



Concurrent reductions in psychotropic medication, assault, and physical restraint in two residential treatment programs for youth



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ABSTRACT

Over the past decade, the level of clinical needs of youth in residential treatment has increased significantly. Youth in out-of-home settings typically experience higher levels of psychotropic medication use than their peers living at home, even when controlling for the severity of clinical issues. The purpose of the current study was to examine the effects of an approach to clinically reassess psychotropic medication utilization for youth residing in residential treatment settings while also observing the impact on the youth's need for physical containment. Medication changes were based on a data-informed process, using input from a multi-disciplinary treatment team. Data for 531 youth who were consecutively admitted to one of two non-affiliated intensive residential treatment programs, one in the Midwest and one in New England, was analyzed. Over half of these youth ($n = 292$, 55%) had their medications reduced during their stay and only 14% ($n = 76$) were prescribed more medication at discharge than they had been taking at admission. The remainder either saw no change during their stay ($n = 104$, 20%) or were never on medication at any time ($n = 59$, 11%). From admission to discharge there was a 62% decrease in the number of assaultive incidents as well as a 72% decrease in the use of physical restraints. These results support the view that residential treatment can provide a treatment milieu that allows for thoughtful reassessment of the clinical basis for behavioral disorders in children that can achieve the dual goals of medication reduction and behavioral stabilization.

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1. Introduction

According to national estimates, residential treatment settings throughout the United States serve approximately 200,000 youth annually between the ages of 6 and 21 years with significant and complex health care needs (Child Welfare League of America, 2009). Over the past decade, the level of clinical needs of youth in residential treatment has increased significantly (Duppong Hurley et al., 2010). As the needs of youth (for the purposes of this paper this refers to children and adolescents) in residential settings have increased, so have the rates of psychotropic medication use (Connor & McLaughlin, 2005; Duppong Hurley et al., 2010). Research has shown that 76% to 91% of youth entering intensive residential treatment settings are on one or more psychotropic medications (Hussey & Guo, 2005; Lyons et al., 2004; Page, Perrin, Tessing, Vorndran, & Edmonds, 2007; Ryan, Reid, Gallagher, & Ellis, 2008), up to 55% of medicated youth have three or

more psychotropic prescriptions (Griffith, Huefner, Epstein, Thompson, & Singh, in press), and that psychotropic medications may or may not be indicated for the particular diagnoses the youth have (Lyons et al., 2004). Research also has suggested that psychotropic medication rates tend to increase while youth are in out-of-home treatment settings, with youth who have been in care longer or who have had multiple placements having higher rates of psychotropic medication use (Najjar et al., 2004; Pathak et al., 2004; Warner, Fontanella, & Pottick, 2007; Zakrski, Wheeler, Burda, & Shields, 2005).

Although psychotropic medication rates of youth with behavioral disorders in general have greatly increased since the early 1990s (Heflinger & Humphreys, 2008; LeFever, Arcona, & Antonuccio, 2003; Najjar et al., 2004), evidence for the effectiveness of pediatric pharmacotherapy remains rather limited (Correll, Kratochvil, & March, 2011; Koelch, Schnoor, & Fegert, 2008; Mehler-Wex et al., 2009). This is particularly true for youth whose complex treatment needs could not be met by single or overlapping interventions, resulting in a history of multiple treatment failures that leads to residential placement. These youth present with more intense or chronic mental health and behavioral problems than youth in community-based settings (Griffith, Epstein, & Huefner, 2012).

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While evidence of the effectiveness of pharmacotherapy in youth remains limited, there have been an increasing number of studies trying to establish the evidence base (Vitiello, 2008). Several studies have indicated that psychotropic medications have effectively reduced mental health and behavioral symptoms. For example, research on the use of psychostimulants for youth with ADHD has demonstrated their effectiveness in reducing symptoms with moderate to large effects (Schachter, Pham, King, Langford, & Moher, 2001); positive effects also have been found when medications and psychosocial treatments were combined for youth with depression (March, Silva, Vitiello, & The TADS Team, 2006; Vitiello et al., 2006); and second generation antipsychotics have been effective for youth with behavioral disturbances and cognitive delay or autism spectrum disorders (Stigler & McDougle, 2008; Van Bellinghen & De Troch, 2001). These research gains showing positive effects of some psychotropic medications for specific target populations or clinical symptoms have been associated with the exponential growth in the popularity of these medications for aggressive behaviors in youth (Najjar et al., 2004; Naylor et al., 2007).

Although there has been increased research suggesting positive effects of some psychotropic medications on the mental health and behavior of youth, there remains a gap between research and practice. Specifically, there is controversy over the use of many psychotropic medications (especially antipsychotic medications which carry a high side-effect burden) for youth due to the relative lack of efficacy research for this population and existing evidence that there is an increased risk for adverse effects in youth (Correll, 2008). While the basic research on pediatric psychopharmacology is growing, it is not adequate to fully understand and support the current level of psychotropic prescribing for youth (Correll et al., 2006; Greenhill et al., 2003; Vitiello, 2007), and it does not answer the research needs presented by actual day-to-day practice for the specific and highly vulnerable population of youth in residential treatment (Griffith et al., 2012).

The high levels of emotional and behavioral impairment that qualify youth for out-of-home treatment often occur in spite of the high rates of psychotropic medication they are receiving at the time of admission (Connor & McLaughlin, 2005; Duppong Hurley et al., 2009). Youth in out-of-home settings typically experience higher levels of psychotropic medication use than their peers living at home, even when controlling for the severity of clinical issues (Raghavan et al., 2005). Additionally, few emotional or behavioral differences have been found between youth in residential treatment with or without psychotropic prescriptions, or for those on one versus multiple psychotropic prescriptions (Griffith et al., 2010; Griffith et al., in press).

Due to the limited knowledge available about the use of psychotropic medications for youth and the high risks for adverse effects, experts in the areas of children's mental health and psychopharmacology have suggested that psychotropic medications should be prescribed cautiously and as part of a treatment plan that includes evidence-based psychosocial approaches (Connor & Meltzer, 2006; Olsson, Marcus, Weissman, & Jensen, 2002). However, due to the limited knowledge about efficacy and safety, it can be difficult for physicians to make informed judgments about the risks and benefits of psychotropic medication options when making treatment decisions (Greenhill et al., 2003; Spellman et al., 2010). This difficulty is compounded for physicians working in residential treatment centers who frequently are presented with youth who have complex and often unknown diagnostic and treatment histories, one or more active psychotropic prescriptions, and significant impairments in emotional and behavioral functioning.

Physicians need to evaluate youth to identify reasons for emotional and behavioral impairment, tease apart influences of medication on behavior, evaluate the benefits and risks of existing psychotropic prescriptions, and make ongoing decisions about the need for and effectiveness of psychotropic medications (Spellman et al., 2010). While algorithms and guidelines have been developed to assist physicians in their decision-making processes for youth in the general population, many physicians have reported that these resources do not adequately address

the issues presented by youth in residential treatment (e.g., high rates of existing psychotropic medication use, unknown treatment histories, comorbidity) (Griffith et al., 2012). Additional approaches are needed to effectively and safely treat these youth.

Although currently no evidence-based methods exist for managing psychotropic medications for youth in residential care, clinicians have begun to develop best practice guidelines for working with other youth populations (e.g., Pappadopulos et al., 2003; Pliszka et al., 2006; Walkup, 2009). Similarly, physicians working in the two residential treatment programs that are the focus of this study have developed an approach that they use to improve the psychotropic medication management process, resulting in both reductions in the use of psychotropic medication and in rates of problem behavior and psychological impairment for youth in residential care (Huefner, Griffith, Smith, Vollmer, & Leslie, 2012). Both of the physicians hold the same basic philosophy about medication management, believing that youth should only be on the medications necessary to meet their treatment needs and no more (the principle of sufficiency).

Upon admission to either of the residential treatment programs examined here, a request is made for all past treatment records including hospital discharge summaries, outpatient records, psychological test reports, lab studies, educational testing, child welfare reports, etc. Once admitted, the youth is then observed in the school and treatment setting by a multi-disciplinary team including learning disability specialists, speech and language therapists, occupational therapists, child behavioral specialists, nurses, and psychiatrists; with each discipline also using information from the youth's history as a context for understanding current clinical needs. The residential team then convenes an initial treatment planning meeting which includes key stakeholders such as the youth, parents or guardians, local school district representatives, child welfare or mental health workers. The resulting formulation takes into account the biological, psychological, social, and educational contributors to the youth's behavior and is the cornerstone upon which the treatment plan is developed. A medication plan, often involving a taper of the admission medications, follows and is an integral part of the overall treatment plan. The team then identifies specific measures that will inform whether the formulation is accurate and the treatment plan is resulting in the desired outcomes. Parents are asked to provide informed consent and youth are involved in this process in a developmentally appropriate manner and are asked to assent to the treatment recommendations, including any medication changes.

The approach to decision making about medications is not a uniform one. The psychiatrists in these programs do not automatically take all youth admitted off all medications as part of a standard admission protocol. Instead, based on the formulation made by the multi-disciplinary team, the residential stay is seen as an opportunity to reassess the efficacy of each medication the youth has been taking at the time of admission to the residential program. Each youth's medication is evaluated for efficacy based on reports of past benefit:risk ratio. Frequently this information is not available to the psychiatrists in these programs so known risk factors of the medications are considered in the benefit:risk equation. In cases where there is support for the medication's efficacy, the medication may still be reassessed over the course of the residential stay as the youth develops new skills to better manage the symptoms for which the medication is prescribed. This allows the program to support the resiliency of youth, develop competency in managing affect and tolerate frustration, practice newly developing skills and minimize exposure to side-effects of medications. For more information see Spellman et al. (2010).

The process of behavioral data monitoring and decision making is continuous. Data are used for all initial decision making and are continually monitored over time to examine the effects of decisions on youth health and behavior. When medication changes are made, an increased frequency of reviewing clinical data occurs to assess how each change affects the youth. Monitoring by behavioral staff plays an important role between regularly scheduled meetings to ensure both youth safety

and medication efficacy as adjustments are made. Consultations with the physicians can occur at any time if either behavioral or health concerns arise.

The purpose of the current study was to examine the effects of this approach to psychotropic medication management on youth residing in two residential treatment settings, and the concurrent changes in youths' assaultive behavior and the use of physical restraint as a means of controlling behavior.

2. Method

2.1. Subjects

Overall, data for 531 youth who were consecutively admitted to one of two non-affiliated intensive residential treatment programs, one in the Midwest and one in New England, was analyzed. The youth were admitted to these programs on or after January 1, 2006 and discharged on or before September 30, 2010. In cases where a youth had more than one episode of care during the study period, only information for the first admission was included in the study. The demographic information for youth in each of these programs and for the overall sample is shown in Table 1. Most youth are admitted to these programs following stays in highly restrictive settings (e.g., inpatient hospitalization, juvenile justice detention). On average, 85–90% of these youth had a history of assaultive behavior at the time of referral.

As the Midwest and New England programs are based on intensive treatment, prior to entry all the youth had received earlier care for their emotional and behavioral needs from other programs such as outpatient counseling, community based services, foster care, or group home services. The medication status of the youth when they enter the programs, therefore, was the result of months and even years of prior services which often included the prescription of psychotropic medications. The average number of medications for youth entering the New England program was 2.6 ($SD = 1.3$; range 0 to 5). Similarly, the average number of medications for youth entering the Midwest program was 2.5 ($SD = 1.8$; range 0 to 8).

In order to examine a diverse sample of youth from different regions of the country with a broad range of treatment needs, the data from the two programs were combined. The Midwest program serves youth ages 7 to 18, and the New England program serves youth ages 4 to 12. Prior research in the Midwest program has shown that children younger than 12 are significantly more emotionally and behaviorally troubled than are youth 13 and older (Huefner & Vollmer, 2012). Because of this earlier finding, an age variable was created. A comparison of the Midwestern youth 7 to 12 with the New England youth 4 to 12, found no significant difference for any of the dependent measures; Wilks' $\lambda = .997$, $F(2, 222) .29$, $p = .75$. The data from the New England program was, therefore, combined with the data for the Midwest program

that were 12 and younger (total $N = 225$). The 13 and older group only had youth from the Midwest program ($N = 306$).

2.2. Measures

All information used in this study was archival and came from the respective organizations' clinical databases. The research protocols were reviewed and approved by the respective organization's Internal Review Boards according to federal guidelines.

Administrative and clinical staff at both organizations recorded all medications each youth was receiving at the time of admission, and all changes in medication regimen over the course of treatment. Psychotropic medication data included specific medication, dosage, frequency, and start and end dates.

2.3. Psychotropic medication use

Following earlier research (Huefner et al., 2012), we created a variable to capture four types of medication status for youth in the study: medications reduced during stay – Medication Reduction; on medication at admission, no change during stay – Medication Maintenance; not on medication at any time – No Medication; and medications increased during stay – Medication Increase. Medication Reduction was defined as being on at least one fewer psychotropic medication at the time of departure compared to the time of admission (e.g., youth enters on three medications and departs on two medications – not necessarily the same medications). Similarly, Medication Increase was defined as being on at least one more medication at the time of departure than at the time of admission (e.g., youth enters on no medication and departs on one medication). Finally, Medication Maintenance was defined as youth departing on the same number of medications as at the time of admission (again, not necessarily the same medications). Medication changes were based on clinical judgment, and occurred at any time during the residential stay. Group classification was based on changes (or the lack thereof) during the overall residential stay.

2.4. Critical events

Data on assaultive behavior and physical restraints during the study period were drawn from critical incident reports recorded in the clinical databases of each organization. One program uses Nonviolent Crisis Intervention (NCI) and the other uses Therapeutic Crisis Intervention (TCI) restraints. All direct care staff in both organizations are certified in these techniques and used these programs without any change in approach duration of the study period. Both the NCI and TCI programs focus on prevention, de-escalation, and the safety of youth and staff in managing acute crises. This incident data comes from direct observation of behaviors. Written critical incident reports are a part of routine treatment and oversight at both organizations. For both organizations, the direct care staff involved in the incident entered the report directly into a clinical database within 24 h of the incident. The use of restraint during individuals' treatment episode indicates their response to the behavioral intervention and potential for change over time. To ascertain a change in assaultive behavior and physical restraint critical events, the number of assaults and physical restraints for each youth was summed for the first 14 days after admission and the last 14 days prior to discharge.

The precise definition for assaultive behavior varied between the two organizations. There was, however, an overall concordance on the scope of assaults with both programs having multiple items recording aggression toward objects, physical assault of others, and threatening behavior events. Each program recorded six types of assaultive critical events, and these were combined to make a single assaultive behavior score for each youth. Physical restraint events were based on a single measure for both programs. Physical restraint is only utilized as an intervention when no other option is available to keep the youth or others involved safe. Among many other treatment needs, the most common

Table 1
Demographic information for Midwest and New England programs.

| Program | New England | Midwest | Midwest | Overall sample |
|-----------------------|-----------------------------|-----------------------------|----------------------------|----------------------------|
| Age group | Younger | Younger | Older | |
| N | 100 | 125 | 306 | 351 |
| Length of stay (days) | $M = 544.9$ $SD = 321.2$ | $M = 193.0$ $SD = 110.2$ | $M = 110.7$ $SD = 70.9$ | $M = 211.8$ $SD = 22.7$ |
| Age at admission | $M = 9.4$ $SD = 1.9$ | $M = 10.9$ $SD = 1.5$ | $M = 15.4$ $SD = 1.3$ | $M = 13.2$ $SD = 3.0$ |
| Sex | Male 71 (71.0%) | 77 (61.6%) | 151 (49.3%) | 299 (56.3%) |
| | Female 29 (29.0%) | 48 (38.4%) | 155 (50.7%) | 232 (43.7%) |
| Race | White 64 (64.0%) | 71 (56.8%) | 186 (60.8%) | 321 (60.5%) |
| | Black 14 (14.0%) | 23 (18.4%) | 66 (21.6%) | 103 (19.4%) |
| | Hispanic 7 (7.0%) | 2 (1.6%) | 10 (3.3%) | 19 (3.6%) |
| | Other 15 (15.0%) | 29 (23.2%) | 44 (14.4%) | 88 (16.6%) |
| State ward | Yes 57 (57.0%) | 70 (56.0%) | 110 (35.9%) | 237 (44.6%) |

underlying reason for referring youth to these programs is aggressive behavior. The reduction of aggression is a treatment goal and key outcome for these youth. Physical restraints are used when clinical intervention fails to de-escalate youth. We use physical restraint as a variable to monitor whether the youth's progress within the treatment program became worse after their medications were changed.

2.5. Analysis

A repeated measures MANOVA was used for significance testing. The dependent measures were counts of Assaultive Behavior and Physical Restraints. The independent variables were Pattern of Change (as described above in the Psychotropic Medication section) and Subject age at the time of admission. Subject age was used to account for known differences between younger and older youth for medication rates and levels of aggressive behavior (Baker, Archer, & Curtis, 2005; Huefner & Vollmer, 2012). As is typical with incident data, assaultive behavior and physical restraint rate were highly skewed (both positively). A reciprocal transformation was used for both these variables in order to minimize the impact of non-normality.

3. Results

Of the 531 youth whose cases were reviewed, over half (n = 292, 55%) had their medications reduced during their stay, and only 14% (n = 76) were prescribed more medication at discharge than they had been taking at admission. The remainder either saw no change during their stay (n = 104, 20%) or were never on medication at any time (n = 59, 11%). As shown in Table 2, the average number of medications at the time of admission for these groups was 3.5 for the Medication Reduction group, 2.2 for the Medication Maintenance, 1.1 for the Medication Increase group, and 0.0 for the No Medication group. Table 2 also shows the average number of medications at discharge for the medication status groups.

The mean number of assaultive incidents for the entire sample during the first two weeks after admission was $M = 1.62$ ($SE = .28$). At discharge, the mean number of assaultive incidents was $M = .62$ ($SE = .08$), representing a 62% decrease from admission to discharge. The average number of physical restraints was $M = 1.07$ ($SE = .12$) at intake and $M = .30$ ($SE = .06$) at discharge, reflecting a 72% decrease. As shown in Table 2, every medication group saw a decrease in the number of physical restraints, and every group but the No Medication group experienced a reduction in assaultive incidents. Of the four groups, the Medication Reduction group experienced the most substantial reduction in both assaults and physical restraints from intake to discharge, with an average of 1.8 fewer assaults and 1.1 fewer physical restraints.

A $2 \times 2 \times 4$ (Time \times Age \times Group) repeated measures MANOVA was used to examine the relationship between patterns of change for psychotropic medications on rates of assaultive behavior and physical

Table 2
Pre–post means and standard errors for psychotropic medications (admission–discharge), assaultive behavior and physical restraints (first 2 weeks–last 2 weeks).

| | | Pre | | Post | |
|------------------------|---------------------|-----|-----|------|-----|
| | | M | SE | M | SE |
| Reduction (n = 292) | Medications | 3.5 | .08 | 1.4 | .06 |
| | Assaults | 2.3 | .49 | 0.5 | .10 |
| | Physical restraints | 1.4 | .18 | 0.3 | .08 |
| No change (n = 104) | Medications | 2.2 | .08 | 2.2 | .08 |
| | Assaults | 0.8 | .20 | 0.4 | .12 |
| | Physical restraints | 0.8 | .20 | 0.2 | .11 |
| No medication (n = 59) | Medications | 0.0 | 0.0 | 0.0 | 0.0 |
| | Assaults | 0.2 | .07 | 0.4 | .20 |
| | Physical restraints | 0.2 | .07 | 0.1 | .04 |
| Increased (n = 76) | Medications | 1.1 | .12 | 2.4 | .13 |
| | Assaults | 1.1 | .28 | 0.9 | .29 |
| | Physical restraints | 0.9 | .25 | .06 | .22 |

restraint over time for youth in an intensive residential program. There were significant overall differences for each of the main effects for the MANOVA analysis: Time, Wilks' $\lambda = .95$, $F(8, 213) = 13.8$, $p < .001$; Age, Wilks' $\lambda = .96$, $F(2, 522) = 12.4$, $p < .001$; and Group, Wilks' $\lambda = .97$, $F(6, 1044) = 2.4$, $p < .05$. The Time \times Group interaction was also significant, Wilks' $\lambda = .97$, $F(6, 1044) = 2.9$, $p < .01$. Table 3 shows the Time in Program, Age, Group, and Time by Group averages and standard errors for assaultive behavior and physical restraints.

There were significant univariate differences for Time in Program for both assaultive behavior and physical restraints; $F(1, 523) = 12.4$, $p < .001$ and $F(1, 523) = 27.5$, $p < .001$ respectively. In both cases, there were significant reductions between the first two weeks and the last two weeks in the program. Assaultive behavior dropped by 67.9% and physical restraints by 71.9%.

There was a significant univariate difference between younger and older youth for assaultive behavior; and $F(1, 523) = 20.4$, $p < .001$. Youth between the ages of 4 and 12 had a rate of assaultive behavior five times greater than the rate for youth between the ages of 13 and 18. There also was a non-significant trend for younger youth to have correspondingly higher rates of physical restraint; and $F(1, 523) = 3.8$, $p = .051$.

There was a significant univariate difference between the medication status groups for physical restraints; $F(3, 523) = 3.4$, $p < .05$. A Bonferroni post hoc test showed that the Medication Reduction group had significantly more physical restraints during both the first and last two weeks in care than did the No Medication group.

There also was a significant univariate Medication group by Time interaction for physical restraints; $F(3, 523) = 5.5$, $p = .001$. Pairwise comparisons were made using Holm's step-down Bonferroni method to control for family-wise error rates (Holm, 1979). First, there were significant reductions for physical restraints over time for the Medication Reduction and the Medication Maintenance groups; $F(1, 291) = 100.2$, $p < .001$ and $F(1, 103) = 24.8$, $p < .001$ respectively. Additionally, the Medication Reduction group had a seven times greater number of physical restraints at the time of admission than did the No Medication group (intercept); $F(1, 349) = 18.3$, $p < .001$. The Medication Reduction also had a ten times greater decrease in physical restraints between the first 2 weeks and the last 2 weeks than did the No Medication group (slope; 1.1 versus .10 respectively); $F(1, 349) = 13.4$, $p < .001$. The

Table 3
Means and standard errors for Assaults and Physical Restraints for Time, Age, Group, and Time by Group interaction, with subscripts for significant post hoc differences.

| | | Assaults | | Physical restraints | |
|----------------|-----------------|------------------|-----|---------------------|------------------|
| | | M | SE | M | SE |
| Time | First two weeks | 1.6 _a | .28 | 1.1 _a | .12 |
| | Last two weeks | 0.5 _b | .08 | 0.3 _b | .06 |
| Age | Younger | 2.0 _a | .35 | 1.0 | .14 |
| | Older | 0.4 _b | .06 | 0.5 | .07 |
| Group | Reduction | 1.4 | .27 | 0.8 _a | .11 |
| | No change | 0.6 | .13 | 0.5 _{ab} | .14 |
| | No medication | 0.3 | .12 | 0.1 _b | .05 |
| Time by Group* | Reduction | 1.0 | .24 | 0.7 _{ab} | .18 |
| | | First 2 weeks | 2.3 | .49 | 1.4 _a |
| | Last 2 weeks | 0.5 | .10 | 0.3 _b | .08 |
| No change | First 2 weeks | 0.8 | .20 | 0.8 _a | .20 |
| | Last 2 weeks | 0.4 | .12 | 0.2 _b | .11 |
| No medication | First 2 weeks | 0.2 | .07 | 0.2 | .07 |
| | Last 2 weeks | 0.4 | .20 | 0.1 | .04 |
| Increased | First 2 weeks | 1.1 | .28 | 0.9 | .25 |
| | Last 2 weeks | 0.9 | .29 | 0.6 | .22 |

Note: Means with subscripts indicate that there was a significant difference for that item; different subscripts indicate which groups were significantly different (all $p < 0.05$).

* There was a significant Time by Group interaction for physical restraints. The differences for change over time within group are shown here. Other pairwise comparisons are given in the Results section.

difference in rate of change may be due to a floor effect, as the No Medication group had a very low physical restraint rate for the first two weeks.

4. Discussion

The purpose of this study was to examine the impact of psychotropic medication management on changes in assaultive behavior and physical restraint. Results showed that in general, both assaults and physical restraints decreased over time regardless of age group or psychotropic medication status (Fig. 1). The significant reductions in assaultive behavior and use of physical restraint indicate that, at least in these measures, youth experienced clear improvement while in these programs. We also argue that the improved outcomes seen in these youth while undergoing significant psychotropic medication reductions are in fact, *prima facie* evidence that the admission levels were no longer clinically indicated. Results also revealed that youth 7 to 12 years old had significantly higher assault rates than did youth 13 to 18 years old. This corresponds to other research showing that aggression levels are significantly higher among younger children in out of home care (Baker et al., 2005; Huefner & Vollmer, 2012).

The four medication patterns merit some discussion. First, it is noteworthy that 55% of the youth were in the Medication Reduction group. This indicates that the attending psychiatrist found that the majority of youth entering these programs to be on higher levels, unnecessary, or on the wrong types of psychotropic medication than were deemed appropriate to their clinical needs. This group entered residential treatment with an average of 3.5 psychotropic medications and departed with an average of 1.4 psychotropic medications. The next largest group, at 20%, was youth in the Medication Maintenance group. Youth in this group were on an average of 2.2 psychotropic medications at both admission and departure.

This study did not look at whether medications were changed or whether medication dosages were adjusted, only the absolute number of medications the youth was taking. Future research with diagnostically similar youth might focus on the changes in class of medication, changes

in dosage, and the number of within-class medications. Fourteen percent of the youth were in the Medication Increase group, who entered the programs on an average of 1.1 psychotropic medications and left on 2.4 psychotropic medications. The smallest group, at 11%, was the No Medication group. Of note, this group had the lowest rates of assaultive behavior and physical restraint, so based on this data it seems reasonable that these youth would not be on medication. We reason that there were other clinical indications for the placement of these youth in a highly restrictive, intensive residential treatment setting, but this is a group that may bear further research in its own right.

Youth in the Medication Reduction and Medication Maintenance groups experienced significant reductions in the use of physical restraint between the first two weeks and the last two weeks. Youth in the Medication Reduction group experienced a significant 79% reduction in physical restraints and a corresponding 78% reduction in assaults (n.s.). This was accomplished at the same time as a 60% reduction in the number of psychotropic medications. Clearly the psychosocial/behavioral interventions and program supports utilized by these programs were effective in reducing problem behavior while allowing for reduction in the number of medications for the majority of the youth.

Conversely, youth in the Medication Maintenance group experienced a similar significant 75% reduction in physical restraints and a corresponding 50% reduction in assaults (n.s.). That this group stayed on the same number of medications during their stay is an indication that the staff psychiatrists felt that the current level of psychotropic medications was appropriate to their clinical needs. Although the youth remained on the same number of medications, it is possible that their medication dosages or classes were changed. Dosing and medication class patterns were beyond the scope of this study but would bear further analysis. This group also experienced the same psychosocial/behavioral intervention as the other study groups and this is likely what accounted for the behavioral improvement found for this group.

It is interesting that the Medication Reduction group was discharged on almost half as many medications as the Medication Maintenance group. If thought of as a separate cohort, the Medication Maintenance group appeared to have been assessed as being appropriately medicated consistent with their clinical formulation. That the Medication Reduction group was able to achieve a discharge medication rate lower than the Medication Maintenance group may speak to a disconnect between the clinical formulation that was used in their care prior to admission to one of the residential treatment programs, and the reformulated clinical understanding of the youth by the residential program's psychiatric staff. There may have been an overreliance on psychotropic medications in prior settings to help these youth in the face of their refractory problem behavior. Although the study design did not directly test for this, we feel that the significant reductions in psychotropic medications in these programs were likely due to the new understanding of the bio-psychosocial-educational underpinnings of each youth's problem behavior that was developed by the clinical management teams. The value of clinical reformulation in developing effective treatment plans and reducing unnecessary psychotropic medication needs to be examined in future research.

There are several limitations to this study. One limitation was that, while our sample did come from two non-affiliated residential treatment programs, the general similarities in approach to treatment and environmental restrictiveness may limit the generalizability of the findings to other settings. This can only be answered by future research, yet using data from more than one agency increases the likelihood that these results might apply to other residential programs that adhere to a similar clinical approach. Another issue is that while assaultive behavior is perhaps the most common reason for referral to these programs, it is by no means the only reason for referral. The results reported here, therefore, do not give a complete picture of the treatment progress for these youth. Finally, the grouping variable that was created corresponds to naturally occurring changes in medication among the youth in

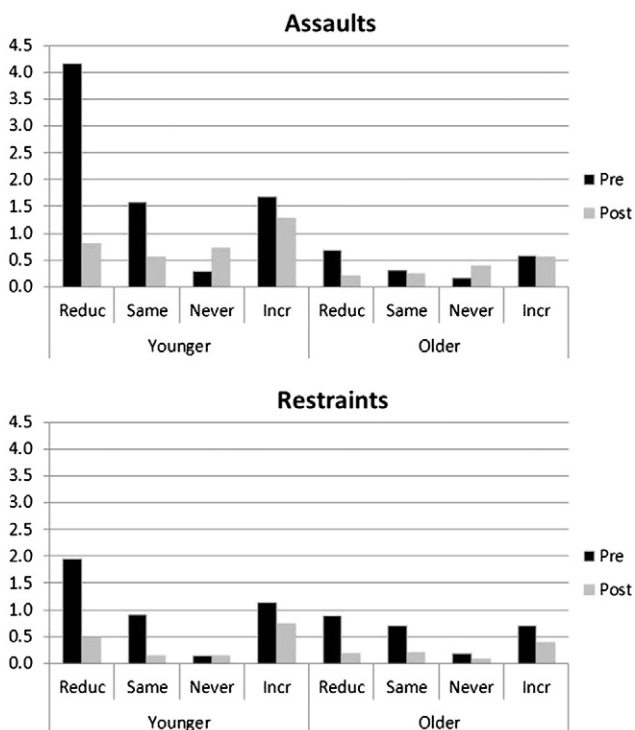


Fig. 1. Average assaultive behavior and physical restraint rates for the Time by Age by Group interaction.

the program, so other factors may underlie the differences seen. Psychotropic medications are also used for purposes other than management and treatment of aggression. Our study did not look at other clinical outcomes measures and this would be an important next step in future research.

It is important to recognize that the population of youth in residential treatment may represent an outlier population since those children who do respond positively to psychotropic medications generally are not being referred for residential treatment. This pattern of treatment history for the youth in these programs likely indicates a unique population that is both treatment refractory and often overmedicated. Additionally, in our study we did not look at dose changes over time, only the absolute number of unique medications each youth was taking. It is possible that in order to have a youth on fewer medications, some may have been prescribed higher doses of the medications on which they were maintained. An examination of both dosage and absolute number of medications bears further study, but the complexity of this question would clearly require very large sample sizes.

Finally, there was a notable discrepancy in length of stay between the New England and Midwest programs. While we don't believe that this difference had any bearing on ultimate outcomes, in future research it would be interesting to address the mechanisms that lead these programs with so much similarity in programmatic approach and outcomes to such disparity in lengths of stay. An examination of the relationship between psychotropic medication use and length of stay, potentially based on the 4 medication change groups used here, is another topic for future research.

This study also raises additional questions that would benefit from future research. First, we were not able to look at what happens to these youth after they leave the residential setting. Are they able to continue to show behavioral improvement in the outpatient setting? Do the youth who came off medications end up back on the medications when they return to the community? These questions can only be answered by a prospective data collection effort. Second, how do we understand the simultaneous phenomenon of medication reduction and behavioral improvement? Is this unique to these two residential settings with a shared philosophy of clinical care or is it being seen in other residential settings? Continued interagency collaborative research will go far in answering these questions. Third, short-term residential settings offer clinically appropriate solutions for a small population of children with refractory behavior, but they are not ideal settings for these children to grow up in. Can these results be replicated in outpatient, community-based treatment settings and what would be required to achieve similar outcomes?

5. Conclusions

The medication status of youth entering residential programs is often the result of months and even years of past medication trials. Frequently there are multiple prescribers who have worked with the youth in both inpatient and outpatient settings and these treatments are often not coordinated. Although it is necessary to understand the rationale, treatment response, and side-effects of past and current medications, this data is commonly unavailable to the residential psychiatrist. This leaves the residential psychiatrist in the difficult position of inheriting a youth's medication regimen without adequate information to know if it is effective or appropriate.

Fortunately residential treatment programs have expertise in treating emotional and behavioral disorders and bring additional resources to the task that are not available in most outpatient and inpatient settings. The availability of a multi-disciplinary team, around the clock data collection, behavioral experts and staff training in de-escalation and crisis management allows for thoughtful medication re-evaluation. Inpatient units are focused on addressing the acute presenting symptom with average lengths of stay of less than one week (Case, Olfson, Marcus, & Siegel, 2007; Greenham & Bisnaire, 2008). In that short time, most

psychiatrists would feel it unwise to take a youth off a medication and instead look to see what new medication can be added. Psychosocial and behavioral treatments require many weeks or months to show effect and are therefore not adapted to short inpatient stays. Outpatient prescribers struggle to find therapists trained in evidence-based psychosocial interventions and are rarely part of a multi-disciplinary team necessary to manage children with aggressive behaviors. Without these resources the outpatient prescriber is frequently averse to taking children off of a medication for fear of destabilizing them further even when the efficacy of the medications is unclear.

Residential treatment can provide a treatment milieu that allows for thoughtful reassessment of the clinical basis for behavioral disorders in children that can achieve the dual goals of medication reduction and behavioral stabilization.

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