Research Article

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Evaluation of the use of psychotropic medication as needed for hospitalized child and adolescent patients and for those children in a residential treatment program

Abstract

Objective: The goal of this study was to evaluate the use of psychotropic medication as needed (Symptomatic treatment) (pro re nata or prn) in children and adolescents in a psychiatric hospital and those children in the residential treatment program.

Methods: The pro re nata medication use of all 152 unduplicated patients admitted to Hawthorn Children's Psychiatric Hospital in St. Louis, Missouri (USA) beginning in April 2015 through March 2016 were reviewed for this study. The medication orders of all patients are placed electronically. Reports on prn medication use at the facility were obtained from the electronic medication administration (e-MAR) utilizing the MetaCare software.

Results: In this study, gender, race, and health insurance coverage had no statistically significant association with prn medication usage. However, the child's age did have a statistically significant association ($p<0.01$) with prn medication usage. Inpatients younger in age were more likely to have received prn medications during their hospitalization.

Conclusion: Due to little empirical evidence for prn's in younger children and these results show an increased use in younger patients, our data suggests that prn's be limited when treating these patients. This data also endorses behavioral treatments to be utilized before a prn is administered.

Keywords: prn medication, psychotropic, antipsychotic, child and adolescent psychiatry

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Introduction

Few studies have analyzed the use of pro re nata (prn) medications in child and adolescent psychiatric hospitals and in residential treatment facilities. As Winterfeld et al.[1] pointed out, guidelines on the prescription and administration of prn psychotropic medication in children and adolescents have been lacking, and the clinical effectiveness of psychotropic prn medication in child and adolescent mental health settings has yet to be established. In a systematic review, aggression and agitation were the most common documented reasons for administering prn psychotropic medications in children and adolescents.[2] Aggressive behavior is universal. And likewise, aggression may also be seen in children with mental retardation, Conduct Disorder, Autism, and Attention-Deficit Hyperactivity Disorder.[3]

Severe agitation in a child or adolescent could be the precursor for many different mental health disorders. The decision to use prn medications and choosing the best medication can be challenging. Many different medications have been used when treating aggression in children. Having a clear understanding of the child's diagnosis can be helpful. Documentation and research regarding treatment outcomes remains scarce.

Aim of study

The aim of this study was to review the pro re nata (prn) use of medication treatment for children and adolescents when managing agitation and aggression in a mental health hospital and in a behavioral health residential treatment facility. The intent of the study was to determine whether patient characteristics such as age, gender, etc. influenced prn medication usage.

Methods

Data and sample

For the purpose of this study, data on prn medication administration were extracted from the electronic medication administration system (e-MAR) for duration of a 12-month period from April 2015 through March 2016. The sample for this study comprised of patients who were admitted and treated in the Inpatient and the Residential program within this time period. All patients in treatment on the inpatient units and in the residential program at the facility from April 2015 through March 2016 were included in the study. It is duly noted that the Inpatient and the Residential patients are different in terms of age range, acuity, and length of stay. The patients in the Inpatient Program

included both children and adolescents, while the Residential Program only had adolescent patients. Compared to the Residential Program, the Inpatient Program admits those patients who have higher acuity, frequently presenting with an imminent or substantial risk of inflicting serious harm to self. The patients in the Residential Program generally have a longer length of stay with an average of nine to twelve months compared to the patients in the Inpatient Program whose average length of stay is about three months. Patients from both programs were combined in the data analysis.

By drawing the sample of unduplicated patients over a 12-month period, some patients were approaching the end of their treatment (more stable), while others were starting their treatment (more acute). Some of the patient's medication data included their entire episode of treatment, while others comprised only a partial episode of their treatment. During the observation period, some patients were transferred from the Inpatient Program to the Residential Program, or vice versa. For the purpose of this study, these cases were treated as two distinct episodes of treatment.

Measures

The dependent variable was the number of prn medication episodes that each patient received. The frequency of prn psychotropic medication administration on each patient was coded as the number of times a patient received a dose of medication as needed to alleviate symptoms of anxiety, agitation and/or aggression. In this study, when an intramuscular injection of haloperidol is administered together with an intramuscular injection of lorazepam, this was counted as one episode of prn medication usage for the patient.

To examine factors associated with prn psychotropic medication usage; this study utilized two independent variables, including patient's race and health insurance status. In this study, the patient's health insurance status of whether the patient had coverage through Medicaid or private insurance was used as an indicator of the patient's socio-economic status. Two additional variables, gender and age, were included as control variables.

Analysis

Descriptive statistics were provided for the demographic characteristics of the study sample. The Negative Binomial Regression model was used for this study. To address time exposure, a variable on the length of stay was added to the model. Statistical analyses were conducted with Stata version 13, using an alpha of 0.01.

Results

The demographic characteristics of the sample are presented in Table 1. A total of 152 unduplicated patients were included in this study, of which 53% were male and 47% were female patients. The patients' age ranged from 6 to 17 years old, with the average age of 14 years (SD=2.5). In terms of race, the sample comprised of 70% Caucasians, 22% African Americans, and 8% of other racial groups. The majority (70%) of the patients had Medicaid. About three fourths of the patients are from the Inpatient Program. The average length of stay of the patients were 125 days (SD=120). About 20% (n=31) of the sample did not receive any prn medication during the study period. The average prn medication administration is about 26 episodes (SD=44.2).

Table 1 Demographics of sample

Demographic Characteristics	N (%)	
Sex		
Male	80	(52.6)
Female	72	47.4
Age (M, SD)	14.1	(2.5)
Race		
Caucasian	107	(70.4)
African-American	33	(21.7)
Others	12	(7.9)
Insurance		
Medicaid	106	(69.7)
Private Insurance	46	(30.1)
Program		
Inpatient	119	(78.3)
Residential	33	(21.7)
Length of stay (M, SD)	125.1	(120.0)
Episodes of prn (M, SD)	26.2	(44.2)

The percentage of prn administration by the type of medication are presented in Table 2. The psychotropic medications that were administered as prn for the management of agitation, aggression, and anxiety symptoms included olanzapine, diphenhydramine, haloperidol, chlorpromazine, hydroxyzine, clonazepam, risperidone, lorazepam, quetiapine, ziprasidone, buspirone, and clonidine. Of these medications, olanzapine was the most frequently prescribed and administered as prn medication, comprising one-third of the medications that were administered as prn.

Table 2 Type of psychotropic medication administered as *prn*

Medications	(%)
olanzapine	34
diphenhydramine	16
haloperidol	13
chlorpromazine	10
hydroxyzine	10
clonazepam	5
risperidone	4
lorazepam	4
quetiapine	3
ziprasidone	1
buspirone	1
clonidine	1

The results of the regression analyses are presented in Table 3. The results indicated that the gender, race, and health insurance status were not associated with the administration of prn psychotropic medication. However, there is a statistically significant association between the age of the patients and the administration of prn psychotropic medication ($p<0.01$), after controlling for other variables. In this study, it appears that patients who were younger in age had a higher likelihood of receiving prn psychotropic medication. For each year increase of age, the expected rate of prn psychotropic medication administration decreased by 14%, holding other variables constant.

Table 3 Results of negative binomial regression model with time exposure

Variables	prn Medication Administration				
	b	SE	*p*	Pr(y)	CI
Sex					
Female	0.54	0.22	0.02	13.36	1.58, 25.13
Age	-0.15	0.04	0.001	-3.40	-5.55, -1.25
Race					
African-American	-0.08	0.28	0.78	-1.99	-15.36, 11.38
Others	-0.73	0.43	0.09	-13.54	-25.88, -1.19
Insurance					
Medicaid	-0.55	0.25	0.03	-15.02	-30.64. 0.59

b, unstandardized regression coefficient; SE, standard error of *b*; *p*, p value for *z* test; Pr(y), predicted number of event (prn medication administration); CI, 95% confidence interval for Pr(y)

Discussion

As noted by Dean et al.,4 acute episodes of aggression and/or agitation are common in children and adolescents receiving inpatient psychiatric treatment. Up to 80% of young people in some studies receive prn medication treatment.[5–7] Pappadopulos et al.[8] noted that antipsychotic medication is often administered to children and adolescents in New York state public inpatient settings in high proportions for complex comorbid conditions involving aggression. In one study,[9] hospitalized children and adolescents perceived prn medication as useful. There are several clinical factors that explain why the younger population has a higher likelihood of receiving prn medications. An older child has the developmental maturity to be able to process and respond to verbal de-escalation techniques which the younger child does not have. Older children generally are more able to effectively communicate their needs before developing into aggression while younger children often lack this ability. Younger children lack the neurological development necessary to process as effectively as older children. In order to decrease the use of prn medication treatment in these hospital facilities, staff members need to implement appropriate behavioral intervention techniques that can be used to prevent escalation of adverse events such as agitation and aggression, which eventually lead to the need for prn medications.[10]

Because a younger child has less medication history, the physicians generally utilize more caution by using lower medication doses. If that is not effective, they may then administer another prn. Therefore, it is more common for a younger patient to have for example: 25mg of diphenhydramine and an hour later, another 25mg of diphenhydramine or a prn of diphenhydramine and then within an hour or two, 0.5mg of risperidone before the desired effect is achieved.

In general, the earlier the inpatient presentation in mental health, often the more severe the prognosis and/or the eventual diagnosis. These factors may make medication treatment in the younger child more challenging and with more uncertainty. At times, a very young, Dysregulated, aggressive child, may often be less verbal. Hence, the diagnostic process by nature of their age often takes a longer time and may often be less accurate. However, this generally improves with age. For example, a 7-year old might be very angry and upset, but may have some difficulty verbalizing and identifying the true source of his anger. One of our patients had become very aggressive toward another peer; however it took us some time to realize he had become angry and very jealous with the peer because the peer's parents were visiting more often than his parents. According to Dean et al.,[4] a key goal in the management of aggressive children is to assist the child in acquiring the skills required to regulate emotional states and control externalizing behavior.

The use of psychotropic medications to redirect aggressive behaviors should be only one component of a comprehensive biopsychosocial treatment plan that must also include other components in addition to medication.[11] According to Deshmukh and colleagues,[12] prn medication should not be used unless the patient clearly exhibits severe aggression, and psychosocial intervention and/or standing medications (when indicated) have not proven to be sufficient to reduce the aggression to manageable levels. Medication combined with behavioral treatment may be required for optimal outcomes in children with more complex problems.[13] In addition, the response rate for children and adolescents to psychotropic medications varies[5] not just due to their psychological and physiological developmental stages, but also due to the fact that most clinical trials of psychotropic medications are conducted on adults. The limited number of trials with children and adolescents often focus on older children. Younger children are poorly represented in pediatric psychiatry medication approval studies, with adolescents taking up the majority of participants. As a result, most approvals are for adolescent clients. Due to these factors, the response rate of children and adolescents to pediatric recommended dosage of psychotropic medications might not necessarily result in the similar robust responses found among older participants in clinical trials.

Evidence supported models of non-pharmacological treatment are also effective in decreasing aggression and behavioral problems in young children with disruptive behavior disorders, reducing child

traumatic stress disorder symptoms.[14] However, access to these evidence-based psychotherapeutic interventions may be limited by a number of variables including provider training, third-party payer restrictions, and parental motivation and participation. As a result of these findings, we have initiated training in somatic soothing technique targeting our younger patients with positive results.

Limitations

The sample for this study was obtained from only one psychiatric treatment facility for children and adolescents. As the only state facility serving the behavioral needs of children and adolescents in Missouri, HCPH often accepts and treats children and adolescents who could not be stabilized over a short hospitalization or have failed multiple residential placements. It is not uncommon for HCPH to work with patients who demonstrate high risk behaviors, such as self-harm, aggression, elopement, etc., and who take a longer time to stabilize.

Therefore, the results of this study have limited generalizability to the larger population of inpatient children and adolescents with behavioral health needs. Being initiated as part of the hospital's program evaluation efforts, this study had a very small sample size due to the duration of the study and the size of the hospital. A replication of this study with a larger sample size is warranted.

Despite the widespread use of these medications, there is a limited amount of empirical data. There is limited information regarding the choice of medications and effective dosing in this population. As Asogwa and colleagues[2] have pointed out, the use of prn psychotropic medication among psychiatrists is largely based on unscientific observation and reports. Deshmukh et al.[12] have pointed out the need for evidence-based guidelines regarding the use of these different pharmacological agents when managing pediatric aggression on inpatient units.

Conclusion

Our study results indicated that the younger the age of the child, the more likely prn medication was utilized on our units. Gender, race, and health insurance coverage had no significant association with prn medication use. We found no comparative studies regarding prn psychotropic medications to assess effectiveness.

Key points

1. Prescribing psychotropic medication as needed for younger patients can be more Challenging due to their shorter history of illness, lack of diagnostic clarity at times, limited exposure to psychotropic treatment, and their stages of neurological and psychological development.
2. Prescription and administration of psychotropic medication as needed should be limited to those with less severe metabolic and/or extrapyramidal side effects.
3. An increase of behavioral interventions may be indicated for inpatients younger in age before a prn is administered.

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Conflicts of interest

The authors have no conflicts of interest to declare.

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