Inpatient Psychiatric Length of Stay

And Readmission Rates

by

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ABSTRACT

Average length of inpatient hospital stays are a concern of many stakeholders within the mental health care community, mental health providers, clinics, hospitals, and insurance companies. An analysis was conducted to determine whether average length of stay is significantly related to readmission rates at industry standard levels of 7 day readmission and 30 day readmission. The results showed that the shortest stay group of 2-3 days and the longest stay group of 8+ days had significantly higher rates of readmission both at 7 day and 30 day readmissions. Further research is necessary to determine both the reliability of these results, and causal explanations.

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Chapter I: Introduction

Average length of stay and readmission rates are a common concern of healthcare providers, mental healthcare providers, and insurance companies alike. The length of an inpatient's hospital stay may predict whether they will consequently return to a normal life or be readmitted to another inpatient stay. The length of an inpatient hospital stay is expensive for everyone involved, but it is also a critical variable in the effective treatment of many psychiatric illnesses. Therefore, it may partially determine the likelihood of readmission of the patient into inpatient care at a later time.

The determination of how long a patient should be in the hospital for psychiatric treatment is not an easy decision for anyone involved. There are many factors which affect the length of stay ranging from diagnosis, co-morbidity of medical illnesses, and age of the patient. Additional contributing factors include previous success of the particular inpatient program related to the particular case at hand, availability of effective outpatient treatment options, availability of effective partial hospitalization options, and so forth. The intention of the present research is the initiation of a series of studies to delineate and thoroughly describe length of stay, readmission, and its implications to the field.

Statement of the Problem

Differing lengths of hospital stay are differentially effective at reducing the readmission rate. The intent of this research is to examine what length of stay serves the psychiatric patient best in regards to avoidance of readmission to inpatient care.

Purpose of the Study

The purpose of this study was to examine variances between different groupings of average length of stay and readmission rates at 7 days and 30 days. Readmission rates at 7 days and 30 days post discharge are considered a facility standard for quality care.

Assumptions of the Study

It is assumed that the membership of the mental health insurance company is similar to the overall mental health patient population. Industry standard of care related to readmission rates at 7 days and 30 days are assumed to be valid measures for quality of care.

Definition of Terms

Average length of stay is defined as the length of stay that is typical for an inpatient hospital stay.

Readmission is defined as the re-admittance of an inpatient mental health patient to another inpatient mental health stay.

Readmission at 7 days is defined as re-admittance within 7 days of discharge from an inpatient mental health stay.

Readmission at 30 days is defined as re-admittance within 30 days of discharge from an inpatient mental health stay, not including those counted as re-admitted within 7 days of discharge.

Days paid is assumed equivalent to length of stay, as the length of stay and the days paid are essentially the same.

Partial hospitalization is defined as a patient commuting to the hospital up to 7 days a week for treatment but residing at home.

Methodology

The population consisted of all members of the mental health insurance company who had claims paid between July 1, 2003 to June 30, 2005 and January 1, 2005 to December 31, 2006, including children, adolescents, adults, geriatric, eating disorders, complex cases, and substance abuse and detoxification inpatients. No claims were excluded from the analysis.

Diagnostic population types for Eating Disorders, Complex Cases, and Alcohol & Substance Abuse were separated based upon the primary and secondary diagnosis code on the claim. If the claim did not fit into one of those three diagnostic populations, then the claim was assigned to Adult General Mental Health Diagnostic Population if the age of the patient was 18 years or older, and Child General Mental Health Diagnostic Population if the age of the patient was under 18 years.

A thorough literature review was conducted before data analysis was begun in order to ensure a comprehensive understanding of the problem. After the literature review was complete the data set was formatted and analyzed using SAS Version 9.1.

Chapter II: Literature Review

According to Lieberman, Wiitala, Elliott, McCormick, & Goyette (1998),

> The past decade has seen dramatic changes in the role played by psychiatric hospitals in the care of patients. Patients who would have remained hospitalized for weeks, months, or even years are now treated mostly or entirely in outpatient settings. Lengths of stay are measured in days. Goals of admission have also changed greatly, from furthering development and building psychological "structure" to stabilizing symptoms, adjusting medication, and facilitating connections to outpatient care. (p.905)

Lieberman, et al., (1998) conducted a study at Dartmouth-Hitchcock Medical Center in New Hampshire while the program went through a change from longer lengths of stay in 1988 to shorter lengths of stay up to approximately 1996. The study consisted of three cohorts during this time frame. They were grouped as follows: cohort 1, 1988-1991; cohort 2, 1992-1993; and cohort 3, 1995-1996. It was discovered that the final cohort 3, consisting of patients with the shortest hospital stay, showed no significant difference in levels of functioning between those in earlier cohort 1 who were solely hospitalized versus those in cohort 2 who were hospitalized and then followed up with partial hospitalization. This finding could be due to the differences in overall level of illness between the two subgroups, further investigation is needed.

Another finding was that the length of stay for those not experiencing a partial hospitalization was approximately 9.6 days, in contrast to those experiencing a partial hospitalization, whose length of stay averaged 6.7 days, followed by weeks of partial

hospitalization. Additionally, readmission rates from cohort 1, N=12 (17.6%) to cohort 2, N=2 (6.3%) decreased, but they increased from cohort 2, N=2 (6.3%) to cohort 3, N=12 (17.1%). Although, there seemed to be no change in readmission rates in relation to the reduction in the average length of stay, there did appear to be adverse affects suffered by the patient population as shown through the study. These adverse affects are indicated by Liberman, et al., (1998) as he concluded "patients are now more depressed and more globally impaired when they leave the hospital." (p.908)

According to the work of Liberman, et al., (1998),

> ...as clinical experience suggests, depressed patients are now discharged more depressed than they previously were, and with lower scores on the Global Assessment of Functioning Scale. One month after discharge, although readmission rates were equal, global and work functioning remained lower among the short-stay group. (p.908)

The findings of Liberman, et al., (1998) should not only be of concern to researchers and clinicians, but to patients, counselors, and insurance companies. This seems to be a time when we are all considering the rising levels of stress within our culture and the rising cost of healthcare. An individual deserves the care that best treats their illness so that they can return to their lives and their work functioning at levels that are as high as possible. Outpatient care may appear to be cheaper, but the length of the care may be more costly and more stressful than inpatient care. In this study this seems to be the case as indicated by longer rather than shorter hospital stays or partial hospitalization.

An analysis completed by Case, Olfson, Marcus, and Siegel (2007) on children and adolescents in community based hospitals indicated by ICD-9-CM codes 290 to 319 showed no significant changes in discharge rates in the decade of 1990 to 2000. In addition, "The proportion of discharges diagnosed with principal bipolar disorders rose dramatically from 2.9% to 15.21%. Increases were also observed in the proportion diagnosed with psychotic disorders" (p.92). Despite the decrease in length of stay and the increase in severity of illness in this particular population, it appears that clinicians are doing more in a shorter amount of time. "Inpatient clinicians who on average evaluated, treated, and discharged mentally ill children over the course of 12 days in 1990 routinely accomplished these tasks in 4 1/2 days by 2000" (Case, et al., 2007, p.94). It is important to note that alarmingly, the quartile with the longest length of stay had the greatest reduction in length of stay "...while the 75th percentile fell significantly from 27.2 to 7.7 days, a decline of 72%" (Case, et al., 2007, p.94). Case, et al., (2007) follows with,

> Declines in average length of stay over the period were generally greatest for diagnoses and other characteristics associated with the longest average length of stay in 1990. Rather than a targeted reduction of average length of stay for treatment of patients with less severe illnesses and, presumably, less complex clinical needs, this trend in average length of stay suggests the emergence of a more uniform standard of inpatient treatment duration irrespective of patient need. (p.94)

This leads to another fact of concern, "Inpatient mental health professionals routinely evaluate, treat, and discharge depressed children and adolescents in 4 days, well before the onset of response to selective serotonin reuptake inhibitor pharmacotherapy or the emergence of adverse effects" (Case, et al., 2007, p.95). This not only leads to a potential

health risk but an issue of follow-up care. Accounting for the effects of anti-depressant medication and the increase in suicidal ideation at the beginning of anti-depressant treatment in children and adolescents, discharging them within days of beginning this medication is alarming without intensive follow-up to insure the safety of the patient.

In addition, research by Case, et al. (2007) indicates that transfers to other inpatient facilities and subsequent treatment are on the decline, with the majority of discharges being to home. Considering the severity of the majority of the illnesses at admission this fact is disconcerting. Additionally, this particular study did not address readmission, as the patients were not identified as to allow such analysis, lending to an uncertainty about the effectiveness of the initial admission.

Several possible conclusions could be garnered from this information. To name a few, first, in order to provide the care the patient needs "...under scrutiny of managed care review, inpatient providers may be indicating more serious diagnoses to justify admission or secure greater reimbursement, a process termed "*diagnostic upcoding*"" (Case, et al., 2007, p.95). Second, there is a disproportionate case mix found at community hospitals. Third, private hospitals and programs are not accounted for within this study.

According to work done by Horvitz-Lennon, Normand, Gaccione, and Frank (2001), "Rising mental health spending has triggered cost-containment efforts primarily aimed at decreasing inpatient utilization" (p. 676). They discovered that, "Regardless of study design, the most frequent exclusion criterion was, by far, "too severely ill" (i.e., dangerousness to self or others; disruptive behavior). Other frequent exclusion criteria were cognitive impairment and antisocial behavior" (Horvitz-Lennon et al., 2001, p.680).

The determination made at the end of the study was that there was no difference in effect between partial hospitalization and inpatient treatments. It is important to note that this result cannot be generalized beyond the applicable population of this research, due to the large amount of exclusions and transference of care from partial to inpatient. In addition, Horvitz-Lennon et al., (2001) also assert "...61% to approximately 80% of partial care patients will eventually be transferred and fully hospitalized. Conversely, approximately 21% to 39% of acutely ill patients may be solely treated with partial hospitalization" (p.682).

The average length of a hospital stay for a psychiatric patient can also be complicated by co-morbidity of medical illness. Work done by Lyketsos, Dunn, Kaminsky, and Breakey (2002) details the issues of comorbidity in psychiatric inpatient cases. According to Lyketsos, et al., (2002), "A wide range of comorbidity has been described, with chronic medical illnesses such as hypertension, heart disease, pulmonary disease, and diabetes, being the most common" (p.24). This is a concern considering these medical illnesses are chronic and require monitoring and in many cases medications in order to control. According to Lyketsos, et al., (2002) this can have effects on psychiatric outcomes, average length of stay, and overall patient functioning. The concern is that "Psychiatric medications also have health effects, such as impaired glucose tolerances, effects on renal function, effects on liver function, and many others" (Lyketsos, et al., 2002, p.24), leading to further medical complications in treatment and effects. In addition, Lyketsos, et al., (2002) state, "Medications used to treat medical illness often have psychiatric effects" (p.24), which leads also to the concern that medications used to treat medical illnesses are contributing to the outcomes of psychiatric

diagnosis and treatments, a viscous circle of medicating to counter the effects of the medications.

Additionally, Lyketsos, et al. (2002) believe that, "another link is that psychiatric patients are less motivated to seek care for medical illness. They are often neglectful of their health and self-care" (p.24), which leads to the possibility that psychiatric patients are at greater risk for medication non-compliance, greater levels of morbidity, and mortality related to medical illness due to their psychiatric illness. A serious concern for doctors, mental health professionals, and insurance companies alike is the statement by Lyketsos, et al., (2002) that, "...psychiatric patients are less likely to receive necessary medical care and have higher rates of morbidity and mortality from medical illnesses when compared with control populations" (p.25). Psychiatric patients need more attention and care in order to avoid the higher rates of morbidity and mortality rates. In addition, Lyketsos, et al. (2002) state that "... medically ill psychiatric patients might have more severe psychiatric symptoms, might have greater functional impairment, and might have longer lengths of stay when hospitalized on psychiatric units" (p.25), due to the greater need for more specialized and intensive care brought on by the combination of psychiatric illness, side effects of a medical nature due to psychiatric medications, medical illness, and psychiatric side effects of medically needed medications. "The presence of a physical diagnosis in depressed inpatients was associated with a stay on the psychiatric unit of a general hospital that was on average 4 days longer" (Lyketsos, et al., 2002, p.25), assumed to be due to the intensity of care required for complicated cases.

Despite the longer hospital stay required by cases of a co-morbid nature at discharge these patients are more impaired in their functioning. According to Lyketsos, et

al., (2002), "...average length of stay was significantly longer by an average of 5.4 days" (p.27). This is concern considering that the stay was longer yet the functioning more impaired upon discharge, most likely leading to another inpatient admission or further outpatient care upon discharge.

Work completed by Pavkov, Boerge, and Czapkowicz (1997) address the concern of average length of stay related to youth hospitalizations in Illinois. The findings showed that, "those diagnosed with attention deficit, psychotic, and conduct disorder experienced longer hospitalizations, in contrast youths diagnosed with depressive disorders, drug and alcohol disorders, and adjustment disorders had shorter hospitalizations" (Pavkov, et al., 1997, p.221). In their work, Pavkov, et al., (1997) point out that, "Some investigators have speculated that the length of hospitalization is dependent upon the type and array of community-based services available in different geographic locations" (p.222).

Interestingly, the work by Grinshpoon, Shershevsky, Levinson, and Ponozovsky (2003) in Israel on a population of long term stay patients, of whom 70% were schizophrenic with an ICD-10 diagnosis, supports the notion that residential treatment does in fact save inpatient hospitalization time. "...(1) only one out of three residents was rehospitalized, (2) and whenever hospitalization was needed, the inpatient stay was substantially shorter" (Grinshpoon, et al., 2003, p.272). Unfortunately, the study did not assess the levels of functioning attained or not attained by the patients who were transferred from inpatient to residential care. The primary goal of treatment should be the improvement of patient functioning using the most effective means available, regardless of whether the means which achieve the goal are inpatient hospitalization, outpatient treatment options, or a combination. The study provides evidence that the

"...rehospitalized residents tended to be younger at first-in-life hospitalization ... than their nonhospitalized counterparts..." (p.272).

A note of caution was included by Grinshpoon, et al. (2003). "However, we are aware that the overall cost of community care is higher than the cost of running the residences, because services that were provided within the hospital are now only available outside of the hospitals... a more rigorous design comparing direct and indirect expenditures in hospital and community is required to answer this question" (p.272). This indication that there is a lack of overall cost benefit analysis between residential, community, and inpatient costs is a concern. Work would need to be completed first to determine which methods of treatments are most effective in terms of different diagnoses. Second, the costs of different methods of treatment would have to be determined. Third, the cost and benefit of each treatment would have to be laid out and analyzed in order to give a more definitive answer to the question, Should long term hospitalized patients remain hospitalized or should they be moved to residential or community treatment options? This particular research doesn't truly answer this question. It tells us that residential and community treatment options save inpatient hospital days. The real question is, at what cost does the saving of inpatient days come?

Research completed by Kunik, Edwards, Molinari, Hale, and Orengo (2001) on geriatric patients specifically suffering from dementia show support for decreasing length of stay. Although the length of stay considered in this particular study could be construed as a long length of stay in general, "a length of stay beyond 20 days rather than beyond 30 days, as previously required' (Kunik, et al., 2001, p.376) requires reporting to their chief. This reduction in average length of stay by 10 days did "...indicate that the

cognitive and emotional status of patients discharged since that time are equivalent to those of patients discharged after longer hospital stays" (Kunik, et al., 2001, p.376), suggesting that this reduction did not have any effect on patient outcomes. Although there was a possible change in outpatient services due to, "shortened lengths of stay, geropsychiatry outpatient services were enhanced – for example, a geropychologist was added to the outpatient treatment plan" (Kunik, et al., 2001, p.377). This leaves unanswered the question, did outpatient services increase and at what cost? Was there an increase in readmissions? It would be valuable to know whether the outpatient treatment had to be extended, since it appears that patient outcome remained the same regardless of the change in average length of stay.

Chapter III: Methodology

This section is a review of the methods used to complete this study. The problem this research addresses is whether average length of stay is at all indicative of readmission rate. In other words does average length of hospital inpatient stay explain any variance in the rate of inpatient readmission, defined as an industry standard of readmission within 7 days of discharge or readmission within 30 days of discharge? The following section discusses the participant selection and description, instrumentation, data collection procedures, data analysis, and limitations of this study.

Participant Selection and Description

The population consists of all members of the mental health insurance company, and may be representative of all mental health patients throughout the country. The sample consisted of all claims paid by the mental health insurance company between July 1, 2003 through June 30, 2005 and between January 1, 2005 through December 31, 2006. In the first two experiments all population subgroups were combined in the final experiment the population subgroups were separated.

In order to determine population subgroups first, the claim was assessed by determining if there was a diagnosis for eating disorders, as seen in Appendix A. If the claim did not have a diagnosis for eating disorders, it was examined for diagnosis codes for complex cases, as seen in Appendix B. If the claim was not related to an eating disorder or complex case diagnosis, it was then tested for substance abuse and detoxification diagnosis codes, as seen in Appendix C. If the claim did belong to one of those classifications the claim was then classified as adult general mental health or child

general mental health based upon the age of the patient. The dates selected were based upon convenience as those were the dates which data was readily available to analyze.

Instrumentation

SAS for Windows, version 9.1.3 service pack 4, was used to complete the data analysis.

Data Collection Procedures

The sample consisted of all claims paid by the mental health insurance company between July 1, 2003 through June 30, 2005 and between January 1, 2005 through December 31, 2006. This data is contained in the data warehouse within the mental health insurance company, the data used is based on claims paid. The data were pooled after a minimum of 90 days from the date of service related to the claim to ensure that a limited number of claims would be lost in adjudication. The data sets are limited to those members with an inpatient mental health stay. Access to this data is limited to authorized personnel working within the company which this research was completed.

Limitations

This study is limited to claims data alone, meaning that any inpatient admissions or readmissions which were not paid by the mental health insurance company were not included in the research. This is considered a serious limitation considering the lack of generalizability of the research to all inpatient stays. Readmissions which were not covered by the mental health insurance company are not included in the study. Those people who do not have access to mental health insurance from the mental health insurance company are not included in the study as we do not have any information beyond those claims which the mental health insurance company has paid. It could be

assumed that people who do not have access to mental health insurance will be a population of different demographics and socio-economical status therefore these results in no way should be generalized to a population of non-mental health insured individuals. Another limitation is the short time frame, limiting the variety of claims. Additionally, this study only assesses industry standard 7 day readmissions and 30 day readmissions, but long term affects of inpatient stays in terms of readmission would be of interest. Finally, this research was conducted within a single mental health insurance company.

Summary

The data was divided into length of stay groupings for analysis as described above. The groupings were based on approximate quartiles of the data. The analyses will consisted of fourteen, one-way ANOVAs, comparing the different length of stay groupings to readmission rates at 7 and 30 days. Keeping in mind the limitation that this research was conducted within a single mental health insurance company, the results should be interpreted with caution with regard to generalizability.

Chapter IV: Results

The analysis began with frequencies for days paid to determine groupings for average length of stay. Days paid indicated that stays in length of 2 to 3 days accounted for 30.69% of claims and were assigned Group 1; stays in length of 4 to 5 days accounted for 29.02% of claims and were assigned Group 2; stays in length of 6 to 7 days accounted for 18.4% of claims and were assigned Group 3; and last, stays in length of 8+ days accounted for 21.89% of claims and were assigned to Group 4; as shown in table 1. The data were quartile to allow for more meaningful analysis, exact quartering was not possible so, approximate quartiles were used.

Table 1

Cumulative Percent of Days Paid for All Claims

Days Paid	Frequency	Cumulative Percent
2	12,346	12.99%
3	16,826	30.69%
4	15,028	46.51%
5	12,551	59.71%
6	9,853	70.08%
7	7,636	78.11%
8	4,524	82.87%
9	3,101	86.13%
10	2,411	88.67%
11	1,865	90.63%

Days Paid	Frequency	Cumulative Percent
12	1,434	92.14%
13	1,304	93.51%
14	1,183	94.76%
15	746	95.54%
16	583	96.16%
17	508	96.69%
18	479	97.20%
19	336	97.55%
20	314	97.88%
21	293	98.19%
22	172	98.37%
23	170	98.55%
24	151	98.71%
25	130	98.84%
26	104	98.95%
27	109	99.07%
28	109	99.18%
29	102	99.29%
30	134	99.43%
31	60	99.49%
32	39	99.53%
33	25	99.56%

Days Paid	Frequency	Cumulative Percent
34	37	99.60%
35	40	99.64%
36	42	99.69%
37	16	99.70%
38	28	99.73%
39	11	99.74%
40	25	99.77%
41	21	99.79%
42	17	99.81%
43	14	99.83%
44	15	99.84%
45	73	99.92%
46	2	99.92%
47	4	99.92%
48	8	99.93%
49	7	99.94%
50	12	99.95%
51	8	99.96%
52	3	99.96%
53	1	99.97%
55	4	99.97%
57	2	99.97%

Days Paid	Frequency	Cumulative Percent
58	2	99.97%
59	2	99.98%
60	3	99.98%
61	2	99.98%
63	1	99.98%
66	2	99.98%
68	4	99.99%
70	2	99.99%
73	1	99.99%
77	1	99.99%
87	1	99.99%
110	3	100%
124	3	100%

Frequency distribution information for claims data from July 1, 2003 through June 30, 2005 revealed that 30,782 claims were for adult general mental health, 4,391 claims were for complex cases, 10,109 claims were for child general mental health, 10,973 claims were for substance abuse & detoxification, and 364 claims were for eating disorders, as indicated in table 2. Frequency distribution information for claims data from January 1, 2005 through December 31, 2006 revealed that 20,841 claims were for adult general mental health, 3,084 claims were for complex cases, 6,550 claims were for child

general mental health, 7,662 claims were for substance abuse & detoxification, and 287 claims were for eating disorders, also indicated in table 2.

Table 2

Comparison of the Number of Claims for Each Subpopulation Based on Claim Time Period

Time Period	Eating Disorders	Complex Cases	Substance Abuse & Detoxification	Adult General Mental Health	Child General Mental Health
July 1, 2003 through June 30, 2005	364	4,391	10,973	30,782	10,109
January 1, 2005 through December 31, 2006	287	3,084	7,662	20,841	6,550
Total Claims	651	7,475	18,635	51,623	16,659

Fourteen One-Way Analyses of Variance (ANOVA) were completed. They included two on the claims from July 1, 2003 through June 30, 2005, two on claims from January 1, 2005 through December 31, 2006, and ten on the combined claims of July 1, 2003 through June, 30 2005 and January 1, 2005 through December 31, 2006 which were separated by diagnosis code into population subgroups, to determine if different population subgroups have different needs regarding length of stay in relation to readmission rates.

The following are the results of three sets of one-way ANOVA on the inpatient hospital stay claims data collected at CIGNA Behavioral Health. The first two one-way ANOVA are completed on claims data July 1, 2003 to June 30, 2005, the second two one-way ANOVA are completed on claims data January 1, 2005 to December 31, 2006 in order to show repeatability of the results of the first two ANOVA. The third set of ANOVA is on the combined claims data found in the first two sets of ANOVA, separated out by population. This separation by population is an attempt to ascertain the effects of the days paid groupings on different populations. The goal of all three sets of analyses is to ascertain the effects of the length of inpatient stay on readmission rates at 7 days and 30 days.

Cohort July 1, 2003 – June 30, 2005

The first set of one-way ANOVA was completed on data ranging July 1, 2003 to June 30, 2005. As stated earlier, the groupings of days paid were used in the analyses to compare shorter lengths of stay to longer lengths of stay, to determine whether there was an effect on readmission rates at 7 and 30 days. The data set included 56,619 observations. The results for readmission rates at 7 days indicate $F\ (3, 56615) = 14.34$, $p < .01$, as indicated in Table 3. Group 1 had 17,690 observations *(M = .089),* Group 2 had 16,280 observations *(M = .082),* Group 3 had 10,199 observations *(M = .086),* and Group 4 had 12,450 observations *(M = .104).* Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. Significant results included; Group 4 to Group 1, Group 4 to Group 3, Group 4 to Group 2, and Group 1 to Group 3, as indicated in Table 4.

Table 3

One-Way ANOVA for Days Paid Groups and Readmission Rate at 7 Days July 1, 2003 to June 30, 2005

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	3.51	1.17	14.34	<.0001**
Error	56,615	4,623.16	.082		
Corrected Total	56,618	4,626.67			

* $p < .05$ ** $p < .01$

Table 4

HSD Comparisons Days Paid Groups and Readmission Rate at 7 Days for July 1, 2003 to June 30, 2005

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 4 - Group 1	.015	.007	.024*
Group 4 - Group 3	.017	.008	.027*
Group 4 - Group 2	.022	.013	.030*
Group 1 - Group 3	.002	-.007	.011*
Group 1 - Group 2	.006	-.002	.014
Group 3 – Group 2	.004	-.005	.013

* $p < .05$ ** $p < .01$

The results for readmission rates at 30 days indicate $F\ (3, 56615) = 31.72$, $p <$ .01, as indicated in Table 5. Group 1 had 17,690 observations ($M = .136$), Group 2 had 16,280 observations ($M = .135$), Group 3 had 10,199 observations ($M = .148$), and Group

4 had 12,450 observations ($M = .171$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. Significant results included; Group 4 to Group 3, Group 4 to Group 1, Group 4 to Group 2, Group 3 to Group 1, and Group 2 to Group 3, as indicated in Table 6.

Table 5

One-Way ANOVA for Days Paid Groups and Readmission Rate at 30 Days for July 1, 2003 to June 30, 2005

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	11.84	3.95	31.72	<.0001**
Error	56,615	7,048.08	.12		
Corrected Total	56,618	7,059.93			

* $p < .05$ ** $p < .01$

Table 6

HSD Comparisons Days Paid Groups and Readmission Rate at 30 Days for July 1, 2003 to June 30,2005

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 4 – Group 3	.023	.011	.036*
Group 4 – Group 1	.036	.025	.046*
Group 4 – Group 2	.036	.025	.047*
Group 3 – Group 4	-.023	-.036	-.011*
Group 3 – Group 1	.012	.001	.024*

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 3 – Group 2	.012	-001	.024*
Group 1 – Group 2	.000	-.009	.010

* $p < .05$ ** $p < .01$

Cohort January 1, 2005 to December 31, 2006

The second set of one-way ANOVA was completed on data ranging January 1, 2005 to December 31, 2006. The groupings of days paid as stated previously in the methods section were used in analysis to compare shorter lengths of stay to longer lengths of stay to determine if there was an effect on readmission rates at 7 and 30 days. The data set included 38,424 observations. The results for readmission rates at 7 days indicate $F\ (3,\ 38420) = 10.67, p < .01$, as indicated in Table 7. Group 1 had 11,482 observations ($M = .093$), Group 2 had 11,299 observations ($M = .087$), Group 3 had 7,290 observations ($M = .097$), and Group 4 had 8,353 observations ($M = .110$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. Significant results included; Group 4 to Group 3, Group 4 to Group 1, and Group 4 to Group 2, as indicated in Table 8.

Table 7

One-Way ANOVA for Days Paid Groups and Readmission Rate at 7 Days for January 1, 2005 to December 31, 2006

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	2.78	.93	10.67	<.0001**
Error	38,420	3,336.09	.09		
Corrected Total	38,423	3,338.87			

* $p < .05$ ** $p < .01$

Table 8

HSD Comparisons Days Paid Groups and Readmission Rate at 7 Days January 1, 2005 to December 31, 2006

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 4 – Group 3	.014	.001	.026*
Group 4 – Group 1	.017	.007	.028*
Group 4 – Group 2	.024	.013	.034*
Group 3 – Group 1	.004	-.007	.015
Group 3 – Group 2	.010	-.001	.021
Group 1 – Group 2	.006	-.004	.016

* $p < .05$ ** $p < .01$

The results for readmission rates at 30 days indicate $F\ (3, 38420) = 26.28$, $P < .01$, as indicated in Table 9. Group 1 had 11,482 observations ($M = .139$), Group 2 had 11,299 ($M = .146$), Group 3 had 7,290 observations ($M = .097$), and Group 4 had 8,353

observations ($M = .110$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. Significant results included; Group 4 to Group 3, Group 4 to Group 2, Group 4 to Group 1, Group 3 to Group 2, Group 3 to Group 1, and Group 1 to Group 3, as indicated in Table 10.

Table 9

One-Way ANOVA for Days Paid Groups and Readmission Rate at 30 Days for January 1, 2005 to December 31, 2006

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	10.35	3.45	26.28	<.0001**
Error	38,420	5,043.79	.13		
Corrected Total	38,423	5,054.14			

* $p < .05$ ** $p < .01$

Table 10

HSD Comparisons Days Paid Groups and Readmission Rate at 30 Days January 1, 2005 to December 31, 2006

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 4 – Group 3	.017	.002	.032*
Group 4 – Group 2	.035	.022	.049*
Group 4 – Group 1	.042	.029	.056*
Group 3 – Group 2	.018	.004	.032*
Group 3 – Group 1	.025	.011	.039*
Group 2 – Group 1	.007	-.005	.019

* $p < .05$ ** $p < .01$

Combined Cohorts

The third set of one-way ANOVA was completed on the combined cohorts of data ranging July 1, 2003 to June 30, 2005 and January 1, 2005 to December 31, 2006. The groupings of days paid as stated previously in the methods section were used in analysis to compare shorter lengths of stay to longer lengths of stay to determine if there was an effect on readmission rates at 7 and 30 days. The analysis was conducted by populations and they were divided out by Adult General Mental Health, Child General Mental Health, Eating Disorders, Complex Cases, and Substance Abuse & Detoxification.

Adult General Mental Health

The data set Adult General Mental Health included 51,622 observations. The results for readmission rates at 7 days indicate $F\ (3,\ 51619) = 18.83$, $p < .01$, as indicated in Table 11. Group 1 had 15,587 observations ($M = .087$), Group 2 had 13,575 observations ($M = .087$), Group 3 had 9,519 observations ($M = .091$), and Group 4 had 12,942 ($M = .110$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. Significant results included; Group 4 to Group 3, Group 4 to Group 1, and Group 4 to Group 2, as indicated in Table 12.

Table 11

One-Way ANOVA for Adult General Mental Health Population Days Paid Groups and. Readmission Rate at 7 Days

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	4.80	1.60	18.83	<.0001**
Error	51,619	4,382.23	.08		
Corrected Total	51,622	4,387.03			

* $p < .05$ ** $p < .01$

Table 12

HSD Comparisons Adult General Mental Health Population Days Paid Groups and Readmission Rate at 7 Days

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 4 – Group 3	.019	.009	.029*
Group 4 – Group 1	.023	.014	.032*
Group 4 – Group 2	.023	.014	.003*
Group 3 – Group 1	.004	-.006	.013
Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 3 – Group 2	.004	-.006	.014
Group 1 – Group 2	.000	-.008	.009

* $p < .05$ ** $p < .01$

The results for readmission rates at 30 days indicate $F\ (3,\ 51619) = 48.69$, $p < .01$, as indicated in Table 13. Group 1 had 15,587 observations ($M = .133$), Group 2 had 13,575 observations ($M = .148$), Group 3 had 9,519 observations ($M = .160$), and Group 4 had 12,942 observations ($M = .184$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. Significant results included; Group 4 to Group 3, Group 4 to Group 2, Group 4 to Group 1, Group 3 to Group 1, and Group 2 to Group 1, as indicated in Table 14.

Table 13

One-Way ANOVA for Adult General Mental Health Population Days Paid Groups and Readmission Rate at 30 Days

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	19.09	6.36	48.69	<.0001*
Error	51,619	6,746.67	.13		
Corrected Total	51,622	6,765.76			

* $p < .05$ ** $p < .01$

Table 14

HSD Comparisons Adult General Mental Health Population Days Paid Groups and Readmission Rate at 30 Days

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 4 – Group 3	.024	.012	.037*
Group 4 – Group 2	.036	.025	.048*
Group 4 – Group 1	.051	.040	.062*

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 3 – Group 2	.012	-.000	.025
Group 3 – Group 1	.027	.014	.039*
Group 2 – Group 1	.014	.003	.025*

* $p < .05$ ** $p < .01$

Complex Cases

The data set Complex Cases included 7,475 observations. The results for readmission rates at 7 days indicate $F\ (3,\ 7471) = 3.04$, p = .03, as indicated in Table 15. Group 1 had 1,615 observations ($M = .099$), Group 2 had 1,722 observations ($M = .070$), Group 3 had 1,366 observations ($M = .089$), and Group 4 had 2,772 observations ($M = .090$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. The only significant pair was between Group 1 to Group 2, as indicated in Table 16.

Table 15

One-Way ANOVA for Complex Cases Population Days Paid Groups and Readmission Rate at 7 Days

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	.73	.24	3.04	.03*
Error	7,471	597.70	.08		
Corrected Total	7,747	598.43			

* $p < .05$ ** $p < .01$

Table 16

HSD Comparisons Complex Case Population Days Paid Groups and Readmission Rate at 7 Days

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 1 – Group 4	.008	-.015	.031
Group 1 –Group 3	.010	-.017	.036
Group 1 – Group 2	.028	.003	.053*
Group 4 – Group 3	.002	-.022	.026
Group 4 – Group 2	.020	-.002	.042
Group 3 – Group 2	.018	-.008	.045

* $p < .05$ ** $p < .01$

The results for readmission rates at 30 days indicate $F\ (3,\ 7471) = 1.22$, $p = .30$, as indicated in Table 17. Group 1 had 1,615 observations ($M = .143$), Group 2 had 1,722 observations (M=.124), Group 3 had 1,366 observations ($M = .089$), and Group 4 had 2,772 observations ($M = .142$). Tukey's Studentized Range (HSD) was not completed for this population as the results of the one-way ANOVA are not significant.

Table 17

One-Way ANOVA for Complex Cases Population Days Paid Groups and Readmission Rate at 30 Days

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	.043	.14	1.22	.30
Error	7,471	885.47	.12		
Corrected Total	7,747	885.90			

* $p < .05$ ** $p < .01$

Child General Mental Health

The data set Child General Mental Health included 16,659 observations. The results for readmission rates at 7 days indicate $F\ (3,\ 16655) = 15.25, p < .01$, as indicated in Table 18. Group 1 had 4,189 observations ($M = .073$), Group 2 had 4,891 observations ($M = .072$), Group 3 had 3,798 observations ($M = .086$), and Group 4 had 3,781 observations ($M = .109$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. Significant results included; Group 4 to Group 3, Group 4 to Group 1, and Group 4 to Group 2, as indicated in Table 19.

Table 18

One-Way ANOVA for Child General Mental Health Population Days Paid Groups and Readmission Rate at 7 Days

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	3.53	1.18	15.25	<.0001*
Error	16,655	1285.47	.12		
Corrected Total	16,658	1289.00			

* $p < .05$ ** $p < .01$

Table 19

HSD Comparisons Child General Mental Health Population Days Paid Groups and Readmission Rate at 7 Days

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 4 – Group 3	.023	.006	.039*
Group 4 – Group 1	.036	.020	.052*
Group 4 – Group 2	.037	.021	.052*
Group 3 – Group 1	.013	-.003	.029
Group 3 – Group 2	.014	-.002	.029
Group 1 – Group 2	.000	-.014	.016

* $p < .05$ ** $p < .01$

The results for readmission rates at 30 days indicate $F\ (3,\ 16655) = 36.46$, $P < .01$, as indicated in Table 20. Group 1 had 4,189 observations ($M = .118$), Group 2 had 4,891 observations ($M = .116$), Group 3 had 3,798 observations ($M = .147$), Group 4 had 3,781 observations ($M = .186$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. Significant results included; Group 4 to Group 3, Group 4 to Group 1, Group 4 to Group 2, Group 3 to Group 1, and Group 3 to Group 2, as indicated in Table 21.

Table 20

One-Way ANOVA for Child General Mental Health Population Days Paid Groups and Readmission Rate at 30 Days

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	13.06	4.35	36.46	<.0001*
Error	16,655	1,988.89	.12		
Corrected Total	16,658	2,001.95			

* $p < .05$ ** $p < .01$

Table 21

HSD Comparisons Child General Mental Health Population Days Paid Groups and Readmission Rate at 30 Days

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 4 – Group 3	.039	.018	.059*
Group 4 – Group 1	.068	.048	.089*
Group 4 – Group 2	.070	.051	.089*
Group 3 – Group 1	.029	-.009	.049*
Group 3 – Group 2	.031	-.012	.051*
Group 1 – Group 2	.002	-.017	.021

* $p < .05$ ** $p < .01$

Substance Abuse and Detoxification

The data set Substance Abuse and Detoxification included 18,635 observations. The results for readmission rates at 7 days indicate $F\ (3,\ 18631) = 3.27, p < .05$, as

indicated in Table 22. Group 1 had 7,675 observations ($M = .103$), Group 2 had 7,283 observations ($M = .088$), Group 3 had 2,690 observations ($M = .095$), and Group 4 had 987 observations ($M = .087$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. The only significant result was between Group 1 to Group 2, as indicated in Table 23.

Table 22

One-Way ANOVA for Substance Abuse and Detoxification Population Days Paid Groups and Readmission Rate at 7 Days

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	.85	.28	3.27	.02*
Error	18,631	1,609.94	.09		
Corrected Total	18,634	1,610.78			

* $p < .05$ ** $p < .01$

Table 23

HSD Comparisons Substance Abuse and Detoxification Population Days Paid Groups and Readmission Rate at 7 Days

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 1 – Group 3	.008	-.009	.025
Group 1 – Group 2	.014	.002	.027*
Group 1 – Group 4	.016	-.009	.042
Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 3 – Group 2	-.006	-.011	.023
Group 3 – Group 4	.008	-.020	.036
Group 2 – Group 4	.002	-.024	.027

* $p < .05$ ** $p < .01$

The results for readmission rates at 30 days indicate $F\ (3,\ 18631) = 2.61, p = .05$, as indicated in Table 24. Group 1 had 7,675 observations ($M = .153$), Group 2 had 7,283 observations ($M = .144$), Group 3 had 2,690 observations ($M = .153$), and Group 4 had 987 observations ($M = .124$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. No significant results were found between any of the groups indicating there is no real significant difference.

Table 24

One-Way ANOVA for Substance Abuse and Detoxification Population Days Paid Groups and Readmission Rate at 30 Days

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	.99	.33	2.61	.05*
Error	18,631	2,353.75	.13		
Corrected Total	18,634	2,354.74			

* $p < .05$ ** $p < .01$

Eating Disorders

The data set Eating Disorders included 651 observations. The results for readmission rates at 7 days indicate $F\ (3,\ 647) = .54$, $p = .65$, as indicated in Table 25. Group 1 had 106 observations ($M = .160$), Group 2 had 108 observations ($M = .166$), Group 3 had 116 observations ($M = .137$), and Group 4 had 321 observations and ($M = .124$). Tukey's Studentized Range (HSD) was not completed as the results were not significant.

Table 25

One-Way ANOVA for Eating Disorders Population Days Paid Groups and Readmission Rate at 7 Days

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	.20	.07	.54	.65
Error	647	78.08	.12		
Corrected Total	650	78.28			

* $p < .05$ ** $p < .01$

The results for readmission rates at 30 days indicate $F\ (3,\ 647) = 2.59$, $p = .05$, as indicated in Table 26. Group 1 had 106 observations ($M = .179$), Group 2 had 108 observations ($M = .222$), Group 3 had 116 observations ($M = .275$), and Group 4 had 321 observations ($M = .161$). Tukey's Studentized Range (HSD) was then completed to determine significance within specific comparisons. The only significant result was between Group 3 to Group 4, as indicated in Table 27.

Table 26

One-Way ANOVA for Eating Disorders Population Days Paid Groups and Readmission Rate at 30 Days

Source	*Df*	*SS*	*MS*	*F*	*p*
Days Paid Grouped	3	1.21	.40	2.59	.05*
Error	647	101.01	.16		
Corrected Total	650	102.22			

* $p < .05$ ** $p < .01$

Table 27

HSD Comparisons Eating Disorders Population Days Paid Groups and Readmission Rate at 30 Days

Days Paid Group Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
		Lower Bound	Upper Bound
Group 3 – Group 2	.054	-.082	.190
Group 3 – Group 1	.097	-.040	.233
Group 3 – Group 4	.114	.004	.224*
Group 2 – Group 1	.043	-.096	.182
Group 2 – Group 4	.060	-.053	.173
Group 1 – Group 4	.017	-.097	.131

* $p < .05$ ** $p < .01$

Chapter V: Discussion

The research question, as stated in the beginning of this research report was: is there a difference in readmission rates based on length of stay? The results indicate yes, there is a difference. The shortest stay group and the longest stay group were at greater risk for readmission than the middle two groups. The questions remain, was the shortest stay group under treated? Was the longest stay group at such instability that the likelihood of readmission is so great that it can not be avoided?

The results for Cohort July 1, 2003 – June 30, 2005 and Cohort January 1, 2005 to December 31, 2006 show similar trending, indicating that the repeatability of the results with similar trending and results is possible, in both cases the significant pairings for 7 day readmission rates were Group 4 to Group 1, Group 4 to Group 3, Group 4 to Group 2, shown in Table 4 & Table 8. One explanation for this is that the longest stay group is just so instable that readmission can not be avoided, thus why it is significantly different from each of the other groups.

Similar to the 7 day readmission rate trending, the 30 day readmission rates show significant differences in both cohorts between Group 4 and Group 3, Group 4 and Group 1, Group 4 and Group 2, Group 3 and Group 1, and Group 3 and Group 2. Once again, the instability and illness level of the longest stay may be so great that readmission is simply more likely. In addition, Group 3 shows significant differences from all other groups, although in this case there was a difference between the two cohorts' mean rates for 30 day readmissions. In the cohort July 1, 2003 - June 30, 2005, Group 3 had the second highest mean rate. One question raised is whether this group is also suffering from the same problems as the longest stay group, but taking longer for the group to

return to inpatient hospitalization. In contrast, the cohort January 1, 2005 – December 31, 2006, Group 3 had the lowest mean rate for 30 readmissions, thus making it the least likely group to be readmitted. This presents a definite contradiction between cohorts. One possible explanation is that outpatient follow-up is possibly better for this group during this time period; possibly the more ill are being pushed into the groupings either longer or shorter than that of Group 3.

In the adult mental health subpopulation, readmission is likely related to a longer stay rather than a shorter stay, as seen in their mean readmission rate for 7 day readmission. This may seem contradictory but it could be explained by severity of illness. Those with more severe illness have a longer inpatient stay. Additionally, the 30 day readmission rate for adult general mental health shows a similar trending. The significant difference between the means involved the group with the longest length of stay or Group 4, and the group with the shortest length of stay, or Group 1. Possible explanations could be that Group 1, the shortest stay group, is not getting enough inpatient hospital time to sufficiently stabilize the patient to allow follow-up treatment to be effective, or follow-up treatment methods may not be sufficiently effective. Conversely, Group 4, the longest stay group, is most likely severely ill, elderly, having co- morbid conditions, or a combination and is likely to be readmitted until new treatment options are found to better serve this population.

The child general mental health subpopulation showed similar results as those of the adult general mental health subpopulation at 7 day readmission rates, with significant results falling to comparisons related to Group 4, the longer length of stay group.

However, for the 30 day readmission rates the child general mental population showed significant differences between all four groups.

The days paid grouping as applied to the complex cases of eating disorders and substance abuse and detoxification was not approximately quartile, as post hoc frequency data show. For example, complex cases was divided into Group 1, N=1,615, (21.6%), Group 2, N=1,722 (23.0%), Group 3, N=1,366 (18.3%), Group 4, N=2,772 (37.1%). A higher proportion of observations in Group 4 could certainly have a negative impact on the analyses; this discrepancy may explain why the results did not show as many significant differences between groupings as adult general mental health or child general mental health subpopulations. It is interesting, however, to note the distribution of complex cases showing a longer length of stay in contrast to the other subpopulations.

Contrary to complex cases, the substance abuse and detoxification subpopulation had higher proportions in the shorter lengths of stay groups. Post hoc analysis showed Group 1, N=7,675 (41.2%), Group 2, N=7,283 (39.1%), Group 3, N=2,690 (14.4%), Group 4, N=987 (5.3%). The higher proportions in Group 1 and 2 may have had a negative impact on the analyses, which may be why the results did not show as many significant comparisons between groupings of days paid for the particular subpopulation when compared to adult general mental health or child general mental health subpopulations. It is likely that substance abuse and detoxification treatment is largely done at the intensive outpatient level which would explain why the stays are shorter in most cases when compared to the other populations.

Similar to complex cases and contrary to substance abuse and detoxification, the eating disorder subpopulation was distributed heavily into the longer stay Group 4. Post

hoc analysis shows Group 1, N=106 (16.3%), Group 2, N=108 (16.6%), Group 3, N=116 (17.8%), Group 4, N=321 (49.3%). The greatest distribution, at almost 50% of the observations in the longest stay grouping, indicates that the longer stays are necessary in proper treatment of eating disorders. This unequal distribution may be one cause of non-significant comparisons in analyses, due to the insensitivity of the method used in grouping these observations for analysis.

Limitations

The study is limited to the membership of the mental health insurance company examined and those members who had paid claims between July 1, 2003 to June 30, 2005 and January 1, 2005 to December 31, 2006. These dates were chosen as a matter of convenience as the data were readily available for analysis at this time. This research was conducted on claims data within a single mental health insurance company; therefore the results of this study should be interpreted with caution.

There is limited ability to generalize the overall results of the first two sets of ANOVA to individual subpopulations such as complex cases, eating disorders, and substance abuse and detoxification. This conclusion is indicated by the third set of ANOVA completed on separate populations. One likely reason these limitations exist is that the method used to divide the observations into groupings by days paid was not sensitive enough to account for the individual population distribution variance. Longer lengths of stay are needed to treat the more severely ill such as those with eating disorders and complex cases. Lesser readmission rates for substance abuse and detoxification could be explained by the commonality of intensive outpatient treatment.

Moreover, it is not known what type of follow-up care was received by the inpatients after discharge. It would be interesting to see the types of follow-up care that patients used and the engagement rates in these follow-up care methods. This would help to determine at what levels they are effective at treating the conditions after discharge and the resulting effects on inpatient readmission.

Conclusions

As work with cohorts from 1988 to 1996 by Liberman, et al. (1998) suggested, the longer lengths of stay had higher readmission rates, as did the shorter lengths of stay. This finding is in agreement with what was also found in the work concluded here, with the longest and the shortest lengths of stay showing the most likely chances for readmission. This conclusion was arrived at after analysis of two cohorts of large data sets. This lends to the validity of the statement; that more research should be done to investigate how average length of stay affects readmission.

Work done by Case, et al. (2007) suggests that cases which are more complex should not be targeted for reduced lengths of stay. This is in agreement with the analyses done on subpopulations, showing the need for longer lengths of stay to treat the more severely ill. The effects of various treatment methods on different subpopulations would be valuable to determine the best methods of treatment for various diagnosis types.

When antidepressant prescriptions are new to patients more time should be given to ensure there are no issues with the patient before discharge, as suggested by Lyketsos, et al. (2002). This is a concern for the general mental health subpopulations of adults and especially children, who are most vulnerable to the effects of antidepressants when they

are a new prescription medication. Research should be done to determine if the length of time such patients spend as inpatients is sufficient given the situation.

Recommendations

Average length of stay is a confusing and often heated topic within the mental health care community. The belief that we are doing a service to our patients, members, or clients by limiting their length of hospital stay in favor of outpatient or partial hospitalization methods of treatment is complicated, to say the least. Further research should be conducted to help define the cost of inpatient treatment versus outpatient treatment or partial hospitalization by measuring the total cost of treatment and the relative success of the treatment method, measured in part by readmission to the same or similar treatment methods.

Further research on length of stay and readmission rates should take into account the different subpopulations and employ methods to test hypotheses that are sensitive to those subpopulations. In hindsight the methods used in this research were not sensitive enough to individual populations but they did lend to overall knowledge of the effects of length of stay on readmission rates in a large scale manner. Further scrutiny should be focused on the variances found within the subpopulations and why those variances exist. That a length of stay can vary from 2 days to 124 days seems very unusual and contradictory. Although each case varies in complexity, treating eating disorders should likely have a longer length of stay than treating an adult with generalized depression and no other complications.

The exclusion of the severely ill from experiments could be detrimental to the results as this is the area where the most ground could possibly be gained considering that

the more severely ill the patient the more likely they will be readmitted. Additionally, work done in general mental health for adults and children should be examined more thoroughly to ensure that the possibility of adding a day to an inpatient stay might possibly reduce costs and better sever the patient rather than increasing costs without benefit. More research should be done on outpatient programs to examine the transferability of successful programs to areas in need of improvements.

This continued research is important for the improvement of the quality of care provided to mental health patients and clients. It is needed to determine cost containment measures, create standards for care better based upon the particular needs of the patient, and to ensure compliance of outpatient treatment and follow-up methods post discharge. The quality of care is the responsibility of all those involved. It does not end with the attending physician.

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Appendix A: Diagnostic Codes for Eating Disorders

Diagnosis Code	Description
307.1	Anorexia Nervosa
307.5	Other / Unspecified Eating Disorder
307.51	Bulimia
307.52	PICA
307.53	Psychogenic Rumination
307.59	Other Disorders Eating

Appendix B: Diagnostic Codes for Complex Cases

Diagnosis Code	Description
290	Senile/Presenile Psychosis
290.1	Presenile Dementia
290.11	Presenile Dementia w/ Delirium
290.12	Presenile Dementia w/ Delusional Features
290.13	Presenile Dementia w/ Depressive Features
290.2	Senile Dementia w/ Delusional or Depressive Features
290.21	Senile Dementia w/ Depressive Features
290.3	Senile Dementia w/ Delirium
290.4	Arteriosclerotic Dementia
290.41	Arteriosclerotic Dementia Delirium
290.42	Arteriosclerotic Dementia Delusion
290.43	Arteriosclerotic Dementia Depressive
293	Transient Organic psychosis
293.81	Organic Delusional Syndrome
293.82	Organic Hallucinations Syndrome
293.83	Organic Affective Syndrome
293.84	Organic Anxiety Syndrome
293.89	Transient Organic Mental Other
293.9	Transient Organic Mental Unspecified
294	Other Organic Psychosis
294.1	Dementia Conditions Class Elsewhere

Diagnosis Code	Description
294.8	Organic Brain Syndrome Other
294.9	Organic Brain Syndrome Unspecified
295.1	Disorganized Schizophrenia
295.2	Catatonic Type Schizophrenia
295.3	Paranoid Type Schizophrenia
295.4	Acute Schizophrenic Episode
295.6	Residual Schizophrenia
295.7	Schizoaffective Schizophrenia
295.9	Unspecified Schizophrenia
297.1	Paranoia
297.3	Shared Paranoid Disorder
298.8	React Psychosis Other
298.9	Psychosis Unspecified
299	Psychosis Origin Childhood
299.1	299.1 Disintegrative Psychosis
299.8	299.8 Other Early Childhood Psychosis
302.2	Pedophilia
302.3	Transvestism
302.4	Exhibitionism
302.6	Psychosexual Identity Disorder
302.7	Psychosexual Dysfunction
302.71	Inhibited Sexual Desire

Diagnosis Code	Description
302.72	Inhibited Sexual Excitement
302.73	Inhibited Female Orgasm
302.74	Inhibited Male Orgasm
302.75	Premature Ejaculation
302.76	Functional Dyspareunia
302.79	Psychosexual Dysfunction Other
302.81	Fetishism
302.82	Voyeurism
302.83	Sexual Masochism
302.84	Sexual Sadism
302.85	Gender Identity Disorder Adult
302.89	Psychosexual Disorder Other
302.9	Psychosexual Disorder Unspecified
306.51	Psychogenic Vaginismus
307	Special Symptoms Syndromes
307.2	Tics
307.21	Transient Tic Childhood
307.22	Chronis Motor Tic Disorder
307.23	Gilles Tourette's Disorder
307.3	Stereotyped Movements
307.42	Persistent Insomnia
307.44	Persistent Hypersomnia

Diagnosis Code	Description
307.46	Somnambulism/ Night Terror
307.47	Sleep Stage Dysfunction Other
307.6	Enuresis
307.7	Encopresis
307.8	Psychalgia
307.89	Other Psychalgia
307.9	Special Symptom Other
312.3	Other Impulse Control Disorder
312.31	Path Gambling
312.32	Kleptomania
312.33	Pyromania
312.34	Intermittent Explosive Disorder
315	Specific Delays Development
315.1	Arithmetical Disorder
315.2	Other Learning Disorder
315.31	Development Language Disorder
315.32	Receptive Language Disorder
315.39	Speech / Language Disorder Other
315.4	Coordination Disorder
315.9	Development Delay Unspecified
316	Psychic Factor w/ Other Disease
317	Mild Mental Retardation

Diagnosis Code	Description
318	Other Mental Retardation
318.1	Severe Mental Retardation
318.2	Profound Mental Retardation
319	Mental Retardation Unspecified
327.01	Insomnia Medical Condition Class Elsewhere
327.02	Insomnia mental Disorder
327.14	Hypersomnia Medical Condition
327.15	Hypersomnia Mental Disorder
327.3	Circadian Rhythm Sleep Disorder
327.31	Circadian Rhythm Sleep Disorder Delayed Phase Type
327.35	Circadian Rhythm Sleep Disorder Jet Lag Type
327.36	Circadian Rhythm Sleep Disorder Shift Work Type
327.44	Parasom Conditions Class Elsewhere
327.8	Other Organic Sleep Disorders
332.1	Secondary Parkinsonism
333.1	Tremor Other
333.7	Symptomatic Torsion Dystonia
333.82	Orofacial Dyskinesia
333.9	Other / Unspecified Extrapyramidal Disorder
333.92	Neuroleptic Malignant Syndrome
333.99	Extrapyramidal Disorder Other
347	Cataplexy & Narcolepsy

Diagnosis Code	Description
607.84	Impotence Organic Origin
608.89	Male Genital Symptoms
625	Female Genital Symptoms
625.8	Female Genital Symptoms Other
780.09	Conscious Alterat. Other
780.57	Sleep Apnea Unspecified
780.9	Other General Symptoms
787.6	Incontinence Feces
799.9	Unknown Cause Morb./Mort. Other
995.2	Adv. Eff. Med. / Biol. Bub. Unspecified
995.52	Child Neglect
995.53	Child Sexual Abuse
995.54	Child Physical Abuse
995.81	Adult Physical Abuse
995.83	Adult Sexual Abuse
V15.81	Hist. Med. Non Compliance
V61.10	Counsel Marital Problem Unspecified
V61.12	Counsel Spousal Abuse Perp.,
V61.20	Counsel Parent Child Prob.
V61.21	Counsel Child Abuse Victim
V61.8	Family Circumstances Other
V61.9	Family Circumstances Unspecified

Diagnosis Code	Description
V62.2	Occupational Circumstances Unspecified
V62.3	Educational Circumstance
V62.4	Social Maladjustment
V62.81	Interpersonal Problem Other,
V62.82	Bereavement Uncomplicated
V62.83	Counsel Physical / Sexual Abuse Perp.
V62.89	Psychological Stress Other
V65.2	Person Feigning Illness
V71.01	Observe Adult Antisocial Behavior
V71.02	Observe Adolescent Antisocial Behavior
V71.09	Observe Mental Condition Other

Appendix C: Diagnostic Codes for Substance Abuse and Detoxification

Diagnosis Code	Description
291	Alcohol Induced Mental Disorders
291.0	Delirium Tremens
291.00	Alcohol Withdrawal Delirium
291.1	Alcohol Amnesic Syndrome
291.10	Alcohol Amnesic Disorder
291.2	Alcoholic Dementia Other
291.20	Dementia Associated with Alcoholism
291.3	Alcohol Hullucinosis
291.30	Alcohol Hullucinosis
291.4	Idiosyncratic Alcohol Intox.,
291.40	Alcohol Idiosyncratic Intoxication
291.5	Alcoholic Jealousy
291.8	Other Alcoholic Psychosis
291.80	Uncomplicated Alcoholic Withdrawal
291.81	Alcohol Withdrawal
291.89	Other Alcoholic Psychosis
291.9	Alcoholic Psychosis Unspecified
292	Drug Induced Mental Disorders
292.0	Drug Withdrawal Syndrome
292.00	Drug Withdrawal
292.01	Opiod Withdrawal

Diagnosis Code	Description
292.02	Sedative Hypnotic Withdrawal
292.03	Cocaine Withdrawal
292.04	Amphetamine Withdrawal
292.11	Drug Induced Paranoid State
292.12	Drug Hallucinosis
292.2	Pathologic Drug Intoxication
292.81	Drug Induced Delirium
292.82	Drug Induced Dementia
292.83	Drug Induced Amnesiac Syndrome
292.84	Drug Induced Depressive Syndrome
292.89	Drug Induced Mental Disorder Other
292.9	Drug Induced Mental Disorder Unspecified
292.90	Unspec. Drug Induced Mental Disorder
303	Alcohol Dependence Syndrome
303.0	Acute Alcoholic Intoxication
303.00	Acute Alcohol Intoxication Unspecified Drinking
303.01	Acute Alcohol Intoxication Cont. Drinking
303.02	Acute Alcohol Intoxication Episodic Drinking
303.03	Acute Alcohol Intoxication Alcoholism Remiss.
303.9	Other/Unspecified Alcohol Dependence
303.90	Other/Unspecified Alcohol Dependence Unspecified
303.91	Alcohol Dep. Other Continuous

Diagnosis Code	Description
303.92	Alcohol Dep. Other Episodic
303.93	Alcohol Dep. Other in Remission
304	Drug Dependence
304.0	Opiate Type Dependence
304.00	Opiate Dependence Unspecified
304.01	Opiate Dependence Continuous
304.02	Opiate Dependence Episodic
304.03	Opiate Dependence Remiss.
304.1	Barbiturate Dependence
304.10	Barbiturate Dependence Unspecified
304.11	Barbiturate Dependence Continuous
304.12	Barbiturate Dependence Episodic
304.13	Barbiturate Remission
304.2	Cocaine Dependence
304.20	Cocaine Dependence Unspecified
304.21	Cocaine Dependence Continuous
304.22	Cocaine Dependence Episodic
304.23	Cocaine Dependence Remission
304.3	Cannabis Dependence
304.30	Cannabis Dependence Unspecified
304.31	Cannabis Dependence Continuous,
304.32	Cannabis Dependence Episodic

Diagnosis Code	Description
304.33	Cannabis Dependence Remission
304.4	Amphetamine Dependence
304.40	Amphetamine Dependence Unspecified
304.41	Amphetamine Dependence Continuous
304.42	Amphetamine Dependence Episodic
304.43	Amphetamine Dependence Remission
304.5	Hallucinogen Dependence
304.50	Hallucinogen Dependence Unspecified
304.6	Other Drug Dependence
304.60	Drug Dependence other Unspecified
304.61	Drug Dependence Other Continuous
304.62	Drug Dependence Other Episodic
304.63	Drug Dependence other In Remission
304.7	Opiate/ Other Drug Dependence
304.70	Opiate/ Other Drug Dependence Unspecified
304.71	Opiate/ Other Drug Dependence Continuous
304.72	Opiate/ Other Drug Dependence Episodic
304.73	Opiate/ Other Drug Dependence Remission
304.8	Multiple Drug Dependence
304.80	Combination Drug Dependence Other Unspecified
304.81	Combination Drug Dependence Other Continuous
304.82	Combination Drug Dependence Other Episodic

Diagnosis Code	Description
304.83	Combination Drug Dependence Other Remission
304.9	Unspecified Drug Dependence
304.90	Unspecified Drug Dependence Unspecified
304.91	Drug Dependence Unspecified Continuous
304.92	Drug Dependence Unspecified Episodic
304.93	Drug Dependence Unspecified Remission
305	Nondependent Abuse Drugs
305.0	Nondependent Abuse Continuous
305.00	Alcohol Abuse Unspecified
305.01	Alcohol Abuse Continuous
305.02	Alcohol Abuse Episodic
305.03	Alcohol Abuse Remission
305.1	Tobacco Use Disorder
305.10	Nicotine Dependence
305.11	Tobacco Disorder Continuous
305.12	Tobacco Disorder Episodic
305.13	Tobacco Disorder Remission
305.2	Nondependent Cannabis Abuse
305.20	Cannabis Abuse Unspecified
305.21	Cannabis Abuse Continuous
305.22	Cannabis Abuse Episodic
305.23	Cannabis Abuse Remission

Diagnosis Code	Description
305.3	Nondependent Hallucinogen Abuse Unspecified
305.30	Hallucinogen Abuse Unspecified
305.31	Hallucinogen Abuse Continuous
305.32	Hallucinogen Abuse Episodic
305.33	Hallucinogen Abuse Remission
305.4	Nondependent Barbiturate Abuse
305.40	Barbiturate Abuse Unspecified
305.41	Barbiturate Abuse Continuous
305.42	Barbiturate Abuse Episodic
305.43	Barbiturate Abuse Remission
305.5	Nondependent Opiate Abuse
305.50	Opiate Abuse Unspecified
305.51	Opiate Abuse Continuous
305.52	Opiate Abuse Episodic
305.53	Opiate Abuse Remission
305.6	Nondependent Cocaine Abuse
305.60	Cocaine Abuse Unspecified
305.61	Cocaine Abuse Continuous
305.62	Cocaine Abuse Episodic
305.63	Cocaine Abuse Remission
305.7	Nondependent Amphetamine Abuse
305.70	Amphetamine Abuse Unspecified

Diagnosis Code	Description
305.71	Amphetamine Abuse Continuous
305.72	Amphetamine Abuse Episodic
305.73	Amphetamine Abuse Remission
305.8	Nondependent Antidepressant Abuse
305.80	Antidepressant Abuse Unspecified
305.82	Antidepressant Abuse Episodic
305.9	Other Nondependent Drug Abuse
305.90	Drug Abuse Unspecified
305.91	Drug Abuse Other Continuous
305.92	Drug Abuse Other Episodic
305.93	Drug Abuse Other Remission