PATIENT LENGTH OF STAY: PREDICTIVE VARIABILITY AMONG FORENSIC AND CIVIL PSYCHIATRIC UNITS AND POPULATIONS

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ABSTRACT

Patient length of stay (LOS) in psychiatric inpatient services has become one of the most popular but least understood measures of treatment efficiency and total cost of care. The initiative to decrease LOS in an effort to reduce total treatment costs will ultimately be more costly, unless LOS predictors are appropriately applied and revised based on individual patient needs to decrease subsequent hospitalizations. Additionally, unit-specific variables such as staff/client ratio, unit size, and treatment approach have a direct impact on unit operations and should be expected to cloud LOS comparisons across facilities. These inherit differences make the prediction of LOS norms in advance more problematic. The present study investigated several patient demographic, clinic, and legal variables as predictors of LOS on forensic and civil psychiatric units at a major metropolitan public hospital. Data on 1,201 patients (forensic n = 767; civil n=434) were collected from the information in medical records routinely collected for quality assurance purposes at a single facility over a 10-year time span (1999-2008). A series of multiple regression analyses were then conducted to determine the best fit prediction equation for each psychiatric unit, and a cross validation approach was utilized to determine the generalizability of those equations.

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CHAPTER 1

INTRODUCTION

Patient length of stay (LOS) in psychiatric inpatient services has become one of the most popular but least understood measures of treatment efficiency and total cost of care. While many professionals consider LOS a futile index of clinical performance (Kirshner, 1982), hospital administrators routinely use the average patient LOS per unit to determine budget changes — sometimes inappropriately using it, not only, as an indicator of the efficiency of treatment, but of the quality of care provided (Blais et al., 2003). Increasing pressure from managed care payers and patient advocacy groups have reinforced the zeitgeist in the inpatient mental health field to decrease LOS in an effort to reduce costs.

LOS is universally recorded with an admission and discharge date, thus making it an easily accessible quantitative measure for statistical purposes (Kirshner, 1982). Unlike medical research, which has successfully used LOS to measure appropriate healing time for specific ailments, surgical procedures, and treatments of physical problems, psychiatric LOS research is further complicated by the interaction of numerous moderating variables (Kirshner, 1982). Harman et al. (2004) discussed the potential problems associated with the use of LOS as an evaluative tool in psychiatric settings, stating that Managed Behavioral Health Organizations (MBHOs) often do not take into account the differences in individual patient characteristics, admission/discharge procedures, and treatment modalities across facilities that could be responsible for the variations in LOS in their networks. Consequently, psychiatric professionals are pressured to conform to capricious norms for LOS that can lead to a patient being released from treatment too soon and requiring rehospitalization (Springer & Paul, 2007).

Historically, LOS researchers have searched for generalizable principles across psychiatric populations while ignoring moderating variables such as unit type, unit size, and patient population, rather than approaching their research from an operations standpoint to aid in decision-making at individual facilities and psychiatric units. The 1990s brought a surge of LOS research in search of specific patient demographic and clinical variables influencing the amount of time a person spent in treatment. What resulted is a large body of research reporting generalized LOS predictors, but little by the way of operational LOS predictors or comparisons of predictors across varying treatment populations.

As a general rule, it can be expected that a patient's chronicity of illness, pre-morbid functioning, socio-economic status, and current level of functioning will directly relate to the course of treatment, patient LOS, and institutional outcome (Paul & Menditto, 1992). More specifically, Huntley et al. (1998) found five factors predicted 17% of variance in LOS in their sample (n=764) drawn from a civil acute unit: a diagnosis of schizophrenia, the number of previous hospital admissions, a diagnosis of a mood disorder, and age all predicted longer LOS, while a secondary diagnosis of substance abuse predicted shorter LOS. A diagnosis of schizophrenia and/or a mood disorder, specifically accompanied with manic behavior, have remained fairly consistent predictors throughout LOS research (Creed, Tomenson, Anthony, & Tramner, 1997), although the predictive power of the variables varies with the population.

Huntley and Associates (1998) note some discrepancies in their research in comparison to the results of previous publications. Specifically, their finding that greater age and number of prior psychiatric admissions leads to longer lengths of stay is largely inconsistent with prior research such as Schumacher and colleagues (1986), who found both variables to be moderate predictors of LOS in a similar sample. The predictability of LOS has been, at best, inconsistent

for a host of other variables as well, including diagnostic-related groups (Creed, Tomenson, Anthony, & Tramner, 1997), medical and psychiatric comorbidity (Sloan, Yokley, Gottesman, & Schubert, 1999), prior hospitalizations (Huntley, Cho, Christman, & Csernansky, 1998), results of various psychological assessments (Blais & Baity, 2005), and patient demographic information (Blais et al., 2003) (see Appendix A).

Inconsistency in LOS research, in addition to the widely held belief by professionals that LOS is a poorly predicted outcome variable (Kirshner, 1982), is likely a consequence of the incorrect patient homogeneity assumption. Researchers making this assumption have cast too wide a net for patient sampling procedures (Burge et al., 2002; Lyons, O'Mahoney, & Larson, 1991) with inclusion of multiple unit types, and disregarding patient population differences. This type of patient sampling provides little utility for future LOS research, and has inadvertently helped support the notion that LOS will always be a poorly predicted static variable (English, Sharfstein, Scherl, Astrachan, & Muszynski, 1986). In addition, researchers making this incorrect assumption of patient homogeneity, therefore ignoring operational variables, have unintentionally helped the managed care organizations to arbitrarily define, and ultimately control, the expected LOS average. Thus private psychiatric hospitals, largely relying on private insurance to fund operations and patient treatment (Hutchins, Frank, & Glied, 2009), often have restrictions placed on a patient's LOS *prior* to treatment and consequently report readmission rates as high as a 70% (Paul & Menditto, 1992).

The initiative to decrease LOS in an effort to reduce total treatment costs will ultimately be more costly, unless LOS predictors are appropriately applied and revised based on individual patient needs to decrease subsequent hospitalizations. Springer and Paul (2007) report that state psychiatric inpatient daily costs have quadrupled in the last 20 years (American Hospital

Statistics 1987, 2007), and attribute the majority of the cost increase to a patient being discharged too soon (i.e. requiring readmission) or staying in treatment longer than necessary (Paul & Mariotto, 1987).

Unit-specific variables such as staff/client ratio, unit size, and treatment approach have a direct impact on unit operations and should be expected to cloud LOS comparisons across facilities. Furthermore, units are often defined by the type of psychiatric population being treated and should be expected to base operations in accordance with the needs of the specified population. It is therefore inappropriate for hospital administrators to assume homogeneity among psychiatric inpatient populations by basing operational decision-making on generalized LOS research. This practice is especially problematic for comparisons across forensic and civil psychiatric units, where legal ramifications drastically impact the design of treatment programs, admission and discharge practices, and the nature of the population.

To date, there are no published research studies directly comparing variables effecting LOS on forensic vs. civil units. Although forensic units vary widely among themselves, forensic units have been historically underrepresented in LOS research. An opportunity to examine variables effecting LOS across such units in the same facility, under the same administration, was provided by the existence of a dataset at Bellevue Hospital Center in New York City. The civil and forensic psychiatric services at Bellevue have an equal number of beds per unit, reducing one of the biggest contributors to unit differences – unit size. Consistencies in administration, unit size, and patient/staff ratios provide an ideal circumstance for LOS comparisons, with treated patient populations on both forensic and civil units being large enough to allow desirable statistical comparisons among predictors of LOS.

The present study examines the need to distinguish between predictors of LOS by using parallel analyses of forensic and civil populations to independently apply demographic, clinical, and legal patient variables to separate prediction equations within each unit type, and will examine the extent to which these prediction equations remain significant when applied to similar samples. This operations-based approach should, not only, demonstrate the inappropriateness of using common LOS predictors across forensic and civil populations and units, but determine whether consistent predictors within each type of unit can aid in decision-making procedures for psychiatric units similar to those used in the present study as well.

CHAPTER 2

METHODS

All data were collected from the information in medical records routinely collected for quality assurance purposes at a single facility over a 10-year time span (1999-2008). Sources of information include, but are not limited to, archival psychological assessment reports, intake assessments, weekly treatment plans, discharge summaries, medical record data provided by other mental health professionals, and legal reports.

Data Collection Site

Bellevue Hospital, a large metropolitan teaching hospital, provides inpatient psychiatric services on 14 units offering a full range of programs, including General (Civil) Psychiatry, Substance Abuse, Geriatric, Child & Adolescent, and Forensic Services. As the nation's oldest public hospital, Bellevue serves the East side of Manhattan and accommodates more than 800 beds, 330 of which are part of the psychiatric service. All 14 psychiatric units are considered acute units offering short-term treatment.

Civil units. Although each of the psychiatric units at Bellevue hold approximately thirty beds, the disproportionate number of civil admissions as compared to the large volume of forensic admissions at this particular hospital required the use of all six general civil units (total 180 beds) for inclusion in the study in order to provide an adequately representative sample. Admission to one of the civil units is generally completed through referral from Bellevue's Comprehensive Psychiatric Emergency Program (CPEP), which provides 24-hour/seven-day a week psychiatric emergency care for individuals considered to be in mental health crisis. Discharge proceedings for these units typically involve post-treatment plans that can take the form of enhanced (voluntary) services or court-mandated community treatment. These plans

include a comprehensive post-discharge treatment plan, arrangements for continued community care, ongoing case management, and monitoring of the patient by an outpatient treatment team.

Forensic units. Unlike the civil units at Bellevue, which offer treatment on both a voluntary and involuntary basis to both males and females, the forensic psychiatric service provides mental health services to male inmates from the New York correctional system who require light-to-maximum security coverage. While both unit types have similar patient/staff ratios, the forensic units are additionally staffed with Department of Correction officers and must abide by guidelines set forth by the New York State Department of Corrections. Unlike most other psychiatric units across the U.S. providing services to forensic patient populations, the forensic units represented in the current study provide acute services to inmates that are pre-arraignment, awaiting trial (i.e. not given bail by the judge at arraignment, or cannot afford to post bail), or serving sentences less than one year at Rikers Island City Jail. Therefore, discharge proceedings for the forensic units at Bellevue are less complicated than typical forensic units, given that most inmates are transferred directly back to Rikers Island to continue the legal proceedings against them or to serve the remainder of their sentence. Such practices are likely to increase the risk of malingering compared to both civil units and free-standing forensic units with direct admissions. Less complicated discharge practices are likely to influence patient LOS for these units as well.

Procedures

During the 10-year time period for data collection, Bellevue hospital updated their medical record system to include electronic records. The transfer of information into the computerized system was ongoing at the time of data collection; therefore many of the participants' electronic records were incomplete. All attempts were made to corroborate recorded

patient information with other available sources of information. In some cases, attention to demographic detail was lacking and it was necessary to refer to older, hard copy medical records to find such information. The total dataset was narrowed by incompleteness of patient information, excluding cases if they did not include 3 or more demographic variables (n = 48).

Forensic populations at this facility are highly motivated to feign serious mental illness in an attempt to serve their sentence in a hospital setting rather than the correctional setting; therefore, new inmates arriving at the forensic inpatient service at Bellevue are interviewed and closely monitored for signs of malingered mental illness before admission. Contingent on the level of sophistication behind the malingering attempt, some inmates successfully gain admission to the psychiatric unit only to be later identified as a malingerer. Therefore, those patients lacking a psychiatric diagnosis, and assigned solely a DSM-IV V-Code of Malingering (V65.2), were excluded from the present study (n = 14).

Additional univariate (LOS days) and multivariate outliers (using Mahalanobis D^2 method) for each type of unit were excluded as follows: Forensic unit univariate outliers (n = 15) with LOS greater than 120 days (e.g. one patient with LOS of 412 days, not representative of an acute unit) or less than 2 days, as well as 47 multivariate outliers; Civil unit univariate outliers (n = 8) with LOS greater than 132 days, and 14 multivariate outliers. Because the forensic units were all male, the females (n < 100) admitted to civil units were also excluded from this study.

Participants. Included in the final dataset were 1,201 males admitted to either of the two forensic (n = 767) or six general psychiatric civil (n = 434) inpatient units during the time period. Given the 10-year span of the data collection, there were several instances (n = 75) where multiple admissions for the same patient were collapsed into a single case, represented as the most recent admission.

Length of stay (LOS). As measured in hospital days, lengths of stay were significantly greater, t (746) = -8.98, $p < .001$, for civil inpatients (M = 43, SD = 22.45) than for forensic inpatients (M = 29, SD = 28.17). These differences as well as the differing discharge criteria, alone, verify that the two types of services should be treated as qualitatively different groups for the purposes of investigating LOS predictors. It should be noted that the differing discharge proceedings of these unit types directly contribute to the amount of time a person spends on the unit before discharge. The discharge process for the civil units is likely to be complicated, therefore prolonged, by potential placement obstacles for the patient's post-treatment care.

Predictor variables. Based on previous LOS research (see Appendix A), a checklist was devised to retroactively identify predictor variables of interest. While all data were derived from archival records that were gathered as part of ongoing clinical and administrative operations, transfer of data from archival records to the checklist employed in the present study was undertaken by trained graduate-level record abstractors who were initially required to reach 100% agreement with the author before recording data on their own. In order to approach analyses from a model comparisons approach, predictors were separated into two categories to best index predictors of LOS at a component level and at an operational level.

The *common predictor variables* of interest include race, age, education level, parental status, marital status, prior inpatient and/or outpatient treatment, and severity of discharge diagnosis (see Table 1). Race/Ethnicity categories included Black, White, Asian, Hispanic, Bi-Racial, and "other" identified races. Education level was documented as graduated from high school (yes/no), as was marital status (yes/no) and parental status (yes/no).

The *forensic predictor variables*, prior criminal history and severity of instant offense (see Table 2), were included to determine if such information would improve results at the

variable level for operational decision making at Bellevue or on similar units. *Severity of Instant Offense* is based on the New York State Penal Code (see Appendix B), which classifies crimes into 12 levels from A1 felonies (most severe) to simple violations (least severe). Although there is no readily available reliability data for severity levels, increasing severity is typically indicative of harsher criminal sentences. The category of instant offense is documented by the NY DOC and provided to staff at Bellevue upon patient transfer from Rikers Island. After this information was recorded for all participants in the forensic sample, it was double-checked for accuracy against the NY State Unified Court System website, offering online access to information regarding current and pending legal cases for authorized users. It should be noted that this information was scarcely available for the civil units (or not applicable), and record abstractors were unable to access such legal records for verification. However, prior criminal history was often noted in medical record reports and such information was documented accordingly.

CHAPTER 3

RESULTS

Preliminary Analyses of Common Predictors

Before undertaking regression analyses to determine the extent to which common predictor variables adequately account for LOS in both civil and forensic samples, the common predictor variables were first examined at the univariate and bivariate levels for the total combined sample (N = 1,201). Functionally, these analyses were performed using SPSS Version19.

Table 1 presents the raw data for selected *common predictor variables*. Several variables were recoded for regression analyses. *Race/Ethnicity* was recoded as "Black", "White", "Hispanic", and "Other", with the "other" category inclusive of lesser-represented racial groups, including "Asian/Pacific Islander" (n = 16) and "Bi/Multi-Racial" (n = 16). Prior Inpatient and Outpatient treatment was combined into a single variable to represent *Previous Psychiatric Treatment* (none = 0, outpatient only = 1, inpatient only = 2, both outpatient and inpatient = 3) as a proxy for chronicity of mental illness. *Diagnostic subgroups* were formed by collapsing DSM-IV primary discharge diagnoses to reflect severity level, as well as type of diagnosis (Alcohol and Drug related = 1; Neurotic and Lesser Disorders = 2; Major Affective Disorders = 3; Schizophrenia and Other Psychosis = 4; Mental Retardation + Dementia = 5). Such ordering of severity levels has been supported by the National Institute of Mental Health (1986) and demonstrated, through highly reliable on-ward observational assessments, to show systematic increases of inappropriate behavior and systematic decreases in appropriate behavior as severity levels increase (Paul et al., 1987). Note that, except for Hispanic ethnicity, all variables presented in Table 1 differed significantly ($p < .05$) between types of units (see Appendix C).

Table 1

Raw Data - Common Predictor Variables for Forensic and Civil Unit Samples

	Unit Type	
	Forensic (n = 767)	Civil (n = 434)
Age:	M = 33.50, SD = 10.41	M = 36.73, SD = 12.62
Race/Ethnicity: n (%)		
Black/African-American:	473 (61.7)	169 (38.9)
White:	104 (13.6)	160 (36.9)
Hispanic:	163 (21.3)	73 (16.8)
Other:[a]	23 (3.0)	20 (4.6)
Marital Status:[b] n (%)*		
Yes:	78 (10.2)	282 (5.1)
No:	537 (70.0)	22 (65.0)
Parental Status: n (%)*		
Yes:	189 (24.6)	53 (12.2)
No:	242 (31.6)	236 (31.6)
Graduated High School/GED: n (%)*		
Yes:	224 (29.2)	153 (35.3)
No:	169 (22.0)	84 (19.0)
Diagnostic Subgroups:[c] n (%)		
Dementia and Mental Retardation:	7 (0.9)	2 (0.5)
Schizophrenia and Other Psychotic Disorders:	323 (42.1)	210 (48.4)
Major Affective Disorders:	149 (19.4)	149 (34.3)
Neurotic and Lesser Disorders:[d]	163 (21.3)	17 (3.9)
Alcohol/Drug Related Disorders:	125 (16.3)	56 (12.9)
Prior Psychiatric Treatment: n (%)*		
Both Inpatient & Outpatient:	78 (10.2)	78 (18.0)
Inpatient Only:	250 (32.6)	158 (36.4)
Outpatient Only:	119 (55.5)	76 (17.5)
None	145 (18.9)	90 (20.7)

*Missing data accounts for percent deviation from 100.

[a]Includes Asian, Pacific Islander, Bi-Racial, and other self-identified races.

[b]Marital categories used by the US Census (never married, now married, separated, divorced, widowed) have been collapsed into "yes" (now - or living as - married and separated) or "no" (never married, divorced, or widowed).

[c]Primary diagnosis was recorded according to the most current DSM-IV (text revision), and further categorized into spectrums of disorders based on levels of severity (see NIMH, 1986).

[d]Includes Anxiety Disorders, Adjustment Disorder and Personality Disorders.

Similar to previous LOS research, LOS for the combined sample in the current study had a significant non-normal distribution, $D(1201) = 0.142$, $p < .001$. To address this violation, the LOS data were transformed using a natural logarithm (base e) to achieve a more normal distribution and improve the statistical analyses. The log transformed LOS was then used in all analyses. Interpretation of the log transformed LOS data in regression analyses allowed for examination of the percent change from the average LOS for a one-unit change in each predictor variable when holding all other independent variables constant. Analysis of bivariate correlations between predictors and log transformed LOS did not significantly differ from correlations with the untransformed LOS variable, indicating that the log transformed LOS variable was a comparable dependent variable.

Examination of the product-moment correlations between LOS and common predictor variables in the combined sample found intercorrelations in expected directions (see Appendix C for intercorrelation matrix). *Severity of discharge diagnosis* produced the strongest correlation with patient length of stay ($r = 0.25$, $p < .001$), indicating that patients with more severe disabilities tended to have a longer LOS. Significant correlations were found between LOS and *parental status* ($r = -.13$, $p < .001$), and *prior psychiatric treatment* ($r = .15$, $p < .001$), demonstrating that patients without children, and with a prior history of psychiatric treatment, tended toward longer lengths of stay. A preliminary examination of the race and ethnicity variables for the combined sample indicated that Black patients were associated with shorter length of stays ($r = -.07$, $p = .014$), while White patients were associated with longer length of stays ($r = .11$, $p < .001$). Lastly, *age* was significantly correlated with LOS ($r = .08$, $p = .004$), wherein older patients are more likely to have a longer length of stay in treatment. Correlations between LOS and Hispanic ethnicity, other race, marital status, and high school education were

not significant for the combined sample, (|*r*|s = .02 to .05, *p*s >.05). The significant correlations with LOS in the combined sample largely reflected differences in the level of relevant predictors between forensic and civil units.

Prediction of LOS in the Combined Psychiatric Sample

To determine the extent to which common predictors adequately account for variability of LOS in both civil and forensic populations, a prediction equation was developed for the combined sample with the following predictor variables: age, race-Black, race-White, race-Hispanic, race-Other, marital status, parental status, high school education, severity of diagnosis, and prior psychiatric treatment, with LOS as the dependent variable. Collinearity was assessed by examination of tolerance statistics and the variance inflation factor (VIF) for each common predictor, with results indicating there was no cause for concern of such collinearity between the variables of interest in the current study (see Table 2).

As shown in Table 2, the overall regression model (inclusive of all 10 common predictors) was a poor fit, predicting only 15% of the variability in LOS in the combined sample (R^2 = .150), but the overall relationship was statistically significant, $F(9, 270) = 5.28$, $p < .001$, with only *severity of primary diagnosis*, $B = .274$, $t = 4.74$, $p < .001$, having a unique positive effect (i.e., longer stay), and *parental status*, $B = -.142$, $t = -2.32$, $p = .021$, having a unique negative effect (i.e., shorter stay) on LOS. None of the remaining common predictors made a significant unique contribution to the prediction of LOS in the combined sample.

In order to create an optimal model for prediction of LOS in the combined psychiatric sample, a subsequent reduced model was created including only the *severity of primary diagnosis* and *parental status* variables to examine the amount of R^2 inflation produced by the inclusion of the nonsignificant predictors in the full model. Using a hierarchical regression

approach, the reduced model (block 2) predicted 12% of variation in LOS, R^2 = 11.7, $F(2, 277)$ = 18.28, p <.001, which was not a significant decrease in R^2 from the original model (block 1), R^2 change = .033, F-change(7, 270) = 1.51, p =.164. As also seen in the full model, *severity of primary diagnosis* produced a significant positive unique effect with the dependent variable, B = .288, t = 5.06, p < .001, indicating that a 1-unit increase in the severity level of psychiatric diagnosis was associated with a 29% increase in the average patient LOS when controlling for parental status. *Parental status,* B = -.152, t = -2.67, p = .008, produced a significant unique negative effect in prediction of LOS for the combined sample, indicating that having children is predictive of a 15% decrease in the average patient LOS for the combined psychiatric sample when holding severity of diagnosis constant.

Table 2

Hierarchical Regression of Common Predictors on Log Transformed LOS (N=1201)

Variable	Model *r*	R^2	R^2change	*F*(df)	B	SE_B	*Beta*	VIF
1) Full Model	.386	.149	.149***	5.26(9, 270)***				
Black (Constant)					2.495	.196	.099	1.171
White					.080	.095	.090	1.021
Hispanic					-.124	.097	.020	1.017
Other					.155	.157	.071	1.024
Age					.007	.004	.099	1.056
Marital Status					.036	.050	.022	1.090
Parental Status					-.247	.099	-.152**	1.167
High School					-.107	.097	-.015	1.001
Severity of Diagnosis					.200	.041	.280***	1.055
Prior Psych History					.075	.044	.095	1.007
2) Reduced Model	.341	.117	-.033	18.28(2, 277)***				
Parental Status					-.247	.092	-.152**	1.015
Severity of Diagnosis					.206	.041	.288***	1.015

*p<.05; **p<.01; ***p<.001.

Model Comparisons

As the distinction between the forensic and civil units is the premise of the present study, the two samples were then analyzed in parallel using a model comparisons approach to determine if significant differences existed between the two groups. Conceptually, this involved independently applying the regression equation developed from the combined sample to both the forensic and civil samples, separately, in order to investigate R^2 change, and size and directionality of beta weights. To support this distinction, correlational and chi-square analyses were first conducted to examine patterns of association between common predictor variables and unit type (Forensic = 1; Civil = 2). Consistent with the hypothesis, there was a significant pattern of association between unit type and all of the common predictors, with the exception of *prior psychiatric treatment,* χ^2 (3, n = 994) = 7.04, p = .07. Bivariate correlations found LOS to be most strongly associated with unit type, r = .27, p < .001 (see Appendix C).

Forensic subsample. As shown in Table 3, application of the optimal combined group equation to the forensic sample, using only *severity of diagnosis* and *parental status* predictors, resulted in a significant model, R^2 = .117, F(2, 215) = 14.62, p < .001, that did not differ significantly from the combined sample model, Z = -0.02, p = .984. Consistent with the combined groups, this model predicted 12% of the variability in LOS, with *parental status* having a significant negative effect on LOS, B = -.138, t = -2.15, p = -.033, and *severity of primary diagnosis*, B = .301, t = 4.69 p < .0001, remaining significantly associated with a longer LOS in the sample of forensic inpatients. In sum, when the combined group equation was independently applied to the forensic subsample, *parental status* was associated with a 14% decrease in the average LOS, and *severity of primary diagnosis* accounted for an increased 30% change in the average patient LOS after controlling for the other variable in the model.

Civil subsample. As can be seen in Table 3, application of the optimal combined group prediction equation to the civil subsample resulted in a significant model, $R^2 = .052$, $F(2, 187) = 5.14$, $p = .007$, with only *severity of diagnosis, B* =.201*, t* = 2.79, $p = .006$, having a significant positive effect on LOS, indicating a 20% increase in the average LOS for a 1-unit increase in severity level. *Parental status, B* = -.080*, t* = -1.11, $p = .270$, did not produce a significant unique contribution to the prediction of LOS in the civil psychiatric sample. Comparison of the fit of the model from the combined to civil sample using the Fisher's Z-test revealed there was a significant difference between the models, $Z = 2.19$, $p = .02$, indicating that the model is a better fit for a sample of combined psychiatric patients than for a sample of only civil patients.

Table 3

Parallel Regression Analysis of Combined Sample Equation by Unit Type

Unit	Model *r*	R^2	Adj. R^2	*F* (df)	B	SE_B	*Beta*	VIF
Forensic Units	.342	.117	.113	28.295 (2, 428)***				
Parental Status					-.223	.074	-.138**	1.007
Severity of Diagnosis					.211	.032	.301***	1.007
Civil Units	.228	.052	.042	5.144 (2, 187)**				
Parental Status					-.120	.108	-.080	1.027
Severity of Diagnosis					.135	.048	.201**	1.027

*p<.05; **p<.01; ***p<.001.

Individual Prediction Equations per Unit Type

In order to establish regression equations that optimally predicted LOS within each sample, and to investigate the operational utility of predictors of LOS within civil and within forensic units, separate prediction equations were then developed for each unit type. Predictors included in each unit model were chosen based on bivariate correlations with the log transformed LOS (see Appendix C, Tables C2, C3). An alpha level of .05 was used for all statistical significance tests.

Forensic-specific model. The *forensic variables* were represented in the overall regression equation for this unit type to investigate whether population-specific variables, such as *severity of instant offense* and *prior criminal history*, accounted for variance above and beyond a general model for a forensic psychiatric population. Table 4 presents raw descriptive data for forensic variables. Given the large amount of missing data for these variables in the civil units and non-significant correlations with LOS (see Appendix C, Table C2), *severity of instant offense* and *prior criminal history* were only analyzed for the forensic sample.

Table 4

Forensic Predictor Variables

	Unit Type	
	Forensic (n = 767)	Civil (n = 434)
Severity of Instant Offense: n (%)*		
A Felony:[a]	55 (7.2)	0 (0.0)
B-Violent Felony:	120 (15.6)	3 (0.7)
B-Nonviolent Felony:	33 (4.3)	0 (0.0)
C-Violent Felony:	72 (9.4)	0 (0.0)
C-Nonviolent Felony:	9 (1.2)	1 (0.2)
D-Violent Felony:	65 (8.5)	0 (0.0)
D-Nonviolent Felony:	46 (6.0)	0 (0.0)
E-Felony:	43 (6.0)	0 (0.0)
A-Misdemeanor:	129 (16.8)	3 (0.7)
B-Misdemeanor:	15 (2.0)	2 (0.5)
Violation:	2 (0.3)	1 (0.2)
Violence Crime: n (%)*		
Yes:	351 (45.8)	3 (0.7)
No:	331 (43.2)	7 (1.6)
Prior Criminal History: n (%)*		
Yes:	555 (86.0)	15 (3.5)
No:	90 (14.0)	13 (3.0)

*missing data accounts for percent deviation from 100;
[a]A-1 Felony (n = 53) and A-2 Felony (n = 1) collapsed into single category representing all A-class Felonies.

Examination of a contingency table for *level of crime* within *psychiatric diagnosis* indicated a significant pattern of association, χ^2 (8, n = 635) = 27.86, p = .001, wherein patients diagnosed with Schizophrenia or other psychotic disorders were more frequently associated with violation and misdemeanor type crimes (51.5%), while patients diagnosed with major affective disorders (44.4%), anxiety related disorders (66.0%), or drug/alcohol related disorders (52.5%) were more frequently associated with violent felonies for the sample of forensic psychiatric inpatients (see Appendix D).

Bivariate correlational analysis of common and forensic predictor variables with log transformed LOS supported seven predictors for inclusion in the forensic regression model: *Hispanic ethnicity* (r =-.07, p = .024), *parental status* (r =-.163, p < .001), *severity of diagnosis* (r =.31 , p < .001), *prior psychiatric history* (r =.18 , p = .002), *category of crime* (r =.15 , p < .001), *violence level* (r = .19 , p < .001) and *prior criminal history* (r =-.083 , p = .018). As presented in Table 5, the full model significantly predicted 16% of the variability in LOS in the forensic sample, R^2 = 15.9; F(7, 325) = 8.69, p < .001, with three variables producing significant effects. As also seen in the combined sample model, *parental status* contributed negatively to the prediction of LOS, B = -.120, t = -2.33, p = .022, indicating that patients without children have a 12% decrease from the average LOS on forensic inpatient units. *Severity of diagnosis* was positively associated with LOS, B = .318, t = 6.07, p < .001, resulting in a 32% increase from the average LOS for each level of severity. *Category of crime* also produced a positive significant effect, B = .178, t = 2.37, p = .021, wherein LOS was increased by 18% from the average forensic LOS for each 1-unit increase in severity of crime.

To examine the amount of R^2 *change* from the general model (created from the combined sample) and the optimized forensic-specific model, a hierarchical multiple regression analysis

was employed. Block 1 represented the general model and included only *severity of diagnosis* and *parental status*, while block 2 represented the forensic-specific model and included *severity of diagnosis*, *parental status,* and *category of crime.* Results indicated that inclusion of *category of crime* in block 2 produced a significant change in R^2 from the general model to the forensic specific model, R^2*-change* = .037, *F-change* (1, 359) = 15.62, p <.001. These results indicate that the addition of a forensic predictor variable significantly contributed to the prediction of LOS in the forensic patient population.

Civil-specific model. Correlational analysis of predictor variables and the log-transformed LOS criterion provided the basis for inclusion of three common variables in the regression model for the civil units: *Age* (r = .11, p = .013), *severity of diagnosis* (r = .21, p < .001), and *prior psychiatric history* (r = .23, p < .001). The three predictors were entered simultaneously into the multiple regression analysis presented in Table 5, and, although a poor fit, resulted in a significant model, R^2 = *.096, F*(3 , 398) = 14.02 p < .001, with only *severity of diagnosis, B = .215, t* = 4.47, p < .001, and *prior psychiatric history, B =.160 , t* = 3.33 , p = .001, contributing a significant positive effect on the prediction of LOS within the civil sample. *Age, B* = .077*, t* = 1.6, p = .110, did not provide a significant unique contribution to the model.

Similar to the analysis in the forensic model, a hierarchical regression equation was then analyzed to examine the amount of R^2*-change* from the general model to the optimized civil-specific model. Block 1 represented the general model and included only *severity of diagnosis* (*parental status* was previously found to be a non-significant predictor in this sample)*,* while block 2 represented the civil-specific model and included *severity of diagnosis* and *prior psychiatric history*. Results indicated that inclusion of *prior psychiatric history* to the general

model produced a significant change in the amount of variability accounted for in LOS in the civil sample, R^2-*change* = .090, *F-change* (1, 398) = 19.25, p <.001.

Table 5

Optimal Unit Specific Models by Unit Type

Unit Model	Model *r*	R^2	Adj. R^2	*F* (df)	B	SE_B	*Beta*	VIF
Forensic Units	.397	.15.9	.139	8.69 (7, 325)***				
Parental Status					-.194	.083	-.120*	1.023
Severity of Diagnosis					.222	.037	.318***	1.060
Category of Crime					.045	.019	.178*	2.253
Hispanic Ethnicity					-.010	.051	-.010	1.037
Prior Psych History					.062	.042	.077	1.062
Violent Crime					.012	.123	.007	2.261
Criminal History					-.169	.121	-.073	1.060
Civil Units	.285	.096	.074	14.02 (3, 398)***				
Severity of Diagnosis					.144	.032	.215***	1.002
Prior Psych History					.104	.031	.160**	1.002
Age					.005	.003	.092	1.003

*p<.05; **p<.01; ***p<.001.

Cross Validation

Within-groups replicability. With the aim of investigating within-groups reliability of unit-specific prediction equations, two equated subsamples for each unit type were formed by random assignment from blocks stratified on potentially confounding variables and resulting adjusted Rs^2 examined from the resulting subsamples. In order to create equated subsamples, participants were first sorted into stratified blocks on LOS, date of admission (to reflect time of year), and unit number (Forensic units at Bellevue: 19West and 19North; Civil units at Bellevue: 18East, 18 West, 20North, 20West, 21North, and 21East); cases were then assigned to one subgroup or the other using the simple randomization feature in SPSS.

Forensic subsamples analysis. Application of the forensic-specific model to subsample 1 (n = 382) produced an adjusted R^2 of 14.0 [F (3, 164) = 10.04, p < .001], while subsample 2 (n =

383) produced an adjusted R^2 of 13.6 [F (3, 175) = 9.61, $p < .001$]. A Fisher's Z-test of the adjusted-R^2s, $Z = .29$, $p = .771$, indicates that the two forensic subsample equations did not significantly differ from one another. The lack of shrinkage between these analyses support within-group reliability for the forensic sample prediction equation in the current study, and speak to the probable operational reliability of such LOS prediction models to be found in similar forensic samples. While theoretically important, the 14% of LOS variance accounted for within the forensic units is not strong enough to set operational LOS norms in advance.

***Civil subsamples analysis*.** Examination of civil subsamples using the optimized civil-specific model produced similar results [subsample 1, $n = 217$, adjusted $R^2 = .085$, $F(2,198) = 10.31$, $p < .001$; subsample 2, $n = 217$, adjusted $R^2 = 0.077$, $F(2, 196) = 9.27$, $p < .001$]. Examination of model fit between the two subsamples, $Z = .16$, $p = .872$, supports the stability of the civil-specific model within the civil psychiatric patient population. As with the forensic subsample, the 8% of LOS variance accounted for in civil units is theoretically important, but far from the level of predictability that would be required to operationally establish LOS norms in advance.

CHAPTER 4

DISCUSSION

Patient LOS in inpatient psychiatric treatment is an exceptionally important variable in the total cost of care that is frequently misunderstood. This study offered an opportunity to examine whether the current practice of using predicted LOS in generally undefined psychiatric samples as a means to establish LOS norms prior to treatment is a justifiable way of reducing total costs. Two specific questions were investigated: (1) whether LOS predictions in a combined sample of forensic and civil psychiatric inpatients from the same facility with the same administration and equal sized units would remain equally predictive when applied individually to forensic and civil samples, and (2) whether development of LOS predictors at the operational level within forensic and civil samples would result in improved prediction that could be used to establish normative LOSs for specific types of units and patients.

Despite the better control of potentially confounding variables in this study, the overall results mirrored those of previous literature in that commonly recorded patient variables roughly accounted for only about 10 - 15% of the variance in LOS. As hypothesized, the forensic and civil samples were clearly different from each other and some of these differences, as well as the contrasting nature of discharge practices, resulted in the failure of a combined prediction equation to apply equally to both types of units and populations. Also as hypothesized, improved prediction equations could be reliably established within both forensic and civil samples; however, the overall amount of variance in LOS that could be accounted for with either group was too low to be operationally useful in establishing LOS norms in advance. Given the consistency in the literature of such findings, as well as those of the present study, it seems clear that further attempts to establish LOS norms in advance are unlikely to meet with success.

Examination of the consistencies in predictors of LOS in the present study, as well as the prior literature, does provide suggestions for better approaches to ensuring that LOS is optimized for any psychiatric population in future work. The finding that *severity of psychiatric diagnosis* was the only variable to significantly contribute to the prediction of LOS in all of the models confirmed previous findings by Huntley et al. (1998). Their work also revealed that diagnostic predictors remained significantly predictive of LOS across multiple prediction models, specifically indicating that a diagnosis of a psychotic disorder or a major mood disorder predicted longer LOS, while a substance related diagnosis predicted a shorter LOS in treatment (Huntley et al., 1998). These findings are consistent with the work of Lyons, O'Mahoney, and Larson (1991), Choca and colleagues (1988), and Malone, Fineberg, and Gale (2004) who reported that patients with severe mental illness (SMI) had significantly longer LOSs than patients diagnosed with lesser disabilities such as personality disorders. Consistencies in these diagnostic groups in the literature are likely accounted for by the severity dimension reflected in the current study, and directly relate to current level of patient functioning.

Unique to the current study, *parental status* significantly contributed to the prediction of LOS in both the combined and forensic samples. On the surface this variable might seem like a surprising finding; however, closer inspection of bivariate correlations with *parental status* and other predictors in the full model indicated that *parental status* was moderately correlated with variables related to social support (*marital status*, $r = .28$, $p < .001$), level of functioning (*severity of diagnosis,* $r = -.12$, $p < .001$), and chronicity of illness (*age,* $r = .20$).

The civil model differed significantly from the combined and forensic models in this study. Similar to the conclusions of Mezzich and Coffman (1985) and Burge and associates (2002), the presence of a *prior psychiatric history* significantly predicted longer LOSs in

treatment for the civil sample, findings that were not duplicated in the combined or forensic models. Conceptually, these findings suggest that *parental status* in the current study is serving as the best proxy for pre-morbid level of functioning in the combined and forensic samples, while *prior psychiatric history* is the best measure of pre-morbid functioning in the civil model.

Specific to the forensic population, analysis of this model revealed that *severity of crime* increased the average LOS by 18% for each one-unit increase in the severity of crime. However, bivariate correlations in the forensic sample yielded a negative correlation, albeit weak, between *severity of crime* and *severity of diagnosis* (r = -.12), indicating that those patients charged with more severe crimes are more often assigned a less severe diagnosis. As the chi-square analyses between diagnostic groups and the nature of crimes demonstrated (see Appendix D), those patients with psychotic diagnoses accounted for the great majority of the less severe misdemeanor/violation type crimes. This finding suggests that level of functioning has a curvilinear relationship with the *level of crime* in the NY State Penal Code, in which some of the most severely disabled patients are arrested for more violation type crimes and less disabled patients are charged with crimes that require a certain amount of sophistication in their level of functioning. It is likely that the most disabled patients are not at a level of functioning to carry out felony crimes, and are more likely creating nuisances on the streets, whereby in previous years these behaviors would have led to hospitalization instead of legal charges. Therefore, patient level of functioning in the forensic sample cannot be established by either *severity of diagnosis* or *severity of crime.*

In sum, the results of this study, combined with the few consistencies in the literature, indicate that the only demographic and clinical data that regularly predict LOS likely gain their power from their relations to the patients' current or past level of functioning or disability. While

such data do provide some useful descriptive information, Cyr and Haley's (1983) statement appears to be a truism, that the perpetual lack of success in the accurate prediction of LOS will "continue to be the rule" (p. 639) until methods are changed to include pertinent patient data that reflect current level of functioning.

In fact, the use of ongoing, reliable, direct observational measures of current patient functioning has been demonstrated to be the best predictor of time-to-independent-release from treatment and the strongest predictor of time to successful discharge (i.e., no rehospitalization; Springer & Paul, 2007). More importantly, there is strong evidence that such methods of observational assessment reduce the costs of inpatient psychiatric treatment not only by ensuring that the most effective procedures are applied, but by ensuring that each patient remain hospitalized long enough to maximize treatment benefits and avoid rehospitalization. In this way, LOS predictions will satisfy hospital administrators and patients' needs alike.

The Time Sample Behavior Checklist (TSBC; Paul, 1987) is the best example of such a method. The TSBC is a method of direct observational assessment that uses an integrated set of procedures for consistent gathering of objective information on adult psychiatric inpatients. This system, by employing non-interactive, independent observers to continually record on-unit behavior of patients and staff, has been recognized as the best method of assessing current level of functioning; it has been established as the paramount method of predicting successful discharge with 95% accuracy (Paul & Mariotto, 1987). With the inclusion of trained non-interactive observers to directly code inpatient behavior on stratified hourly time samples, the TSBC provides data that accounts for a patient's level of functioning during all waking hours, 7 days a week. Based on these observations, rate scores are then accumulated over specified time periods (typically a full 7-day week's observations) to provide objective information on TSBC

indexes reflecting several levels of appropriate and inappropriate patient functioning (Paul, 1987). Such information can then be used, not only to evaluate improvements in patient functioning over time in treatment, but to ultimately predict discharge readiness (Springer & Paul, 2007) and level of patient functioning in the community up to 18 months post-discharge (Paul & Mariotto, 1987).

The TSBC system is unique as a standardized inpatient assessment instrument in that it provides the best objective, ongoing measurement of patient behavior that automatically serves as a basis for program evaluation. When used in combination with the Staff-Resident Interaction Chronograph (SRIC), another direct, observational coding instrument designed to objectively record all on-unit staff-patient interactions, this system provides the most reliable source of on-unit happenings.

The results of this study, although adding little by the way of clinical significance, are theoretically interesting and practically important in that they establish several guidelines for future LOS research. Most importantly, there is no evidence to suggest that future LOS research will ever empirically support the notion that a patient's LOS can be accurately predetermined prior to admission. If the purpose of such predictions is to regulate and control treatment costs, administrators should also consider the financial risks associated with releasing patients too soon based on inaccurate LOS prediction models. In that regard, future research should move away from the use of hospital admission records as the sole source of data for LOS predictions and rather incorporate direct observational assessment methods to more accurately assess current level of functioning as it relates to patient LOS. In this way, inpatient treatment should be able to, not only, reduce costs, but improve the quality and cost-effectiveness of treatment for those who are most in need of mental health services as well.

References

American Hospital Association. (1987, 2007). *Hospital Statistics*. Chicago, IL

Blais, M. A., & Baity, M. R. (2005). A comparison of two mental status examinations in an inpatient psychiatric sample. *Assessment*, *12*(4), 455-461. doi:10.1177/1073191105281441

Blais, M. A., Matthews, J., Lipkis-Orlando, R., Lechner, E., Jacobo, M., Lincoln, R., Gulliver, C., et al. (2003). Predicting length of stay on an acute care medical psychiatric inpatient service. *Administration and Policy in Mental Health and Mental Health Services Research*, *31*(1), 15-29. doi:10.1023/A:1026044106172

Burge, P., Ouellette-Kuntz, H., Saeed, H., McCreary, B., Paquette, D., & Sim, F. (2002). Acute psychiatric inpatient care for people with a dual diagnosis: Patient profiles and lengths of stay. *Canadian Journal of Psychiatry. Revue Canadienne De Psychiatrie*, *47*(3), 243-249. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11987475

Burnam, M. A., & Escarce, J. J. (1999). Equity in managed care for mental disorders. *Health Affairs (Project Hope)*, *18*(5), 22-31.

Butcher, J., Dalstrom, W., Graham, J., Tellegen, A., & Kraemmer, B. (1989). *Manual for administering and scoring the MMPI-2.* Minneapolis, MN: University of Minnesota Press.

Choca, J. P., Peterson, C. A., Shanley, L. A., Richards, H., & Mangoubi, E. (1988). Problems in using statistical models to predict psychiatric length of stay: An Illustration. *Psychiatric Services*, *39*(2), 195-197.

City of New York Department of Correction. (n.d.). Rikers Island Facilities. Retrieved May 25, 2010, from http://www.nyc.gov/html/doc/html/facilities/locate_facility.shtml

City of New York Department of Correction. (n.d.). DOC Statistics - Average Inmate Admissions. Retrieved May 25, 2010, from http://www.nyc.gov/html/doc/html/stats/doc_stats.shtml

Cohen, J., Cohen, West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Coid, J., Kahtan, N., Gault, S., Cook, A., & Jarman, B. (2001). Medium secure forensic psychiatry services: Comparison of seven English health regions. *The British Journal of Psychiatry*, *178*(1), 55-61. doi:10.1192/bjp.178.1.55

Creed, F., Tomenson, B., Anthony, P., & Tramner, M. (1997). Predicting length of stay in psychiatry. *Psychological Medicine*, *27*(04), 961-966. doi:10.1017/S0033291796004588

Cyr, J. J., & Haley, G. A. (1983). Use of demographic and clinical characteristics in predicting length of psychiatric hospital stay: a final evaluation. *Journal of Consulting and Clinical Psychology*, *51*(4), 637-640. doi: 10.1037/0022-006X.51.4.637

Diagnostic and Statistical Manual of Mental Disorders, fourth edition Text Revision, DSM-IV-TR. (2000). American Psychiatric Association, Washington DC.

Drake, R. E., & Wallach, M. A. (1989). Substance abuse among the chronic mentally ill. *Hospital and Community Psychiatry*, *40*(10), 1041-1046.

English, J., Sharfstein, S., Scherl, D., Astrachan, B., & Muszynski, I. (1986). Diagnosis-related groups and general hospital psychiatry: The APA study. *American Journal of Psychiatry*, *143*(2), 131-139.

Essock, S. M., & Goldman, H. H. (1995). States' embrace of managed mental health care. *Health Affairs*, *14*(3), 34.

Gordon, R., Jardiolin, P., & Gordon, K. (1985). Predicting length of hospital stay of psychiatric patients. *American Journal of Psychiatry*, *142*(2), 235-237.

Harman, J., Cuffel, B., & Kelleher, K. (2004). Profiling hospitals for length of stay for treatment of psychiatric disorders. *The Journal of Behavioral Health Services and Research*, *31*(1), 66-74. doi:10.1007/BF02287339

Hopko, D. R., Lachar, D., Bailley, S. E., & Varner, R. V. (2001). Assessing predictive factors for extended hospitalization at acute psychiatric admission. *Psychiatric Services*, *52*(10), 1367-1373. doi:10.1176/appi.ps.52.10.1367

Huntley, D. A., Cho, D. W., Christman, J., & Csernansky, J. G. (1998). Predicting length of stay in an acute psychiatric hospital. *Psychiatric Services*, *49*(8), 1049-1053.

Hutchins, E., Frank, R., & Glied, S. (2009). The evolving private psychiatric inpatient market. *The Journal of Behavioral Health Services and Research*. doi:10.1007/s11414-009-91996

Jayaram, G., Tien, A., Sullivan, P., & Gwon, H. (1996). Elements of a successful short-stay inpatient psychiatric service. *Psychiatric Services*, *47*(4), 407-412.

Kennedy, H. (2001). Do men need special services? *Advance Psychiatric Treatment*, *7*(2), 93-99. doi:10.1192/apt.7.2.93

Leamon, M. H., Gibson, D. R., Canning, R. D., & Benjamin, L. (2002). Hospitalization of patients with cocaine and amphetamine use disorders from a psychiatric emergency service. *Psychiatric Services*, *53*(11), 1461-1466. doi:10.1176/appi.ps.53.11.1461

Lyons, J. S., O'Mahoney, M. T., & Larson, D. B. (1991). The Attending psychiatrist as a predictor of length of stay. *Hospital & Community Psychiatry*, *42*(10), 1064-1066.

Malone, D., Fineberg, N. A., & Gale, T. M. (2004). What is the usual length of stay in a

psychiatric ward? *International Journal of Psychiatry in Clinical Practice*, *8*(1), 53. doi:10.1080/13651500310004498

Mental Health: A Report of the Surgeon General - Chapter 6. (2000). Retrieved May 20, 2010, from http://www.surgeongeneral.gov/library/mentalhealth/chapter6/sec4.html

Mezzich, J. E., & Coffman, G. A. (1985). Factors influencing length of hospital stay. *Hospital and Community Psychiatry*, *36*(12), 1262-1270.

Morey, L. C. (1991). *Personality Assessment Inventory: Professional manual.* Tampa, FL: Psychological Assessment Resources.

NIMH. (1986). *Additions of resident patients at end of year, state and county mental health hospitals by age and diagnosis, by state United States, 1983.* Rockville, MD: Division of Biometry and Applied Sciences, Survey and Reports Branch, National Institute of Mental Health.

NIMH. (2010) "NIMH: The numbers count—Mental disorders in America.." National Institute of Health. www.nimh.nih.gov/publicat/numbers.cfm.

Paul, G.L (Ed.) (1987). *Observational assessment instrumentation for service and research–The Time-Sample Behavioral Checklist: Assessment in residential treatment settings, Part 2*. Champaign, IL: Research Press.

Paul, G.L., Licht, M., Power, C., & Engel, K. (1987). The Database for TSBC evidence and normative comparisons. In G. L. Paul (Ed.). *Observational assessment instrumentation for service and research–The Time-Sample Behavioral Checklist: Assessment in residential treatment settings, Part 2* (pp. 51 – 68). Champaign, IL: Research Press.

Paul, G.L., & Mariotto, M.J. (1987). Predictive relationships of TSBC higher-order scores to other measures of performance and outcomes. In G.L. Paul (Ed.), *Observational*

assessment instrumentation for service and research–The Time-Sample Behavioral Checklist: Assessment in residential treatment settings, Part 2 (pp. 211 – 236). Champaign, IL: Research Press.

Paul, G. L., and Menditto, A. A. (1992). Effectiveness of inpatient treatment programs for mentally ill adults in public psychiatric facilities. *Applied and Preventive Psychology: Current Scientific Perspectives, 1*, 41-63.

Ries, R. K., Yuodelis-Flores, C., Comtois, K. A., Roy-Byrne, P. P., & Russo, J. E. (2008). Substance-Induced suicidal admissions to an acute psychiatric service: Characteristics and outcomes. *Journal of Substance Abuse Treatment*, *34*(1), 72-79. doi:10.1016/j.jsat.2006.12.033

Roy-Byrne, P., Dagadakis, C., Ries, R., Decker, K., Jones, R., Bolte, M., Scher, M., et al. (1995). A Psychiatrist-rated battery of measures for assessing the clinical status of psychiatric inpatients. *Psychiatric Services*, *46*(4), 347-352.

Roy-Byrne, P., Russo, J., Rabin, L., Fuller, K., Jaffe, C., Ries, R., Dagadakis, C., et al. (1998). A Brief medical necessity scale for mental disorders: Reliability, validity, and clinical utility. *The Journal of Behavioral Health Services and Research*, *25*(4), 412-424. doi:10.1007/BF02287511

Schumacher, D. N., Namerow, M. J., Parker, B., & Fox, P. (1986). Prospective payment for psychiatry–feasibility and impact. *New England Journal of Medicine*, *315*(21), 1331–1336.

Sinclair, J. M., Latifi, A. H., & Latifi, A. W. (2008). Co-Morbid substance misuse in psychiatric patients: prevalence and association with length of inpatient stay. *Journal of Psychopharmacology*, *22*(1), 92-99. doi:10.1177/0269881107082029

Sloan, D. M., Yokley, J., Gottesman, H., & Schubert, D. S. P. (1999). A Five-Year study on the interactive effects of depression and physical illness on psychiatric unit length of stay. *Psychosomatic Medicine*, *61*(1), 21-25.

Springer, J. R., & Paul, G. L. (2008). Predicting time-to-independent-release from current level of functioning for psychiatric inpatients: A "Survivor" analysis. *Journal of Behavioral Health Services & Research*, *35*(3), 315-333. doi:10.1007/s11414-007-9096-9

Appendix A

Expanded Review of Literature

Predictors of LOS have changed little over the years, with most of the focus on diagnostic categories, static demographic variables and chronicity of illness. With the exception of a psychotic diagnosis (Huntley et al., 1998), these predictors are of limited generalizability when attempting to apply them to inpatient units offering different types of treatment services. Attempts to apply the same predictors of LOS across different units has been met with inconsistent results, despite the current practice of Managed Behavioral Health Organizations (MBHO's) using LOS as a measure of performance for hospitals in their network with outcome possibly effecting credentialing. Harman et al. (2004) discussed the potential problems associated with the use of LOS as an evaluative tool, stating that MBHO's often do not take into account the differences in individual patient characteristics, admission procedures, and treatment modalities across facilities that could be responsible for the variations in LOS in their networks. Difficulty in designing statistical methods to estimate these systematic differences can lead to an overestimation of the predictors of LOS (Choca, Peterson, Shanley, Richards, & Mangoubi, 1988) most often used by these organizations, and underestimation of facility specific variables that should be most important when evaluating hospital performance.

Attending Clinicians

One such systematic difference in units between and within psychiatric hospitals is the attending psychiatrist (Lyons et al., 1991). Lyons and colleagues (1991) examined this potential confound when they analyzed a sample of 2,000 inpatients admitted over a two-year period from 1988 to 1989 to determine if the attending psychiatrist predicted the length of time a patient spent in treatment on one of five units in a 120-bed psychiatric institute in a large teaching

hospital. They found the amount of variance in LOS that could be attributed to the attending clinician varied from year to year, with 9.8% of the variation accounted for in 1988 and 12.8% in 1989, while diagnostic categories (the focus of the majority of LOS research up to that date) contributed little to explanation of variation across units within the facility. Their study was an important step in LOS research, as they were among the first to identify potential problems with using only one type of psychiatric unit for analysis when differing units should be expected to offer distinctive services defined by the type of patient population they are treating. To address this threat to external validity, the researchers included in their study patients admitted to two general units, an adolescent unit, an eating disorders unit, an older adult unit, and a long-term care unit within the same hospital over a two-year period. However, the design of the study was not so that individual unit predictors of LOS could be reported. Admittedly, this distinction was not within the focus of the research question, as their main focus was to determine if the attending psychiatrist contributed significantly to the variance in LOS across varying units, a question that was adequately answered by the study design.

Mezzich and Coffman (1986) noted the importance of including the opinions of mental health professionals in a LOS prediction study. They used a survey method designed to measure which factors were perceived by mental health professionals to be important to the prediction of LOS in inpatient treatment. The survey, which included 21 factors scored on a 3-point scale from "not important" to "very important" in the prediction of LOS, was sent to 139 mental health professions (with a 70% response rate, final $n = 97$) representing many different theoretical backgrounds and positions in the hospital (37 Psychiatrists, 29 Social Workers, 19 Psychologists, and 12 administrators). Topping the list of the most important factors perceived to be predictive of LOS was symptomology ($M = 2.78$), adaptive functioning ($M = 2.67$) and social supports (M

= 2.67), while the least important factors were reported as marital status (*M* = 1.54), referral source (*M* = 1.47), and sex of patient (*M* = 1.18).

Diagnosis and Demographic Variables

With increasing awareness of the importance of understanding predictors of LOS, there was a surge of research in the late 1990's investigating how client-specific demographic and clinical variables predicted LOS. Many individual variables and combinations of variables were examined to see how they were related, if at all, to the amount of time a person spent in inpatient treatment. Huntley et al. (1998) found five factors predicted 17% of variance in LOS in their sample (*n*=764) drawn from an acute unit in Missouri using a multiple step-wise regression approach: a diagnosis of schizophrenia, number of previous hospital admissions, diagnosis of a mood disorder, age, and negatively associated was a secondary diagnosis of substance abuse disorder. A diagnosis of Schizophrenia and a Mood disorder, specifically with manic behavior, have remained fairly consistent as positive predictors in research on LOS (Creed, Tomenson, Anthony, & Tramner, 1997), however Huntley and Associates (1998) note some discrepancies in their research in comparison to the results of previous publications. Specifically, their finding that greater age and number of prior psychiatric admissions leads to longer lengths of stay has historically been inconsistent with research using a similar sample, for example Schumacher and Colleagues (1986) found both variables to be moderate, at best, predictors of LOS.

Substance Abuse

A trend commonly reported in treatment with the seriously mentally ill population is the high prevalence of substance abuse (Drake, & Wallach, 1989). As with any population seeking attention from a medical or psychological professional, it is important for a clinician to obtain an accurate substance abuse history. However, given the nature of the mentally ill population it can

oftentimes be difficult to obtain this information (e.g. a lack of familial support to provide biopsychosocial history, acute psychiatric problems presented on admission). Nonetheless, when this information is obtained and substance abuse or dependence is included in a multiaxial diagnosis, many researchers have reported a negative association with LOS in inpatient treatment (Huntley et al., 2008; Jayaram, Tien, Sullivan, & Gwon, 1996; Sinclair, Latifi, & Latifi, 2008). In 2008, Reis and Coworkers at the University of Washington - St. Louis Medical School published a study examining the impact of substance abuse severity level, what they refer to as Substance-Induced Symptomology (SIS), on length of stay on a voluntary psychiatric inpatient service at a county hospital treating patients with suicidal ideation upon admission. All patients in their sample (*n*=5,166) at admission received the Psychiatric Assessment Form (PAF) administered by the attending clinician. The PAF – expanded from the Psychiatric Symptom Assessment Scale (PSAS; Roy-Bryne et al., 1995, 1998) – groups presenting psychiatric problem severity into four levels based on a 7-point scale for each item (none, mild, moderate, and severe). A Substance-Induced Syndrome (SIS) rating, indicating amount of symptomology upon admission believed to be attributed to substance abuse or dependence, was found by examining the PAF item addressing alcohol and drug problems (AODP) and four groups were formed from the total sample based on this rating: *No* SIS (*n* = 1,985, 0 rating, admitting presentation not due to substance abuse), *Mild* SIS (*n* = 1,062, 1-2 rating, mildly substance-induced), *Moderate* SIS (*n* = 1,607, 3-4 rating, moderately substance-induced), and *Mostly* SIS (*n* = 462, 5-6 rating, most or all of admission presentation due to substance use). Using an ANCOVA approach with pairwise Bonferroni comparisons, the authors reported a significant decrease in LOS as the SIS rating increased, a finding generally supported in LOS research with substance abuse as a negative

predictor. In discussion of this finding, they make a very powerful observation that is poignant across any psychiatric populations studied in LOS research:

> The authors' clinical experience, as well as information from an informal, unpublished verbal survey of American Society of Addiction Medicine (ASAM) members during the state of the art national conference in Washington, DC, in 2004, suggests that the usual LOS allowed by managed care entities for a diagnosis of a substance-induced condition is 1 or 2 days. Further, ASAM members verbally reported that this short LOS pushed them to overdiagnose psychiatric conditions, such as major depression or bipolar depression, to more adequately treat patients, as well as save patients from enormous bills, because these traditional psychiatric diagnoses are covered for 6–8 days. (p. 77)

Should these informal observations be representative of current practice in psychiatric hospitals across the nation, it is frightening the extent to which this over-diagnosis effect might skew LOS research, cost inflation, and the integrity of diagnostic-related groups. This observation also speaks to the importance of increasing the output of LOS research specifically focused on comparison of predictors between psychiatric units offering different treatment modalities, and treating different types of psychiatric problem behaviors. Clinically, it is of little value to make assumptions that all patients under the same diagnostic umbrella will require the same amount of time in inpatient treatment; nevertheless the Managed Behavioral Health Organizations (MBHO) can only rely on the published LOS research to come to these conclusions. Consideration of changes to the policies of the MBHO's will only come as a result of a change in the focus of LOS research.

Leamon, Gibson, Canning, and Benjamin (2002) examined individuals admitted to a Psychiatric Emergency Service (n = 2,357) with psychiatric problems accompanied with either

cocaine or amphetamine use. These two substances were chosen for study because of the tendency for these drugs to present in ways similar to the inclusion criteria of certain psychiatric diagnostic categories, and they are also the most commonly abused drugs in the hospital used in the study. Once seen by a multi-disciplinary team of mental health professionals upon arrival to the psychiatric crisis unit (all patients must meet criteria for involuntary status upon admission), there is a 23-hour minimum LOS before terminal decisions of transfer placement or discharge are made. The researchers were interested to see if either cocaine- or amphetamine-related disorders led to more transfers to one of the hospitals psychiatric inpatient units, and further if this substance abuse predicted longer or shorter LOS once transferred to the units. While they report no association with patient demographic variables and LOS, they found that patients brought to the crisis unit with amphetamine use were more likely to be transferred out of the crisis unit to a locked inpatient unit than the patients seen at the crisis unit with cocaine use (Leamon et al., 2002, p. 1465). However, once transferred to the inpatient unit, those patients with cocaine-related disorders tended to have a longer LOS than those transferred with amphetamine-related disorders. These findings, while important to a broad understanding of individual variables associated with LOS and transfer in inpatient care from emergency services, are largely ignored by managed care and private insurance providers who combine treatment of substance abuse and mental health care when defining a maximum amount of coverage.

Utility of Assessments at Admission

Hopko, Lachar, Bailley, and Varner (2001) studied the utility of the Brief Psychiatric Rating Scale-Anchored Version (BPRS-A) when administered within 48 hours of hospitalization to predict LOS on an acute psychiatric service. They found that the BPRS-A subscales resulted in successful categorization of up to 80% of patients requiring extended care (ultimately

transferring to non-acute, extended care units). Specifically the BPRS-A subscales measuring uncooperativeness, thought disorder and disorganization were positively associated with the need for extended hospital care and the scale measuring general psychological discomfort was associated with shorter inpatient stays.

Blais and associates (2003) developed a prospective checklist instrument to predict LOS upon admission based on positively associated variables including ECT, cognitive functioning, level of activities of daily functioning (ADL), number of consultations, number of procedures, severity of psychiatric symptoms, commitment hearing, number of medical diagnoses, legal status, age, psychotic features, discharge placement, and type of admission. Also included in the checklist are negatively associated variables such as admission GAF scores and co-morbid substance abuse. Positively associated variables each contributed a certain amount of "points," while the negatively associated predictors subtracted points from a total score. The score was used as a prediction of the numbers of days a patient will likely need hospitalization. They then trained professionals in their respective institution on the use of the checklist at admission, and re-evaluated the tool after 4 months of use. They report the scores on the checklist were significantly predicted a patient's actual LOS and staff reported a greater understanding of factors associated with LOS in their facility.

Appendix B

NY State Criminal Category Examples

A-1 Felony

Arson 1*
Criminal possession of controlled substance 1
Criminal sale of controlled substance 1
Conspiracy 1
Kidnapping 1
Murder 1

A-2 Felony

Criminal possession of controlled substance 2
Criminal sale of a controlled substance 2

B-Violent Felony

Assault 1
Criminal Possession of a Weapon 1
Burglary 1
Manslaughter 1
Rape 1
Robbery 1

B-Nonviolent

Criminal Possession of Stolen Property 1
Grand Larceny 1

C-Violent Felony

Burglary 2
Criminal Possession of a Weapon 2

C-Non-Violent

Grand Larceny 2
Vehicular Manslaughter 1

D Violent

Assault 2
substance 1

D-Non-Violent

Criminal Mischief 2

E-Felony

Criminal Contempt 1
Criminal Possession of Stolen Property 4
Grand Larceny 4

A-Misdemeanor

Graffiti
Menacing
Resisting arrest
Theft of Services

B-Misdemeanor

Criminal Sale/Possession of Marijuana 5

Violation

Disorderly Conduct
Trespassing
Loitering
Failing to respond to an appearance ticket

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*Indicates the degree level of the charge