



Published in final edited form as:

J Behav Health Serv Res. 2013 January ; 40(1): 97–110. doi:10.1007/s11414-012-9314-y.

Antipsychotic Treatment Patterns and Aggressive Behavior Among Adolescents in Residential Facilities

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Abstract

This study examined the association between acute aggressive behavior patterns of 145 adolescents in residential treatment facilities with use of and changes in antipsychotic medication for the chronic management of aggression. Seclusion/restraint (S/R) frequency over 12 months was used to categorize youth into none, low, moderate, and high S/R groups. Data were analyzed using longitudinal mixed effects logistic regression models that allowed for intra-subject variability over time. The high and moderate S/R groups were significantly more likely to receive antipsychotics, get higher doses, and have changes in medication compared with the none S/R group. Increases in antipsychotic dose were associated with a lower likelihood of changes in antipsychotic medication over time. Despite persistent antipsychotic use at higher doses, youth in the high and moderate S/R groups continued to be secluded/restrained frequently. The findings question the adequacy of these medications in managing aggressive behavior.

Introduction

The increase in antipsychotic medication use among children and adolescents has been primarily due to the prescription of second generation antipsychotics (SGAs). There was a six-fold increase in antipsychotic use nationally from 201,000 children and adolescents in 1993 to 1,224,000 in 2002; 92% of the antipsychotic prescriptions between 2000–2002 were

for SGAs.¹ More recent data demonstrate a continued trend of increased antipsychotic prescribing for children and adolescents.^{2,3} A major reason for concern over the increased prescribing of SGAs is because of the risk of metabolic side effects, including weight gain, dyslipidemia, and risk of diabetes.⁴ This trend also has raised concern about the appropriateness of use because the majority of youths treated with SGAs (77%) do not have a psychotic disorder.⁵ Other disorders for which children and adolescents are prescribed an antipsychotic, but currently lack an approved indication, include attention-deficit/hyperactivity disorder (ADHD), disruptive behavior disorders, anxiety, and depressive disorders.^{2,5–8}

This issue is particularly salient among children and adolescents in residential treatment centers (RTCs). Approximately half of youth who are prescribed SGAs in RTCs do not have a history of psychosis, bipolar disorder, or tic disorder; rather, these medications are used mainly to manage aggressive behavior.^{9,10} More than one third (35–37%) of youth in RTCs receive antipsychotics.^{9,10} However, this rate varies across states (13–48%).¹⁰ While antipsychotics are commonly prescribed for aggression, 17% of the youth who received antipsychotic medication did not have psychotic or aggressive symptoms.¹⁰

The high rate of antipsychotic use is likely due to the fact that youth in RTCs are among those with serious emotional disturbances (SED). As a result, RTCs offer intensive multidisciplinary treatment for youth with severe emotional and behavioral issues, and are sometimes the last resort for some of the most psychiatrically impaired youth. Given that SED and aggressive/violent behavior are among the common reasons for referral to RTCs,¹¹ these youth have significant mental health needs, which increases the likelihood of receiving antipsychotics.

This has raised concern among mental health advocates and policy makers alike about the quality of care for this vulnerable population. Use of antipsychotics to manage aggressive symptoms without a schizophrenia spectrum or bipolar spectrum disorder, or without clear evidence to support such treatment has, important implications for the quality of care and effective clinical management of these youth.⁹ Food and Drug Administration (FDA)-approved indications for SGA use among youth with psychosis in schizophrenia, mania in bipolar disorder, and “irritability” in autism are based on the evidence from several double-blind, placebo-controlled studies.^{12–14} There is also evidence (but no FDA-approved indication) to support risperidone treatment for children with below average to low average IQ.^{15,16} Otherwise, much of the data are derived from open-label studies or studies with small sample sizes.

Given the limited evidence for SGAs in children and adolescents, an expert panel synthesized evidence-based data with consensus to develop the Treatment Recommendations for the Use of Antipsychotics for Aggressive Youth in 2003 (TRAAY).^{15,17} The recommendations are a 14-step approach to prescribing antipsychotics in youth, which include standardized ratings scales to track aggressive behavior, psychosocial and educational components to treatment, and treatment of primary psychiatric disorders prior to initiating treatment with an antipsychotic for aggression.¹⁷ If significant aggression persists despite the initial steps, treatment with an SGA would be warranted. The recommendations then suggest tapering or discontinuing SGA treatment for individuals whose aggressive behavior is in remission for a minimum of 6 months.¹⁷

Currently, there is no published research investigating temporal trends in antipsychotic use in relation to chronic management of aggression. The present study examined antipsychotic treatment as part of a monthly treatment plan and the management of chronic aggression over the course of adolescents’ residential stay. The objectives were to examine the

likelihood of (a) receipt of antipsychotic treatment and (b) changes in antipsychotic treatment as a function of aggressive behavior. The analysis was restricted to antipsychotics used chronically as part of a scheduled treatment and excluded those prescribed “as needed.” It was hypothesized that the likelihood of (a) receipt of an antipsychotic and (b) more frequent changes in antipsychotic treatment over the course of a 12-month residential stay would vary as a function of the frequency of acute aggressive behavior. It was also hypothesized that youth who did not display aggressive behavior for the majority of the 12 months in residence would receive a lower dose of antipsychotic medication compared to youth who displayed frequent aggressive behavior throughout residence.

The present study was conceptualized by members of the Maryland Children’s Mental Health Institute (i.e., the Institute), which is a public–academic partnership between the Maryland State Mental Hygiene Administration, the state public mental health system, the Maryland Coalition of Families for Children’s Mental Health, and the divisions of child and adolescent psychiatry at Johns Hopkins University and University of Maryland. This study is one component of the institute’s broader effort to reduce seclusion/restraint use in child and adolescent psychiatric facilities.^{18–21} This study was approved by the Institutional Review Boards at the Maryland Department of Health and Mental Hygiene and the Johns Hopkins University School of Medicine for an archival record search. A waiver of informed consent was granted because there was no direct contact with youth and the chart review data were de-identified so as to maintain the youth’s privacy.

Methods

Setting

This study was a naturalistic investigation of youth in two public RTCs. The RTC’s intensive programs provide mental health and special education services for 12–18-year-old adolescents with emotional, behavioral, and learning difficulties. The programs’ mission is to provide comprehensive care that facilitates adolescents’ reintegration into the community. Psychosocial and psychiatric evaluations are completed upon admission. Services offered include individual, group, and family therapy; assistance with independent living skills; and therapeutic and recreational activities, which are typical services offered in RTCs.²² In addition, a 6th through 12th grade curriculum, which includes academics, music, art, business education, pre-vocational, and automotive training, is provided for all residential clients. The facilities were staffed with approximately 36 line staff, 8–12 nursing staff, 12–15 psychologists/social workers, and 4–6 psychiatrists. In any given shift, the youth-to-staff ratio was approximately 6–8:1.

The approach to the management of chronic, non-crisis aggressive behavior is a combination of psychotherapy and pharmacologic treatment and can include oral SGA medications. Seclusion/restraint interventions, including intramuscular injections of antipsychotic medications, are reserved for the most severe episodes of acute aggressive behavior when there is concern for safety, and the youth has not responded to other less restrictive interventions, such as removal from milieu or oral medication.^{18,19,22}

Data collection

Retrospective data regarding characteristics at admission, ongoing chronic treatment, and the use of aggression management interventions during residence were obtained from the medical charts. Characteristics at admission included demographics, admission diagnoses, referral source, history of prior psychiatric hospitalizations, and aggression history. Information about ongoing treatment was gathered from the monthly treatment plans and included psychiatric diagnostic profile, prescribed psychotropic medications, and

psychotherapy and behavioral management plans. Prescribed psychotropic medications included those that were part of the ongoing chronic treatment plan. Moreover, this study focused on scheduled antipsychotic medication, not PRN (i.e., as needed) that are given during an acute aggressive episode.

Use of seclusion or restraint was an indicator of acute aggressive behavior. This information was gathered from the medical chart and an electronic database and included the use of a chemical restraint via intramuscular injection, physical restraint, and seclusion. A seclusion/restraint event was used as an indicator of aggressive behavior because it represents the most severe behaviors. Other less severe aggressive behaviors and those that do not result in seclusion/restraint are important, but they were not consistently and clearly documented. Consequently, chart records of less severe behaviors would result in misclassification bias and thereby compromise the internal validity of the study. In addition, the more extreme behaviors present the most challenging situations that pose the greatest clinical challenge in these facilities.

Sample selection

Data were collected for 298 adolescents who were admitted to residential facilities from July 2000 through December 2004. The sample for the analysis was those youth who (1) had an admission date on or after July 1, 2000 when data collection began for this study, (2) had complete data on treatment planning from admission to discharge, and (3) had at least 12 months in residence, which is the average length of stay. This resulted in a sample of 145 of the 298 (49%) for the present analysis. Although many youth were in residence longer than 1 year ($n=118$; 81%), only data from the first 12 months in residence were used for the analysis.

The study was designed to examine the first 12 months in the RTC for several reasons. First, at the time of the study, the average length of stay was 12 months or less. Other investigators have similarly examined use of restraints among youth in RTC over an 11- to 12-month study period.²² Moreover, the longer youth are in an RTC the more time they would have an opportunity to be secluded/restrained and the first 12 months are less likely to be confounded by time. Finally, the first 12 months is also a period of relationship building and treatment planning, and so it is critical to investigate behaviors early on in residence and identify opportunities to maximize youth outcomes.

Sample characteristics

Compared to the 153 youth excluded, the 145 youth in the study sample were significantly younger ($M=14.1\pm 1.4$ years vs. $M=14.6\pm 1.5$ years; $p=0.001$). The study sample was more likely to have had a history of aggression toward self (84 vs. 65%; $p<0.001$) and others (97 vs. 89%; $p=0.01$) upon admission to residence and more likely to receive an antipsychotic medication during their residential stay (72 vs. 48%; $p<0.0001$). There were no differences in gender, race, IQ, or admission diagnoses.

The sample was predominantly male (74%) and African American (52%). Diagnoses upon admission to residence included nearly 75% with a behavior disorder (oppositional defiant disorder, disruptive behavior disorder, conduct disorder, intermittent explosive disorder, and impulse control disorder, not otherwise specified), almost 50% with ADHD, 33% with depression or a non-specific mood disorder, and 25% with bipolar disorder. Only three participants (2%) were diagnosed with a primary psychotic disorder. A large proportion of youth in this sample had a history of aggression and averaged five prior psychiatric hospitalizations (Table 1). Of the 105 prescribed an antipsychotic medication during the course of their residential stay, 104 (99%) received an SGA. All participants received some

form of non-pharmacologic treatment: individual therapy (99%), family therapy (82%), group therapy (81%), behavior management (8%), or case management (2%).

Seclusion/restraint groups

Assignment to low, moderate, and high seclusion/restraint (S/R) groups was based on prior research that used their average number of seclusion/restraints over the 12-month residential stay.²¹ Similar methods used by other investigators have demonstrated that this categorization resulted in distinct seclusion/restraint trajectories.^{22,23}

There was no difference in gender, ethnicity, admission diagnosis, aggression history, juvenile justice involvement, or length of stay across the four S/R groups. There was a significant difference in age across S/R groups with youth in the High S/R group significantly younger at admission ($F=4.17$, $df=3,141$, $p<0.01$). Youth in the high (89%), moderate (89%), and low (69%) S/R groups were more likely to be prescribed an antipsychotic than those in the none S/R group (56%) ($p<0.01$). The differences in use of mood stabilizers approached significance (high S/R 83%; moderate S/R 79%; low S/R 62%; none S/R 58%, $p=0.07$), while there was no difference in use of antidepressants (high S/R 72%; moderate S/R 76%; low S/R 83%; none S/R 72%, $p=0.71$), or ADHD medications (high S/R 72%; moderate S/R 58%; low S/R 62%; none S/R 62%, $p=0.81$).

Data Analysis

Descriptive statistics were used to characterize the age, sex, race, psychiatric diagnoses, prior psychiatric hospitalizations, psychotropic medication use, and duration of residence. Psychotropic medications were categorized as antidepressant, antipsychotic, mood stabilizer, and ADHD medication (including all stimulants and atomoxetine). Seclusion/restraint is utilized as a proxy for aggressive behavior because only aggressive acts that resulted in a seclusion/restraint were factored into the S/R group classification. Additionally, seclusion/restraint is a marker for severe aggression; lesser acts of aggression which led to other interventions such as oral chemical restraint, confinement to one's room, and removal from milieu were not captured in these group classifications. Typically, the behavior that resulted in seclusion/restraint was noted as severe aggression, threatening behaviors, threat of injury to self, or others. Fifty subjects (34%) had no seclusions/restraints over the 12 months (none S/R group). The low S/R group ($n=39$; 27%) had an average of less than one seclusion/restraint per month (i.e., at most one every other month). The moderate S/R ($n=38$; 26%) and high S/R ($n=18$; 12%) groups were defined by an average of up to two and more than two seclusion/restraints per month, respectively.²¹

Fisher's exact tests for categorical variables and analysis of variance for continuous variables were used for bivariate associations between demographics, diagnosis, and medication treatment among youth with none, low, moderate, and high S/R use. Longitudinal, mixed effects logistical regression models were used to examine the association between the likelihood of antipsychotic treatment over time as a function of S/R group. The dependent variables were binary measures of (a) antipsychotic treatment (yes/no) and (b) change in antipsychotic treatment (yes/no). Change in antipsychotic treatment was defined as initiating or discontinuing a medication from the current month to the next month. A separate analysis was done to examine the association between S/R group and chlorpromazine equivalent (CPZ-EQ) doses over time. The independent variable was S/R group, where the none group was the reference category for all analyses. Individual doses were converted to CPZ-EQ doses.^{24,25} For CPZ-EQ doses, chlorpromazine 100 mg was considered equivalent to risperidone 2 mg, olanzapine 5 mg, quetiapine 75 mg, ziprasidone 60 mg, aripiprazole 7.5 mg, clozapine 50 mg, haloperidol 2 mg, haloperidol decanoate 40 mg, fluphenazine 1.5 mg, perphenazine 10 mg, and pimozide 1 mg.^{24,25} Time was modeled

as a continuous measure of the days from the date of admission to each successive treatment evaluation date. Use of seclusion/restraint was a binary indicator of aggressive behavior in the current month.

To estimate the likelihood of antipsychotic treatment, models were adjusted for time, aggressive behavior in the current month, age, gender, and race. The model used to estimate the likelihood of changes in antipsychotic treatment was adjusted for antipsychotic dose in addition to the covariates used to estimate the likelihood of antipsychotic treatment. The S/R group is a marker for a behavior pattern and not the use of a specific intervention. The seclusion/restraint variable pertains to whether an intervention occurred in the current month and was included as a covariate because current use would have a temporal association with antipsychotic use the next month.

The SAS® procedure PROC GENMOD was used to model the log odds of antipsychotic treatment and changes in antipsychotic prescribing. Data are reported as odds ratios and adjusted odds ratios with 95% confidence intervals. All data were analyzed using SAS® version 9.1 (SAS Institute, Cary, NC, USA). Model fit was determined using the quasi-likelihood information criterion for generalized estimating equations.²⁶

Results

Antipsychotic treatment patterns

The S/R groups displayed significantly different patterns of antipsychotic use over time ($p < 0.001$; Fig. 1a). A larger proportion of youth in the high S/R group received an antipsychotic (80–90%) relative to the moderate (75–80%), low (60–65%), and none (40%) S/R groups. Moreover, youth in the high and moderate S/R groups were more likely to experience an antipsychotic medication switch relative to those in the low and none S/R groups ($p < 0.01$).

Antipsychotic dose patterns were also assessed as average daily milligrams of CPZ-EQ for the 12 months in residence. There was a significant difference in antipsychotic dose over time across S/R groups (Fig. 1b). The average CPZ-EQ antipsychotic doses ranged from 255 mg in the high, 231 mg in the moderate, 107 mg in the low, and 55 mg in the none S/R group (Table 2). The average daily dose in the high ($p = 0.01$), moderate ($p = 0.0001$), and low ($p < 0.05$) S/R groups was significantly higher than the none group.

Longitudinal analysis

The results from the longitudinal analyses assessing the likelihood of antipsychotic use over the course of a 12-month residential stay are depicted in Table 3. For the first set of analyses, the dependent variable was the likelihood of antipsychotic use in the current month. The dependent variable for the second set of analyses was the likelihood of change in antipsychotic medication in the subsequent month.

The likelihood of receiving antipsychotic medication in a given month as a function of duration in residence was not statistically significant (Table 3: model 1). In model 2 (Table 3), S/R group was added; youth who had no seclusions/restraints served as the reference group. Youth classified in the moderate or high S/R use groups have roughly six to nine times the odds, respectively, of receiving antipsychotic medication in the current month compared to the none S/R group. By comparison, the low S/R group is more than twice as likely to receive antipsychotic medication relative to the none S/R group (model 4A). The association between S/R group and antipsychotic use remained significant after controlling for S/R in the current month, age, gender, and race (models 3A; 4A).

The findings were similar for the analysis that examined the likelihood of changes in antipsychotic prescribing in a subsequent month (Table 3). Each additional day in residence, since admission, was significantly associated with a lower likelihood of changes in antipsychotic prescribing (Table 3, model 1) and remained significant in each model that controlled for S/R group, seclusion/restraint, CPZ-EQ dose, and age, gender, and race (Table 3, model 4). Moreover, every CPZ-EQ milligram increase in dose resulted in a 1% decrease in the likelihood of a switch in antipsychotic treatment ($p<0.001$). S/R group was added in model 2, with none S/R as the reference group. Those in the moderate or high S/R groups were significantly more likely to experience changes in antipsychotic prescribing relative to the none S/R group (Table 3, model 2), which did not significantly change when the use of seclusion/restraint in the current month was added to the model (Table 3, model 3). The moderate group had an odds of 3.8 ($p<0.001$), and the high group had an odds of 4.3 ($p<0.05$) of experiencing changes in antipsychotic prescribing after adjusting for seclusion/restraint use in the current month, chlorpromazine dose, and demographics (Table 3, model 4).

Discussion

Summary of findings

Several key findings from this study have important implications for chronic management of aggression among youth in RTC. First, the proportion of youth treated with antipsychotic medication was significantly greater among the groups with more frequent and persistent seclusion/restraint throughout the first 12 months in residence. Second, antipsychotic dose was significantly higher in the high and moderate S/R group. Third, increases in antipsychotic dose were associated with a decrease in the likelihood of switching antipsychotic medication.

Chronic, scheduled use of antipsychotics remained consistent over 12 months. Over three quarters of youth in the high and moderate S/R groups regularly received antipsychotic medication. Forty to 60% of youth who had less frequent aggressive behavior, i.e., the none and low S/R groups, received treatment with antipsychotic medication without a reduction in dose during 12 months in residence. Antipsychotic use was not explained by the presence of a psychotic disorder because so few youth were diagnosed with psychosis. Of note, the proportion of youth prescribed mood stabilizers was greater in the high, moderate, and low S/R groups compared to the none S/R group.

Nearly half of the youth in the low and none S/R groups were routinely prescribed antipsychotics at doses of 50–100 mg CPZ-EQ, which are sub-therapeutic for the treatment of psychotic or bipolar disorders. While the low S/R group displayed less frequent aggressive behavior, there was no evidence of tapering antipsychotic treatment over the 12 months. Additionally, 40% of the none S/R group was prescribed antipsychotics over the 12-month study, even though they did not display aggressive behavior that warranted a seclusion/restraint. This is a group where one might expect a trend toward a decreased prescribing or discontinuation of antipsychotics. However, the percentage of youth prescribed antipsychotics remained relatively stable over the 12 months, as did the dose, which is not consistent with the TRAAY recommendations for tapering or discontinuing antipsychotic medication for youth whose aggressive behavior is in remission.¹⁷ It is possible that tapering antipsychotic treatment may be difficult to implement in clinical practice. Since youth in the low S/R group averaged less than one S/R per month, treatment providers may have been reluctant to discontinue antipsychotics as this may result in increased levels of aggression. The findings suggest that the low and none S/R groups may represent a subgroup of youth for whom antipsychotic tapering and use of alternative behavioral management interventions could be an option.

Moreover, compared to the low and none S/R groups, antipsychotic doses of 200–300 mg CPZ-EQ were significantly higher for youth classified in the high and moderate S/R groups, yet only 27% of the 56 youth in these two groups were diagnosed with a psychotic or bipolar disorder. Despite higher antipsychotic doses, these youth continued to have aggressive behavior. This raises questions about the possible need for adjunctive behavioral interventions specifically modified for youth in RTCs.

From a clinical perspective, despite chronic treatment with antipsychotics among the high S/R group, these youth continued to display acute episodes of aggressive behavior throughout the 12 months. Antipsychotics may have a role in the management of chronic aggression,^{16,17} and without treatment youth may have experienced worse outcomes, such as an inpatient admission. However, the data suggest that the chronic antipsychotic treatment may not have been adequate to manage aggression since youth in the high S/R group continued to average two or more seclusions/restraints per month. This group undoubtedly represents the most difficult of youth in residential treatment, although demographically and diagnostically they did not appear different from the other groups. It is likely that for this group, medication alone is not sufficient to manage aggression and adjunctive therapeutic treatments may be needed above and beyond what is currently provided in residential treatment.

Implications for measurement

Consequently, it may be useful to identify youth with high and moderate seclusion/restraint after the first 2 months of residence and implement targeted interventions for this sub-group of adolescents. For example, Beck et al. found discrete seclusion restraint trajectories in a state psychiatric hospital and recommended developing specific interventions for the high-trajectory class, while also considering modifications in treatment for low-risk patients.²³ In another study, 48 out of 155 adolescent females in an RTC accounted for 76% of the restraints.²² Thus, a small subgroup of youth contribute to the majority of seclusion/restraint. Based on their findings, Leidy and colleagues recommended examining trends and clustering patterns and focusing on the subgroup with the most frequent pattern of seclusion and restraint.²²

One approach could be to develop an assessment protocol in RTCs which is administered several times during the residential stay as part of a continuing process that informs treatment.²⁷ Part of this protocol could be to use standardized ratings of aggressive behavior, as well as differentiating between types of aggression, in developing targeted treatments.^{28,29} Reactive aggression involves impulsive and explosive anger which can result in irritability and hyperarousability,²⁸ and certain medications and specific therapies can be used to manage these symptoms. In fact, a consensus group consisting of researchers, academic and practicing clinicians, FDA, National Institute of Mental Health, patient, and family advocates concluded that impulsive aggression represents a public health concern and can be measured precisely enough to merit pharmacological studies, including a placebo-controlled discontinuation trial after first stabilizing for >6 months of pharmacological treatment.³⁰ Treatment of ADHD with a stimulant, or combined with divalproex for ADHD and a disruptive disorder, can reduce aggression.^{31,32} Further studies targeting psychopharmacological interventions for impulsive aggression are needed.³³ Unlike reactive aggression, proactive aggression is not responsive to pharmacologic treatment.²⁸

Implications for intervention

Several evidence-based treatment interventions may be especially promising for managing aggressive behavior as an alternative (for those with less frequent aggression) or adjunctive (for those with more frequent aggression) to antipsychotic medication. A structured

cognitive-behavioral self control training program for adolescents in residential treatment settings showed improvements in aggression in two small studies.^{34,35} In a pilot study utilizing three levels of dialectical behavioral therapy (DBT) intensity in an adolescent residential treatment setting, those who received DBT had significant improvement in overall functioning, in addition to a decreased number of psychotropic medications at discharge.³⁶ Several youth residential treatment programs in Maine have adapted and implemented a Dialectical Behavioral Therapy-Informed Program, as a component of the evidence-based treatments utilized in its system of care.³⁷

Another study specifically looked at reducing medication prescribing in an adolescent residential treatment center utilizing a medically directed cognitive-behavioral treatment approach.³⁸ Overall, there was a significant reduction in psychotropic medications prescribed, without a corresponding increase in behavior problems and seclusion/restraints.³⁸ These data suggest that perhaps a more multi-modal approach to treatment could be a way to ultimately decrease antipsychotic prescribing or at least target the lowest effective dose.

The study is limited in a number of ways. The data were gathered retrospectively from medical charts, and so it is likely that some information is missing. The researchers worked closely with the facility staff to ensure the most complete and accurate information was collected. The study may have underestimated aggressive behaviors because only those that resulted in seclusion/restraint were examined. However, it is the most aggressive behaviors that are most challenging and most likely to result in changes in medication treatment, which was the focus of this study. Since this was a chart review, any issues related to specific staff/youth interactions or specific to the RTC milieu were not documented. Future studies would benefit from parsing out aggressive acts toward others from those toward one's self. Data were not available prior to admission to residence and so it was not possible to assess pre-existing treatment. However, this study was not designed to assess initiation of antipsychotic treatment, but rather the changes in antipsychotic medication. This should not compromise the study findings because prior treatment with antipsychotic medication would not have been temporally related to current seclusion/restraint. Even though the data reflect 2004 practice patterns, use of SGAs for chronic management of behavior problems is still common practice in 2012. Several studies have documented national increases in the use of antipsychotics for indications other than schizophrenia or bipolar disorder.^{2,3} Thus, the findings are still relevant to current prescribing practices. This correlational study does not infer causation. While the average number of seclusion/restraints is not a perfect proxy for aggressive behavior, this is the best available information. The authors focused the analysis on a 12-month period following admission to residence, and thus, it may not be sufficient time to assess antipsychotic tapering or discontinuation. Finally, it is possible that inclusion of youth with at least 12 months in residence selected the most severely impaired youth. Even so, these are the youth who are most likely to be treated with antipsychotics and for whom further study of the effectiveness of these medications in managing aggression is warranted.

Implications for Behavioral Health

Those youth with the highest frequency of seclusion/restraints per month continued to engage in aggressive behavior despite the steady use of antipsychotic medication. These data suggest that non-pharmacologic interventions, specifically evidence-based practices (EBP), may be needed as adjunctive treatments for adolescents whose aggressive behavior cannot be successfully managed with antipsychotic medications. Additionally, a trial off of antipsychotics may be indicated for those youth with infrequent aggressive behavior, given the side effect profile associated with these medications. This will require access to clinicians trained to deliver evidence-based adjunctive treatments, such as CBT and DBT as

well as considering systematic approaches to optimal medication management and standardized ongoing assessments to inform treatment. To date, rigorous discontinuation trials in this youth population are lacking. Further study is warranted to assess whether antipsychotic medication can be successfully tapered or discontinued and replaced with non-pharmacological aggression management interventions.

There is clearly a role for RTCs for those youth with psychiatric illnesses and behaviors who cannot be safely maintained in the community. RTCs have been shown to improve outcomes for youth with severe emotional and behavior disorders.^{39,40} As there has been a growing movement in the field of psychiatry to move toward evidence-based practices in varied treatment settings to improve outcomes, there has also been increased awareness of the need to establish research standards in RTCs.¹¹ Of note, the American Association of Children's Residential Centers' position paper from October 2008 acknowledged the need to integrate EBP in residential treatment centers.⁴¹ This policy paper suggests creating evidence-based cultures to "redefine residential as an evidence based ecology within which careful multimodal work is being done".⁴¹ As part of this movement toward EBPs, there is also the need for outcomes measurement to demonstrate effectiveness.^{37,42} RTCs are an important part of the system of care for youth with severe psychiatric illness, and instituting evidence-based practices will only improve upon the contributions already being made.

Acknowledgments

We are grateful for the support of Dr. Brian Hepburn, Director, Maryland Mental Hygiene Administration (MHA); Gayle Jordan-Randolph, M.D., Jean Smith, M.D., Holly Sikoryak, M.D., David Horn, M.D. (Child Mental Health Institute for Children and Adolescents) (MHA); Eileen Hansen, LCSW, Ruth Anne McCormick, RN, C., DNSc, (University of Maryland); and Jane Walker (Maryland Coalition of Families for Children's Mental Health). The authors are grateful to Sarah Davarya for her assistance with the data collection. This work was made possible through the financial support of the Maryland Mental Hygiene Administration (D Pruitt, M Riddle, PI) and T32 MH20033-10 (M Riddle, PI).

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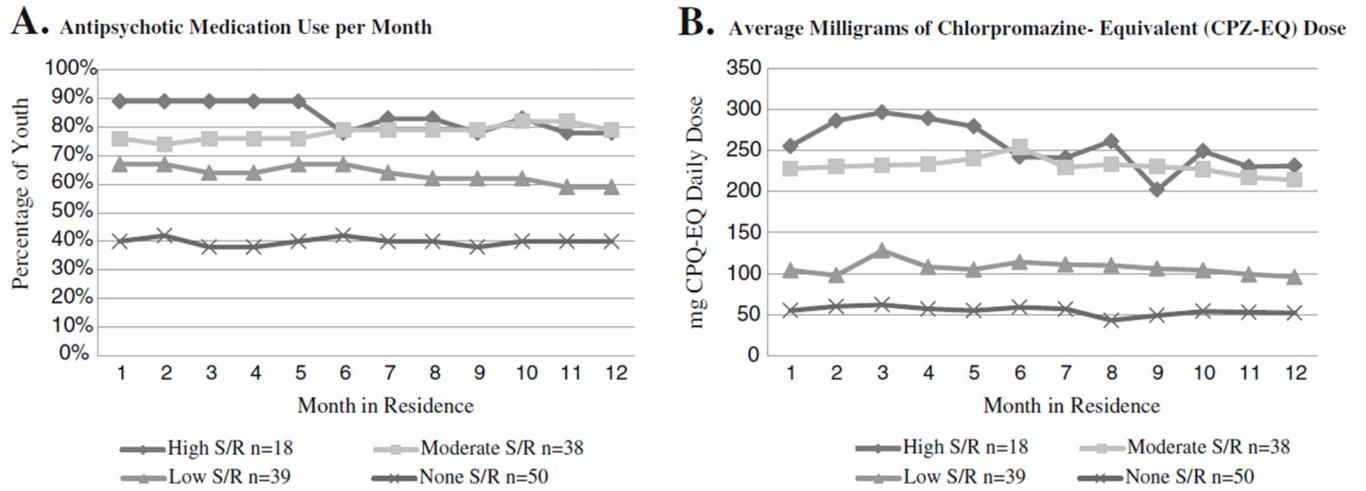


Figure 1. Antipsychotic use and dosing per month by seclusion/restraint (S/R) group. **a** Antipsychotic medication use per month. **b** Average milligrams of chlorpromazine equivalent (CPZ-EQ) dose

Table 1

Characteristics at admission of 145 youth in a residential facility between 2000 and 2005

Sample characteristics	Seclusion/restraint (S/R) groups				p
	None (N=50)	Low (N=39)	Moderate (N=38)	High (N=18)	
Male	41 (82%)	31 (79%)	23 (61%)	12 (67%)	0.10
Black	23 (46%)	17 (44%)	24 (63%)	12 (67%)	0.16
Age (years) Mean ± SD	14.3±1.4	14.4±1.3	13.9±1.3	13.2±1	0.007
Admission diagnosis					
Bipolar disorder	11 (22%)	11 (28%)	11 (29%)	3 (17%)	0.72
Psychotic disorder	0	2 (5%)	1 (3%)	0	0.38
Depression ^a	21 (42.5)	11 (28%)	11 (29%)	6 (33%)	0.50
Mood disorder NOS	10 (20%)	13 (33%)	13 (34%)	7 (39%)	0.29
Anxiety	6 (12%)	8 (21%)	9 (24%)	5 (28%)	0.34
ADHD	23 (46%)	18 (46%)	17 (45%)	10 (56%)	0.90
Substance abuse	6 (12%)	9 (23%)	2 (5%)	1 (6%)	0.11
Behavior disorders ^b	36 (72%)	26 (67%)	27 (71%)	14 (78%)	0.88
Aggression history					
Aggression toward property	35 (70%)	30 (77%)	27 (71%)	16 (89%)	0.43
Aggression toward self	42 (84%)	32 (82%)	32 (84%)	16 (89%)	0.99
Aggression toward others	46 (92%)	39(100%)	37 (97%)	18 (100%)	0.24
Juvenile justice involvement					
DJJ referral	11 (22%)	4 (10%)	0	1 (6%)	0.006
Criminal/legal history	20 (40%)	10 (26%)	12 (32%)	7 (39%)	0.51
Prior psychiatric hospitalization (mean ± SD)	5.5±13.8	6.3±15.4	4.2±2.1	4.6±2.1	0.88
Duration of residence (days) (mean ± SD)	496±173	458±113	515±146	564±163	0.09

^aDepression and dysthymia

^bODD Oppositional Defiant Disorder, CD Conduct Disorder, DBD Disruptive Behavior Disorder, Intermittent Explosive Disorder, Impulse Control Disorder

Table 2

Psychotropic treatment and antipsychotic dosing in milligram chlorpromazine equivalents

	Seclusion/restraint (S/R) groups			
	None (N=50)	Low (N=39)	Moderate (N=38)	High (N=18)
Psychotropic medication use				
Antipsychotic	28 (56%)	27 (69%)	34 (89%)	16 (89%)
Antidepressant	36 (72%)	32 (83%)	29 (76%)	13 (72%)
Mood stabilizer ^a	29 (58%)	24 (62%)	30 (79%)	15 (83%)
ADHD ^b	31 (62%)	24 (62%)	22 (58%)	13 (72%)
Average daily antipsychotic dose (mean ± SD)	55 mg±81	107 mg±131	231 mg±236	255 mg±254

^aMood stabilizer = valproic acid, lithium, carbamazepine, gabapentin, topiramate, oxcarbazepine

^bADHD = stimulants and atomoxetine

Table 3

Longitudinal mixed effects logistic regression analyses: antipsychotic treatment in relation to seclusion and restraint

	Model 1	Model 2	Model 3	Model 4
	OR (CI)	aOR (CI)	aOR (CI)	aOR (CI)
Likelihood of antipsychotic treatment				
Time (days)	0.999 (0.998–1.000)	0.999 (0.998–1.000)	0.999 (0.998–1.000)	0.999 (0.998–1.000)
S/R group ^a				
Low (vs. none)		2.694 (1.239–5.856)*	2.690 (1.236–5.852)*	2.732 (1.242–6.012)*
Moderate (vs. none)		5.683 (2.509–12.873)***	5.641 (2.475–12.859)***	5.036 (2.183–11.619)***
High (vs. none)		9.070 (2.576–31.938)***	8.826 (2.472–31.513)***	7.793 (2.15–28.214)*
Seclusion/restraint ^b			1.017 (0.828–1.248)	1.017 (0.828–1.489)
Age at admission				0.974 (0.776–1.221)
Gender				1.192 (0.567–2.506)
Race				1.514 (0.789–2.905)
Likelihood of change in antipsychotic treatment				
Time (days)	0.991 (0.989–0.993)***	0.991 (0.989–0.993)***	0.991 (0.989–0.993)***	0.992 (0.990–0.994)***
S/R group				
Low (vs. none)		1.398 (0.900–2.172)	1.471 (0.943–2.297)	1.729 (0.997–2.998)**
Moderate (vs. none)		1.977 (1.306–2.992)***	2.251 (1.445–3.507)***	3.831 (2.036–7.207)***
High (vs. none)		1.849 (1.117–3.062)**	2.344 (1.277–4.303)**	4.260 (1.863–9.739)**
Seclusion/restraint			0.7445 (0.482–1.150)	0.828 (0.550–1.245)
Chlorpromazine dose				0.993 (0.990–0.997)***
Admission age				1.04 (0.899–1.223)
Gender				1.005 (0.606–1.667)
Race				0.984 (0.645–1.502)

aOR adjusted odds ratio

* $p < 0.02$;

** $p < 0.05$;

*** $p < 0.001$

^aSeclusion/restraint group are groups determined by the number of seclusion/restraint per month in residence

^bSeclusion/restraint is a dichotomous variable which represents whether or not a subject had a seclusion/restraint in a given month