BRIEF COMMUNICATION

Factors Predicting Length of Stay in an Adolescent Psychiatric Unit, South Bronx, NY: A Short Report

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Abstract

Objective: Mental health disorders account for around 1.8 million inpatient community hospital stays in the U.S.A. Our study aims to highlight the factors impacting the length of stay at a community hospital in the U.S.A. **Methods:** We reviewed 300 randomly selected charts to examine the factors impacting the length of stay in an adolescent inpatient psychiatric unit in 2011 and 2015. All data were analyzed in SPSS v. 20 with multiple regression analysis. **Results:** Longer length of stay among adolescents was associated with multiple psychiatric diagnoses, co-occurring medical comorbidities, not living with biological parents, history of mental illness, legal problems, substance use in the family, seclusion, restraints during current admission, and schizophrenia. **Conclusion:** Longer length of stay among adolescents in a psychiatric inpatient unit was associated with severity of psychopathology, hospital parameters and family stability.

Key Words: Length of stay, mental health, adolescents, Psychiatric illnesses

Résumé

Objectif: Les troubles de santé mentale représentent environ 1,8 million d'hospitalisations en hôpital communautaire aux États-Unis. Notre étude vise à mettre en évidence les facteurs influant sur la durée de séjour à un hôpital communautaire aux États-Unis. **Méthodes:** Nous avons étudié 300 dossiers choisis au hasard pour examiner les facteurs influant sur la durée de séjour dans une unité de psychiatrie pour adolescents hospitalisés en 2011 et 2015. Toutes les données ont été analysées au moyen du programme SPSS contre 20 par une analyse de régression multiple. **Résultats:** Une durée de séjour plus longue chez les adolescents était associée à de multiples diagnostics psychiatriques, à des comorbidité médicales co-occurrentes, au fait de ne pas habiter avec les parents biologiques, aux antécédents de maladie mentale, aux problèmes avec la justice, à l'utilisation de substances dans la famille, à l'isolement, à la contention durant l'hospitalisation en cours, et à la schizophrénie. **Conclusion:** Une durée de séjour plus longue chez les adolescents hospitalisés dans une unité de psychiatrie était associée à la gravité de la psychopathologie, aux paramètres de l'hôpital et à la stabilité familiale.

Mots clés: Durée de séjour, santé mentale, adolescents, maladies psychiatriques

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Introduction

Inpatient psychiatric hospitalization is an important component of psychiatric services provided to patients struggling with mental health issues. Psychiatry, in the last few decades, has experienced a fundamental change in the locus of care for these patients (Doessel, Scheurer, & Chant, 2005). This fundamental change began with the process of deinstitutionalization in the early 1960s, leading to greater emphasis on community-based services. Deinstitutionalization policies also resulted in the unavailability of psychiatric beds and a considerable reduction in the duration of stay in mental health institutions for these patients (Durbin, Lin, Layne, & Teed, 2007). They also introduced challenges concerning greater burdens on hospital emergency departments, length of stay (LOS), recidivism, and inappropriate admission processes, leading to dissatisfaction and lack of confidence in mental health systems among consumers (Doessel et al., 2005).

In addition to these challenges, inpatient hospital stays also generate a greater burden on mental healthcare costs in the U.S.A. (Doessel et al., 2005). According to data from the Health Care Cost and Utilization Project (HCUP), an inpatient hospital stay accounts for a 7% share of healthcare utilization, but costs around 33% of all healthcare spending in the U.S.A. (Tulloch, Fearon, & David, 2011). In 2008, mental health illnesses and substance abuse disorders accounted for 1.8 million inpatient community hospital stays, with a cost of 9.7 billion US dollars (Tulloch et al., 2011).

According to Tulloch et al., the average length of an inpatient hospital stay in the U.S.A. was eight days, which was significantly longer but associated with lower costs than a stay at a non-mental health and substance abuse facility (Tulloch et al., 2011). The factors governing LOS and its associated costs might differ from those in a general healthcare facility. Interestingly, according to Lee et al., hospital characteristics are major predictors of LOS, accounting for 51% of the variation (Lee, Rothbard, & Noll, 2012). In contrast, clinical characteristics and different diagnoses accounted for little variation (3%) in the length of hospital stay (Lee et al., 2012).

Despite an increased focus on research exploring LOS and recidivism at psychiatric hospitals, most of the data have been published from departments affiliated with academic institutions. Hence, there is a paucity of data that could be used to delineate the factors associated with LOS at inpatient psychiatric departments in community hospitals in the U.S.A. These community hospitals differ from teaching hospitals in several indicators such as profitability, wage indices, geographical location, critical access and comparatively low compliance with leapfrog standards, national quality forum practices and structural indicators of quality (Shahian et al., 2012). In addition, these community hospitals have a lower unadjusted cost of care per inpatient discharge (Shahian et al., 2012). Our study thus aims to explore these factors to improve the quality and cost-effectiveness of service delivery at a community hospital in the South Bronx, New York, U.S.A.

Methods

This retrospective chart review was conducted in Bronx Lebanon Hospital as a resident-led initiative for quality improvement at this center. A total of 300 charts selected randomly with a random number generator were reviewed. All belonged to child and adolescent patients aged 12 to 18 years who were admitted to the inpatient psychiatry department at the hospital in 2011 and 2015. These years were selected because the data records maintained in these years were more stringent and of higher quality. There were no exclusion criteria based on comorbid medical diagnoses, compliance with medication, or ethnicity. Before initiating the study, ethical approval was sought and obtained from the Ethical Review Board of Bronx Lebanon Hospital, in New York, U.S.A. Two reviewers who were blind to the study hypothesis used a specially-developed data abstraction tool to extract data for age, gender, number of diagnoses, medical diagnoses, history of abuse, legal status, history of seclusions and restraints, use of intramuscular medications, suicide history, living with biological parents, family history of mental illness, legal history, substance use, and the results of urine toxicology tests. The data abstraction tool was developed and operationalized as a manual by discussion with the senior authors, who were board certified in child and adolescent psychiatry. Possible predictors of LOS were identified by reviewing previous studies on this subject. The data abstraction tool was then pilot tested for convenience and practicality. To avoid bias in the data extraction procedure, the data extractors cross-checked the data, and discrepancies were resolved by discussion in conjunction with the senior authors. However, no inter-rater reliabilities were assessed with Cohen's kappa statistic.

A priori sample size calculations were performed with GPower (version 3.1.7). For an anticipated medium effect size ($f^2 = 0.15$), a 5% probability of alpha error, 95% statistical power and twenty predictors, a minimum sample size of 222 was estimated to be adequate for the present study. All data were analyzed in SPSS v. 20 (IBM, Illinois, USA). Mean (SD) was calculated for quantitative variables, and frequencies (%) were calculated for categorical variables. Statistical differences in the proportions of respondent characteristics were identified with the chi-squared goodness of fit statistic. Then linear regression analysis with a backward method was used to identify predictors of increasing LOS among adolescents at the Bronx Lebanon Hospital. History and quantile-quantile plots were observed to establish normality, and values for variance inflation factor (VIF) and tolerance (TOL) were checked for assumptions of collinearity. P values ≤ 0.05 were considered statistically significant.

Results

The mean (SD) age of adolescents admitted to the hospital was 14.10 years (3.50). The mean (SD) number of psychiatric diagnoses in these patients was 2.10 (.74), and the mean LOS was 21.17 (18.50) days. The proportion of males (n = 155, 51.7%) was slightly higher than females. Most adolescents were Hispanic 177 (59.0%), followed by African American 103 (34.3%). Most adolescents [236 (78.7%)] reported living with their biological parents, while 54 (18%) lived with foster parents and 10 (3.3%) lived in group homes. A high percentage of respondents [86 (28.7%)] had a history of suicidal behaviors, and 60 (20.1%) were involved in seclusion and restraint during their hospital stay. Ninety-nine (33.0%) of these adolescents had received at least one intramuscular medication.

Among the adolescents in the present study, 37 (12.3%) had one or more medical diagnoses. More than one fourth [80 (26.7%)] of the patients reported a history of abuse, the most common being sexual abuse in 41 (13.70%) followed by physical abuse in 35 (11.7%) and emotional abuse or neglect in four (1.3%). Our participants had a substantial family history of mental illness [106 (35.30%)] and substance-related disorders [35 (11.7%)]. A diagnosis of disruptive disorder was recoded in 123 (41.0%), substance-related disorder in 53 (17.7%), post-traumatic stress disorder in 24 (8%), neurodevelopmental disorder in 69 (23.0%), schizophrenia spectrum disorder in 33 (11.0%), mood disorder in 190 (63.3%), and anxiety disorder in 11 (3.7%) (Table 1). Almost 47.0% of the adolescents admitted to Bronx Lebanon had positive urine toxicology test findings. Most of the adolescents tested positive for cannabinoids and amphetamine (Table 2).

Multiple regression analysis yielded a significant model that explained 25.3% of the variation in LOS in the patients admitted to Bronx Lebanon. According to the model, increasing LOS among adolescents was associated with increasing numbers of psychiatric diagnoses, medical diagnoses, seclusions and restraints, not living with biological parents, family history of mental illness, legal and substance use, and schizophrenia spectrum disorders. However, a diagnosis of disruptive disorder was associated with a shorter LOS at the hospital (Table 3).

Discussion

Our study identifies a number of factors associated with LOS in a community-based hospital in the U.S.A. These factors corroborate previous findings reported from tertiary care teaching hospitals. In the following paragraphs we present a rationale for these findings. According to our analysis, increasing LOS among adolescents admitted to Bronx Lebanon Hospital was associated with increasing numbers of psychiatric diagnoses and medical diagnoses, seclusions and restraints, not living with biological parents, family history of mental illness, legal problems, substance use, and schizophrenia spectrum disorders. However, the diagnosis of disruptive disorders was associated with a shorter LOS at the hospital.

Our findings are partially consistent with a systematic review conducted by Tulloch at al., who identified several factors associated with LOS at psychiatric hospitals, including psychotic disorder, medical comorbidity, multiple previous admissions, age, severity of illness, cognitive impairment, and sociodemographic characteristics of the patients (Bessaha, Shumway, & Smith, 2017; Tulloch et al., 2011). Patients with schizophrenia spectrum disorder in our study tended to have a longer LOS, in contrast to those with disruptive disorders in the inpatient department. These factors can be explained by a number of rationales. For example, patients with more severe symptoms such as psychosis, poor insight, and low level of functioning require long-term healthcare. Schizophrenia spectrum disorders are also associated with higher rates of mortality, involuntary admission, noncompliance, complex drug treatments, and disposition towards the residential healthcare facility, which also play an important role in longer LOS (Tulloch et al., 2011). Moreover, patients with serious mental illnesses are more likely be covered by public insurance, which may fund their longer hospital LOS. However, a diagnosis of disruptive disorder was associated with shorter LOS. This finding contrasts with previous reports that associated callous/unemotional traits with longer hospital stays (Stellwagen & Kerig, 2010). Our finding may be rooted more in the treatment approaches and financial model of the hospital than in the individual's characteristics. For example, aggressive patients exhibiting destructive behaviors may have been transferred to a facility that is better suited for acute care, thus shortening their LOS.

A high percentage of patients in our study had a comorbid medical diagnosis that was also associated with longer LOS. According to Hert et al., this particular population has a higher risk of obesity, diabetes mellitus, metabolic syndrome, obstetric complications, HIV and hepatitis B and C, among other illnesses (Hert et al., 2011; Lyketsos, Dunn, Kaminsky, & Breakey, 2002). Therefore, patients with severe psychiatric symptoms not only have high mortality rates but also tend to report poor physical health due to an unhealthy lifestyle, poor insight and impaired level of functioning (Sourander, Ellilä, Välimäki, & Piha, 2002). Moreover, many psychotropic drugs are known to cause significant side effects if used without appropriate prescribing and titration. Such patients tend to stay in the hospital longer, with an average prolongation of LOS of 3.25 days (Hert et al., 2011). Therefore, identifying and managing medical problems during the inpatient stay are crucial to treating the patient holistically (Hert et al., 2011; Lyketsos et al., 2002).

Almost 20% of the respondents in our study sample had experienced seclusions and physical restraints, associated

Table 1. Frequencies of demographic characteristics of respondents (n = 300)				
Variable	Subcategories	Frequency (n)	Percentage (%)	χ^2 statistic
Gender	Male	155	51.7%	145.00[†]
	Female	145	48.3%	
Ethnicity	African American	103	34.3%	123.38[3]
	Hispanic	177	59.0%	
	Others	20	6.7%	
Medical diagnosis	No	263	87.7%	263.00[3]
	Yes	37	12.3%	
Abuse	Physical	35	11.7%	384.29[3]
	Sexual	41	13.7%	
	Emotional/Neglect	4	1.3%	
	None	220	73.3%	
Legal status	Yes	41	13.8%	256.00[3]
	No	256	86.2%	
Seclusion and restraint	Yes	60	20.1%	239.0[3]
	No	239	79.9%	
IM medication given	Yes	99	33.0%	201.00[3]
	No	201	67.0%	
Suicide history	Yes	86	28.7%	214.00[3]
	No	214	71.3%	
OPD referral	Yes	241	81.1%	241.00[3]
	No	56	18.9%	
FU with plan	Yes	141	58.0%	141.00[1]
	No	102	42.0%	
Family history	Mental illness	106	35.3%	199.01[3]
	Substance related disorder	35	11.7%	
	Legal	1	0.3%	
	None	158	52.7%	
30 days readmission	Yes	18	7.4%	224.0[3]
	No	224	92.6%	
Substance related disorder	No	247	82.3%	247.00[3]
	Yes	53	17.7%	
Disruptive disorder	No	177	59.0%	177.00[2]
	Yes	123	41.0%	
Traumatic stress disorder	No	276	92.0%	24.00[3]
	Yes	24	8.0%	
Neurodevelopmental disorder	No	231	77.0%	231.00[3]
	Yes	69	23.0%	
Schizophrenia spectrum disorder	No	267	89.0%	267.00[3]
	Yes	33	11.0%	

Table 1. continued				
Variable	Subcategories	Frequency (n)	Percentage (%)	χ^2 statistic
Mood disorder	No	110	36.7%	190.00[3]
	Yes	190	63.3%	
Anxiety	No	289	96.3%	11.00[3]
	Yes	11	3.7%	
Living Situation	Biological	236	78.7%	287.12[3]
	Foster/Adopted	54	18.0%	
	Group home	10	3.3%	
┼ Denotes P > 0.05, 1 Denotes P < 0.05, 2 denotes P < 0.01, 3 denotes P < 0.01				

Table 2. Frequency of drug use among adolescents admitted to Bronx Lebanon Hospital, NY (n = 300)		
Drug	Frequency (n)	Percent (%)
Benzodiazepines	4	1.3
Cannabinoids	42	14.0
Cocaine	3	1.0
Methadone	2	0.7
PCP	4	1.3
Amphetamines	26	8.7
Not contributory	41	13.7
None	178	59.3

with a longer LOS. Our findings are consistent with a nationwide case–control study which concluded that longer LOS in an adolescent inpatient unit was associated with increased hours of restraint (Sourander et al., 2002). Seclusions and restraints are usually used when patients exhibit aggression and severe symptoms of psychosis and disruptive disorder, pose a high risk of danger to themselves or others, are not compliant with treatment, and are admitted involuntarily to inpatient hospitals (Atkins & Ricciuti, 1992; Delaney & Fogg, 2005). These findings are consistent with results from a similar study in Finland: 17 out of 20 patients in their study sample who were mechanically restrained had been admitted to the inpatient unit for more than 90 days (Atkins & Ricciuti, 1992).

We also found that longer LOS in children and adolescents tends to be associated with not living with their biological parents and a family history of mental illness, legal issues and substance abuse. This finding emphasizes the importance of strong family and social support systems, which provide strength to the patient as well as the treatment team, and reduce the psychosocial burden associated with their illness. Patients lacking strong family support, and living in foster care or a child protection facility, are also more likely to be subjected to seclusion and safety holds (Furre, Sandvik, Heyerdahl, & Friis, 2014). Moreover, the high frequency of a family history of mental illnesses and substance use disorders in our study sample is a foreboding prognostic factor. The severity of psychopathology and adherence to the treatment regimen are mediated by family history of mental illness in these children and adolescents, leading to an increased LOS at the hospital (Hussey & Guo, 2005).

Limitations

The present study builds on previous literature by providing new insights into factors that predict LOS in community hospital settings. However, the results of this study should be generalized with caution. This study was conducted in only one community hospital in New York, U.S.A. Accordingly, our results should not be generalized to other regions and hospital settings. Prior to data abstraction, the authors did not establish inter-rater reliability during the pilot phase. However, an attempt to minimize errors was made by having additional reviewers cross-check all data. Moreover, the chart review methodology poses several limitations regarding inferences of causality and temporality; future studies should therefore use rigorous study designs, a larger sample size and multiple sites.

Table 3. Predictors of length of stay of adolescents admitted to Bronx Lebanon Hospital (n=300)

Variables	B	S.E.	Beta	T statistics	P-value
(Constant)	39.964	7.114		5.618	< 0.001
Number of diagnoses	5.274	1.480	0.210	3.564	< 0.001
Medical diagnosis	-9.050	3.084	-0.160	-2.934	0.004
Seclusions & restraints	-17.884	2.371	-0.386	-7.542	< 0.001
Living with biological parents	6.770	2.310	0.149	2.931	0.004
Family history of mental illness, legal status and substance abuse	3.566	1.887	0.096	1.889	0.060
Disruptive disorder	-4.194	2.141	-0.111	-1.959	0.051
Schizophrenia spectrum disorder	7.519	2.992	0.128	2.513	0.013
Backward regression model, ANOVA F = 15.309, P < 0.001, adjusted R2 = 25.3%					

Conclusion

The increased length of stay among adolescents is related to their health condition, hospital parameters and the patient's family support network.

Acknowledgements / Conflicts of Interest

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