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Psychiatric Disorders and Trends in Resource Use in Pediatric Hospitals

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abstract

OBJECTIVE: To describe recent, 10-year trends in pediatric hospital resource use with and without a psychiatric diagnosis and examine how these trends vary by type of psychiatric and medical diagnosis cooccurrence.

METHODS: A retrospective, longitudinal cohort analysis using hospital discharge data from 33 tertiary care US children's hospitals of patients ages 3 to 17 years from January 1, 2005 through December 31, 2014. The trends in hospital discharges, hospital days, and total aggregate costs for each psychiatric comorbid group were assessed by using multivariate generalized estimating equations.

RESULTS: From 2005 to 2014, the cumulative percent growth in resource use was significantly (all $P < .001$) greater for children hospitalized with versus without a psychiatric diagnosis (hospitalizations: +137.7% vs +26.0%; hospital days: +92.9% vs 5.9%; and costs: +142.7% vs + 18.9%). During this time period, the most substantial growth was observed in children admitted with a medical condition who also had a cooccurring psychiatric diagnosis (hospitalizations: +160.5%; hospital days: +112.4%; costs: +156.2%). In 2014, these children accounted for 77.8% of all hospitalizations for children with a psychiatric diagnosis; their most common psychiatric diagnoses were developmental disorders (22.3%), attention-deficit/hyperactivity disorder (18.1%), and anxiety disorders (14.2%).

CONCLUSIONS: The 10-year rise in pediatric hospitalizations in US children's hospitals is 5 times greater for children with versus without a psychiatric diagnosis. Strategic planning to meet the rising demand for psychiatric care in tertiary care children's hospitals should place high priority on the needs of children with a primary medical condition and cooccurring psychiatric disorders.

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Dr Zima conceptualized and designed the study, created the psychiatric diagnostic groups, and drafted the initial manuscript; Mr Rodean conducted the data analysis, provided statistical consultation on the data source, presentation, and interpretation, and reviewed and revised the manuscript; Dr Hall supervised the data analysis, provided statistical consultation on the data source, presentation, and interpretation, and reviewed and revised the manuscript; Drs Bardach, Coker, and Berry provided consultation on the study design, data presentation, and interpretation and reviewed and revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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WHAT'S KNOWN ON THIS SUBJECT: Pediatric hospital use and costs for psychiatric disorders has substantially increased. However, little is known about how psychiatric and medical diagnosis cooccurrence differentially influences pediatric hospitalization resource use.

WHAT THIS STUDY ADDS: The rise in hospitalizations to US freestanding children's hospitals between 2005 and 2014 was 5 times higher in children with versus without a psychiatric diagnosis. The greatest rise occurred in children with a primary medical diagnosis and cooccurring psychiatric diagnosis.

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Pediatric hospitalizations for child mental disorders are common and costly. In 2009, nearly 1 in 10 US pediatric hospitalizations was for a primary psychiatric diagnosis, and the aggregate charges for depression alone were $1.3 billion; estimates that exceed those for asthma.[1] Between 2006 and 2011, pediatric hospitalizations for mental disorders among US children have increased by nearly 50%, with total expenditures of $11.6 billion.[2] During this time period, however, the percent change in pediatric hospitalizations varied by type of psychiatric disorder. Pediatric hospitalizations for mood disorders significantly rose, whereas the percent change in hospitalizations for other mental disorders was stable and those for alcohol-related conditions declined.[2]

Earlier studies also suggest that cooccurring psychiatric disorders, either as a primary or secondary diagnosis, are an important driver of pediatric hospitalizations and costs. Children with common mental disorders, such as autism and attention-deficit/hyperactivity disorder (ADHD), have higher health care use than children without these conditions.[3–5] Cooccurring child psychiatric disorders also substantially increase health service use for other chronic conditions (eg, asthma, sickle cell, obesity).[6–8] Together, these findings raise the question of whether the type of psychiatric comorbidity differentially influences pediatric hospitalization resource use and, if so, to what extent over time?

This study thus describes recent 10-year trends in tertiary care children's hospitalizations, length of stay, and costs for psychiatric disorders and stratifies these trends by 2 types of psychiatric comorbidity. The types are: (1) hospitalizations with and without a psychiatric diagnosis; and (2) among hospitalizations with any psychiatric diagnosis, primary medical diagnosis with at least 1 secondary psychiatric diagnosis, primary psychiatric diagnosis with at least 1 secondary medical diagnosis, and hospitalizations with only psychiatric diagnoses. In addition, this study describes the most recent percent change in hospitalizations for specific psychiatric disorder groups by these psychiatric comorbid subgroups. Collectively, these data will further guide strategic planning by children's hospitals as they strive to integrate mental health care into their health care systems.

METHODS

Study Design and Data Source

This study is a retrospective cohort analysis using the Pediatric Health Information System (PHIS) database (Children's Hospital Association, Overland Park, KS) approved for exemption by the institutional review board of the University of California at Los Angeles. PHIS includes hospital discharges from 49 tertiary care children's hospitals with administrative data for each, including demographic characteristics, billing information, and up to 52 procedures and 41 diagnoses classified by the *International Classification of Disease, Ninth Revision, Clinical Modification*. Each record represents a single discharge; therefore, a patient (possessing a unique identifier) may contribute >1 record. Consistent with the Uniform Hospital Discharge Data Set rules,[9] diagnosis codes are abstracted directly from the electronic medical records and checked for being present and clinically valid.

Study Population

The study population was comprised of all inpatient and short-term observation unit stays of patients ages 3 to 17 years between 2005 through 2014 from 33 hospitals with discharge and billing data for the entire study period, which accounts for ~23% of all pediatric hospitalizations of children aged 3 to 17.[10] This age range was selected to create a study population that was at risk for need of psychiatric consultation or treatment.

Study Variable Construction

Hospital Resource Use

The main dependent variables were the cumulative percentage change in hospital discharges, days spent in the hospital, and aggregate hospital costs accrued for each psychiatric comorbid group. Billed hospital charges were converted to costs by using ratios of cost-to-charge specific to the year, hospital, and service line. These ratios of cost-to-charge were obtained through the Medicare Cost Report System database by Truven Health Analytics (Ann Arbor, MI). The costs were adjusted for regional cost of living and then inflated to 2014 dollars by using the Consumer Price Index for medical care.[11]

Psychiatric Disorder Groups

To create psychiatric disorder categories, we adapted the multilevel mental health groupings from the ICD-9–based Clinical Classification Software (CCS) from the Agency for Healthcare Research and Quality, and then adapted the multilevel CCS groupings by using 2 previous approaches.[1,2] The psychiatric disorder groups, corresponding lowest CCS levels, and ICD-9 CM diagnosis codes are summarized in Supplemental Table 3.

Psychiatric Comorbidity Classification

Psychiatric comorbidity was conceptualized as 2 types. We first assessed whether a hospitalization was with or without any psychiatric diagnosis. Among hospitalizations with any psychiatric disorder, we assessed whether the hospitalization fell within the following subgroups: (1) primary medical diagnosis and at least 1 secondary psychiatric

diagnosis (med + psych); (2) primary psychiatric diagnosis and at least 1 secondary medical diagnosis (psych + med); and (3) psychiatric diagnoses without any medical (ie, nonpsychiatric) diagnosis (psych only).

Patient and Hospital Characteristics

Demographic characteristics assessed for each psychiatric comorbid group were age, sex, race/ethnicity, and insurance type. Each hospitalization was characterized by medical complexity by using version 2 of Feudtner's complex chronic conditions (CCCs) classification system.[12] For subgroup analyses, hospitalizations were classified as either "medical" or "surgical" by using the All Patients Refined Diagnosis Related Group, version 3.0 (3M Health Information Systems, Salt Lake City, UT). Presence of a psychiatric unit was determined by any billing codes for psychiatric unit bed charges.

Statistical Analysis

To assess associations of patient demographic and clinical characteristics by type of psychiatric comorbidity, we used bivariate Rao-Scott χ^2 tests, accounting for hospital clustering. *P* values <0.05 were considered statistically significant, and all analyses were performed with SAS, version 9.4 (SAS Institute, Inc, Cary, NC). To assess aggregate trends in the growth of hospital discharges, hospital days, and total aggregate costs for hospitalized patients within each psychiatric comorbid group, we used linear, multivariable regression. Multivariable models were derived by using generalized estimating equations to account for clustering of data within hospitals. The linear generalized estimating equation models included fixed effects for patient demographic and clinical characteristics as well as US child population attributes that could potentially impact hospital resource use, including: total population of US children, the total number of nonneonatal US pediatric hospitalizations, the total number of US children enrolled in Medicaid, and the number of US children living in poverty. An interaction term between psychiatric comorbid group and year was used to compare the adjusted growth over time among the psychiatric comorbid groups. Mean annual growth was calculated as the annual percent change between consecutive years, and cumulative growth was calculated as the percent change between 2005 and 2014. Subgroup analyses were performed on medical (ie, nonsurgical) hospitalizations, hospitalizations with no CCC present, hospitals with psychiatric units for the full study period, and hospitals without psychiatric units for the full study period.

RESULTS

Study Population

From 2005 through 2014, there were 3 114 099 hospitalizations in the 33 freestanding children's hospitals. These hospitalizations accounted for 12 253 353 hospital days at a total inflation- and wage-adjusted cost of $45.5 billion. During the study period, there was significant cumulative percent increase (all $P \leq .001$) in total number of hospitalizations (41.5%), hospital days (25.7%), and hospital costs (40.8%) for all patients. Of the total hospitalizations, 18.3% (n = 568 449) were associated with a psychiatric disorder, either primary or secondary. Of the hospitalizations with a psychiatric diagnosis, more than three-fourths (76.6%; n = 435 626) were for med + psych diagnoses, 17.6% (n = 100 331) were for psych + med diagnoses, and 5.7% (n = 32 492) were for psych only diagnoses.

Among the pediatric hospitalizations in 2014, child demographic characteristics and prevalence of CCCs significantly varied (all $P \leq .001$) by the presence of any psychiatric diagnosis and by the type of psychiatric comorbidity (Table 1). Among hospitalizations for combined medical and psychiatric disorders, the number of CCCs and organ systems affected also substantially differed by whether the primary diagnosis was medical or psychiatric. For med + psych hospitalizations, 55.9% (n = 37 816) had at least 1 CCC compared with only 16.7% (n = 2721) for psych + med hospitalizations. More than one-quarter (26.4%) of the med + psych hospitalizations had ≥2 CCCs, and the most frequent CCCs were neurologic and neuromuscular (24.4%), technology dependence (19.0%), and gastrointestinal disorders (16.9%). Among hospitalizations for psych + med diagnoses, only 3% had ≥2 CCCs and the most frequent CCCs were cardiovascular (6.0%), metabolic (4.4%), and neurologic and neuromuscular disorders (4.0%). The frequency distributions of the CCC types for hospitalizations with and without a psychiatric diagnosis and by type of psychiatric comorbidity are summarized in Supplemental Table 4.

Trends in Hospital Resource Use: Children With and Without a Psychiatric Diagnosis

The cumulative percent growth in hospitalizations, hospital days, and aggregated hospital costs for any psychiatric disorder substantially exceeded (all $P \leq .001$) that for hospitalizations without a psychiatric diagnosis (Fig 1). Between 2005 and 2014, hospitalizations with a psychiatric diagnosis rose 137.7% from 36 598 to 87 002. This rate of growth was >5 times higher than for hospitalizations without a psychiatric diagnosis (26.0%; from 227 558 to 286 669). For hospitalizations with a psychiatric diagnosis, the cumulative rise in hospital days was 92.9% from 249 063 to 480 341, and costs rose 142.7% from $671 million to $1.6 billion. In contrast, hospital days

TABLE 1 Sample Characteristics of a Retrospective Cohort of Tertiary Care Children's Hospitalizations for Children Ages 3 to 17 Years in 2014 by Type of Psychiatric Comorbidity

			Any Psychiatric Diagnosis[a]		Psychiatric Comorbid Groups[a]		
		Total (*N* = 373 671)	Yes (*N* = 87002)	No (*N* = 286 669)	Med + Psych (*N* = 67 645)	Psych + Med (*N* = 16 247)	Psych Only (*N* = 3110)
		N (%)	*N* (%)	*N* (%)	*N* (%)	*N* (%)	*N* (%)
Age, y	3–5	92 467 (24.7)	11 061 (14.1)	81 084 (28.3)	10 854 (16.0)	435 (2.7)	94 (3.0)
	6–11	92 204 (24.7)	15 699 (20.0)	75 220 (26.2)	14 660 (21.7)	1897 (11.7)	427 (13.7)
	12–17	189 000 (50.6)	51 867 (66.0)	130 365 (45.5)	42 131 (62.3)	13 915 (85.6)	2589 (83.2)
Sex	Boy	196 827 (52.7)	41 685 (53.0)	151 586 (52.9)	36 837 (54.5)	6928 (42.7)	1476 (47.6)
	Girl	176 756 (47.3)	36 928 (47.0)	135 017 (47.1)	30 799 (45.5)	9312 (57.3)	1628 (52.4)
Race/ethnicity	White/NH	186 443 (49.9)	45 628 (58.0)	137 505 (48.0)	37 967 (56.1)	9156 (56.4)	1815 (58.4)
	Black/NH	74 650 (20.0)	13 876 (17.6)	58 910 (20.5)	11 692 (17.3)	3450 (21.2)	598 (19.2)
	Hispanic	74 022 (19.8)	11 555 (14.7)	60 051 (20.9)	11 746 (17.4)	1847 (11.4)	378 (12.2)
	Other	38 556 (10.3)	7568 (9.6)	30 203 (10.5)	6240 (9.2)	1794 (11.0)	319 (10.3)
Payer	Government	209 676 (56.1)	46 348 (58.9)	158 856 (55.4)	40 418 (59.8)	8800 (54.2)	1602 (51.5)
	Commercial	146 341 (39.2)	29 682 (37.8)	113 162 (39.5)	24 998 (37.0)	6793 (41.8)	1388 (44.6)
	Self-pay	8580 (2.3)	1455 (1.9)	7108 (2.5)	959 (1.4)	435 (2.7)	78 (2.5)
	Other	7709 (2.1)	881 (1.1)	6413 (2.2)	1111 (1.6)	161 (1.0)	24 (0.8)
	Missing	1365 (0.4)	261 (0.3)	1130 (0.4)	159 (0.2)	58 (0.4)	18 (0.6)
CCC count	0	220 014 (58.9)	41 918 (53.3)	173 441 (60.5)	29 946 (44.3)	13 528 (83.3)	3099 (99.6)
	1	98 263 (26.3)	20 226 (25.7)	76 187 (26.6)	19 832 (29.3)	2233 (13.7)	11 (0.4)[b]
	2+	55 394 (14.8)	16 483 (21.0)	37 041 (12.9)	17 867 (26.4)	486 (3.0)	0 (0.0)

NH, non-Hispanic.

[a] For both psychiatric comorbid groups (any, 3 subgroups) all differences were significant at $P < .001$.

[b] Overlap with severe mental retardation.

for only medical illness rose 5.9% from 842 242 to 891 768, and costs rose 18.9% from $3.1 billion to $3.7 billion. Nevertheless, the overall cost per hospital day was less for hospitalizations with a psychiatric diagnosis. For hospitalizations with a psychiatric diagnosis, the costs per hospital day rose from $2694 per day to $3393 per day compared with $3696 per day to $4150 per day for hospitalizations without a psychiatric diagnosis. The mean annual and cumulative growth rates of hospital discharges, hospital days, and costs by hospitalizations with and without a psychiatric diagnosis for each year are summarized in Supplemental Table 5.

Trends in Hospital Resource Use: Children With Combined Medical and Psychiatric Diagnoses and Only Psychiatric Diagnoses

The cumulative percent growth in hospital use and costs also varied (all $P \leq .001$) by type of psychiatric comorbidity. Hospitalizations, hospital use, and costs for combined medical and psychiatric disorders substantially increased, whereas these indices decreased for only psychiatric disorders (Fig 2). Among the combined diagnosis groups, the rise in hospitalizations for med + psych diagnoses was 160.5% (from 25 967 to 67 645): only slightly higher than that for psych + med diagnosis, which was 143% (from 6687 to 16 247). The rise in hospital days for med + psych diagnoses was 102.8% (from 167 394 to 355 473): slightly less than that for psych + med diagnoses, which was 106.4% (from 53 338 to 110 067). However, hospital costs for med + psych diagnoses rose 156.2% (from $573 million to $1.5 billion) compared with a 115.5% rise (from $66 million to $142 million) for psych + med diagnoses. The costs per hospital day for med + psych diagnoses also rose from $3423 per day to $4127 per day, but the costs per hospital day for psych + med diagnoses were less and relatively stable from $1237/day to $1290/day. In contrast, for psych only disorders, hospitalizations declined 21.1%

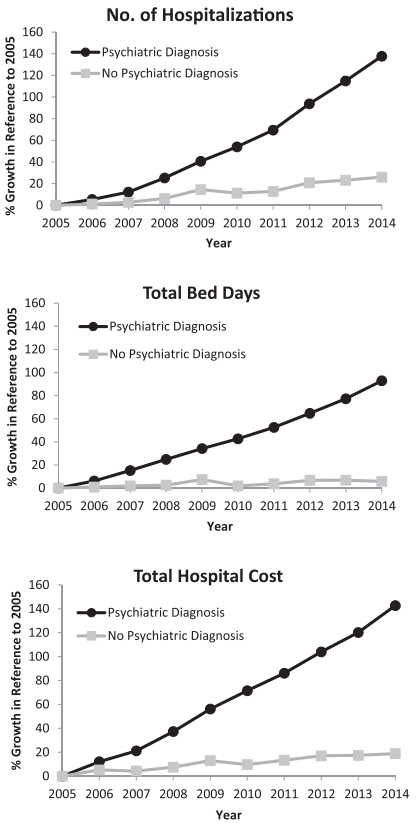

FIGURE 1
Trends in hospital resource use for children with and without a psychiatric diagnosis from 2005 to 2014.

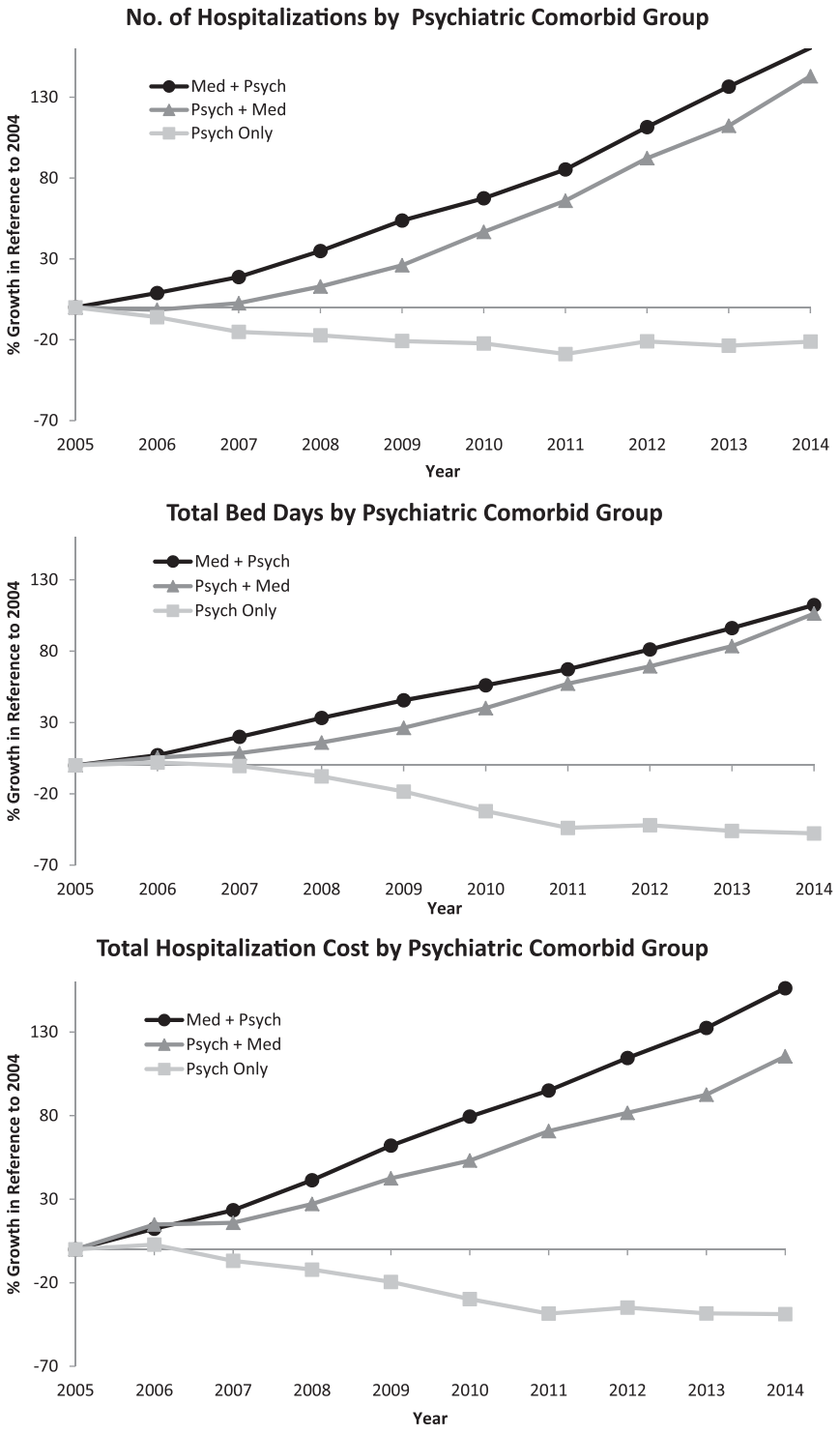

FIGURE 2

Trends in hospital resource use for children with any psychiatric diagnosis by psychiatric comorbid group from 2005 to 2014.

(from 3944 to 3110), hospital days decreased by 47.8% (from 28 331 to 14 801), and costs declined by 38.8% (from $33 million to $20 million). The mean annual and cumulative growth rates of hospital discharges, hospital days, and costs by type of psychiatric comorbidity for each year are summarized in Supplemental Table 6.

Most Recent Hospital Resource Use

In 2014, there were 373 671 hospitalizations, which accounted for 1 372 109 hospital days at a total cost of $5.3 billion. Almost one-quarter (23.3%) of the hospitalizations were for any psychiatric diagnosis (n = 87 002), corresponding to 35.0% of total hospital days (n = 480 341) and 30.6% of total hospital costs ($1.63 billion). Among pediatric hospitalizations with a psychiatric disorder, the majority of hospital resource use was for hospitalizations for med + psych diagnoses (Fig 3). More than three-quarters of the hospitalizations with a psychiatric diagnosis (77.8%, n = 67 645) were for a primary medical diagnosis, accounting for 74.0% of hospital days (n = 355 473) and 90.2% of hospital costs ($1.47 billion). In contrast, hospitalizations for psych + med diagnoses comprised 18.7% of hospitalizations with a psychiatric diagnosis (n = 16 247), 22.9% of hospital days (n = 110 067), and 8.7% of hospital costs ($142 million). Hospital resource use for psych only diagnoses was relatively small (hospitalizations: 3.6%, n = 3110; days: 3.1%, n = 14 801; costs: 1.2%, $20 million).

The distribution frequencies of the 10 most common psychiatric disorder groups and percent change in hospitalizations by psychiatric disorder group also differed by type of psychiatric comorbidity (Table 2). The most common psychiatric diagnoses for hospitalizations for med + psych diagnoses were developmental disorders (22.3%), ADHD (18.1%), and anxiety disorders (14.2%). In contrast, among hospitalizations for psych + med diagnoses, the most common disorders were anxiety disorders (14.3%), depression (13.2%), and suicide and self-injury (13.2%). Among hospitalizations for psych only diagnoses, the most common disorders were depression (17.5%), anxiety disorders (15.8%), and

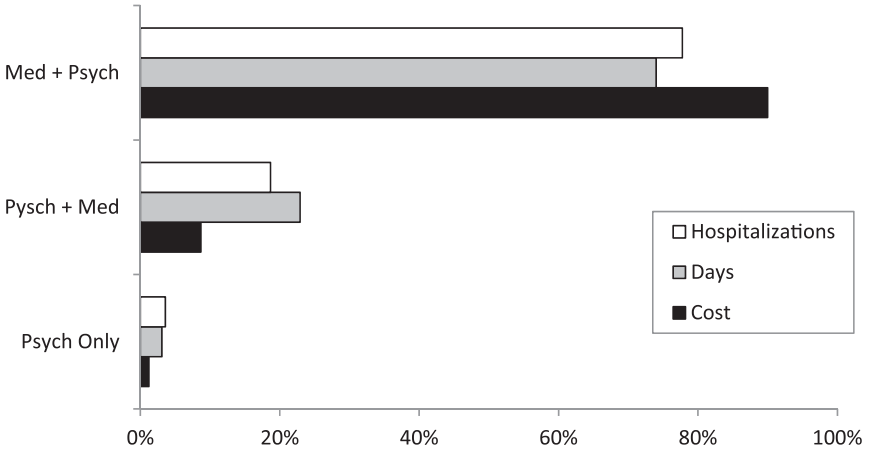

FIGURE 3
Proportion of hospitalizations with a psychiatric diagnosis by psychiatric comorbid group in 2014.

TABLE 2 Distribution Frequencies of 10 Most Common Psychiatric Disorder Groups in 2014 and Percent Change in Hospitalizations from 2005 to 2014 by Type of Psychiatric Comorbidity

	Med + Psych Diagnoses	
	N (%) in 2014	% Change 2005 to 2014
Developmental disorder	22 401 (22.3)	173.8
ADHD	18 163 (18.1)	205.4
Anxiety disorder	14 312 (14.2)	373.8
Depression	9355 (9.3)	131.7
Autism	9107 (9.1)	289.7
Suicide and self-injury	4451 (4.4)	229.0
Bipolar	3700 (3.7)	139.3
Substance abuse	3542 (3.5)	136.0
Miscellaneous	3375 (3.4)	217.8
Externalizing behavior disorder	3294 (3.3)	170.7
	Psych + Med Diagnoses	
Anxiety disorder	7590 (14.3)	294.3
Suicide and self-injury	7267 (13.7)	1087.4
Depression	7042 (13.2)	215.9
ADHD	5398 (10.1)	200.6
Externalizing behavior disorder	4740 (8.9)	141.0
Bipolar	4481 (8.4)	105.6
Miscellaneous	3492 (6.6)	187.6
Substance abuse	2681 (5)	181.3
Developmental disorder	2328 (4.4)	149.8
Eating disorder	1720 (3.2)	176.5
	Psych Only Diagnoses	
Depression	1491 (17.5)	0.3
Anxiety disorder	1348 (15.8)	10.9
Suicide and self-injury	1229 (14.4)	1948.3
ADHD	894 (10.5)	−22.2
Bipolar	874 (10.2)	−30.6
Externalizing behavior disorder	832 (9.7)	−34.4
Substance abuse	368 (4.3)	−14.2
Miscellaneous	341 (4)	14.4
Autism	278 (3.3)	26.9
Developmental disorder	193 (2.3)	−46.2

suicide and self-injury (14.4%). For these 2 groups, the greatest percent change was for suicide and self-injury (psych + med: +1087%; psych only: +1948%).

DISCUSSION

Findings from this study suggest that the rise in hospitalizations to tertiary care children's hospitals with a psychiatric diagnosis between 2005 and 2014 substantially exceeds that for hospitalizations without a psychiatric diagnosis, and this rise is differentially influenced by the type of psychiatric and medical diagnosis co-occurrence. These findings were consistent across subgroups, revealing that the differences were not localized to a particular patient population or hospital type (Supplemental Table 7). Hospital resource use for combined medical and psychiatric diagnoses increased, driven mostly by hospitalizations for a primary medical diagnosis, whereas hospital resource use for only psychiatric disorders declined, consistent with the national shift to managed care for behavioral health services.[13–17] In 2014, almost 4 out of 5 hospitalizations with a psychiatric disorder were for children with a primary medical diagnosis, accounting for almost 90% of the hospital costs for any psychiatric diagnosis.

These findings have several potential interpretations. The substantial rise in pediatric hospitalizations with a psychiatric diagnosis may be influenced by an increased prevalence of mental health disorders in children who are hospitalized for medical diseases over time. Alternatively, the rise in documented psychiatric diagnoses in hospitalized children may be related to an increase in coding. Findings from a sensitivity analysis, however, suggest that this may only partially explain the observed 10-year rise because

the percent increase in documented secondary medical diagnoses for hospitalizations without any psychiatric diagnoses exceeded that for documented secondary psychiatric diagnoses for psychiatric only hospitalizations (60.3% vs 42%) (Supplemental Table 8). Additional explanations for the rise in documented psychiatric diagnoses include increased recognition of mental disorders, closer clinical alignment between the primary medical and psychiatric diagnoses (eg, traumatic injury due to suicide attempt and major depression), correlation with longer length of stay, or expansion of behavioral health services.[18] Future research is needed to examine the impact of changes in children's hospital capacity to deliver behavioral health services and how the cooccurrence of medical and psychiatric disorders affects care delivery and outcomes over time.

In addition, the rise in cost per hospital day for pediatric hospitalizations for med + psych diagnoses substantially exceeded that for hospitalizations for psych + med diagnoses or for psych only diagnoses. One explanation for this may be differences in clinical need. Hospitalizations for med + psych diagnoses had a larger proportion of children with ≥2 CCCs, consistent with the national rise in medical complexity.[19–21] Inpatient care for psych only disorders also tends to use less ancillary services, and labor costs per patient (ie, group occupational therapy) may be held more constant.

In addition, among hospitalizations for psych + med diagnoses or psych only diagnoses, depression and suicide and self-injury accounted for 26.9% to 31.9% of the psychiatric diagnostic groups, respectively. Although the largest increase was in suicide and self-injury, some of this rise may be confounded by an increase in the uptake of using a new code that was added to PHIS in 2005. The higher proportion of adolescents and females in this group may also be explained in part by the disproportionate rise in major depression among girls during and after puberty.[22] Together, these findings are consistent with previous national studies[1,2,13] and underscore the need for quality improvement interventions that target improving linkage with community mental health care after pediatric hospitalization.[23]

This study has several limitations. First, the data source is limited to tertiary care children's hospitals that contributed billing data to PHIS throughout the study period and may not be generalizable to all tertiary care children's hospitals. Hospitals included from the PHIS database tended to be larger and saw a greater proportion of patients with private insurance than those that were not included, although differences in sex, race, and census region were not statistically or meaningfully different. The national rise in pediatric hospitalizations for a primary psychiatric diagnosis also may be underestimated because rates of pediatric hospitalizations for a primary psychiatric diagnosis among tertiary care children's hospitals in 2009 were one-third that of a nationally representative sample of pediatric hospitalizations (9.6% vs 3.3%).[1] In addition, freestanding psychiatric hospitals were not included, International Classification of Disease, Ninth Revision, Clinical Modification codes for psychiatric disorders may be underreported[24] and of limited accuracy,[25] and patient shifts across tertiary care children's hospitals, general hospitals, and psychiatric hospitals could not be assessed. Second, the unit of analysis was a hospitalization and not the child. The cumulative rise in hospitalizations with a psychiatric diagnosis may be overestimated because repeat users were not excluded and the risk for readmission for psychiatric patients may be greater.[2,26] Third, given that children's hospitals are tertiary care facilities, the medical complexity of hospitalizations with a psychiatric disorder may also be overestimated.[19] Fourth, child- and parent-level predictors of hospitalizations were missing, and thus findings could be biased because of uncontrolled confounding.[27]

CONCLUSIONS

This is the first study to examine trends in tertiary care children's hospitalizations, length of stay, and aggregated hospital costs by type of psychiatric comorbidity. The 10-year rise in resource use for pediatric hospitalizations with a psychiatric diagnosis substantially exceeded that for pediatric hospitalizations without a psychiatric diagnosis and varied by psychiatric comorbid group. Findings from this study suggest that pediatric hospitalizations for a primary medical condition are the main driver of the rise in pediatric hospitalizations with a psychiatric diagnosis and account for the majority of costs. Strategic planning to meet the rising demand for psychiatric care in tertiary care children's hospitals should place high priority on the needs of children with a primary medical condition and co-occurring psychiatric disorders.

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ABBREVIATIONS

ADHD: attention-deficit/hyperactivity disorder
CCC: complex chronic condition
CCS: Clinical Classification Software
PHIS: Pediatric Health Information System

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