Effect of Timing of Psychiatry Consultation on Length of Pediatric Hospitalization and Hospital Charges

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ABBREVIATIONS
APR-DRG: All Patient Refined Diagnostic Related Groups
DSM-IV-TR: *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision*
FTE: full-time equivalent
IQR: interquartile range
PCLS: psychiatry consultation liaison services

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abstract

OBJECTIVES: The purpose of this study was to evaluate the impact of timing of a psychiatry consultation during pediatric hospitalization on length of hospital stay and total hospitalization charges.

METHODS: The charts of 279 pediatric patients (totaling 308 consultations) referred to the psychiatry consultation liaison service at a freestanding tertiary pediatric hospital between January 1, 2010, and June 30, 2010 were retrospectively analyzed. The variables analyzed included the following: patient demographic characteristics; dates of admission, psychiatric consultation, and discharge; psychiatric diagnoses based on the psychiatric diagnostic evaluation; psychiatric treatment disposition; and illness severity and total charges associated with the medical stay.

RESULTS: Earlier psychiatry consultation was associated with shorter length of stay and lower hospitalization charges after adjusting for psychiatric functioning, physical illness severity, and psychiatric disposition. Poorer psychiatric functioning and milder physical illness were associated with shorter referral time.

CONCLUSIONS: Timely involvement of psychiatry consultation services during a medical or surgical hospitalization was associated with reductions in length of stay and total hospital charges in pediatric settings. These findings have important effects on quality of care via decreasing burden on the patient and family and on the medical system resources. Educating pediatric health care providers about the importance of early psychiatry consultation regardless of physical illness severity or psychiatric acuity will likely improve resource management for patients and hospitals.

Psychiatry consultation liaison services (PCLS) have become well integrated into pediatric hospital settings[1] in a fashion similar to adult hospital settings. The co-occurrence of mental and physical health problems is common in adult and pediatric patients with chronic health conditions.[2,3] A recent study highlighted that 18% of hospitalizations in freestanding children's hospitals within the United States include a mental health diagnosis.[4]

Adult and pediatric studies have found that the manifestation of psychiatric symptoms within inpatient medical and surgical settings can affect length of stay, with longer stays reported in patients with primary or comorbid psychiatric disorders compared with the general patient population.[4–7] In addition, co-occurring psychiatric and medical illness is associated with higher hospital expenses, greater number of procedures, and increased number of rehospitalizations.[4,8–10]

In hospital settings, psychological factors commonly exacerbate physical illness–associated symptoms, and emotional and somatic reactions may be misattributed to medical complications or misinterpreted as symptoms of medical conditions (eg, pain, fatigue, sleep disturbance, delirium), thereby contributing to increased health care utilization and costs.[10–15]

It is well established in adult medical and surgical inpatient settings that psychiatric services are effective for responding to troubling mental health symptoms,[6,9] are well received by patients and referring medical services, and contribute to staff education about psychiatric illness and management.[16–20] PCLS involvement has been found to reduce medical complications, length of stay, and number of hospitalizations via early referral for psychiatric consultations,[21] behavioral health interventions (cognitive-behavioral or supportive therapies),[22,23] treatment of psychiatric presentation on medical and surgical units (ie, delirium, depression),[10,21] and facilitating access to appropriate psychiatric treatment postdischarge.[21,24,25]

Despite these positive aspects, PCLS in inpatient medical and surgical settings has been traditionally viewed as financially unprofitable[26] until recently, when efforts proving the cost-effectiveness of consultation psychiatry have been successfully undertaken.[10] In today's current health care climate of cost savings, limited allocation of resources, and expectations to demonstrate value of service and clinical productivity, there is a great need to highlight the benefit of psychiatry consultations to hospitals and insurance companies.[1,27,28] Unfortunately, the financial savings found in providing a psychiatry consultation during adult hospitalizations[8] have not been explored or replicated during pediatric hospitalizations. As such, our study focused on the potential impact of earlier PCLS involvement on length of stay and total hospital charges, with consideration of psychiatric functioning, physical illness severity, and psychiatric discharge disposition.

METHODS

The present study included a consecutive series of pediatric patients (up to age 18 years) referred to the PCLS at a freestanding pediatric hospital between January 1, 2010 and June 30, 2010. At the time of the study, the hospital had 395 licensed beds and 150 outpatient clinics serving >25 000 inpatients and 514 700 outpatients annually. The PCLS had 3.0 full-time equivalent (FTE) child and adolescent psychiatrists, 1.5 FTE child psychologists, 1.0 FTE child and adolescent psychiatry residents, 1.5 FTE predoctoral psychology interns, and 2.0 FTE postdoctoral psychology fellows providing consultations to general medical and surgical inpatient units. An attending psychiatrist or psychologist performed the consultations with a psychiatry or psychology trainee, and they remained involved in the patient care until discharge.

Sample

Inpatient psychiatry consultation requests from the medical and surgical units were considered for subject selection; patients referred by critical care and solid organ transplant services were excluded. This strategy was chosen to maintain consistency in terms of the electronic documentation systems and psychiatric care, which were different for these 2 groups. Two influential outliers were removed from the data set (log-transformed value for the patients' length of stay was >4 SDs from the mean).

Procedures

The PCLS records were queried for the specified dates and, with approval from the hospital's institutional review board, medical records were retrospectively reviewed for pediatric patients with a psychiatric consultation during the study period. The following information was recorded: (1) patient demographic characteristics and dates of admission, psychiatric consultation, and discharge; (2) psychiatric treatment disposition (outpatient treatment or inpatient psychiatric facility); (3) psychiatric diagnoses based on the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* (DSM-IV-TR),[29] axes I and II; (4) psychiatric functioning based on the global assessment of functioning score, DSM-IV-TR axis V; (5) primary medical diagnosis at discharge based on All Patient Refined Diagnostic Related Groups (APR-DRG) and the *International Classification of Diseases, Ninth Revision*; (6) physical illness severity (by using pediatric-focused hospital case-mix index as a risk-adjusted measure based on APR-DRG and severity of illness within the diagnosis-related groups); and (7) total charges associated with the hospitalization, as determined by the hospital's financial office for each study participant.

Data Analysis

The primary aim of the present study was to determine if early referral to PCLS was associated with shorter length of stay and reduced total hospital charges. Given the likely

complicated and complex relationship between psychiatric functioning, physical illness severity, psychiatric disposition, referral time, length of stay, and total hospital charges, path analysis was used to evaluate the hypothesized model shown in Fig 1. We hypothesized that: (1) psychiatric functioning and physical illness severity would be associated with referral time, length of stay, discharge disposition, and total hospital charges; (2) psychiatric disposition would be associated with length of stay (given the known difficulty with finding inpatient psychiatric placements for patients boarding on the medical floors[30]); and (3) length of stay would be associated with total hospital charges.

Univariate statistics revealed that physical illness severity, referral time, length of stay, and total hospital charges were positively skewed, and they were therefore log-transformed for analysis. Descriptive statistics such as mean and SDs for normally distributed variables, median and interquartile ranges (IQRs) for skewed variables, and frequency and percentages for categorical variables were generated for variables collected for the study. Patient demographic characteristics, primary medical discharge diagnoses, DSM-IV-TR diagnoses, PCLS consultation characteristics, and referring services for PCLS were summarized by using descriptive summary statistics. Spearman's correlation was used to assess the relationship between referral time and (observed/expected) length of stay. All statistical analyses were 2-sided with a significance level of 0.05. Data analyses were conducted by using either SPSS version 21 (for the univariate analyses [IBM SPSS Statistics, IBM Corporation, Armonk, NY]) or MPlus version 7.11 (for the path analysis [Muthén & Muthén, Los Angeles, CA]).

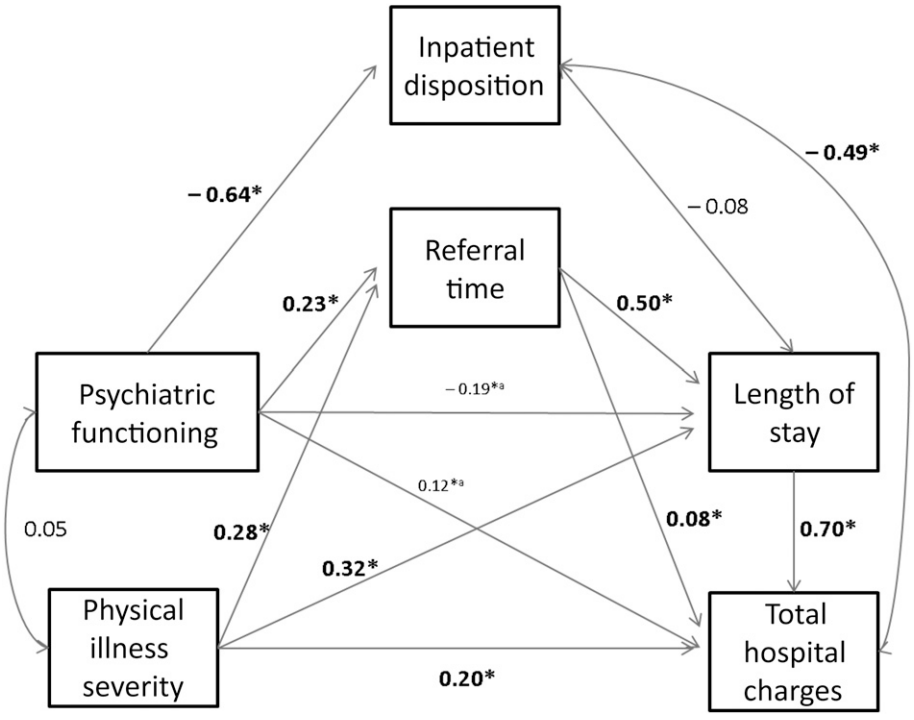

FIGURE 1 Path model used to test the effect of referral time to PCLS on length of stay and total hospital charges, adjusting for psychiatric and physical functioning and psychiatric disposition. Standardized coefficients are presented and marked for significance with ($P < .05$). [a]Although the direct effect of psychiatric functioning on length of stay and total charges was significant, when accounting for the fact that psychiatric functioning was associated with referral time and thus length of stay, the overall effect of psychiatric functioning on both length of stay and total hospital charges costs was ultimately not significant ($P = .17$ and .08, respectively).

RESULTS

A total of 513 total inpatient psychiatry consultations were recorded for the study period, of which 60% ($N = 308$) met the criteria for inclusion in the analysis. Individual participants included 279 children and adolescents (age range: 2–18 years), with a median age of 15 years (IQR: 12–16), representing 4% of the overall 6729 individual patients admitted to the medical and surgical units served by the PCLS during the 6-month study period. Table 1 summarizes the demographic characteristics of the individual patients seen by the PCLS for the time period, and Tables 2 and 3 describe the sample's medical and psychiatric characteristics, respectively. The majority of patients were female (73%) and white (76%). Anxiety and depressive disorders were the most common psychiatric diagnoses (30% and 29%, respectively) and the mean ± SD global assessment of functioning score was 49 ± 11.5. According to the psychiatric evaluations conducted by PCLS clinicians, there was considerable psychiatric comorbidity, with 43% of patients having >1 psychiatric diagnosis. Tables 4 and 5 summarize characteristics related to the hospitalization and consultation referral, respectively. One-quarter of the patients (25%) required inpatient

TABLE 1 Demographic Characteristics of Unique Patients Referred to PCLS

Characteristic	Value ($N = 279$)
Age at first referral in study period, y	
Median (IQR)	15 (12–16)
Gender, *n* (%)	
Female	203 (73)
Male	76 (27)
Race/ethnicity, *n* (%)	
White/not Hispanic or Latino	212 (76)
Hispanic or Latino	30 (11)
Black	30 (11)
Asian	5 (2)
Other	2 (<1)

psychiatric treatment programs at discharge from the hospital. The majority of the patients were discharged to outpatient therapy and/or psychotropic medication management (59%), and 7% of patients received referrals to psychiatric day programs. For 9% of the sample, no psychiatric treatment dispositions were needed. Patients were referred to the PCLS a median of 1 day (IQR: 1–3) after their admission and had a median length of stay of 4 days (IQR: 2–7). For each patient, the expected length of stay was calculated by dividing the patient's observed length of stay by an adjustment factor based on the diagnosis-related groups and severity of each patient's condition provided by the Children's Hospital Association Pediatric Health Information System.[31] Using the ratio between observed length of stay and expected length of stay (observed/expected), a significant, positive correlation of 0.34 was found between referral time and observed-to-expected length of stay ($P = .0001$). This finding indicated that a delay in PCLS referral was associated with a longer than expected length of stay, accounting for patients' physical illness severity. Not surprisingly, there was a strong association between length of stay and total hospital charges ($P < .001$).

As expected, path analysis revealed a complex relationship among the study variables. Figure 1 shows the model relationships and the fit measures for the model. Overall, the findings indicate that the model fits reasonably well (root mean square error of approximation: 0.02 [95% confidence interval: 0–0.12]; comparative fit index: 0.99; Tucker-Lewis index: 0.99). The model accounts for 43% of the variability in length of stay and 76% of the variability in total hospital charges. Severity of physical illness (higher case-mix index values) was associated with a longer time to referral to PCLS, longer length of stay, and higher total hospital charges ($P < .001$ for each). Poor psychiatric functioning (lower global assessment of functioning scores) was associated with a shorter referral time ($P < .001$) and with a greater likelihood of being discharged to an inpatient psychiatric facility ($P < .001$). After accounting for the fact that psychiatric functioning was associated with referral time and thus length of stay, the overall effect of psychiatric functioning on both length of stay and total hospital charges was ultimately not significant ($P = .17$ and .08, respectively). Finally, being discharged to an inpatient psychiatric facility was not significantly associated with an increased length of stay ($P = .51$) but was significantly associated with lower total hospital charges ($P < .001$).

Our primary goal was to assess the effect of earlier PCLS referral on length of stay and total hospital charges, adjusting for psychiatric functioning, physical illness severity, and psychiatric disposition. After adjusting for these factors, we found that a 10% decrease in referral time to PCLS was associated with a 7.9% shorter length of stay (95% confidence interval: 6.4–9.5; $P < .001$). Given the association between length of stay and total hospital charges,

TABLE 2 Primary Medical Discharge Diagnosis Categories Based on Major Diagnostic Criteria for APR-DRG and ICD-9

Variable	Value ($N = 305$)[a]
Major diagnostic criteria, *n* (%)	
Mental diseases and disorders	57 (19)
Diseases and disorders of the nervous system	52 (17)
Diseases and disorders of the digestive system	47 (15)
Endocrine, nutritional, and metabolic diseases and disorders	26 (8)
Poisonings, toxic effects, other injuries, and other complications of treatment	24 (8)
Diseases and disorders of the musculoskeletal system and connective tissue	22 (7)
Diseases and disorders of the circulatory system	19 (6)
Diseases and disorders of the respiratory system	14 (5)
Diseases and disorders of the kidney and urinary tract	11 (4)
Diseases and disorders of blood, blood-forming organs, and immunologic disorders	7 (2)
Rehabilitation, after care, other factors influencing health status and other health service contacts	6 (2)
Diseases and disorders of the hepatobiliary system and pancreas	5 (2)
Ear, nose, mouth, throat, and craniofacial diseases and disorders	4 (1)
Other	11 (4)
Case-mix index	
Median (IQR)	0.88 (0.58–1.33)

ICD-9, *International Classification of Diseases, Ninth Revision*.
[a] Data available for 305 of 308 psychiatric consultations.

TABLE 3 DSM-IV-TR Diagnostic Categories of Patients Referred to PCLS

Variable	Value ($N = 308$)
Diagnostic category, *n* (%)[a]	
Anxiety disorders	91 (30)
Depressive disorders	90 (29)
Somatoform disorders	66 (21)
Disruptive disorders	58 (18)
Adjustment disorders	42 (14)
Eating disorders	38 (12)
Bipolar affective disorders	30 (10)
Learning disability	23 (7)
Substance abuse–related disorders	16 (5)
Pervasive and other developmental disorders	14 (5)
Delirium and psychosis	14 (5)
Other	19 (6)
No psychiatric diagnosis	12 (4)
Global assessment of functioning score	
Mean ± SD	49 ± 11.5
Median (IQR)	50 (40–58)
Minimum, maximum	10, 76

[a] Total percentage exceeds 100% because patients often had >1 psychiatric diagnosis.

a 10% decrease in referral time to PCLS was associated with a 7.9% decrease in total hospital charges (95% confidence interval: 6.4–9.3; $P < .001$) even after accounting for other factors. The majority (~80%) of the effect of delayed referral time on total hospital charges was due to the increase in length of stay ($P < .001$).

DISCUSSION

Previous studies with adult patients showed the quantifiable effects of psychiatric illness on many aspects of care, including length and costs of medical hospitalizations.[3,7–9] The present study is the first of its kind to quantitatively assess the effect of psychiatry consultation on pediatric hospitalizations. Similar to the adult literature, we found that earlier psychiatry consultation was associated with shorter hospitalization. This study also suggests that, even after accounting for physical illness severity, shorter referral time to psychiatry consultation services leads to reduction in the total charges of hospitalization, mainly due to the association with shorter hospitalization.

Our study is unique in that it accounts for both psychiatric functioning and physical illness severity in an effort to better discern the impact of PCLS on health care utilization for medically hospitalized pediatric patients. It is not surprising that patients with greater physical illness severity were referred to PCLS later during their admission, had longer stays, and higher total charges, likely owing to their fragile health. However, our findings highlight the potential benefit of PCLS, in that regardless of physical illness severity, a 10% quicker referral time to PCLS was associated with a 7.9% shorter length of hospitalization and 7.9% lower total hospital charges. Patients in tertiary care hospitals are generally sicker than those in general hospitals and have higher risks of adverse outcomes and decreased quality of life due to complex chronic illnesses.[32,33] Our findings are consistent with other studies showing that complex chronically ill children at freestanding children's hospitals have a relatively high burden of mental health comorbidities.[4] As hospitals develop budgets and place greater emphasis on revenue-generating services, the effect of PCLS on pediatric inpatient care should not be underestimated. These services are typically not part of the larger profit producers in hospital settings; therefore, demonstrating cost-offset through shortened hospital stays and decreased health care charges is an important way to demonstrate the value of PCLS at pediatric institutions. With the exponentially growing costs of health care, these savings cannot be overlooked.

It is reassuring that patients with poor psychiatric functioning prompted early referrals to PCLS by medical staff. In addition, patients who required inpatient psychiatric treatment programs at discharge had lower total hospital charges; it is possible that, among other factors, such patients had primary psychiatric needs and therefore were less likely to undergo extensive medical tests and procedures during the hospitalization. The finding that referral time to psychiatry ultimately affects the patients' length of stay (and, subsequently, total hospital charges) highlights the importance of early collaboration between pediatric hospital health care providers and psychiatry consultation services.

TABLE 4 Admission Characteristics

Admission Characteristics	Value ($N = 308$)
Referral time to PCLS, d	
Median (IQR)	1 (1–3)
Length of stay, d	
Median (IQR)	4 (2–7)
Minimum, maximum	1, 28
1–7 d	267 (75%)
8–14 d	62 (17%)
≥15 d	29 (8%)
Total hospital charges, $	
Median (IQR)	17302 (9392–35091)

TABLE 5 Referring Services to PCLS

Referring Services, *n* (%)	Value ($N = 308$)
General pediatrics (hospitalists)	65 (21)
Neurology	54 (18)
Adolescent medicine	39 (13)
Gastroenterology	33 (11)
Pulmonary	14 (5)
General surgery	14 (5)
Pain service	11 (4)
Endocrine	10 (3)
Intermediate care program	10 (3)
Cardiac surgery/cardiology	7 (2)
Renal/urology	7 (2)
Toxicology	6 (2)
Hematology	5 (2)
Other	33 (11)

Our findings from a pediatric setting corroborate existing adult literature demonstrating that a collaborative multidisciplinary approach for effective identification, assessment, and management of physically ill patients in need of psychiatric support improves overall outcomes of the hospitalization[19,24] and shortens length of hospitalization.[8]

One of the 2 most frequent diagnostic categories in our study was depressive disorders (29%), consistent with a recent study which found that depression is the most common mental health diagnosis in freestanding children's hospitals for patients aged 3 to 20 years.[4] Studies have shown that patients with less overt psychiatric symptoms such as depression are at risk for delayed identification and assistance and, therefore, have a more protracted hospital course.[21,24] Hospital initiatives that can expedite referral to PCLS, such as nursing screens for depression and suicide risk and in-service programs for hospital staff by PCLS, can be beneficial in promptly addressing the needs of depressed youth with medical problems. In addition, thorough psychiatric evaluations and evidence-based treatments may reduce unnecessary medical tests and interventions and further decrease the charges of hospitalization. This finding is especially relevant in patients diagnosed with somatoform disorders,[14] which were found to be the third most common diagnostic category in our sample (21%).

The present study has several limitations. Given the nature of retrospective chart review, data were not collected prospectively. Although this study focused on psychiatric consultation referrals, not all patients seen by the PCLS were included in the analysis; patients seen on the critical care and solid organ transplant services were excluded as described previously, and this exclusion may have affected the results. The study used data from a 6-month time period rather than an entire year; it may, therefore, not account for the ebb-and-flow of psychiatric consultations that occur across a 12-month period. However, the sample size had large enough power to detect statistically significant findings; the likelihood that 6 additional months would have resulted in different conclusions is minimal. The results might not be generalizable, as the study was done in 1 tertiary freestanding pediatric hospital that has a specific routine of PCLS consultations and collaboration with medical teams. In addition, the finding of reduction in hospital charges with timely PCLS consultation is likely due to the significant association between these 2 variables, as each hospital day is a major driver of costs. Finally, data were analyzed within the confines of the available pediatric-focused hospital case-mix index as a risk-adjusted measure based on APR-DRG and severity of illness within the diagnosis-related groups. Given the complexity of the cases seen at our tertiary hospital, creation of a pediatric control group without PCLS involvement for each APR-DRG and severity combination was not feasible in our study.

Useful directions for future studies include exploring how individual patient factors and/or referring medical services might be differentially associated with the referral time to psychiatric consultation, length of hospitalization, and associated hospital charges in pediatric populations.

CONCLUSIONS

The importance of psychiatric consultation services in inpatient pediatric medical and surgical settings can be demonstrated by assessing resource management for patients and families (shorter length of hospitalization), hospitals, and managed care systems (lower total hospital charges). To the best of the authors' knowledge, this is the first study to show that early PCLS involvement in a pediatric hospital setting is associated with shorter length of stay and decreased total hospital charges.

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