to assess within the scope of this study and may present a bias in measurement. Another issue regarding diagnosis that this study fails to address is that many, if not most, patients have multiple diagnoses. In this study, Axis I and II diagnoses are limited to the primary diagnosis. Unfortunately, substance use is often considered a secondary Axis I diagnosis and is generally regarded as a factor of interest given the high numbers of patients with co-occurring substance use disorders. However, this obstacle was overcome by creating a category that identified all individuals with a history of substance use diagnosis.

Another possible concern is misclassification. Much of these data are gathered at the time of admission, and many patients are acutely psychotic at the time. This may have resulted in recording incorrect information about patients. Furthermore, missing data are extremely problematic. Most patients were lacking data for at least one factor. This necessitated the inclusion of a group representing missing data for most variables and introduces some bias into any findings.

Another potential source of misclassification stems from the fact that patients may have been admitted to multiple hospitals during the study period, and this study fails to include any admissions to other hospitals. Furthermore, the study population is highly

transient and it is unknown how many patients left the area and were admitted to facilities outside of southern Nevada. Misclassification may also result as many patients are admitted to local emergency rooms, but are released while waiting for a bed to become available at Rawson Neal Psychiatric Hospital. As a result of the myriad other options for hospitalization, it is likely that some admissions were miscategorized as a non-rapid readmission when in fact they were rapidly readmitted elsewhere, and this is likely to introduce bias into the results.

The generalizability of this study may be hampered by the focus on one southern Nevada psychiatric facility only. Those with private insurance have a number of other inpatient options to choose from, and the risk factors may be different from our study population, which predominantly includes those without insurance and those with Medicaid or Medicare. The number of patients with Medicaid and/or Medicare benefits is likely to have dropped during the course of the enrollment period as well due to changes brought about by the Affordable Care Act.

RNPH has also been under the media microscope for the past year due to allegations of patient dumping. This has led to increased scrutiny by government and private regulatory agencies and may have resulted in a level of caution by inpatient psychiatrists that has not been replicated elsewhere. At approximately the midpoint of the study period, patient length of stay began increasing dramatically. In the latter part of 2012, stays of over 90 days were unheard of, but became more common toward the end of the study, which could introduce bias into analyses including use of length of stay as an independent variable. Additionally, other states and private hospitals may have more

resources available at their disposal, which may result in differences in risk factors for rapid readmission.

There are numerous potential difficulties and limitations when it comes to studying psychiatric patients, who often experience instability in their lives. This makes accurate data collection difficult; however, with continued study, much can be learned about the population via replication of results from multiple studies.

Further research on rapid readmission should focus on several different areas. It is critical that future work focus on risk factors that are most easily modifiable. As such, future studies should examine whether enrollment in various community-based programs, such as outpatient clinics, counseling, service coordination, or intensive programs including Programs for Assertive Community Treatment, Assisted Outpatient Treatment, and Mental Health Court result in reduced rapid readmission. Furthermore, it would be beneficial to consider whether providing financial and social supports reduces rates of rapid readmission, and if there is a cumulative effect when patients participate in multiple programs and services. It is also important that studies attempt to look at inter-hospital differences to sort out which interventions are effective and to see how implementation impacts the effectiveness of interventions.

### Conclusion

In conclusion, this study has demonstrated that there are several factors associated with rapid readmission of psychiatric patients, including modifiable factors such as living arrangements and social supports, and factors that are not easily changed, such as diagnosis type. Many of the same factors are associated with frequency of rapid

readmission. It is important to understand frequency of rapid readmission in order to better target appropriate programming and services in accordance with different levels of service utilization. Lastly, although there was some evidence of an association between length of stay and time to readmission, the relationship continues to be poorly understood, and warrants further studies that are adequately populated in multiple regional locations.

**Appendix A- Extended Tables**

<b>Table 2. Characteristics of Patients Admitted to Rawson Neal Psychiatric Hospital, May 2012- April 2014 (N=7,177)</b>				
<b>Characteristic</b>	<b>Non-RR</b>	<b>%</b>	<b>RR</b>	<b>%</b>
<b>Total</b>	6134	85.5	1043	14.5
<b>Sex</b>				
Male	3442	56.1	633	60.7
Female	2683	43.7	409	39.2
Missing	9	0.1	1	0.1
<b>Race</b>				
White	3194	52.1	578	55.4
Black	1207	19.7	244	23.4
Other	386	6.3	65	6.2
Missing	1347	21.9	156	21.0
<b>Ethnicity</b>				
Hispanic/Latino	946	15.4	144	13.8
Not Hispanic/Latino	4505	73.4	869	83.3
Unknown	683	11.1	30	2.9
<b>Age</b>				
17-24	1110	18.1	156	15.0
25-34	1800	29.3	336	32.2
35-44	1388	22.6	264	25.3
45-54	1302	21.2	213	21.1
55 and above	530	8.6	74	8.4
Missing	4	0.1	0	0
<b>Veteran Status</b>				
Yes	294	4.8	41	3.9
No	4927	80.3	794	76.1
Missing	913	14.9	208	19.9
<b>Marital Status</b>				
Married	651	10.6	68	6.5
Never Married	3258	53.1	626	60.0
Divorced	1245	20.3	186	17.8
Separated	352	5.7	70	6.7
Widowed	135	2.2	22	2.1
Missing	493	8.0	71	6.8
<b>Sexual Orientation</b>				
Heterosexual	2383	38.8	408	39.1
Homosexual	108	1.8	17	1.6
Other	51	0.8	9	0.9
Missing	3592	58.6	609	58.4
<b>Living Situation</b>				
With relatives	1158	18.9	142	13.6
With non-relatives	669	10.9	148	14.2
Alone	1146	18.7	244	23.4
Foster Care	4	0.1	1	0.1
Missing	3157	51.5	508	48.7
<b>Homeless Indicator</b>				
On the streets	30	0.5	9	0.9
In a Homeless Shelter	420	6.8	128	12.3
Not Homeless	2992	48.8	461	42.2
Other/Unknown/Missing	2692	43.9	445	42.6
<b>Living Arrangement</b>				



Homeless Shelter	620	10.1	195	18.7
Private Residence/Household	4144	67.6	635	60.9
Other Agency Arranged	87	1.4	25	2.4
Other Residential/Institutional Setting	407	6.6	83	8.0
On the street	16	0.3	8	0.8
Jail/Correctional Facility	18	0.3	3	0.3
Missing	842	13.7	94	9.0
<b>Employment</b>				
Yes	79.3	12.9	71	6.8
No	1661	27.1	290	27.8
Missing	3680	60.0	682	65.4
<b>Financial Resources</b>				
Yes	3448	56.2	603	57.8
No	2160	35.2	387	37.1
Missing	526	8.6	53	5.1
<b>SSI/SSDI</b>				
Yes	1200	19.6	340	33.0
No	4399	71.7	644	61.7
Missing	535	8.7	55	5.3
<b>Medicaid/Medicare</b>				
Yes	663	10.8	208	19.9
No	2160	35.2	387	37.1
Missing	3311	54.0	448	43.0
<b>Legal History</b>				
Denied	2746	44.8	368	35.3
Yes	3121	50.9	639	61.3
Missing	267	4.4	36	3.5
<b>Medication Compliance</b>				
Strength	1088	17.7	146	14.0
Weakness	3846	62.7	760	72.9
Missing	1200	19.6	137	13.1
<b>Support System</b>				
Yes	3896	63.5	636	61.0
No	1034	16.9	263	25.2
Missing	1204	19.6	144	13.8
<b>Stable Housing</b>				
Strength	3203	52.2	477	45.7
Weakness	2489	40.6	497	47.7
Missing	442	7.2	69	6.6
<b>Financially Stable</b>				
Strength	1693	27.6	260	24.9
Weakness	3558	58.0	558	53.5
Missing	883	14.4	225	21.6
<b>Financial Needs</b>				
No	1112	18.1	202	19.4
Yes	2343	38.2	442	42.4
Missing	2679	43.7	399	38.3
<b>Financial/Housing Needs</b>				
No	1702	27.7	288	27.6
Yes	3258	53.1	622	59.6
Missing	1174	19.1	133	12.8
<b>Substance Use Diagnosis (Referent: no)</b>				
No	2812	45.8	418	40.1
Yes	3322	54.2	625	59.9
<b>Axis I Diagnosis</b>				
Psychotic	1728	28.2	409	39.2

Bipolar	656	10.7	135	12.9
Mood	2115	34.5	313	30.0
Substance Use	664	10.8	112	10.7
Other	705	11.5	52	5.0
Missing	266	4.3	22	2.1
<b>Axis II Diagnosis</b>				
Personality	756	12.3	151	14.5
Cognitive/Developmental	83	1.4	28	2.7
Other	59	1.0	6	0.6
None/Deferred/Unknown	4970	81.0	836	80.2
Missing	266	4.3	22	2.1

**Table 3. Bivariate Analysis Factors Associated with Rapid Readmission Among Rawson Neal Psychiatric Hospital Patients, All Admissions May 2012-April 2014 (N=12,068)**

<b>Characteristic</b>	<b>OR</b>	<b>CI</b>
<b>Sex (Referent: male)</b>		
Female	0.738	(0.671, 0.813)
<b>Race (Referent: white)</b>		
Black	1.027	(0.917, 1.150)
Other	0.840	(0.744, 0.947)
<b>Ethnicity (Referent: not Hispanic/Latino)</b>		
Hispanic/Latino	0.838	(0.733, 0.958)
<b>Age (Referent: 17-24)</b>		
25-34	1.324	(1.142, 1.535)
35-44	1.444	(1.240, 1.682)
45-54	1.119	(0.953, 1.314)
55 and above	0.863	(0.692, 1.076)
<b>Veteran Status (Referent: no)</b>		
Yes	0.877	(0.706, 1.090)
<b>Marital Status (Referent: married)</b>		
Never Married	2.482	(1.977, 3.114)
Divorced	2.093	(1.641, 2.670)
Separated	2.127	(1.595, 2.836)
Widowed	1.477	(0.977, 2.235)
<b>Sexual Orientation (Referent: heterosexual)</b>		
Homosexual	0.903	(0.641, 1.273)
Other	1.064	(0.691, 1.639)
<b>Living Situation (Referent: with relatives)</b>		
With non-relatives	1.705	(1.434, 2.027)
Alone	1.658	(1.414, 1.945)
Foster Care	2.785	(0.852, 9.106)
<b>Homeless Indicator (Referent: not homeless)</b>		
On the streets	2.181	(1.360, 3.496)
In a Homeless Shelter	1.971	(1.707, 2.276)
Other/Unknown/Missing	1.205	(1.091, 1.332)
<b>Living Arrangement (Referent: private residence/household)</b>		
Homeless Shelter	2.159	(1.913, 2.437)
Other Agency Arranged	1.802	(1.334, 2.433)
Other Residential/Institutional Setting	1.817	(1.563, 2.112)
On the street	2.708	(1.559, 4.702)
Jail/Correctional Facility	1.853	(0.869, 3.950)
<b>Employment (Reference: no)</b>		
Yes	2.782	(2.214, 3.497)
<b>Financial Resources (Referent: yes)</b>		
No	0.984	(0.893, 1.085)
<b>SSI/SSDI (Referent: yes)</b>		
Yes	0.538	(0.488, 0.593)
<b>Medicaid/Medicare (Referent: yes)</b>		
No	0.589	(0.522, 0.665)
<b>Legal History (Referent: denied)</b>		
Yes	1.940	(1.747, 2.155)
<b>Medication Compliance (Referent: strength)</b>		
Weakness	1.746	(1.507, 2.023)
<b>Support System (Reference: yes)</b>		
No	1.392	(1.251, 1.549)
<b>Stable Housing (Referent: strength)</b>		
Weakness	1.664	(1.513, 1.831)
<b>Financially Stable (Referent: strength)</b>		

Weakness	0.772	(0.700, 0.852)
<b>Financial Needs (Referent: no)</b>		
Yes	0.836	(0.751, 0.930)
<b>Financial/Housing Needs (Referent: no)</b>		
Yes	1.189	(1.072, 1.319)
<b>Substance Use Diagnosis (Referent: no)</b>		
Yes	1.327	(1.207, 1.460)
<b>Axis I Diagnosis (Referent: mood)</b>		
Psychotic	1.452	(1.299, 1.623)
Bipolar	1.081	(0.914, 1.279)
Substance Use	1.094	(0.922, 1.297)
Other	0.659	(0.534, 0.814)
<b>Axis II Diagnosis (Referent: personality)</b>		
Cognitive/Developmental	1.115	(0.838, 1.483)
Other	1.161	(0.808, 1.669)
None/Deferred/Unknown	0.548	(0.488, 0.615)

<b>Table 4. Bivariate Analysis of Factors Associated with Rapid Readmission Among Rawson Neal Psychiatric Hospital Patients, Index Admission Only May 2012-April 2014 (N=7,177)</b>		
<b>Characteristic</b>	<b>OR</b>	<b>CI</b>
<b>Sex (Referent: male)</b>		
Female	0.829	(0.725, 0.948)
<b>Race (Referent: white)</b>		
Black	1.117	(0.948, 1.316)
Other	0.850	(0.717, 1.008)
<b>Ethnicity (Referent: not Hispanic/Latino)</b>		
Hispanic/Latino	0.789	(0.653, 0.954)
<b>Age (Referent: 17-24)</b>		
25-34	1.328	(1.083, 1.629)
35-44	1.353	(1.094, 1.675)
45-54	1.164	(0.933, 1.453)
55 and above	0.993	(0.739, 1.335)
<b>Veteran Status (Referent: no)</b>		
Yes	0.865	(0.619, 1.210)
<b>Marital Status (Referent: married)</b>		
Never Married	1.839	(1.413, 2.395)
Divorced	1.430	(1.066, 1.918)
Separated	1.904	(1.331, 2.723)
Widowed	1.560	(0.932, 2.612)
<b>Sexual Orientation (Referent: heterosexual)</b>		
Homosexual	0.919	(0.845, 1.550)
Other	1.031	(0.504, 2.110)
<b>Living Situation (Referent: with relatives)</b>		
With non-relatives	1.804	(1.406, 2.314)
Alone	1.736	(1.390, 2.169)
Foster Care	2.039	(0.226, 18.367)
<b>Homeless Indicator (Referent: not homeless)</b>		
On the streets	1.947	(0.919, 4.127)
In a Homeless Shelter	1.978	(1.586, 2.467)
Other/Unknown/Missing	1.073	(0.932, 1.234)
<b>Living Arrangement (Referent: private residence/household)</b>		
Homeless Shelter	2.053	(1.712, 2.461)
Other Agency Arranged	1.875	(1.193, 2.948)
Other Residential/Institutional Setting	1.331	(1.036, 1.710)
On the street	3.263	(1.391, 7.656)
Jail/Correctional Facility	1.088	(0.319, 3.703)
<b>Employment (Reference: no)</b>		
Yes	1.950	(1.484, 2.562)
<b>Financial Resources (Referent: yes)</b>		
No	1.024	(0.892, 1.177)
<b>SSI/SSDI (Referent: yes)</b>		
Yes	0.511	(0.441, 0.591)
<b>Medicaid/Medicare (Referent: yes)</b>		
No	0.571	(0.472, 0.690)
<b>Legal History (Referent: denied)</b>		
Yes	1.528	(1.331, 1.754)
<b>Medication Compliance (Referent: strength)</b>		
Weakness	1.473	(1.218, 1.780)
<b>Support System (Reference: yes)</b>		
No	1.558	(1.329, 1.827)
<b>Stable Housing (Referent: strength)</b>		
Weakness	1.341	(1.170, 1.536)
<b>Financially Stable (Referent: strength)</b>		

Weakness	1.021	(0.872, 1.196)
<b>Financial Needs (Referent: no)</b>		
Yes	1.038	(0.866, 1.245)
<b>Financial/Housing Needs (Referent: no)</b>		
Yes	1.128	(0.970, 1.313)
<b>Substance Use Diagnosis (Referent: no)</b>		
Yes	1.266	(1.107, 1.447)
<b>Axis I Diagnosis (Referent: mood)</b>		
Psychotic	1.599	(1.362, 1.877)
Bipolar	1.391	(1.116, 1.733)
Substance Use	1.140	(0.903, 1.438)
Other	0.498	(0.367, 0.677)
<b>Axis II Diagnosis (Referent: personality)</b>		
Cognitive/Developmental	1.689	(1.063, 2.682)
Other	0.509	(0.216, 1.201)
None/Deferred/Unknown	0.842	(0.697, 1.018)

**Table 5. Multivariate Analysis of Factors Associated with Rapid Readmission Among Rawson Neal Psychiatric Hospital Patients, All Admissions May 2012-April 2014 (N=12,068)**

<b>Characteristic</b>	<b>OR</b>	<b>CI</b>
<b>Sex (Referent: male)</b>		
Female	0.873	(0.785, 0.972)
<b>Race (Referent: white)</b>		
Black	0.900	(0.796, 1.018)
Other	0.965	(0.811, 1.147)
<b>Ethnicity (Referent: not Hispanic/Latino)</b>		
Hispanic/Latino	0.989	(0.815, 1.201)
<b>Age (Referent: 17-24)</b>		
25-34	1.086	(0.926, 1.273)
35-44	1.194	(1.005, 1.418)
45-54	0.866	(0.718, 1.044)
55 and above	0.701	(0.543, 0.904)
<b>Marital Status (Referent: married)</b>		
Never Married	1.405	(1.110, 1.795)
Divorced	1.370	(1.059, 1.772)
Separated	1.293	(0.954, 1.753)
Widowed	1.002	(0.648, 1.550)
<b>Living Situation (Referent: with relatives)</b>		
With non-relatives	1.051	(0.865, 1.276)
Alone	1.195	(0.996, 1.434)
Foster Care	2.345	(0.674, 8.167)
<b>Homeless Indicator (Referent: not homeless)</b>		
On the streets	1.171	(0.641, 2.138)
In a Homeless Shelter	1.018	(0.804, 1.289)
Other/Unknown/Missing	1.367	(1.146, 1.631)
<b>Living Arrangement (Referent: private residence/household)</b>		
Homeless Shelter	1.441	(1.180, 1.760)
Other Agency Arranged	1.198	(0.870, 1.650)
Other Residential/Institutional Setting	1.279	(1.082, 1.510)
On the street	1.706	(0.850, 3.425)
Jail/Correctional Facility	1.053	(0.476, 2.328)
<b>SSI/SSDI (Referent: yes)</b>		
No	0.688	(0.571, 0.830)
<b>Medicaid/Medicare (Referent: yes)</b>		
No	0.886	(0.716, 1.096)
<b>Legal History (Referent: denied)</b>		
Yes	1.283	(1.142, 1.442)
<b>Medication Compliance (Referent: strength)</b>		
Weakness	1.339	(1.144, 1.567)
<b>Support System (Reference: yes)</b>		
No	1.027	(0.905, 1.167)
<b>Stable Housing (Referent: strength)</b>		
Weakness	1.408	(1.240, 1.599)
<b>Financially Stable (Referent: strength)</b>		
Weakness	1.001	(0.848, 1.183)
<b>Financial Needs (Referent: no)</b>		
Yes	1.070	(0.904, 1.267)
<b>Financial/Housing Needs (Referent: no)</b>		
Yes	0.995	(0.860, 1.150)
<b>Substance Use Diagnosis (Referent: no)</b>		
Yes	1.171	(1.046, 1.311)
<b>Axis I Diagnosis (Referent: mood)</b>		
Psychotic	1.172	(1.030, 1.334)

Bipolar	0.980	(0.819, 1.171)
Substance Use	1.067	(0.885, 1.286)
Other	0.895	(0.713, 1.125)
<b>Axis II Diagnosis (Referent: personality)</b>		
Cognitive/Developmental	1.018	(0.745, 1.390)
Other	1.112	(0.750, 1.649)
None/Deferred/Unknown	0.624	(0.550, 0.708)



**Table 9. Multivariate Analysis of Factors Associated with Frequency of Rapid Readmission Among Patients Admitted to Rawson Neal Psychiatric Hospital, All Admissions May 2012- April 2014 (N=7,177)**

Characteristic	One RR		Two to Three RRs		Four or More RRs	
	OR	CI	OR	CI	OR	CI
<b>Sex (Referent: male)</b>						
Female	1.139	(1.017, 1.277)	0.797	(0.697, 0.912)	0.754	(0.657, 0.866)
<b>Race (Referent: white)</b>						
Black	0.977	(0.853, 1.119)	0.883	(0.757, 1.031)	0.856	(0.734, 0.999)
Other	0.995	(0.830, 1.191)	0.838	(0.672, 1.044)	0.977	(0.779, 1.226)
<b>Ethnicity (Referent: not Hispanic/Latino)</b>						
Hispanic/Latino	0.851	(0.693, 1.045)	1.131	(0.888, 1.440)	0.916	(0.709, 1.183)
<b>Age (Referent: 17-24)</b>						
25-34	1.205	(1.018, 1.426)	1.370	(1.190, 1.691)	1.229	(1.005, 1.503)
35-44	0.981	(0.812, 1.185)	1.508	(1.204, 1.888)	1.370	(1.103, 1.701)
45-54	0.924	(0.756, 1.129)	1.159	(0.912, 1.475)	0.752	(0.591, 0.956)
55 and above	0.797	(0.614, 1.036)	1.056	(0.782, 1.426)	0.285	(0.193, 0.422)
<b>Marital Status (Referent: married)</b>						
Never Married	1.339	(1.059, 1.694)	1.299	(0.985, 1.715)	2.319	(1.573, 3.418)
Divorced	1.227	(0.955, 1.577)	1.111	(0.828, 1.492)	2.135	(1.425, 3.197)
Separated	1.947	(1.460, 2.598)	1.002	(0.693, 1.450)	1.822	(1.151, 2.885)
Widowed	0.995	(0.639, 1.550)	1.756	(1.144, 2.695)	0.343	(0.128, 0.920)
<b>Living Situation (Referent: with relatives)</b>						
With non-relatives	1.165	(0.953, 1.423)	1.242	(0.979, 1.576)	1.502	(1.151, 1.960)
Alone	1.182	(0.982, 1.423)	1.408	(1.125, 1.760)	1.776	(1.382, 2.281)
Foster Care	3.004	(0.793, 11.384)	2.168	(0.408, 11.508)	1.392	(0.151, 12.856)
<b>Homeless Indicator (Referent: not homeless)</b>						
On the streets	0.934	(0.449, 1.940)	0.778	(0.342, 1.772)	0.975	(0.455, 2.090)
In a Homeless Shelter	0.946	(0.706, 1.268)	0.878	(0.647, 1.190)	0.877	(0.662, 1.188)
<b>Living Arrangement (Referent: private residence/household)</b>						
Homeless Shelter	1.281	(0.996, 1.648)	1.816	(1.396, 2.361)	2.188	(1.716, 2.788)
Other Agency Arranged	1.277	(0.891, 1.832)	1.447	(0.978, 2.140)	0.882	(0.568, 1.368)
Other						
Residential/Institutional						
Setting	1.100	(0.906, 1.336)	1.626	(1.328, 1.992)	1.169	(0.940, 1.454)
On the street	1.787	(0.739, 4.325)	2.595	(1.019, 6.609)	2.396	(0.966, 5.946)
Jail/Correctional Facility	0.856	(0.338, 2.172)	0.840	(0.304, 2.322)	0.346	(0.097, 1.235)
<b>SSI/SSDI (Referent: yes)</b>						
Yes	0.613	(0.507, 0.742)	0.915	(0.733, 1.141)	0.368	(0.288, 0.470)
<b>Medicaid/Medicare (Referent: yes)</b>						
No	1.076	(0.852, 1.359)	0.431	(0.332, 0.559)	1.137	(0.861, 1.502)
<b>Legal History (Referent: denied)</b>						
Yes	1.235	(1.094, 1.393)	1.431	(1.240, 1.651)	1.877	(1.602, 2.199)
<b>Medication Compliance (Referent: strength)</b>						
Weakness	1.345	(1.143, 1.582)	1.539	(1.268, 1.868)	1.933	(1.549, 2.412)
<b>Support System (Reference: yes)</b>						
No	1.024	(0.881, 1.190)	1.254	(1.069, 1.472)	1.006	(0.857, 1.181)
<b>Stable Housing (Referent: strength)</b>						
Weakness	1.020	(0.888, 1.171)	1.132	(0.966, 1.327)	1.735	(1.473, 2.043)
<b>Financial Needs (Referent: no)</b>						
Yes	1.259	(1.050, 1.510)	1.102	(0.902, 1.347)	0.866	(0.792, 1.068)
<b>Financial/Housing Needs (Referent: no)</b>						
Yes	0.926	(0.794, 1.081)	1.151	(0.963, 1.376)	1.070	(0.888, 1.290)
<b>Substance Use Diagnosis (Referent: no)</b>						
Yes	1.227	(1.086, 1.387)	1.131	(0.984, 1.301)	1.373	(1.186, 1.590)

<b>Axis I Diagnosis (Referent: mood)</b>						
Psychotic	1.352	(1.175, 1.556)	1.504	(1.277, 1.771)	1.267	(1.075, 1.493)
Bipolar	1.206	(1.004, 1.448)	1.222	(0.984, 1.516)	0.627	(0.485, 0.812)
Substance Use	0.988	(0.802, 1.216)	1.186	(0.935, 1.503)	1.043	(0.827, 1.316)
Other	0.623	(0.480, 0.810)	0.816	(0.607, 1.097)	1.054	(0.800, 1.389)
<b>Axis II Diagnosis (Referent: personality)</b>						
Cognitive/Developmental	1.198	(0.804, 1.786)	1.227	(0.810, 1.858)	1.424	(0.978, 2.076)
Other	0.846	(0.507, 1.413)	0.705	(0.396, 1.253)	1.004	(0.615, 1.640)
None/Deferred/Unknown	0.814	(0.699, 0.948)	0.627	(0.533, 0.739)	0.508	(0.433, 0.597)

## **Appendix B – List of Acronyms**

APA	American Psychiatric Association
CI	Confidence Interval
CITI	Collaborative Institutional Training Initiative
CMS	Centers for Medicare and Medicaid Services
DPBH	Department of Public and Behavioral Health
DSM-IV	Diagnostic and Statistical Manual of Disorders, Version 4
ER	Emergency Room
ITP	Information Technology Professional
LOS	Length of Stay
OR	Odds Ratio
RNPH	Rawson Neal Psychiatric Hospital
RR	Rapid Readmission
SAMHSA	Substance Abuse and Mental Health Services Administration
SMI	Serious Mental Illness
SNAMHS	Southern Nevada Adult Mental Health Services
SPSS	Statistical Package for the Social Sciences
SSI/SSDI	Supplemental Security Income/Social Security Disability Insurance
TJC	The Joint Commission
UNLV	University of Nevada, Las Vegas
VIF	Variance Inflation Factor

## References

- Amaro, Yesenia. (2014, February 26). Inundated by the mentally ill, valley emergency rooms close to ambulances. *Las Vegas Review Journal*. Retrieved from: <http://www.reviewjournal.com/news/inundated-mentally-ill-valley-emergency-rooms-close-ambulances>
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders (DSM-IV)* (4th ed.). Washington, DC: Author.
- Appleby, L., Desai P.N., Luchins D.J., Gibbons R.D., & Hedeker D.R. (1993). Length of stay and recidivism in schizophrenia: a study of public psychiatric hospital patients. *American Journal of Psychiatry*, *150* (1), 72-76.
- Appleby, L., Luchins, D.J., Desai, P.N., Gibbons R.D., Janicak P.G., Marks R. (1996). Length of inpatient stay and recidivism among patients with schizophrenia. *Psychiatric Services*, *47*, 985-990.
- Bernardo, A.C. & Forchuk, C. (2001). Factors associated with readmission to a psychiatric facility. *Pschiatr Serv*, *52*(8), 1100-02
- Casper, E.S. & Donaldson, B. (1990). Subgroups in the population of frequent users of inpatient services. *Hospital and Community Psychiatry*, *41*, 189-191.
- Casper, E.S, Romo, J.M., & Fasnacht, R.C. (1991). Readmission patterns of frequent users of inpatient services. *Hospital and Community Psychiatry*, *42*, 1116-1117.
- Chakraborty, N. & Aryiku, C. (2008). Reasons for rapid readmissions to general adult psychiatry wards. *Progress in Neurology and Psychiatry*, *12*, 14-18.
- Colenda, C.C. & Hamer, R.M. (1989). First admission young adult patients to a state hospital: relative risk for rapid readmission. *Psychiatric Quarterly*, *60*, 227-236.
- Cuffel, B.J., Held, M., Goldman, W. (2002). Predictive models and the effectiveness of strategies for improving outpatient follow-up under managed care. *Psychiatr Serv*, *53*, 1438-43.
- De Francisco, D., Anderson, D., Pantano, R., & Kline, F. (1980). The relationship between length of hospital stay and rapid readmission rates. *Hosp Community Psychiatry*. *31*, 196-7.
- Dietzen, L. L., & Bond, G. R. (1993). Relationship between case manager contact and outcome for frequently hospitalized psychiatric clients. *Hospital and Community Psychiatry*, *44*, 839-843.

- Division of Public and Behavioral Health. (2014). *Lake's Crossing Center*. Retrieved May 6, 2014 from:  
[http://mhds.state.nv.us/index.php?option=com\\_content&view=article&id=30&Itemid=56](http://mhds.state.nv.us/index.php?option=com_content&view=article&id=30&Itemid=56)
- Durbin, J., Lin, E., Layne, C., & Teed, M. (2007). Is readmission a valid indicator of the quality of inpatient psychiatric care? *J Behav Health Serv Res*, 34(2), 137-50.
- Executive Order No. 2013-26: Establishing the Governor's Behavioral Health and Wellness Council, (2013).
- Green, J.H. (1988). Frequent rehospitalization and noncompliance with treatment. *Hospital and Community Psychiatry*, 39(9), 963-965.
- Gruber, J.E. (1992). Paths and gates: the sources of recidivism and length of stay on a psychiatric ward. *Medical Care*, 20, 1197-1208.
- Havassy, B.E. & Hopkin, J.T. (1989). Factors predicting utilization of acute psychiatric inpatient services by frequently hospitalized patients. *Hosp Community Psychiatry*, 40(8), 820-23.
- Haywood, T.W., Kravitz H.M., Grossman L.S., Cavanaugh J.L. Jr, Davis J.M., & Lewis D.A. (1995). Predicting the "revolving door" phenomenon among patients with schizophrenic, schizoaffective, and affective disorders. *American Journal of Psychiatry*, 152 (6), 856-861.
- Herz, J.S., Endicott, J., Spitzer, R.L. (1975). Brief hospitalization of patients with families: Initial results. *Am J Psychiatry*, 132, 413-18.
- Holzer, III, C.E. and Nguyen, H.T., psy.utmb.edu.
- Irmiter, C., McCarthy, J.F., Barry, K.L., Soliman, S., & Blow, F.C. (2007). Reinstitutionalization following psychiatric discharge among VA patients with serious mental illness: a national longitudinal study. *Psychiatry*, 78(4), 279-86.
- Kastrup, M. (1987a). The use of a psychiatric register in predicting the outcome "revolving door patient". *Acta Psychiatr Scand*, 76, 552-560.
- Kastrup, M. (1987b). Who became revolving door patients? Findings from a nation-wide cohort of first time admitted psychiatric patients. *Acta Psychiatr Scand*, 76 (1), 80-88.
- Klinkenberg, W.D. & Calsyn, R.J. (1996). Predictors of receipt of aftercare and recidivism among persons with severe mental illness: a review. *Psychiatric Services*, 47, 487-96

- Knights, A., Hirsch, S.R., & Platt, S.D. (1980). Clinical change as a function of brief admission to hospital in a controlled study using the Present State Examination. *British Journal of Psychiatry*, *137*, 170-9180.
- Korkeila, J.A., Lehtinen, V., Tuori, T., & Helenius, H. (1998). Frequently hospitalized psychiatric patients: a study of predictive factors. *Soc Psychiatry Psychiatric Epidemiol*, *33*(11), 528-34.
- Landreth, K. & Brandenburg, C. (2006). Mental Health Problems and Needs in Nevada. In *The Social Helath of Nevada Report*. UNLV Center for Democratic Culture Retrieved from: <http://cdclv.unlv.edu/healthnv/mentalhealth.html>
- Lewis, T. & Joyce, P.R. (1990). The new revolving door patients: results from a national cohort of first admissions. *Acta Psyciatr Scand*, *82*(2), 130-135.
- Lyons, J.S., O'Mahoney M.T., Miller S.I., Neme J., Kabat J., & Miller F. (1997). Predicting readmission to the psychiatric hospital in a managed care environment: implications for quality indicators. *Amercian Journal of Psychiatry*, *1997*, 337-340.
- Marken, P.A., Stanislav S.W., Lacombe S., Pierce C., Hornstra R., & Sommi R.W. (1992). Profile of a sample of subjects admitted to an acute care psychiatric facility with manic symptoms. *Psychopharmacology Bulletin*, *1992*, 201-205.
- Martinez-Ortega, J.M. Gutierrez-Rojas, L., Jurado, D., Higuera, A., Diaz, F.J., & Gurpegui, M. (2012). Factors associated with frequent admissions in a general hospital in Spain. *Int J Soc Psychiatry*, *58*(5), 532-5. doi: 10.1177/0020764011413061
- Mojtabai, R., Nicholson, R.A., & Neesmith, D.H. &. (1997). Factors affecting relapse in patients discharged from a public hospital: results from survival analysis. *Psychiatr Q*, *68*, 117-128.
- Moran, P.W., Doerfler, C.A., Scherz, J., & Lish, J.D. (2000). Rehospitalization of psychiatric patients in a managed care environment. *Mental Health Services Research*, *2*(4), 191-8.
- Moss, J., Li, A., Tobin, J., Weinstein, I.S., Harimoto, T., Lanctot, K.L. (2014). Predictors of readmission to a psychiatry inpatient unit. *Comprehensive Psychiatry*, *55*(3), 426-30.
- Munetz, M.R., Grande, T., Kleist, J., & Peterson, G.A. (1996). The effectiveness of outpatient civil commitment: a conceptual model. *Psychiatr Serv*, *47*, 1251-3

- Nelson, E.A., Maruish, M.E., & Axler, J.L. (2000). Effects of discharge planning and compliance with outpatient appointments on readmission rates. *Psychiatric Services, 51*(7), 885-888.
- Ng, C.G, Loh, H.S., Yee, H.A., & Zainal, N.Z. (2012). The prevalence and associated factors of psychiatric early readmission in a teaching hospital, Malaysia. *Malaysian Journal of Psychiatry Ejournal, 21*(1).
- Oyffe, I., Kurs, R., Gelkopf, M., Melamed, Y., & Bleich, A. (2009). Revolving -door patients in a public psychiatric hospital in Israel: Cross sectional study. *Croat Med J, 50*(6), 575-82.
- Pillard, E. (1979). Nevada's Treatment of the Mentally Ill, 1882-1961. *Nevada Historical Society Quarterly, 22*(2), 83-99. Retrieved from: <http://nsla.nevadaculture.org/statepubs/epubs/210777-1979-2Summer.pdf>.
- Polk-Walker, G.C., Chan W., Meltzer A.A., Goldapp G., & Williams B. (1993). Psychiatric recidivism prediction factors. *Western Journal of Nursing Research, 15*, 163-176.
- Postrado, L.T. & Lehman, A.F. (1995). Quality of life and clinical predictors of rehospitalization of persons with severe mental illness. *Psychiatric Services, 46*, 1161-1165.
- Rosca, P., Bauer, A., Grinshpoon, A., Khawaled, R., Mester, R., & Ponizovsky, A.M. (2006). Rehospitalizations among psychiatric patients whose first admission was involuntary: a 10-year follow-up. *Isr J Psychiatry Relat Sci, 43*(1), 57-64
- Rosenheck, R., Massari, L., & Astrachan, B.M. (1990). The impact of DRG-based budgeting on inpatient psychiatric care in Veterans Administration medical centers. *Medical Care, 28*, 124-134.
- Sanguinetti, V.R., Samuel, S.E., Schwartz, S.L., & Robeson, M.R. (1996). Retrospective study of 2,200 involuntary psychiatric admissions and readmissions. *Am J Psychiatry, 153*, 392-6.
- Stickney, S.K., Hall, R.C.W., & Gardner, E.R. (1980). The effect of aftercare referral procedures on aftercare compliance. *Hospital and Community Psychiatry, 31*, 567-569.

- Stranges, E., Levit, K., Stocks, C., & Santora, P. (2011). State Variation in Inpatient Hospitalizations for Mental Health and Substance Abuse Conditions, 2002-2008. *HCUP Statistical Brief #117*. Agency for Healthcare Research and Quality, Rockville, MD. Retrieved on May 6, 2014 from: <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb117.pdf>
- Substance Abuse and Mental Health Services Administration. (2013). *Results from the 2012 National Survey on Drug Use and Health: Mental Health Findings*, NSDUH Series H-47, HHS Publication No. (SMA) 13-4805. Rockville, MD: Substance Abuse and Mental Health Services Administration.
- Sullivan, G., Wells K.B., Morgenstern H., & Leake B. (1995). Identifying modifiable risk factors for rehospitalization. A case-control study of seriously mentally ill persons in Mississippi. *Am J Psychiatry*, *152*, 1749-1755.
- Swett, C. (1995). Symptom severity and number of previous psychiatric admissions as predictors of readmission. *Psychiatric Services*, *46*, 482-485.
- Swigger, M.E., Astrachan B., Levine M.A., Mayfield V., & Radovich C. (1991). Single and repeated admissions to a mental health center: demographic, clinical, and service use characteristics. *International Journal of Social Psychiatry*, *37*, 259-266.
- Tansella, M., Micciolo R., Biggeri A., Bisoffi G., & Balestrieri M. (1995). Episodes of care for first-ever psychiatric patients. A long term case-register evaluation in a mainly urban area. *Br J Psychiatry*, *167*, 220-227.
- Thompson, E.E., Neighbors, H.W., Munday, C., Trierweiler, S.J. (2003). Length of Stay, Referral to Aftercare, and Rehospitalization Among Psychiatric Inpatients. *Psychiatric Services*, *54*, 1271-1276.
- Thornicroft, G., Gooch, C., & Dayson, D. (1992). The TAPS project. 17: Readmission to hospital for long term psychiatric patients after discharge to the community, *BMJ*, *305*, 996-8. doi: <http://dx.doi.org/10.1136/bmj.305.6860.996>
- Vasudeva, S., Narendra Kumar, M.S, & Chandra Sekhar, K. (2009). Duration of first admission and its relation to the readmission rate in a psychiatric hospital. *Indian J. Psychiatry*, *51*(4), 280-284.
- Vogel, S. & Huguelet, P. (1997). Factors associated with multiple admissions to a public psychiatric hospital. *Acta Psychiatr Scand*, *95*, 244-253.



- Watanabe-Galloway, S. & Zhang, W. (2007). Analysis of US trends in discharges from general hospitals for episodes of serious mental illness, 1995-2002. *Psychiatric Services*, 58, 496-502.
- Webb, S., Yaquez, L., & Langdon, P.E. (2007). Factors associated with multiple readmission to a psychiatric hospital. *Journal of Mental Health*, 16(5), 647-61. doi:10.1080/09638230701494845
- Zhang, J., Harvey, C., & Andrew, C. (2011). Factors associated with length of stay and the risk of readmission in an acute psychiatric inpatient facility: a retrospective study. *Australian and New Zealand Journal of Psychiatry*, 45, 578-85.

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