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Correlates of psychiatric inpatient readmissions of children and adolescents with mental disorders

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ABSTRACT

To identify correlates of psychiatric readmission of youth, we conducted a consecutive, retrospective 1-year cohort study (07.01.2014–06.30.2015) of youth (age = 5–17.9) admitted to psychiatric inpatient facility. Stepwise elimination, multivariable logistic regression analyses were conducted to identify independent correlates of 1-year and 30-day psychiatric readmissions. The Family/Caregiver Interview Tool (FCIT) was given to caregivers of 30-day readmitted youth and analyzed using generalized linear model to predict time to readmission. Altogether, 1231 youth experienced 1534 hospitalizations. The 1-year readmission rate was 32.4%; 30-day readmission rate was 10.2%. Significant independent correlates of readmissions were longer length of stay, higher antipsychotic treatment rates, living closer to the hospital, and comorbid obesity, all accounting for 12.2% of variance. FCIT revealed that caregiver's ability to fill prescription after discharge delayed readmission, while shorter time to follow-up appointment hastened it. Illness exacerbation was responsible for 73% of 30-day readmissions; system of care factors accounted for 13%. Compared to clinicians, caregivers significantly underestimated environment of care factors (including caregiver's mental health) as the primary cause for readmission. Readmissions are common and correlate with illness severity and systems of care factors. Family support services may help reduce readmissions. Hospital-specific qualitative investigation may help identify intervention targets to reduce readmissions.

1. Introduction

Acute care hospital readmissions are increasingly used as an indicator of a hospital's quality of care (Joynt et al., 2016). A process for identifying and classifying readmissions as Potentially Preventable Readmissions (PPR) has been developed and used for pay-for-performance penalties (Sills et al., 2016). When psychiatric and non-psychiatric PPR across pediatric hospitals are compared, mental health-specific readmission rates are found to be higher, with 7.6% vs. 4.4% 30-day readmission rates, respectively, in one report (Bardach et al., 2013).

Psychiatric readmissions have been studied in the adult (Donisi et al., 2016; Manu et al., 2014; Moss et al., 2014) and, to a lesser extent, pediatric populations (Cheng et al., 2017; James et al., 2010; Tossone et al., 2014; van Alphen et al., 2016). Prior quantitative assessments of psychiatric readmissions have identified numerous demographic (Zilber et al., 2011) and illness-based risk factors, such as more severe or psychotic diagnoses (Manu et al., 2014), prior hospitalizations (Lin et al., 2008; Zilber et al., 2011), history of substance use (Lorine et al., 2015), as well medical comorbidities, such as increased body mass index (BMI) (Manu et al., 2014), chronic pain (Pham et al., 2016), and smoking (O'Hagan et al., 2017). In pediatric populations, 1-year readmission rates are substantial (21–31%), and the identified risk factors involve symptom clusters (self-injury), history of prior hospitalizations, as well as longer index hospitalization (James et al., 2010; Tossone et al., 2014; van Alphen et al., 2016). Little is known about caregiver factors contributing to readmission (James et al., 2010), but in one study, harsh parental discipline and disengaged parent-child relationship increased the risk (Blader, 2004); and family history of mental illness has also been implicated (Tossone et al., 2014). Evidence for the association of system-based factors, such as timeliness and intensity of aftercare, with risk of readmission, has been mixed (Cheng et al., 2017; James et al., 2010; Yampolskaya et al., 2013).

The objectives of the study were to identify correlates of 1-year and 30-day readmission rates using qualitative and quantitative data. We

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reviewed our hospital's readmission data to broadly examine the association of demographic, illness, and treatment variables with risk of a 30-day and 1-year psychiatric hospital readmission. Additionally, for youth readmitted within 30 days, we assessed the detailed responses to the Family/Caregiver Interview Tool, which explores in depth the communication, coordination, and other systemic barriers faced by families and patients. We hypothesized that illness-related, caregiver-, and systems-related factors play a role in increasing the risk of psychiatric readmissions of youth.

2. Methods

2.1. Setting and procedures

We conducted a retrospective review of consecutive pediatric (5.0–17.9 y.o.) psychiatric admissions over the course of one year 07.01.2014–06.30.2015 ("survey year") at a freestanding psychiatric hospital located in the suburbs of New York City (NYC). The hospital has one pre-adolescent unit (age 5–12.9 y.o.) with a maximum census of 14 beds, and 3 adolescent units (age 13–17.9 y.o.) with a combined maximum census of 50 beds.

Based on the Centers for Medicare and Medicaid Services (CMS) definitions, an "index hospitalization" or "index admission" refers to an episode of hospital treatment which was followed by a potentially preventable readmission (Ellimoottil et al., 2017). For patients with multiple admissions, only the first one is an index admission, and subsequent hospitalizations are considered readmissions. A "30-day readmission" was defined as a hospitalization at our facility following a recent discharge ($\leq$30 days) from our or another acute inpatient facility. "Time to readmission" was the number of days (0–30) between the most recent discharge and the 30-day readmission at our hospital. Readmissions to our hospital were screened for up to 365 days following the survey year to calculate the 30-day and 1-year readmission rates accurately.

2.2. Measures

Predefined demographic, illness, and treatment variables were extracted from the electronic medical record by generating a detailed report of all pediatric admissions during the survey year +30 days, using filters for age and dates of hospitalization.

As part of New York State's Children's Readmission Collaborative initiative, the Family/Caregiver Interview Tool (FCIT) was developed. The FCIT is a 5-page semi-structured, clinician-administered and clinician-coded interview that elicits detailed information about the nature and quality of the discharge plan and aftercare services as well as breakdowns at parent, patient, provider and system levels. The instrument is based on a readmission review tool developed by the Agency for Healthcare Research and Quality (AHRQ) for use in general medical settings; this psychiatry-focused version of FCIT had not been validated. ("Tool 2: Readmission Review Tool. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/professionals/systems/hospital/medicaidreadmitguide/medread-tool2.html," 2019) For a period of about 1 year, FCIT was administered by the psychology and social work clinicians as part of the regular clinical intake procedures to all parents or caregivers of youth readmitted to our inpatient service within 30-days of discharge. In an effort to capture readmissions from other hospitals, not just same-hospital readmissions, (the rates can differ significantly) (Khan et al., 2015), youth that were readmitted within 30 days from other area hospitals were identified on admission during clinical interview, and flagged for administration of the FCIT. FCIT variables were extracted from the paper forms and were matched with appropriate episode of admission for each subject by one of the first two authors.

This chart review study received Institutional Review Board (IRB) approval from the Northwell Health IRB. New York State's Office of Mental Health gave permission to include a blank FCIT in this report.

2.3. Data analysis

We aimed to (a) calculate same-hospital readmission rates, (b) compare youth readmitted during the survey year with those only admitted once, and (c) to report data and correlates from the available FCIT interviews for youth readmitted within 30 days of their index hospitalization.

(a) Following CMS methodology (Mull et al., 2013), the 30-day readmission rate was calculated by dividing the number of same-hospital 30-day readmissions (taking place over the course of the survey year and subsequent 30 days) by the total number of hospitalizations during the survey year. Total (raw) readmission rate was calculated by dividing the number of all same-hospital readmissions over the course of the survey year plus 365 days (each youth followed for 365 days after index admission) by the total number of hospitalizations during the survey year.

(b) To assess characteristics of re-hospitalized youth, we extracted demographic, illness, and treatment variables of the cohort of youth hospitalized for the first time at our hospital during the survey year (Fig. 1); within the cohort, we compared those who were not readmitted in the next 365 days (Fig. 1, A) with those who were readmitted (Fig. 1, B1 and B2). For youth who were readmitted more than once during the survey year, the data from the first readmission was used in the analysis. Figs. 1 and 2 illustrate the cohort and which data was available and were included in this analysis. Since we focused on outcomes of youth who had their initial hospitalization during the survey year, youth hospitalized prior to the survey year were not included in the cohort; Records were checked for 5 years prior to and 1 year after the survey year, to ascertain readmission vs. non-readmission status accurately. Detailed readmission data was available for the readmissions taking place during the survey year and subsequent 30 days. Therefore subjects were excluded from the multivariate comparison if their first readmission took place after the survey year + 30 days. Within the subset of readmitted youth, we compared 30-day readmissions (Fig.1-B1) and readmissions taking place after 30 days since last discharge had passed (Fig.1-B2). In addition to the primary diagnoses, two high-risk comorbid/secondary diagnoses (substance use and obesity) were extracted from the medical records. Chi-square and ANOVA tests were used for the analysis of categorical and continuous variables, respectively. Additionally, we conducted a backward elimination logistic regression analysis to identify variables independently associated with 30-day and 1-year readmissions. Variables were entered into the model if they were significant at $p < 0.1$ in univariate analyses; least significant variables were then eliminated step-by-step if they had $p > 0.05$.

(c) For youth with a 30-day readmission, we analyzed available responses to the FCIT interview (Fig. 1-C) with a parent or caregiver. We conducted descriptive analyses and modeled demographic, illness and treatment variables, nature of the discharge plan, aftercare services, as well as identified parent, patient, provider and system level issues. We used generalized linear model to identify variables independently associated with time to readmission in the 30-day readmission set.

Data on reasons for admission were collected in the following way: On the FCIT (see addendum), the "reason for readmission" was a multifactorial item (Item 2) where clinicians elicited a narrative (free-text response) from parent/caregiver, followed by a semi-structured clinician-coded response in multiple, not mutually-exclusive categories. Following the FCIT Interview with parent and youth, clinicians summarized their impression ("Root cause of readmission"). Broadly, we conceptualized all risk factors for readmission as being either 1)

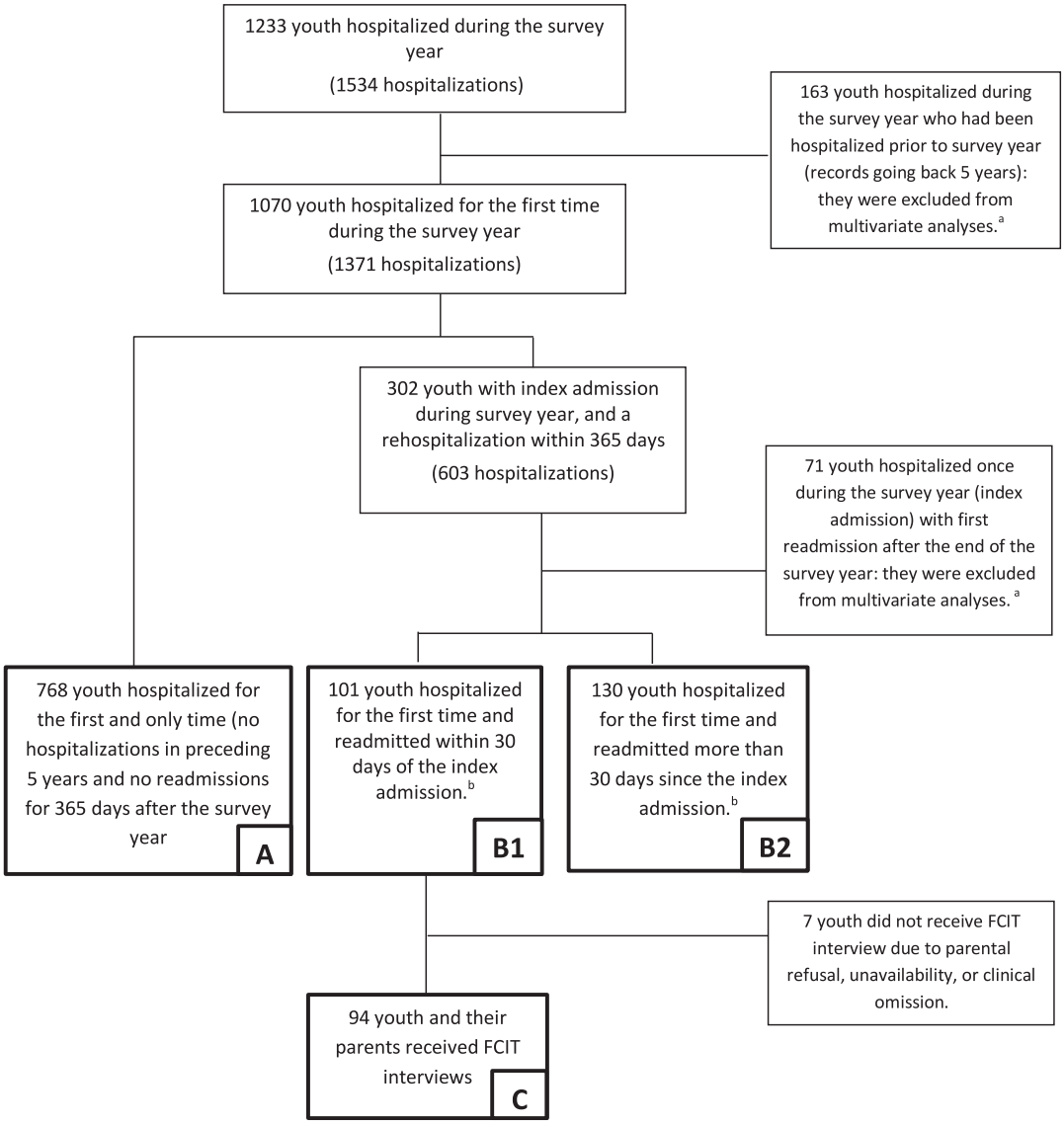

Fig. 1. Flow of Patients Hospitalized During the Study Period For data reported in Tables 1–3, we compared characteristics of youth hospitalized for the first and only time during the survey year (box A), with youth who experienced a 30-day readmission (box B1) or a 365-day readmission (box B2). Based on the Center for Medicare and Medicaid Services definition, an "index hospitalization" or "index admission" refers to an episode of hospital treatment which was followed by a potentially preventable readmission. (Mull et.al., 2013) For patients with multiple readmissions, only the first one is considered an index admission because the latter cases were potential readmissions.

[a]All readmissions were included in calculating the readmission rates, including those taking place after the survey year. However, detailed data was not available for these 71 youth, and they were excluded from the comparison group.

[b]For youth who had multiple hospitalizations during the survey year, we analyzed data from their first readmission, not from the index or subsequent hospitalizations.

patient-centered factors, including illness and treatment failure, such as persistence or worsening of symptoms of mental illness, and treatment non-adherence, including due to side effects; 2) environmental of care factors, focusing on primary caregiver and immediate environment (e.g., caregiver's poor (mental) health, limited financial resources, homelessness, limited ability to meet child's treatment needs); or 3) systems of care factors (e.g., medication or treatment not covered by insurance, inability to get timely appointment or needed services). We further used McNemar-Bowker's test to compare clinicians' and caregiver's agreement on the cause of readmission.

JMP® statistical software Version 9.0 (SAS Institute Inc., Cary, NC, 1989–2019) was used for all analyses.

3. Results

3.1. Total hospitalizations and readmission rate

Over the course of one year, 1233 youth (female = 57.9%, mean age = 14.6 ± 2.7 years) experienced 1534 hospitalizations during the survey year. Altogether, 768 (62.3%) youth were hospitalized for the first and only time, while 464 (37.7%) had multiple hospitalizations: 221 (17.9%) experienced their index hospitalization and readmission(s) during the survey year, 163 (13.2%) were hospitalized during the survey year, and prior to the survey year (electronic medical records were available going back 5 years), 71(5.8%) were hospitalized once during the survey year but readmitted within 365 days of their discharge, and 10 (0.8%) were hospitalized within 30 days of a discharge from another hospital. Among the 302 survey year readmissions, 172

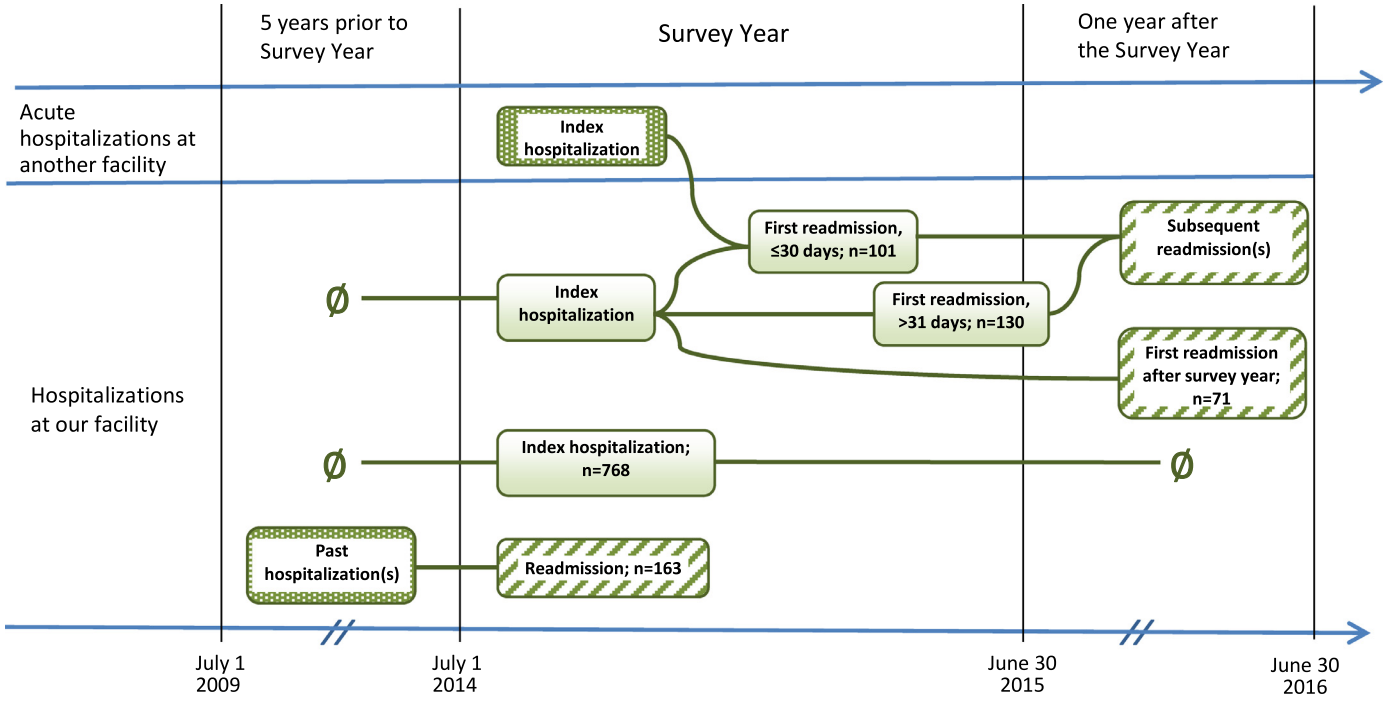

Figure 1. Timeline and possible pathways of admissions and rehospitalizations. N is reported whenever 1 patient corresponds to 1 hospitalization

Legend:
- Inpatient hospitalizations included in calculation of readmission rate and multivariate analyses ("cohort")
- Inpatient hospitalizations included in calculation of readmission rate, but not in multivariate analyses
- Inpatient hospitalizations, not included in calculations or analyses
- Ø No hospitalizations occurred during a time frame

Fig. 2. Timeline and possible pathways of admissions and rehospitalizations. N is reported whenever 1 patient corresponds to 1 hospitalization.

(14.5%) youth were hospitalized twice, 34 (2.8%) three times, and 15 (1.2%) four times, 3 (0.2%) five times, and 1 youth (0.08%) was hospitalized seven times. Among the 221 youth who experienced their initial and subsequent hospitalization(s) at our hospital during the survey year, the first-time readmission took place within 30 days for 91youth (7.4% of all youth, 41.2% of readmissions) and after more than 30 days had passed for 130 youth (10.5% of all youth, 58.8% of readmissions). Among the 71 youth hospitalized for the first time during the survey year and readmitted after the survey year, there were 3 (4.2%) 30-day readmits and 68 (95.6%) readmissions that took place within the following 335 days. The 30-day readmission rate was 10.2%; the raw (365-day) readmission rate was 30.4%.

3.2. Predictors of 1-year readmission

Compared to youth who were hospitalized only once during the survey year ($n = 768$ youth), those re-hospitalized ($n = 231$, 30.1%) had higher rates of Medicaid eligibility ($\chi^2 = 5.6$; $p = 0.019$), lived outside of the New York city (NYC) boundaries ($\chi^2 = 7.1$; $p = 0.0077$), and closer to the hospital (F ratio = 7.0; $p < 0.0083$). Re-hospitalized youth had longer lengths of stay (F ratio = 90.4; $p < 0.0001$), were more likely to receive a diagnosis of depression ($\chi^2 = 8.3$; $p = 0.0039$), bipolar-spectrum disorder ($\chi^2 = 9.4$; $p = 0.0022$), have comorbid obesity ($\chi^2 = 7.2$; $p = 0.0072$), and were more likely to be discharged on an antipsychotic medication ($\chi^2 = 64.8$; $p < 0.0001$). *Re*-hospitalized youth were more also likely to be discharged to a group home/residential treatment, rather than home to live with biological or foster parents ($\chi^2 = 7.1$; $p = 0.0076$). Further, re-hospitalized youth were more likely to be transferred to a long-term hospitalization ($\chi^2 = 25.5$; $p < 0.0001$); when discharged to the community, they were more likely to be referred to more intensive out-of-hospital care (day programs, residential programs), than youth hospitalized only once ($\chi^2 = 13.2$; $p = 0.0003$). Full results are summarized in Table 1.

Entering all the significant variables in the univariate analyses listed above (Table 1) into the logistic regression model (as there were no variables significant at $p = 0.05$ to $p < 0.10$), the following variables were independently associated with any re-hospitalization in the final model: non-NYC residence ($\chi^2 = 18.9$; $p < 0.0001$), comorbid diagnosis of obesity ($\chi^2 = 6.6$; $p = 0.010$), greater length of stay ($\chi^2 = 44.2$; $p < 0.0001$), and treatment with antipsychotic medication at discharge ($\chi^2 = 37.9$; $p < 0.0001$). The model predicted 12.2% of the variance ($p < 0.0001$).

3.3. Predictors of 30-day vs >30-day readmissions

Compared to youth readmitted after 30 days had passed from most recent hospitalization ($n = 130$, 56.3% of all analyzed youth), 30-day-readmitted youth were less likely to be African-American ($\chi^2 = 4.9$; $p = 0.027$) and more likely to be discharged to a home setting vs. a group home ($\chi^2 = 5.8$; $p = 0.023$), while sex, age, other race, median income, distance from the hospital, Medicaid eligibility, primary or comorbid diagnoses, length of stay, prescription of antipsychotics at discharge or intensity of after-hospital treatment did not differ between the two groups (Table 2). In the logistic regression analysis, only

Table 1
Demographic and illness characteristics for youth admitted once over the survey year vs. those readmitted at any time during the survey year.

Variable	Total included in analysis (n = 999)	Single hospitalization (n = 768)	First-time readmissions (n = 231) [a]	p-value
Age, years mean ± SD	14.6 ± 2.7	14.7 ± 2.7	14.5 ± 2.7	0.42
Adolescents (age ≥ 13.0), n (%)	786 (78.7)	607 (79.0)	179 (77.5)	0.61
Sex, male, n (%)	416 (41.6)	327(42.6)	89 (38.5)	0.27
Race, n (%)	972 [b]	749 [b]	223 [b]	
Caucasian	572 (58.9)	449 (60.0)	123 (55.2)	0.20
African-American	200 (20.6)	148 (19.8)	52 (23.3)	0.25
Hispanic	176 (18.1)	131 (17.5)	45 (20.2)	0.36
Asian / East Indian	24 (2.5)	21 (2.8)	3 (1.4)	0.32
Household median income, $ mean, ± SD		86,817 ± 22,207	88,564 ± 21,932	0.30
Primary insurance: Medicaid, n (%)	367 (36.7)	267 (34.8)	100 (43.3)	**0.019**
Residence: NYC, n (%)	150 (15.0)	128 (16.7)	22 (9.5)	**0.0077** [c]
Distance from the hospital, miles, mean ± SD		15.6 ± 10.2	13.6 ± 9.7	<**0.0083** [c]
Primary diagnosis				
Depressive disorders	494 (49.5)	399 (52.0)	95 (41.1)	**0.0039**
Bipolar-spectrum disorders	402 (40.2)	289 (37.6)	113 (48.9)	**0.0022**
Psychotic disorders	46 (4.6)	34 (4.4)	12 (5.2)	0.63
ADHD/other DBD	28 (2.8)	21 (2.7)	7 (3.0)	0.81
PTSD	5 (0.5)	5 (0.7)	0 (0)	0.59
ID/PDD	7 (0.7)	6 (0.8)	1 (0.4)	1.0
Other	17 (1.7)	14 (1.8)	3 (1.3)	0.77
High-risk comorbid diagnoses				
Substance use	184 (18.4)	143 (18.6)	41 (17.8)	0.76
Obesity	36 (3.6)	21 (2.7)	15 (6.5)	**0.0072**
Length of Hospitalization, days		7.4 ± 6.0	13.4 ± 13.4	<**0.0001** [c]
Discharged on antipsychotic medication n, (%)	486 (48.7)	320 (41.7)	166 (71.9)	<**0.0001** [c]
Discharged on >1 antipsychotic medications (n = 480*)	12 (2.5)	7 (2.2))	5.(3.0)	0.55
Residential status at discharge				
Home (biological or foster parents)	922 (95.1)	727 (96.0)	195 (91.6)	**0.0076**
Residential/Group Home	48 (5.0)	30 (4.0)	18 (8.5)	
Disposition, in-pt. vs. outpatient				
Long-term in-patient. hospitalization	29 (2.9)	11(1.4)	18 (7.8)	<**0.0001** [c]
Out-of-hospital care	970 (97.1)	757 (98.6)	213 (92.2)	
Out-of-hospital disposition:				
Outpatient providers	846 (90.5)	674 (92.3)	172 (83.9)	**0.0003** [d]
Partial/day/residential programs	89 (9.5)	56 (7.7)	33 (16.1)	

Abbreviations: ADHD: attention-deficit/hyperactivity disorder; DBD: disruptive behavior disorders; ID/PDD: intellectual disability/pervasive developmental disorder; NYC: New York City; PTSD: posttraumatic stress disorder; SD: standard deviation.

[a] n = 231 includes 221 youth hospitalized and readmitted at our hospital as well as 10 youth rehospitalized after being discharged from another facility.

[b] Total n for which data was available.

[c] These values were similarly significant, when youth experiencing single hospitalization were compared with the subset of youth readmitted within 30-days (n = 101).

[d] This value was not significant, when youth experiencing single hospitalization were compared with the subset of youth (n = 101) readmitted within 30-days (p = 0.15).

discharge to a family home (vs. residential facility) independently predicted a 30-day readmission (p = 0.011), predicting 2.2% of the variance (p = 0.011).

3.4. Characteristics of youth with a 30-day readmission

3.4.1. Family/Caregiver interview tool (FCIT) interview

FCIT Interview was completed with parents of 94 readmitted youth (93.1% of all known unique 30-day readmissions). Among them, 86 (91.5%) were living with biological or adoptive parent(s), 2 (2.1%) were living with foster parent(s), and 6 (6.4%) were living in a residential treatment center or a "group home." Most (85, 90.4%) experienced a same-hospital readmission, while 9 (9.6%) of interviews captured a readmission from another hospital to our hospital. Only 6.9% of families of 30-day readmitted youth did not receive FCIT interview, either due to parental refusal or unavailability, or clinical omission.

Prior to the 30-day readmission, the discharging hospital referred 50 (65.9%) youth to outpatient services, with a mean time to first appointment of 4.1 ± 3.1 days, while 31 (34.1%) were referred to more intensive programs (Day- or partial programs), with a mean time to appointment of 2.8 ± 3.1 days.

The semi-structured factors (Item 2, clinician-coded checkboxes with multiple responses permitted) contributing to readmission included worsening of symptoms (76.3%); significant symptoms at home (72.0%); danger to self or others (55.9%); significant symptoms at school (30.1%); disruptive behaviors (at home or school) (31.2%); patient refusing medication or services (14.0%); referral for readmission by outpatient provider (14.0%); caregiver stress, conflicts or logistical difficulties with service participation (28.0%); difficulty getting appropriate (15.1%) and timely (14.0%) psychiatric services; substance use (9.7%); difficulty maintaining medication regiment, including due to high cost/insurance issues (2.2%), side effects (2.2%), or other reason (1.1%); (Table 3).

Results regarding discharge plan related items are summarized in Table 4. Complete FCIT form is included as a supplement.

3.4.1.1. Discharge plan. When recalling the most recent ("failed") discharge from the hospital, 4.7% of parents reported that they did not have any discharge meeting (Question 3a), and 22.6% reported some lack of understanding of, or agreement with the discharge plan (Question 3a-d).

Table 2
Demographic and illness and treatment characteristics for youth re-hospitalized within 30 days of discharge vs. those readmitted in 31 or more days.

Variable	First-time readmissions (n = 231)	≤30 day readmissions (n = 101)[c]	31 + readmission (n = 130)	p-value
Age, years mean ± SD	14.5 ± 2.7	14.3 ± 2.7	14.6 ± 2.7	0.39
Adolescents (age ≥13.0), n (%)	179 (77.5)	76 (75.3)	103 (79.2)	0.47
Sex, male, n (%)	89 (38.5)	45 (44.6)	44(33.6)	0.10
Race, n (%)	223[a]	94 [a]	129 [a]	
Caucasian	123 (55.2)	57 (60.6)	66 (51.2)	0.16
African-American	52 (23.3)	15 (16.0)	37 (28.7)	**0.027**
Hispanic	45 (20.2)	19 (20.2)	26 (20.2)	1.0
Asian / East Indian	3 (1.4)	3 (3.2)	0 (0)	0.07
Household median income, $ mean ± SD	88,564 ± 21,932	89,014 ± 21,530	89,214 ± 22,316	0.78
Primary insurance: Medicaid, n (%)	100 (43.3)	41 (40.6)	59 (45.4)	0.47
Residence: NYC, n (%)	22 (9.5)	10 (9.9)	12 (9.2)	0.86
Distance from the hospital, miles, mean ± SD	13.6 ± 9.7	13.4 ± 11.0	13.8 ± 8.6	0.73
Primary diagnosis				
Bipolar-spectrum disorders	113 (48.9)	44 (43.6)	69 (53.1)	0.15
Depressive disorders	95 (41.1)	46 (45.5)	49 (37.7)	0.23
Psychotic disorders	12 (5.2)	7 (7.0)	5 (3.9)	0.37
ADHD/other DBD	7 (3.0)	2 (2.0)	5 (3.9)	0.47
Other	3 (1.3)	1 (1.0)	2 (1.5)	1.0
ID/PDD	1 (0.4)	1 (2.0)	0 (0)	0.43
PTSD	0 (0)	0 (0)	0 (0)	-
High-risk comorbid diagnoses				
Substance use	21 (2.7)	15 (14.9)	26 (20.0)	0.31
Obesity	15 (6.5)	5 (5.0)	10 (7.7)	0.43
Length of Hospitalization, days	13.4 ± 13.4	13.2 ± 12.6	13.4 ± 14.0	0.94
Discharged on antipsychotic medication n, (%)	166 (71.9)	71 (70.3)	95 (73.1)	0.64
Discharged on >1 antipsychotic medications ([b])	5 (3.0)	1 (1.4)	4 (4.2)	0.40
Residential status at discharge				
Home (biological or foster parents)	195 (91.6)	90 (96.8)	105 (87.5)	**0.023**
Residential/Group Home	18 (8.5)	3 (3.2)	15 (12.5)	
Disposition, level of treatment				
Out-of-hospital care	213 (92.2)	93 (92.1)	120 (92.3)	0.95
Long-term inpatient hospitalization	18 (7.8)	8 (7.9)	10 (7.7)	
Out-of-hospital disposition:				
Outpatient providers Partial/day/residential programs	172 (83.9)	81 (88.0)	91 (80.5)	0.15
	33 (16.1)	11 (12.0)	22 (19.5)	

Abbreviations: ADHD: attention-deficit/hyperactivity disorder; DBD: disruptive behavior disorders; ID/PDD: intellectual disability/pervasive developmental disorder; NYC: New York City; PTSD: posttraumatic stress disorder; SD: standard deviation.

[a] Data available for only n = 223.

[b] Data available for n = 166.

[c] n = 101 includes 91 youth hospitalized and readmitted at our hospital as well as 10 youth rehospitalized within 30 days of being discharged from another facility.

3.4.1.2. Information at discharge. Overall, 88.2% of caregivers reported that they received all four types of discharge information, including information on follow-up appointment (98.9%), any additional referrals (94.0%), contact information for any questions/concerns (96.7%) and medication instructions (97.7%) (Question 4).

3.4.1.3. Readiness for discharge home. Overall, 45.6% of caregivers felt that the child was not fully ready for discharge, while 37.1% of the parents felt that they were not ready to appropriately care for the child after discharge (Questions 5).

3.4.1.4. Insurance barriers. Overall, 86.7% parents reported low barriers to accessing services or medication related to the insurance status, with 7.8% of caregivers reporting "medium," and 5.3% reporting "high" insurance barriers (Question 6).

3.4.1.5. Medications at discharge. Altogether, 94.4% of parents reported discharge of their child on some medication, with 60.0% receiving actual medication at discharge. Among those discharged without actual medication, 16.7% (8.5% of all responders) had some difficulty with filling or could not fill the prescription (Questions 7, 8).

3.4.1.6. Administering and taking the medication. Overall, 9.2% of caregivers reported that their child did not take the prescribed medication after discharge, while 19.3% reported side effects on the medication. Only 5.0% of caregivers reported that the child had some or full responsibility for taking or storing the psychiatric medication (Question 9a, b, c).

3.4.1.7. Aftercare services. At the time of "failed" discharge, 65.5% of youth were referred to outpatient level of care, 28.9% to partial hospital or day program level of care, while 5.6% were transferred to residential treatment. (Question 11)

3.4.1.8. Barriers to treatment. Some barriers to treatment were identified by 21.5% of parents, particularly parenting/family demands (15.4%); work/other demands (13.2%); insurance (12.7%); and transportation (9.9%); (Question 16, a-d)

3.4.1.9. Avoiding re-hospitalization. On this free-form response, 33.1% reported that the discharging hospital did everything right/nothing more could have been done. However, 30.1% of caregivers believed that a longer stay in the hospital would have prevent "failed" discharge, 17.5% attributed readmission to an inadequate/failed aftercare plan, and 6.0% believed a medication adjustment during prior treatment would have helped, while 13.1% attributed readmission to other reasons.

3.5. Correlates of "time to readmission"

Factors that were associated with time to readmission included difficulty getting appropriate psychiatric services/appointments (*F*

Table 3
Association of factors contributing to readmission (item 2) on the Readmission Questionnaire and time to readmission.

Clinician-coded reason for readmission based on caregiver's statement (Item 2)[a]	n of responders (% of total responders)	Time to readmission, days ± SD	*p*-value
Child's symptoms got worse - Yes	71 (76.3)	13.9 ± 7.8	0.47
- No (not a reason for readmission)	22 (23.7)	15.3 ± 8.4	
Child could not be managed at home – Yes	67 (72.0)	14.6 ± 7.7	0.53
- No (not a reason for readmission)	26 (28.0)	13.4 ± 1.6	
School problems (refusing school, disruptive at school, etc.) –Yes	28 (30.1)	13.6 ± 7.6	0.63
- No (not a reason for readmission)	65 (69.9)	14.5 ± 8.1	
Disruptive behaviors (at home or school) – Yes	29 (31.2)	14.2 ± 8.0	1.0
- No (not a reason for readmission)	64 (68.8)	14.3 ± 8.0	
Danger to self or others – Yes	52 (55.9)	14.5 ± 7.8	0.77
- No (not a reason for readmission)	41 (44.1)	14.0 ± 8.1	
Substance use – Yes	9 (9.7)	14.2 ± 8.2	0.99
- No (not a reason for readmission)	84 (90.3)	14.3 ± 7.9	
Needing more support [b] - Yes	27 (29.0)	16.0 ± 7.8	0.17
- No (not a reason for readmission)	66 (71.0)	13.5 ± 7.9	
Difficulty getting services/appointment –Yes	13 (14.0)	18.8 ± 9.1	**0.023**
- No (not a reason for readmission)	80 (86.0)	13.5 ± 7.5	
Needed more intensive services – Yes	14 (15.1)	13.4 ± 5.6	0.65
- No (not a reason for readmission)	79 (84.9)	14.4 ± 8.3	
Family or caregiver stress/changes/life events – Yes	26 (28.0)	15.7 ± 6.5	0.29
- No (not a reason for readmission)	67 (72.0)	13.7 ± 8.4	
Could not maintain medication regiment – Yes [c]	5 (5.4)	23.6 ± 6.5	**0.0059**
- No (not a reason for readmission)	88 (94.6)	13.7 ± 7.7	
Difficulty obtaining medication – yes	2 (2.2)	22.5 ± 7.8	0.14
- No (not a reason for readmission)	91 (97.8)	14.1 ± 7.9	
Problem administering, due to side effects – Yes	2 (2.2)	28.5 ± 0.7	**0.0093**
- No (not a reason for readmission)	91 (97.8)	13.9 ± 7.7	
Child refused medication or services – Yes	13 (14.0)	14.6 ± 8.7	0.86
- No (not a reason for readmission)	80 (86.0)	14.2 ± 7.8	
Child was referred for readmission by outpatient provider – Yes			
- No (not a reason for readmission)	13 (14.0)	17.2 ± 8.4	0.15
	80 (86.0)	13.8 ± 7.7	

[a] Multiple reasons were permitted for each readmission questionnaire.
[b] This item included options for "difficulty getting services/appointment" and "needed more intensive services".
[c] This item included non-adherence due to "difficulty obtaining medication" and "problems administering," which included side effects.

ratio = 5.3; $p = 0.023$), any difficulty maintaining the medication regiment (F ratio = 7.9; $p = 0.0059$), particularly due to side effects (F ratio = 7.1; $p = 0.0093$). Paradoxically, presence of each of these factors was associated with increased time to readmission (Table 3). Among the remaining FCIT responses (Table 4), "problems with filling the prescription after discharge" (F ratio = 5.68, $p = 0.021$) hastened readmission, while shorter time from discharge to follow-up appointment shortened it ($r^2 = 0.16$, $p = 0.0028$) (positive correlation with "time to readmission").

The following variables, significant at $p < 0.1$, were entered into the generalized linear model: difficulty getting an appointment, could not maintain medication regiment, non-adherence due to side effects, caregiver's reason for readmission, ability to fill a prescription after discharge, and number of days from discharge to follow-up appointment. The following variables were independently associated with a shorter time to readmission: ability to fill a prescription after discharge ($\chi^2 = 17.0$; $p < 0.0001$) and shorter time from discharge to follow-up appointment ($\chi^2 = 7.1$; $p = 0.0077$).

3.6. Root cause of readmission

Parental/caregiver perception of the main reason for readmission (free-text response) most frequently involved report of persistence or worsening of symptoms (84.8%). Environment of care factors, such as parental stress or lack of resources, were not cited by caregivers, while systems of care factors included parental reports that the child was discharged too soon (9.8%), or significant failure of aftercare (3.3%) (Table 5). The remaining 3.3% of parents could not attribute readmission to a particular cause, which was associated with shorter time to re-hospitalization ($p = 0.046$).

Clinicians administering the FCIT categorized the root cause of 73.2% of readmission as illness-related, 13.4% due to environment of care/family factors, and 13.4% due to systems of care factors (Table 5). Clinicians and parents did not agree on the root cause of readmission, as the responses were significantly different ($p = 0.010$).

4. Discussion

The main findings of this study of characteristics and correlates of psychiatric readmissions of youth with psychiatric disorders were: over the course of one year, the raw readmission rate was 18.2% and the 30-day readmission rate was 11.2%. Hospitalizations of readmitted youth were independently characterized in the final model by longer length of stay, and higher antipsychotic treatment rates, each potential markers of illness severity/complexity, as well as by living outside of NYC, and higher comorbid diagnosis of obesity. Compared to readmitted youth within just 30-day, those readmitted after longer intervals were, in the final model, more likely to reside at a residential treatment facility rather than with family or foster parents. However, these risks factors for readmission, while statistically significant, predicted only 12.2% and 2.2% of variance in the 2 logistic regression models, respectively. This finding suggests that other factors, not measured in our study, are responsible for readmissions, which need to be identified by casting a wider net of assessed variables that are potentially related to avoidable readmissions of psychiatrically ill youth. Detailed FCIT assessments revealed that caregiver's ability to fill a prescription after discharge delayed readmission, while shorter time to first follow-up appointment hastened it. Exacerbation of illness was responsible for the majority (73–85%) of 30-day readmissions, based on both, clinicians' and caregivers' impressions, while system of care factors accounted for 13% of readmissions. Compared to clinicians, caregivers significantly underestimated environment of care factors (including caregiver's stress and mental illness) as the primary cause for readmission.

The 30-day readmission rate of 11.3% at our psychiatric hospital

Table 4
Association of selected responses regarding discharge plan related items on the Readmission Questionnaire and time to readmission.

Variable/Question	N of responders (% of total responders)	Time to readmission, days ± SD	*p*-value
Discharge plan at time of discharge			
Q.3a Did you participated in discharge meeting?			
- Yes	82 (95.3)	14.3 ± 8.1	0.74
- No	4 (4.7)	13.0 ± 2.4	
Q.3b Did the Hospital explain the whole plan to you?			
- Yes	86 (97.7)	14.2 ± 7.9	0.27
- No	2 (2.3)	8.0 ± 8.5	
Q.3c Did you understand the D/C Plan?			
- Yes	84 (94.4)	14.6 ± 8.1	0.13
- No/Somewhat	5 (5.6)	9.0 ± 5.4	
Q.3d Did you agree w D/C plan?			
- Yes	75 (84.3)	14.5 ± 8.2	0.46
- No/Somewhat	14 (15.7)	12.7 ± 7.0	
Q3(a-d combined)			
- Adequate planning, explanation and agreement	65 (77.4)	14.7 ± 8.2	0.21
- One or more deficiencies on D/C planning	19 (22.6)	12.1 ± 6.2	
Q4 (a-d combined)			
- Caregiver received contact, appointment, and medication information	67 (88.2) [b]	14.7 ± 8.1	0.35
- One or more deficiencies in D/C information	9 (11.8)	12.0 ± 8.4	
Q.5a: Overall, how ready for d/c did you feel your child was?			
- Ready	49 (54.4)	14.4 ± 8.9	0.81
- Somewhat ready/Not ready	41 (45.6)	14.0 ± 6.9	
Q.5b: Overall, how ready did you feel to care for your child at home?			
- Ready	56 (62.9)	14.9 ± 8.7	0.30
- Somewhat ready/Not ready	33 (37.1)	13.1 ± 6.8	
Q.6 Has insurance status created barriers to accessing services/medication?			
- Low barriers	65 (86.7) [b]	13.8 ± 8.0	0.25
-Medium or High barriers	10 (13.3)	17.0 ± 8.7	
Medication-related questions			
Q.7: Was your child discharged on any medication?			
- Yes	84 (94.4) [b]	14.2 ± 8.0	0.64
- No	5 (5.6)	16.0 ± 10.5	
Q.8a: Did you leave the hospital with a supply of medication			
- Yes	48 (60.0)	13.1 ± 7.9	0.12
- No	32 (40.0)	16.0 ± 7.8	
Q.8b If you left the hospital with a prescription, were you able to fill it?			
- Yes	40 (83.3)	19.3 ± 8.3	**0.021**
- Some problems/No	8 (16.7)	12.9 ± 6.8	
Q.9a: After leaving the hospital, did your child take the meds as prescribed?			
- Yes	79 (90.8)	14.1 ± 8.0	0.99
- No	8 (9.2)	14.0 ± 5.4	
Q9.b: Were there any side effects?			
- Yes	17 (19.3)	16.4 ± 7.4	0.31
- No	71 (80.7)	14.2 ± 8.0	
Access to services and prevention of readmission questions			
Q. 11: Which service child was referred to on d/c			
- Outpatient (including substance use programs)	59 (65.5)	14.8 ± 7.9	0.28
- Intensive outpatient (e.g. partial or day programs	26 (28.9)	13.7 ± 7.7	
- Residential setting	5 (5.6)	9.0 ± 10.8	
Q.12b: Number of days from discharge to follow-up appointment, mean ± SD (range)	3.1 ± 3.0 (0–13 days)*		**0.0028** $r^2 = 0.16$ [a]
Q.16a: Did insurance issues interfere with your participation in (aftercare) services?			
- Yes/Somewhat	10 (12.7)	13.6 ± 7.3	0.80
- No	69 (87.3)	14.3 ± 8.1	
Q16b-d: Did transportation, family demands or work obligations interfere with participation in (aftercare) services	17 (21.5)	11.6 ± 9.1	0.13
- Yes/Somewhat	62 (78.5)	14.9 ± 7.6	
- No			
Q.24 What could the (discharging) hospital have done differently to prevent readmission?			
- Child needed longer stay	25 (30.1)	13.0 ± 8.1	0.45
- Other responses/"I don't know"	58 (69.9)	14.4 ± 7.6	

Abbreviations: D/C – discharge (refers to the discharge from previous hospital, prior re-admission, during which this assessment was conducted. SD – standard deviation.

[a] Since this variable is continuous, correlation with "time to readmission" was tested by bivariate linear fit.

[b] Small discrepancies in n (%) from those reported in the Results section are due to the "time to readmission" variable missing for 1 patient, who was excluded from analyses reported in this Table.

was higher than the rate in general pediatric hospitals across United States of 6.5% (Berry et al., 2013), and similar to prior estimates of 30-day readmission rates for pediatric psychiatric treatment facilities, with rates of 7.5–12.2% (Fontanella, 2008; James et al., 2010). While in other adult (Lorine et al., 2015) and pediatric (Cheng et al., 2017) studies psychotic-spectrum diagnoses conferred rehospitalization risk, in our cohort, no specific psychiatric diagnostic category was associated with risk of readmission. Higher BMI was shown to be associated with

Table 5
Parent/Caregiver reason for readmission and root cause for readmission in clinician's impression.

Reason for 30-day readmission	n of responders (% of total 93 responders)	Time to readmission, days ± SD	*p*-value
Caregiver's primary reason for readmission, categorized:			
- Illness factors/symptoms exacerbation	77 (84.8)	14.2 ± 7.8	0.053*
- Environment of care/family factors	0 (0)	NA	
- System of care factors	12 (13.1)	17.5 ± 7.6	
- Not sure/"I don't know"	3 (3.3)	5.3 ± 5.9	
Clinician's impression, root cause of readmission, categorized:			
- Illness factors/symptoms exacerbation	60 (73.2)	13.5 ± 7.8	0.57
- Environment of care/family factors	11 (13.4)	14.4 ± 6.4	
- System of care factors	11 (13.4)	16.3 ± 2.4	

* Parents' inability to give a reason ("not sure") for readmission, $n = 3$, was associated with time to readmission, $p = 0.046$, when dichotomized.

psychiatric readmission in adult population (Manu et al., 2014); in our study there was an association of comorbid obesity and readmission in youth. Numerous factors likely account for this association, including effect of mental illness and treatments on obesity, as well as negative effects of obesity on psychiatric illness severity and treatment resistance (Lopresti and Drummond, 2013; Rankin et al., 2016). Non-NYC residency was a risk factor for any readmission to our hospital, while proximity to the hospital was not. Since we did not specifically test for this association, its significance is unclear. This finding may be a consequence of varying availability and robustness of outpatient services in smaller communities, and is consistent with the findings of a recent review that demonstrated that the risk of readmission not only relates to patient characteristics but also to system and environmental factors that vary between geographical areas (Kalseth et al., 2016).

Exacerbation of illness was responsible for most of the readmissions based on clinicians' and parents' qualitative reports. Illness exacerbation can be attributed to multiple factors, including natural course of illness, medication non-adherence, medication non-efficacy, and inadequacy of out-of-hospital services, among others. Our result suggest that difficulty filling a prescription was correlated with time to readmission, and this likely contributed to exacerbation of illness. Facilitating medication and treatment access at the time of discharge may be one way to reduce readmissions.

There is ample evidence that caregivers' mental illness (Bitsko et al., 2016; Mok et al., 2016) and adverse social determinant of health (SDH) factors (Victorino and Gauthier, 2009) negatively impact child's mental health. In our cohort, available SDH factors (race, income, Medicaid eligibility) were not strongly associated with readmission.

Caregiver factors, such as stress, parental mental or physical illness, and single-parent home, were identified as the proximal cause of 13.4% of readmissions, as assessed by clinicians, but never by the caregiver themselves. This finding suggests that either the caregivers lack awareness of their contribution to child's deterioration (a result of a cognitive bias, or unwillingness to disclose it) or that the clinicians tend to "over-diagnose" it. Our data lends further support to the need to consider caregiver factors, such as parental stress and parent-child relationship in evaluating risk for readmission, when attempting to reduce potentially avoidable psychiatric readmission of youth, as suggested previously (Blader, 2004). There is ample evidence that family support services (psychoeducational, skills-based, emotional, or logistical interventions, particularly when clinician-led) improve child mental health outcomes and are increasingly cost-effective (Hoagwood et al., 2010). Wider acceptance and implementation of family support services would likely ameliorate numerous obstacles to avoiding readmissions identified by the FCIT.

After discharge from inpatient treatment, the intensity of interventions invariably decreases. A study of adult psychiatric readmissions attributed the risk, in part, to the quality of after-hospital care (Zhang et al., 2011). In another study, improved care coordination and access to care through the arrangement of a follow-up appointment within 7 days, availability of 24 h crisis intervention, and assertive outreach to nonadherent individuals reduced suicide rates (While et al., 2012). In our cohort of readmitted youth, those with aftercare appointments immediately following the discharge were rehospitalized more quickly; this association may be explained by a "common-cause factor" such greater severity of illness, rather than direct causality. Therefore this association requires further investigation.

In our cohort, residing outside of family home (e.g., in a residential treatment center) appeared to delay re-hospitalization; however since we did not specifically test for this association, its significance is unclear. Prior findings on this are mixed; for example James et al. (2010) found that receiving any aftercare services decreased risk of readmission, with more intensive services having the least effect. A potential explanation of our results is that greater out-of-hospital structure and supervision available to patients in residential settings may have protective effect on risk of readmission.

Antipsychotic medications are frequently initiated during a psychiatric admission, and are found to be among the most common classes of discharge medications, with over half of youth leaving the hospital on an antipsychotics in one study (Procyshyn et al., 2014). In our study 72% of readmitted youth received antipsychotic medication. Medicaid-enrolled children are frequently prescribed antipsychotics in the absence of psychotic or mood disorder diagnoses; in a national study, 1 in 7 antipsychotic-prescribed youth had ADHD as their only diagnosis (Matone et al., 2012). Antipsychotic polypharmacy (2.9%) is a discouraged practice that lacks efficacy data and is associated with higher burden of adverse effects. Our rates of antipsychotic polypharmacy were lower than in systematic review of 15 studies (9.6% in children, 12.0% in adolescents) (Toteja et al., 2014), and in more recent reports, where the 13.8% of discharged youth received more than one antipsychotic (Saldaña et al., 2014).

In our study we attempted to identify risk factors for readmission using quantitative and qualitative approaches. We found that the qualitative approach yielded meaningful information that can lead to specific interventions aimed at reducing readmissions. Based on our findings, we implemented a trial program to provide all youth with a 30-day supply of medication at the time of discharge.

4.1. Limitations of the study

The results of this study need to be interpreted within its limitations. Data for 71 patients who had their first 1-year readmission outside of the survey year was not available, reducing the sample size available for comparison, and potentially underrepresenting patients who remained non-hospitalized the longest. Additionally, variables for certain readmission risk factors were not available, particularly those related to illness severity and chronicity. Furthermore, we had incomplete knowledge about a child's hospitalizations at other facilities, before, during or after the survey year, and therefore, it is likely that some readmitted youth were counted as those experiencing a single hospitalization. We used comorbid diagnosis of obesity as proxy for body mass index, but could not consider most of the other comorbid

diagnoses as potential risk factors for readmission. FCIT interviews were not conducted with all of 30-day readmitted youth's parents. Other factors that may contribute to effectiveness of pediatric mental health care, such as organizational financing and reimbursement, outcomes monitoring, and productivity targets (Schoenwald et al., 2008) were also not evaluated.

5. Conclusion

Hospital readmissions are common and related to some degree to illness severity/complexity-related factors. FCIT revealed that caregivers face multiple obstacles at discharge and after the child leaves the hospital, particularly with obtaining medications; that they underestimate their own contribution to child's deterioration; and that shorter time to scheduled follow-up hastens readmission. Available factors associated with social determinants of health were not correlated with readmission.

Preventing psychiatric readmissions requires that the mental health care team attends to a broad range of illness-perpetuating or exacerbating factors, including illness, treatment, environment of care, and systems of care factors, and engages multiple resources at the hospital (nursing, dietary, behavioral specialists, administration), as well as outside of the hospital (school, extended family, social and child protective services). While such effort requires effective leadership, communication, and significant additional resources, it has most promising potential at preventing re-hospitalization, one of the most costly manifestations of insufficiently managed mental illness in youth.

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Declaration of Competing Interest

All authors have NO conflicts of interest to report.

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Supplementary materials

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