

# A Retrospective Review of Antipsychotic Medications Administered to Psychiatric Patients in a Tertiary Care Pediatric Emergency Department

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**OBJECTIVES** An increasing number of pediatric patients with psychiatric chief complaints present to emergency departments (EDs) nationwide. Many of these patients require treatment with antipsychotic medications to treat agitation. We sought to examine the use of antipsychotic medications in pediatric patients presenting to a tertiary care pediatric ED.

**METHODS** We performed a retrospective electronic medical record review of patients presenting to a tertiary care pediatric hospital from January 2009 through February 2016 with a psychiatric chief complaint who received an antipsychotic medication in the ED.

**RESULTS** A total of 229 patients were identified, 54.1% of whom were male. Mean age was  $14.4 \pm 2.6$  years. Commonly administered medications included olanzapine (51.1%), aripiprazole (26.6%), haloperidol (24.0%), and risperidone (11.8%). Eighty-seven patients (38.0%) were given at least 1 intravenous or intramuscular dose of antipsychotic medication. A total of 113 patients (49.3%) received only 1 antipsychotic medication, 65 (28.4%) received 2, 30 (13.1%) received 3, and 21 (9.2%) received 4 or more antipsychotics. Median length of stay (minutes) increased significantly with increasing number of medications administered ( $p < 0.001$ ). Length of stay was significantly shorter in patients given only oral medications (675.6 minutes, IQR 418–1194) compared to those given at least one intramuscular or intravenous dose (951 minutes, IQR 454–1652) ( $p = 0.014$ ).

**CONCLUSIONS** In this retrospective series, the majority of patients were treated with newer oral antipsychotics. Administration of multiple medications was associated with a significantly longer length of stay in the ED, as was parenteral administration of antipsychotics.

**ABBREVIATIONS** ED, emergency department; EMR, electronic medical record; IM, intramuscular; IV, intravenous; LOS, length of stay; MAR, medication administration record

**KEYWORDS** agitation; antipsychotic; aripiprazole; haloperidol; lurasidone; olanzapine; pediatric; quetiapine; risperidone; ziprasidone

J Pediatr Pharmacol Ther 2019;24(3):234–237

DOI: 10.5863/1551-6776-24.3.234

## Introduction

The number of emergency department (ED) visits for psychiatric complaints in children has greatly increased over the last 15 years.<sup>1</sup> Previous studies<sup>2</sup> have shown that children with mental health diagnoses have longer lengths of stay (LOS), require more frequent admissions, and many have multiple visits for similar complaints relative to other ED patients. Many of these patients may arrive agitated or become acutely agitated during their stay. Chemical restraint of these patients may be necessary to protect both patient and healthcare provider safety or to expedite the medical evaluation. It has been reported<sup>3</sup> that up to 1 in 15 children require chemical or physical restraints during evaluation. As in the adult population, benzodiazepines, antihistamines, neuroleptic medications, and atypical antipsychotics

are the general classes of medications used for chemical restraint in the pediatric population.

Rates of off-label use of atypical antipsychotic medications in pediatric EDs continue to increase, including in agitated patients. Few studies have looked specifically at newer antipsychotic use in the pediatric ED setting. Our study aimed to characterize the use of antipsychotic medications in pediatric patients presenting to a large single tertiary care pediatric ED with a volume of approximately 90,000 patients annually.

## Materials and Methods

This was a retrospective observational study that was approved by the local institutional review board. Inclusion criteria included all patients presenting to the hospital's pediatric ED with a psychiatric chief

complaint who were administered at least 1 antipsychotic medication during their ED stay. Antipsychotics were defined as those medications traditionally used to treat psychotic disorders; sedatives such as benzodiazepines and primary antimuscarinic agents (e.g., diphenhydramine) were not included. Data were abstracted from the electronic medical record (EMR) system (EPIC, Verona, WI) from January 2009 to February 2016. Patients were identified using ICD-10 codes and medication administration records (MARs) available via the SlicerDicer tool available in the EPIC EMR. All patient records, identified electronically, were reviewed manually. Home medications were determined through review of the reconciled medication list in the patient's history and physical for that visit. Medications administered during the visit were manually abstracted from the patient MAR for each encounter. Data collected included patient age, sex, current antipsychotic medications prescribed prior to the ED admission, vital signs at presentation, chief complaint(s), ED LOS, and patient disposition. For each medication administered, drug, dose, route of administration (oral, intramuscular [IM], or intravenous [IV]), and any adverse effects/outcomes were recorded.

Tachycardia was defined as a heart rate that fell within the >95th percentile of resting heart rate for age. Hypertension was defined as a systolic or a diastolic blood pressure that fell within the >95th percentile of blood pressure for age. All data abstracted were transcribed into a standardized Microsoft Excel 2008 for Mac (Microsoft, Redmond, WA) spreadsheet. Data were analyzed using Stata 14.1 (College Station, TX). Continuous data variables were assessed for normality and analyzed as distributions dictated. Data comparisons were made using Wilcoxon rank sum tests and Kruskal-Wallis tests. Post hoc nonparametric comparisons were made using the Dunn pairwise comparisons.

## Results

Two hundred twenty-nine patients with a psychiatric chief complaint who received at least 1 antipsychotic medication were identified. The majority of patients were male, with a mean patient age of  $14.4 \pm 2.6$  years. Most patients (85.2%) were on daily antipsychotic medications prior to their ED admission. Forty-two (18.3%) were tachycardic and 13 (5.7%) were hypertensive on presentation. Suicidal ideation was the most common presenting complaint (47.6%), followed by aggression (28.0%) and homicidal ideation (10.5%) (Table 1). Medications administered during the ED admission are presented in Table 2. The 3 most commonly administered medications were olanzapine (51.1%), aripiprazole (26.6%), and haloperidol (24.0%).

Length of ED stay by medication characteristics is presented in Table 3. Median LOS for patients increased with increasing numbers of medications received. Patients who received a total of 1, 2, 3, or greater than

**Table 1.** Characteristics of Pediatric Emergency Department Patients Seen for Psychiatric Chief Complaints, January 2009 to February 2016 (N = 229)

Characteristics	Results
Age, yr, mean $\pm$ SD	14.4 $\pm$ 2.6
Sex, male, n (%)	124 (54.1)
Previously received antipsychotics, n (%)	195 (85.2)
Chief complaint,* n (%)	
Suicidal ideation	109 (47.6)
Aggression	64 (28.0)
Homicidal ideation	24 (10.5)
Hallucinations	17 (7.4)
Agitation	14 (6.1)
Other	24 (10.5)

\* Some patients had more than 1 chief complaint.

3 medications had median LOS of 543, 766, 1134, and 1389 minutes, respectively (Kruskal-Wallis  $\chi^2 = 23.26$ ;  $p < 0.001$ ). The Dunn pairwise comparisons identified significant differences between all pairwise comparisons with the exception of the 3 to greater than 3 medications comparison. Eighty-seven patients (38.0%) were given at least 1 IV or IM dose of antipsychotic. Median LOS in patients given only oral medications (675.5 minutes, IQR: 418–1194) was significantly shorter than that of patients given at least 1 IM or IV dose of medication (951 minutes, IQR: 454–1652) ( $z = -2.47$ ;  $p = 0.014$ ).

A total of 191 patients (83.4%) were either admitted ( $n = 12$ ) or transferred to another inpatient mental health facility ( $n = 179$ ); median LOS differed by patient disposition (Kruskal-Wallis  $\chi^2 = 28.54$ ;  $p < 0.0001$ ). Median ED LOS was significantly shorter for patients discharged (383.5 minutes) when compared to those of patients who were either admitted (637 minutes) ( $p = 0.0123$ ) or transferred to another inpatient facility (892 minutes) ( $p < 0.0001$ ).

## Discussion

In this single-center retrospective review, most patients presenting to the ED with a psychiatric chief complaint were treated with newer oral antipsychotics. Prescribers may favor these medications because of their more favorable side effect profiles, though the true efficacy in this patient population is not known.<sup>4</sup> In our patient population, their use appeared to be safe, with no adverse outcomes reported; however, absence of reported adverse effects may be subject to reporting bias given the retrospective nature of our study. Most patients in our cohort did not have objective signs of agitation (e.g., hypertension or tachycardia) prior to medication administration.

A substantial number of patients in our cohort required treatment with 2 or more medications, and

**Table 2.** Medications Received by Emergency Department Patients Seen for Psychiatric Chief Complaints, January 2009–February 2016 (N = 229)

Medication*	Total, n (%)	Oral, n	Parenteral, n
Olanzapine	117 (51.1)	75	42
Aripiprazole	61 (26.6)	61	0
Haloperidol	55 (24.0)	4	51
Risperidone	27 (11.8)	26	1
Quetiapine	23 (10.0)	23	0
Lurasidone	9 (3.9)	9	0
Ziprasidone	5 (2.2)	5	0

\* Some patients were given multiple medications.

increasing numbers of medications were associated with significantly longer lengths of ED stay and higher rates of admission. We were not able to determine cause and effect from our data; that is, it is not clear whether treatment with 2 or more medications resulted in longer LOS and higher admission rate or whether those patients requiring more than 1 medication were more agitated and therefore more likely to need admission as a result of their underlying psychiatric illness.

The median LOS for patients administered at least 1 antipsychotic consistently exceeded the LOS for pediatric ED visits for other conditions. Key factors that have been associated with a longer LOS in previous reviews<sup>4</sup> were need for admission and need for transfer. In our patient population, both administration of multiple medications and parenteral administration of antipsychotics were associated with a longer LOS in the ED. Again, cause and effect are unable to be determined. It is quite possible that the increased LOS

seen in our patients who were admitted or transferred as compared to those patients who were discharged was a function of bed availability or lack thereof. Given the scarcity of psychiatric inpatient treatment facilities, this is likely to have had at least some effect on our results.

Most medications used to treat pediatric agitation and psychiatric disorders are used in an off-label manner, with data extrapolated from adult studies.<sup>5,6</sup> Our study demonstrated a significant association between patient outcome (ED LOS and final patient disposition) and number of medications and route of administration. Additional prospective studies are needed to further elucidate these relationships. Similarly, prospective randomized controlled trials comparing specific agents are lacking. Further studies comparing commonly used antipsychotics, including ziprasidone, aripiprazole, and haloperidol, in acute agitation are needed to determine their efficacy in the pediatric ED.

**Table 3.** Length of Stay by Medication Number/Route and Patient Disposition (N = 229)

Characteristic	Patients, n	ED Length of Stay (min), Median (IQR)	Significance
Number of medications			
1	113	543 (351–1057)	$\chi^2 = 23.26$ ; $p < 0.001^*$
2	65	766 (552–1321)	
3	30	1134 (574–1846)	
4 or more	21	1389 (874–1652)	
Route of administration			
Oral only	142	675.5 (418–1652)	$z = -2.47$ ; $p = 0.014$
IM and/or IV	87	951 (454–1652)	
Patient disposition			
Discharged home	38	383.5 (193–646)	$\chi^2 = 28.54$ ; $p < 0.0001^†$
Admitted	12	637 (516–1050)	
Transferred	179	892 (502–1502)	

ED, Emergency Department; IM, intramuscular; IV, intravenous

\* Post hoc Dunn pairwise comparisons identified significant differences in median length of ED stay between 1 and 2 medication ( $p = 0.0082$ ); 1 and 3 medications ( $p = 0.001$ ); 1 and 4 or more medications ( $p = 0.001$ ); 2 and 3 medications ( $p = 0.0449$ ); and 2 and 4 medications ( $p = 0.0246$ ).

† Post hoc Dunn pairwise comparisons identified significant difference between patients discharged home and admitted ( $p = 0.012$ ) and patients discharged home and transferred to another facility ( $p < 0.0001$ ).

## Conclusions

In this retrospective series, the majority of patients with chief psychiatric complaints were treated with newer oral antipsychotics, and a substantial number required treatment with 2 or more medications. Most patients did not have objective signs of agitation (e.g., hypertension or tachycardia) prior to medication administration. Administration of multiple medications was associated with a longer length of stay in the ED, as was parenteral administration of antipsychotics.

## ARTICLE INFORMATION

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**Disclosure** The authors declare no conflicts or financial interest in any product or service mentioned in the manuscript, including grants, equipment, medications, employment, gifts, and honoraria. The authors had full access to all the data and take responsibility for the integrity and accuracy of the data analysis.

Accepted December 1, 2018

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