

RESEARCH ARTICLE

# Patient Risk Factors for Violent Restraint Use in a Children's Hospital Medical Unit

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ABSTRACT

**BACKGROUND AND OBJECTIVES:** To inform efforts to reduce violent restraint use, we examined risk factors for restraint use among hospitalized children with known behavior concerns.

**METHODS:** We conducted a retrospective cross-sectional study of restraint events in all hospitalizations from 2017 to 2019 on a 10-bed medical-surgical unit with dedicated mental health clinician support. We examined characteristics of restraint events, used adjusted logistic regression models to identify independent risk factors for restraint use, and used an adjusted Poisson regression model to determine the adjusted rate of restraint events per hospital day.

**RESULTS:** The sample included 1507 hospitalizations representing 1235 patients. Among included hospitalizations, 48% were for a psychiatric indication awaiting transfer to an inpatient psychiatric unit, and 52% were for a primary medical or surgical problem. Sixteen percent had a restraint event. Patient demographic characteristics were not associated with risk of a restraint event. Having a psychiatric indication for hospitalization was an independent risk factor for restraint use (odds ratio: 2.85; 95% confidence interval: 2.06–3.94). Rate of restraint use per day decreased as length of stay increased; hospitalizations lasting 9 days or longer had a 58% lower rate of restraint use per day than 1- to 2-day hospitalizations ( $P < .001$ ).

**CONCLUSIONS:** Interventions to reduce restraint use may benefit from incorporating information about a patient's psychiatric risk factors, including type and number of diagnoses and reason for hospitalization. Future efforts could investigate whether providing enhanced behavior supports during the first several days of a patient's hospitalization reduces violent restraint use.



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Acute care hospitals are increasingly called on to care for children with mental health conditions.<sup>1,2</sup> In 2014, nearly 80% of hospitalizations in children with psychiatric conditions occurred in medical settings, not psychiatric hospitals.<sup>1</sup> Pediatric medical hospital units are typically not well staffed with experts in mental health care, nor are the physical environments designed to best support children with mental health concerns.<sup>3-6</sup> Hospitalized children with any psychiatric problem are at risk for worse outcomes than their peers, including longer hospitalizations, more complications, and higher risk of hospital readmissions.<sup>7</sup> Furthermore, children with psychiatric conditions are at risk for behavior-related safety events, including the need for physical restraint.<sup>7</sup>

Children with mental health conditions are at risk for self-harm, including suicide attempts, nonsuicidal self-injury, and other forms of injury, including head-banging, biting, and skin-picking.<sup>8</sup> Hospital staff caring for patients with mental health problems face a higher risk of assault from patients, compared with those working with other patient populations.<sup>9</sup> To maintain the safety of patients and staff, environmental strategies and medications are typical first-line treatments for agitation or aggression, and physical restraint is used when more conservative measures fail.<sup>9</sup> In health care settings, physical restraint includes any practice or device that limits a patient's freedom of movement.<sup>10</sup> When used to prevent a patient from injuring him- or herself or someone else, physical restraint is termed "violent restraint" and includes manual physical holding of a patient by staff and application of restraint devices to restrict movement. In this article, the term "restraint" refers to violent restraint designed to prevent a patient from harming him- or herself or someone else. There is no evidence to reveal that restraint use benefits patients,<sup>11</sup> and restraint is associated with risk of bodily injury to patients and staff, weakened clinician-patient relationships, and psychological trauma to patients and

staff.<sup>8,12</sup> In some cases, restraint can serve as a last resort intervention for preventing immediate harm to clinical staff or injury to patients.<sup>10</sup> However, the risks and ethical issues associated with restraint use make this practice a suboptimal strategy for managing aggression or agitation.<sup>13</sup> Currently, little guidance exists for health care systems on how to avoid restraint use or employ alternative techniques to manage agitation or aggression.

There is a need to better understand restraint use to develop better alternative noninvasive interventions to manage agitation and reduce risk of harm. To work toward developing interventions that can prevent restraint use, we sought to understand (1) prevalence of restraint use among hospitalized children with known behavior concerns, (2) characteristics of patients exposed to restraints, (3) characteristics of restraint events, and (4) risk factors for restraint use.

## METHODS

### Design, Data Source, and Setting

We conducted a retrospective cross-sectional study among children and adolescents hospitalized in our 600-bed freestanding children's hospital specialized medical behavioral unit (MBU) from January 2017 to December 2019. We examined which clinical and sociodemographic factors were associated with the primary outcome of restraint use. The hospital's institutional review board approved this study.

The MBU is an acute care 10-bed inpatient pediatric medical-surgical unit with enhanced behavioral health supports. The unit is staffed with an attending pediatrician, physician's assistants, nurse practitioners, a full nursing and nursing leadership team, a dedicated consulting psychiatrist, psychiatric nurse practitioner, psychologist, board-certified behavior analyst, child life specialist, and social worker. The unit design also provides the highest safety standards feasible in a medical unit including controlled badged access to the unit and all equipment. The unit is not licensed to provide inpatient psychiatric treatment.

Patients may be admitted or transferred to the MBU if they have a psychiatric condition requiring active management during a medical hospitalization, history of significant aggression in a medical setting, or have demonstrated behavior problems placing self, staff, or others at significant risk of harm. Because of the lack of available community resources and limited inpatient psychiatric hospital beds, patients with a primary presenting psychiatric problem awaiting psychiatric disposition are also admitted to the MBU. An example of a typical patient admitted to the MBU for a medical problem is an adolescent with autism and a history of aggression hospitalized for treatment of constipation who requires a nasogastric tube to administer a large-volume osmotic laxative. An example of a typical patient admitted to the MBU for a psychiatric problem is a child with a history of aggression and elopement presenting with worsening aggression who is medically cleared and is awaiting psychiatric disposition. When the MBU is at capacity, patients who are otherwise eligible for the MBU are admitted to general pediatric teams. When MBU beds become available, patients with high risk of self-harm, aggression toward staff, or elopement are given highest priority for admission or transfer to the MBU. Before opening the MBU, patients who were eligible for the MBU were cared for by general pediatric teams. Hospitalizations for patients >22 years of age were excluded from this analysis.

Per hospital and regulatory protocols, restraint use is closely monitored. Hospital protocol requires that staff attempt noninvasive strategies to de-escalate unsafe behaviors before initiating restraint. Conservative strategies include offering food, drinks, and other comfort measures, distraction, active listening and/or problem-solving, prompting and/or demonstrating coping skills such as deep breathing, and making changes to the environment to support the patient such as decreasing stimulation or increasing the staffing ratio. When these are not sufficient to address aggression or agitation, medication is administered via oral, intravenous, or intramuscular route. If the patient is unable to regain safe behavioral control with these measures,

the patient is placed in a manual physical hold until restraint devices can be applied. In some cases, restraints are applied to facilitate psychotropic medication administration. Hospital policy dictates that patients should not be restrained without also receiving medication to treat aggression or agitation. The restraint devices must be ordered by an ordering clinician (physician, nurse practitioner, or physician's assistant), and the attending physician and patient's caregiver must be made aware of the restraint event. The patient must be assessed by the ordering clinician as soon as possible at the start of the restraint event, and while the patient remains in restraints, their well-being must be assessed and documented every 15 minutes by a registered nurse. For children <9 years, restraints must be reassessed by an ordering clinician every 1 hour, and for children ≥9 years, every 2 hours. Restraints are removed in a stepwise fashion, starting with 1 leg, as soon as the patient can demonstrate safe behavioral control. Registered nurses and psychiatric technicians place restraint devices, and these staff are required to complete Crisis Prevention Institute training in verbal de-escalation and safe application and removal of restraint devices annually.

### Predictor Variables

We examined the association of patient sociodemographic and clinical characteristics with restraint use. Sociodemographic factors were ascertained from the electronic health record by using structured fields completed by parents and/or guardians on admission and included patient age, race (white, Black, Asian American, other), ethnicity (Hispanic/non-Hispanic), sex (male or female), and insurance status (private, public, or other). Clinical characteristics included the patient's psychiatric diagnoses, length of stay in days, history of previous hospital admission, and indication for hospitalization. Indication for hospitalization was categorized into primary psychiatric (ie, no medical or

surgical problem and awaiting psychiatric disposition) versus medical or surgical. Psychiatric conditions were identified by using *International Classification of Diseases, 10th Revision*, codes associated with the admission. Psychiatric conditions were categorized into 14 groups by using an existing scheme.<sup>1,14</sup>

### Outcomes

The primary outcome of interest was restraint use, documented by the patient's bedside nurse in the electronic health record. We calculated the length of restraint events by calculating the difference between the time of application and removal of restraint devices as documented by the patient's bedside nurse. We counted each episode of restraint as a separate event so that a patient who had restraint devices placed, removed, and then placed a second time would have 2 restraint events. Documentation of restraint events is closely monitored for regulatory compliance and audited by nursing leadership.

### Statistical Analysis

We described sociodemographic and clinical characteristics for patients with and without restraint use during their hospitalization using frequencies and percentages. We compared differences between groups using *t* tests for continuous variables and  $\chi^2$  tests for categorical variables.

We used a mixed-effects multinomial logistic regression model to estimate the adjusted odds of restraint use independently associated with each sociodemographic and clinical characteristic of interest. The model used a random effect to account for clustering because of some patients had multiple unique admissions within the data set. Other covariates were selected a priori on the basis of literature review and included patient age, race, sex, insurance status, and psychiatric diagnoses, as well as indication for hospitalization (psychiatric, medical or surgical). We included year of presentation (ie, 2017, 2018, 2019) as a

covariate because restraint practices could change with time. We used an adjusted Poisson model with a log-link function to estimate the adjusted rate of restraint events per hospital day. All analyses were done at the level of hospitalization. We used SAS statistical program version 9.4 (SAS Institute, Inc, Cary, NC). A *P* value of <.05 was considered statistically significant.

## RESULTS

### Sample Characteristics

The final sample included 1507 hospitalizations representing 1235 patients. The demographic characteristics of included hospitalizations are described in Table 1. Patients in the included hospitalizations were 56% male and 44% white, 42% Black, 8% Hispanic, 2% Asian American, and 12% another race. Among included hospitalizations, 56% were reimbursed by using public insurance (ie, Medicaid), 41% with private insurance, and 3% with self-pay or charity care. The median age was 12 years old (interquartile range [IQR]: 8–15).

The primary reason for hospitalization was a psychiatric problem (ie, no medical or surgical complaints and awaiting psychiatric disposition) in 46% of included hospitalizations. The remaining 54% of hospitalizations were for a primary medical and/or surgical problem and patients were admitted to the MBU because of a behavioral or psychiatric need. In 19% of hospitalizations, no formal psychiatric diagnosis was associated with the hospitalization. For those patients, chart review revealed that reasons for admission to the MBU included transient behavior problem (eg, aggression in the context of steroid administration), need for behavior analyst services (eg, family support to treat oral medication refusal), of psychiatric diagnosis being suspected but not formally associated with the hospital discharge summary.

Among included patients, 12% of the sample (*n* = 150) had >1 hospitalization within the 3-year time frame. The median length of hospital stay was 3.1 days (IQR: 1.5–7.1 days).

**TABLE 1** Characteristics of Hospitalizations for Children at Risk for Behavior Problems in an Acute Care Pediatric Hospital From 2017 to 2019

Characteristic	Total (N = 1507)	No Restraint Used (n = 1273)	Restraint Used (n = 234)	P
<b>Demographic characteristics</b>				
Age, median (IQR), d	12 (8–15)	12 (8–15)	13 (9–16)	.0183
Age group, %, d				.2060
3–9	479	32.8	26.1	
10–14	536	35.0	38.9	
15–17	390	25.4	28.6	
18+	102	6.8	6.4	
Sex, %				.2641
Male	845	55.5	59.4	
Female	662	44.5	40.6	
Race, %				.1365
White	667	45.4	38.0	
Black	632	40.7	48.7	
Asian American	35	2.3	2.1	
Other	173	11.6	11.1	
Ethnicity, %				.4255
Hispanic	122	7.9	9.4	
Not Hispanic	1385	92.1	90.6	
Insurance status, %				.0033
Public	873	56.0	67.9	
Private	590	40.9	29.9	
Other	44	3.1	2.1	
<b>Hospital use characteristics</b>				
LOS, median (IQR), d	3.06 (1.45–7.08)	2.79 (1.3–6.0)	6.76 (2.91–15.79)	<.0001
LOS group, %, d				<.0001
0–2	645	46.4	23.1	
3–5	382	26.2	20.9	
6–8	165	10.6	12.8	
9+	315	16.8	43.2	
Reason for hospitalization, %				<.0001
Psychiatric	700	41.9	70.9	
Medical and/or surgical	807	58.1	29.1	
Year of hospitalization				.018
2017	590	40.4	32.0	
2018	553	36.6	37.2	
2019	364	23.0	30.3	

—, not applicable.

### Characteristics of Patients Requiring Restraint Use

Table 1 reveals bivariate comparison between hospitalizations with and without restraint use. In unadjusted bivariate comparisons, hospitalizations with a violent restraint event were more often for patients who were older ( $P = .0183$ ), had public health insurance ( $P = .003$ ), and had a longer length of stay ( $P < .0001$ ). Hospitalizations with a violent restraint

event were more likely to have a psychiatric reason for hospitalization ( $P < .0001$ ) compared with hospitalizations without a restraint event.

### Independent Association of Clinical and Demographic Characteristics With Restraint Use

The adjusted odds ratios (aORs) of restraint use by patient demographic and

hospital use characteristics are displayed in Table 2. No demographic characteristic measured was associated with restraint use. Among clinical characteristics, having a psychiatric reason for hospitalization was an independent risk factor for restraint use (aOR: 2.85; 95% confidence interval [CI]: 2.06–3.94). Having a longer length of stay was also an independent risk factor for restraint use. The longer

**TABLE 2** Odds of Restraint Use Among Hospitalized Children and Adolescents at Risk for Behavior Problems

Patient Demographic Characteristics	aOR (95% CI)
Hospitalizations	<i>N</i> = 1507
Age group, y	
3–9	Referent group
10–14	1.04 (0.68–1.59)
15–17	1.31 (0.83–2.06)
18+	0.81 (0.38–1.69)
Sex	
Female	Referent group
Male	1.36 (0.96–2.17)
Race	
White	Referent group
Black	1.19 (0.80–1.79)
Asian American	1.00 (0.32–3.10)
Other	0.95 (0.48–1.86)
Ethnicity	
Non-Hispanic	Referent group
Hispanic	1.20 (0.60–2.40)
Insurance status	
Public	Referent group
Private	0.65 (0.43–0.96)
Other	1.02 (0.35–2.97)
Hospital use characteristics	
LOS, d	
0–2	Referent group
3–5	1.50 (0.96–2.33)
6–8	2.09 (1.22–3.57)
9+	4.89 (3.21–7.46)
Reason for hospitalization	
Medical and/or surgical	Referent group
Psychiatric	2.89 (2.04–4.09)
Year of hospitalization	
2017	Referent group
2018	1.11 (0.76–1.63)
2019	1.43 (0.94–2.17)

the hospitalization, the higher the odds of restraint use, with hospitalizations lasting  $\geq 9$  days having the highest risk of restraint use, (aOR: 5.73; 95% CI: 3.86–8.51) followed by hospitalizations lasting 6 to 8 days (aOR: 2.20; 95% CI: 1.33–3.64). Although patients were more likely to have a restraint event during a longer hospitalization, longer hospitalizations had a lower rate of restraint use per day. Adjusting for other clinical and demographic factors, hospitalizations lasting  $\geq 9$  days had a 58% lower rate of restraint events per day

compared with hospitalizations lasting 0 to 2 days ( $P < .001$ ), suggesting that risk of restraint use is higher in the first several days of a hospitalization than in subsequent days.

### Prevalence and Independent Association of Mental Health Diagnosis With Restraint Use

The prevalence of each psychiatric diagnosis and the aORs of restraint use by psychiatric diagnosis, adjusting for clinical and demographic covariates, are displayed

in Table 3. The most common psychiatric disorders were attention-deficit/hyperactivity disorder ( $n = 503$ ), autism spectrum disorder ( $n = 432$ ), and impulse control and conduct disorder ( $n = 449$ ). The 3 psychiatric diagnoses most strongly associated with restraint use were autism spectrum disorder (aOR: 2.07; 95% CI: 1.41–3.05), bipolar disorder (aOR: 1.99; 95% CI: 1.13–3.51), and impulse control and conduct disorder (aOR: 1.93; 95% CI: 1.33–2.81). Psychiatric multimorbidity was common, with 68% of hospitalizations having  $\geq 2$  psychiatric diagnoses, and 11% having  $\geq 6$  psychiatric diagnoses. Having a higher number of psychiatric diagnoses was associated with increased odds of restraint use.

### Timing and Characteristics of Restraint Events

In total, 1114 restraint events occurred within the 3-year study period (2017–2019), with a rate of 101 restraint events per 1000 hospital days. Sixteen percent of hospitalizations had a restraint event. In hospitalizations in which restraints were used, more than two-thirds (67%) of them involved  $>1$  restraint event. The median number of restraint events among hospitalizations with a restraint event was 2 (IQR: 1–5). The median duration of each restraint event was 56 minutes (IQR: 29–80). The median total duration of all restraint events during a hospitalization with restraint use was 132 minutes (IQR: 56–342). Figure 1 reveals the timing and frequency of the number of restraint events per hospitalization. Half of all restraint events occurred on hospital day 1.

### DISCUSSION

Although The Joint Commission and the American Academy of Child and Adolescent Psychiatry recommend limiting restraint to serve as a last resort intervention, few effective alternatives exist, and the practice remains a part of the care of children and adolescents.<sup>15</sup> Restraints were used in  $\sim 16\%$  of hospitalizations between 2017 to 2019 in our sample of hospitalized children and adolescents with behavioral health concerns. More than

**TABLE 3** Psychiatric Diagnoses and Odds of Restraint Use Among Hospitalized Children and Adolescents at Risk for Behavior Problems

	n (%)	aOR (95% CI)
<b>Mental health diagnosis</b>		
ADHD	501 (13.9)	0.65 (0.40–1.05)
Anxiety	373 (10.4)	0.81 (0.53–1.21)
Autism	432 (11.9)	1.71 (1.05–2.59)
Bipolar disorder	84 (2.3)	1.99 (1.13–3.51)
Depression	315 (8.7)	1.23 (0.79–1.91)
Impulse control and conduct disorder	449 (12.4)	1.93 (1.33–2.81)
Intellectual disability and development disorder	269 (7.4)	1.33 (0.89–1.98)
Feeding and eating disorder	113 (3.2)	1.23 (0.68–2.23)
Suicide attempt or self-injury	321 (8.9)	1.24 (0.81–1.89)
Schizophrenia	120 (3.3)	0.94 (0.53–1.67)
Learning disorders	143 (4.0)	1.34 (0.81–2.21)
Substance abuse	45 (1.2)	0.539 (0.17–1.75)
Trauma related disorder	153 (4.2)	1.49 (0.94–2.38)
Other psychiatric diagnosis	292 (8.2)	0.70 (0.46–1.05)
<b>No. psychiatric diagnoses</b>		
0	295 (19.6)	Referent group
1	188 (12.5)	3.37 (0.99–11.43)
2	240 (15.9)	5.45 (1.59–18.76)
3	266 (17.7)	10.95 (2.57–41.07)
4	218 (14.4)	10.98 (2.57–46.09)
5	135 (8.9)	18.36 (3.56–94.61)
≥6	165 (10.9)	27.24 (3.99–185.72)

ADHD, attention-deficit/hyperactivity disorder.

two-thirds of the hospitalizations with any violent restraint events had >1 restraint event. In hospitalizations with restraint events, patients were more likely to have a psychiatric reason for admission and stay longer than patients who did not require restraint use. We found that observable demographic characteristics like sex, race, ethnicity, and age did not vary between those who did and did not require restraints. Longer hospitalizations had a higher absolute risk of any restraint use because patients had more opportunity to have a behavior exacerbation requiring restraints. Nevertheless, most restraint events occurred on the first hospital day. In adjusted analyses, the rate of restraint use per day was lower for longer hospitalizations (ie, the risk of a patient having a restraint event on any given hospital day decreases with a longer hospital stay).

In pediatric inpatient psychiatric settings, demographic characteristics such as sex, race, and ethnicity are predictors of

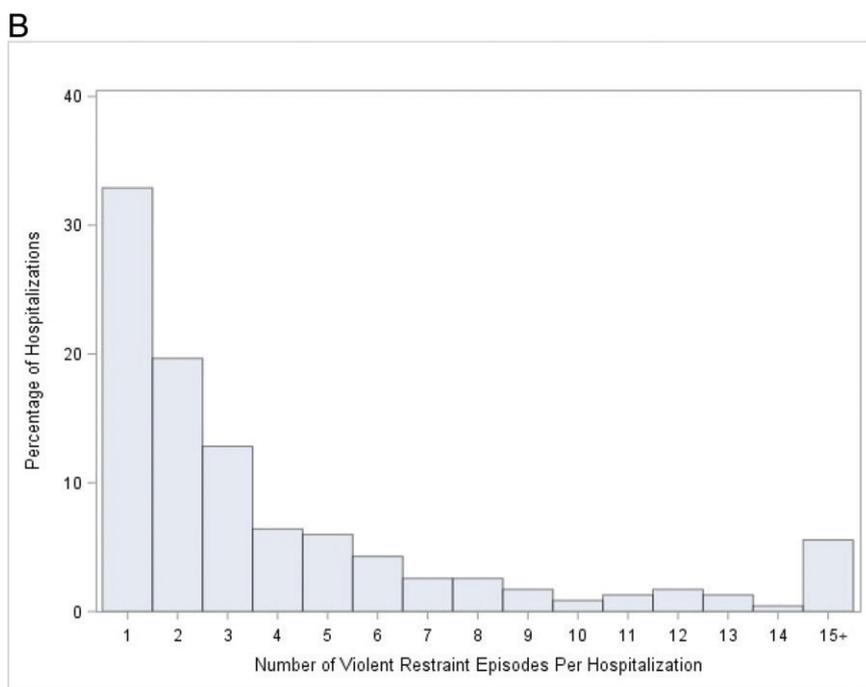
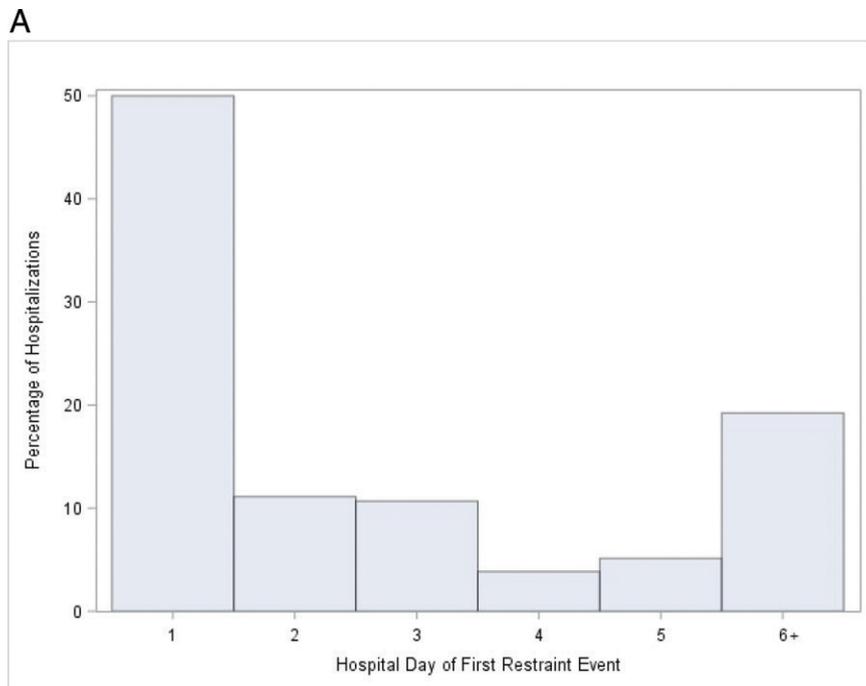
restraint use.<sup>15,16</sup> In a 2008 study, Martin et al<sup>15</sup> found that Black patients at a pediatric inpatient psychiatric unit were 4 times more likely to use restraints compared with white patients. However, this association has not been seen as commonly in medical settings. Our findings align with those of previous similar studies examining restraint use among adolescents with psychiatric disorders in a medical setting. Dorfman et al<sup>11</sup> found that demographic factors like race, ethnicity, age, and insurance status were not associated with restraint use. One reason for this variation could be differences in the expectations and demands placed on patients in medical settings compared with inpatient psychiatric settings. Another could be differences in regulatory practices surrounding restraint use between the 2 environments. Although some previous research has revealed younger age to be

a predictor of restraint use, this is not a consensus viewpoint,<sup>11,17–19</sup> and in our study, we did not find that age was associated with restraint use.

More than 80% of our sample had ≥1 psychiatric diagnosis; 1 in 10 had ≥6 psychiatric diagnoses. Having ≥2 psychiatric diagnoses was associated with a higher risk of restraint use compared with having 1 or no psychiatric diagnoses. In previous studies, researchers have found that schizophrenia or other psychosis, bipolar disorder, personality disorders, and impulse control disorder are risk factors for restraint use in inpatient psychiatric settings.<sup>17,20,21</sup> In our study, autism, bipolar disorder, and impulse control and conduct disorder were the psychiatric diagnoses most highly associated with restraint use. In future studies, researchers could explore the potential of using psychiatric diagnoses along with other strong risk factors for restraint use to create a risk stratification scheme. A scheme proactively identifying patients at highest risk of restraint use could enable teams to provide extra therapeutic support directed toward those patients.

Our findings also revealed that patients were at highest risk of restraint use on the first several days of a hospitalization. The longer a hospitalization lasted, the lower the rate of restraint events per day. These findings suggest that providing additional supports to patients early in their hospitalization may help avoid the need for restraints.

This study has several limitations that warrant consideration. First, the study design was a retrospective cross-sectional study, so we could not establish temporality. Second, the unique patient population with high psychiatric complexity and the setup of the study unit, with dedicated mental health specialist staff, limits generalizability. Nevertheless, this unique setup allowed our study team to collect detailed information about restraint events in a high-risk population with access to mental health supports. Third, we did not have information on several important risk factors for



**FIGURE 1** Histograms revealing the timing and frequency of restraint events. A, This histogram reveals the proportion of restraint events that occurred on each hospital day. B, This histogram reveals the number of violent restraint events per hospitalization.

restraint use, such as history of psychological trauma, social services involvement, history of aggression or restraint use before the hospitalization, baseline psychotropic medication use, and characteristics of the school, home, and

family environment, which are known predictors of unsafe behaviors in children and adolescents. Lastly, psychiatric diagnosis obtained from the patient's electronic health record may not meet strict diagnostic criteria,<sup>14</sup> and for some

patients, psychiatric diagnoses identified by the clinical team may not have been formally associated with the hospitalization in the discharge or billing summary and therefore could be missing in our data set.

## CONCLUSIONS

Among patients with known behavior concerns hospitalized in a children's hospital medical unit, restraint events were more frequent on the first hospital day than later in the hospitalization. The strongest independent risk factors for restraint use were having a primary psychiatric reason for hospitalization and the number and type of psychiatric diagnoses. This new information can be incorporated in future work to reduce children's risk of exposure to restraints.

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