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Multiple Psychiatric Diagnoses Common in Privately Insured Children on Atypical Antipsychotics

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Abstract

Objective—To evaluate the prevalence of atypical antipsychotic use in privately insured children and the diagnoses associated with treatment.

Study design—Claims were used to conduct a retrospective cohort study of children aged 2 through 18 years in the Midwest, covered by private insurance between 2002 and 2005 (n = 172 766). The 1-year prevalence of children receiving atypical antipsychotics was determined along with associated diagnoses.

Results—The 1-year prevalence of atypical antipsychotics ranged from 7.9 per 1000 in 2002 to 9.0 in 2005. The leading diagnoses were disruptive behavior disorders (67%), mood disorders (65%), and anxiety disorders (43%). The authors found that 75% of children on atypical antipsychotics had more than one psychiatric diagnosis.

Conclusions—Atypical antipsychotic use is primarily seen in children who have multiple psychiatric diagnoses. Studies are needed to assess the long-term safety and effectiveness in such patients with multiple diagnoses.

Keywords

antipsychotic agents; prevalence; mental disorders; insurance

Introduction

Between 1995 and 2002, a 5-fold increase in antipsychotic use in children and adolescents occurred in the United States, largely because of increases in the use of atypical antipsychotic medications.¹ In 2001, as many as 14.9 per 1000 Medicaid-enrolled children were using atypical antipsychotics, despite the fact that these medications were not FDA approved for pediatric patients.² Although studies have found evidence of significant side effects in children, including weight gain, hyperlipidemia, hyperprolactinemia, extrapyramidal complications, potential cardiac arrhythmias, and most recently, transient

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ischemic attacks,³⁻¹² evidence suggests that atypical antipsychotics may be effective in the treatment of behavior disorders, schizophrenia, and bipolar disorders.¹³⁻²³ Given this evidence, risperidone received FDA approval for the treatment of irritability associated with autism in October 2006 and for schizophrenia or bipolar disorder in August 2007.^{24,25} Given this evidence, risperidone received FDA approval for the treatment of irritability associated with autism in October 2006 and schizophrenia and bipolar disorder in August 2007 along with aripiprazole in February 2008.

Cooper et al¹ examined antipsychotic medication usage in Medicaid-insured youths and found that 53% of new users were being treated for behavioral or mood disorders. Similarly, in a population of children in a public mental health system, Patel et al²⁶ found disruptive behavior disorders to be the leading diagnoses associated with antipsychotic treatment along with depressive and bipolar disorders. It is unclear if similar prescribing practices occur in privately insured populations.^{2,27} We evaluated the prevalence of atypical antipsychotic use in privately insured children and the diagnoses associated with treatment.

Methods

Atypical antipsychotic prescriptions paid between January 1, 2002, and December 31, 2005, were extracted using inpatient and outpatient administrative records from a large private insurance company in a moderately sized Midwestern state. Inclusion criteria were (1) age 2 to 18 years and (2) simultaneous pharmacy and medical coverage continuously for more than 1 year. All dosage forms for aripiprazole, clozapine, olanzapine, quetiapine, risperidone, and ziprasidone were included in the analysis using individual National Drug Codes (Cerner Multum, Denver, CO).

We defined the 1-year prevalence of atypical antipsychotics as the number of children with at least 1 prescription for a specified medication during each year of the study period. Individuals who received more than 1 antipsychotic during a single year contributed a single case to the prevalence.

Diagnostic codes were assigned by practitioners using the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM). Grouping of diagnoses was as follows: disruptive/aggressive behavior, mood, anxiety, psychotic, developmental (including autism), and other mental disorders (see appendix). Other mental disorders included diagnoses such as tic disorders, Tourette's syndrome, and dependent and nondependent drug use. An individual may have had more than 1 psychiatric diagnosis during the entire study period and contributed 1 case under each diagnostic category, as appropriate.

Analyses using SAS version 9.1 (SAS Institute, Cary, NC) included descriptive statistics and ² tests for bivariate analyses. Subanalyses included evaluation of the use of antipsychotic medications across gender and age. The association between antipsychotic medication use and diagnostic category was computed using odds ratios. Differences were considered statistically significant at a 2-sided $P < .05$ level.

Approval for human subjects research and a waiver of informed consent were received by the institutional review board at Saint Louis University.

Results

The study population included 172 766 children with a mean age of 10.4 (standard deviation [SD] = 4.9) years. Of these, 51% (88 159) were boys. A total of 2194 individual children received at least 1 prescription for an atypical antipsychotic during the entire study period.

In all, 64% of children receiving atypical antipsychotics (1404) were male, and the mean age was 12.6 (SD 3.8) years.

The 1-year prevalence of antipsychotic use was 7.9 per 1000 in 2002 (total enrolled $n = 73\,894$), 8.1 per 1000 in 2003 ($n = 84\,323$), 8.6 per 1000 in 2004 ($n = 94\,832$), and 9.0 per 1000 in 2005 ($n = 99\,467$). In 2005, the prevalence was lower in girls (6.2 per 1000) than boys (11.6 per 1000), with boys being 1.9 times more likely to receive an atypical antipsychotic than girls (95% confidence interval [CI] = 1.6, 2.2; $P < .001$). Children 10 years of age and older were 2.3 times more likely to be prescribed atypical antipsychotics than children younger than 10 (95% CI = 2.0, 2.6; $P < .001$).

Across the entire study period, disruptive disorders, including attention deficit/hyperactivity disorder (ADHD), were the most common diagnoses, except in the oldest age group (Table 1). The most common single ICD-9-CM diagnosis was ADHD, found in 1242 children or 57% of all the children receiving atypical antipsychotics. The most common psychiatric diagnoses categorized as “other” were tic disorders and dependent and nondependent drug use (ICD-9-CM 304 and 305). A total of 141 children (6.4%) on atypical antipsychotics had no psychiatric diagnosis coded during the study period.

We found that 75% of the 2194 children on antipsychotics had more than one psychiatric diagnosis during the study period (Figure 1). The leading combinations were a disruptive behavior and a mood disorder (258, 12%) and a disruptive disorder, a mood disorder, and an anxiety disorder (175, 8%). Children with multiple diagnoses coded during the study period were 9.7 times more likely to be prescribed atypical antipsychotics than children with a single psychiatric diagnosis (95% CI = 8.7, 10.9; $P < .001$).

Boys on atypical antipsychotics were 2.6 times more likely than girls to have a diagnosis of disruptive disorder (95% CI = 2.1, 3.1; $P < .001$) and 1.7 times more likely to have a diagnosis of developmental delay (95% CI = 1.3, 2.2; $P < .001$). Girls were 1.6 times more likely to have a diagnosis of mood disorder (95% CI = 1.4, 2.0; $P < .001$) and 1.5 times more likely to have a diagnosis of anxiety disorder (95% CI = 1.3, 1.8; $P < .001$). Regardless of the diagnosis, older children were more likely to be prescribed antipsychotics than children 2 to 4 years of age (Table 2).

Risperidone was the most commonly prescribed atypical antipsychotic medication (1170 children, 53%) followed by quetiapine fumarate (720 children, 33%). Other atypical antipsychotics included olanzapine (471 children), aripiprazole (434 children), ziprasidone (197 children), and clozapine (2 children).

Discussion

In privately insured children and adolescents, the prevalence of atypical antipsychotics was 9.0 per 1000 in 2005. Boys were almost 2 times more likely to receive atypical antipsychotics than girls. Most important, the leading diagnoses among children on antipsychotics were disruptive behavior disorders (67%). In addition, our study is the first to describe the multiple psychiatric diagnoses found in most children (75%) on atypical antipsychotics. In fact, these children were almost 10 times more likely to be on an atypical antipsychotic than children with a single psychiatric diagnosis.

The 2005 prevalence of atypical antipsychotic use in our study was higher than the 2001 prevalence of 2.67 per 1000 identified in a previously published study of privately insured youth across the United States²⁷ and lower than the published prevalence of 13.1 per 1000 in 2001 in a Midwest Medicaid population.² The differences in prevalence are probably because of variability in study populations, as evidenced by studies that have found

dramatically lower rates of use in the United Kingdom, for example.²⁸ Previous studies have found that privately insured youth have consistently lower psychotropic prevalence than Medicaid-insured youth^{2,29}; our study findings suggest that this continues to be the case. Our findings suggest a persistent trend in the use of atypical antipsychotics in privately insured youth and may explain the higher prevalence in our privately insured population. Finally, the differences in prevalence may reflect variability in prescribing practices by region of the country as a result of state policies and/or mental health care access, although previous studies have found no such variation.^{30,31}

We found that disruptive behavior disorders were the leading diagnoses (67%) associated with the use of atypical antipsychotics, similar to previous studies. Cooper et al³² found that 43% of children on atypical antipsychotics were diagnosed with ADHD or conduct disorder, whereas Patel et al²⁶ and Olfson et al³³ found that 35% and 38%, respectively, had a disruptive behavior disorder. Each study found a lower percentage of children with common diagnoses, including mood, psychotic, and anxiety disorders, relative to our findings. However, Cooper et al and Patel et al assessed Medicaid populations before 2002, and Olfson et al examined only outpatient visits between 1993 and 2002. Cooper et al identified a dramatic rise in the use of antipsychotics for behavior disorders; our findings suggest that this trend has continued. In addition, our findings are similar to a study assessing US trends in antipsychotic use, which found that 53% of new users received prescriptions for behavioral indications.¹ Harrison-Woolrych et al¹¹ surveyed physicians about the indications for treatment and confirmed disruptive disorders to be the leading indication for atypical antipsychotic use.¹¹

Although previous studies have shown that there is increasing use of multiple psychotropic drugs in children,³⁴⁻³⁶ this is the first study to identify the high rate of multiple psychiatric diagnoses in children on atypical antipsychotics. Zito et al³⁷ found that 41% of youth in foster care covered by Medicaid insurance received 3 different classes of drugs (primarily antidepressants, ADHD drugs, and antipsychotic agents).³⁷ This has been found even in very young children.³⁸ Although a series of studies have examined the safety of certain concomitant psychotropic drugs (primarily methylphenidates and selective serotonin reuptake inhibitors), only one included atypical antipsychotics.^{20,39-44}

Although atypical antipsychotics appear to be a promising source of treatment for children with conduct disorders,^{9,44,45} many studies that have been conducted in children focused on children with developmental delays such as autism.^{7,21,44,46-51} Of note, only 14% of our population on atypical antipsychotics had a diagnosis of developmental delays, including autism, mental retardation, and learning disabilities. Almost half of these children were prescribed atypical antipsychotics other than risperidone, the most extensively studied of the atypical antipsychotics at the time of the study. Our finding that 75% of children prescribed atypical antipsychotics were diagnosed with multiple psychiatric conditions indicates that rigorously controlled long-term studies in children with multiple disorders beyond disruptive behavior and/or developmental delay are needed to guide treatment.⁴⁶

The present analysis has some limitations. Prescribing rates may not be generalizable to the entire population because this is a retrospective analysis of prescription and diagnosis claims from a private payer health plan. We only looked at atypical antipsychotics; however, by 2002 atypical antipsychotics made up more than 92% of antipsychotics prescribed nationally.^{2,33} Billing diagnoses were used rather than standardized diagnostic assessments. The diagnostic criteria used by practitioners to code a particular diagnosis were not controlled; however, the codes are likely to reflect the physician's perception of the diagnoses prompting treatment. Practitioners are limited as to the number of diagnoses they may code for a single visit. Therefore, we collapsed codes over the study period to obtain a

total clinical picture for a single participant. We did not link dates of diagnostic codes to prescriptions. Given the potentially transient nature of certain psychiatric diagnoses, this may not be accurate. In addition, children who were enrolled for the entire study period may have contributed to the individual prevalence for more than 1 year. Finally, our analysis did not capture any prescriptions filled outside of the pharmacy plan, nor did it assess drug compliance.

Conclusions

The prevalence of atypical antipsychotics in privately insured children (9.0 per 1000 in 2005) is substantial, and although less than the prevalence in Medicaid populations, now this group ranks as one of the most commonly prescribed to youth and is frequently being prescribed in children with multiple psychiatric diagnoses. Safety and effectiveness studies in such children are necessary given the high rate of use in this population.

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Appendix

International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) Codes

Diagnosis	ICD-9-CM
Anxiety disorders	300-300.3, 300.5-300.9, 309.2x, 309.4, 309.81, 313.0
Mood disorders	296, 300.4, 301.1x, 309.0, 309.1, 311, 313.1
Disruptive/aggressive behavioral disorders	309.3, 312.xx, 313.81, 314.xx, V40.3, V40.9
Psychotic disorders	292.1x, 293-295.9, 297-298.9, 299, 299.1-299.91, 368.16, 780.1
Developmental disorders	299.0, 315-319, V40.0-V40.2, V79.2
Other disorders	290-292.0, 292.2-292.9, 301-301.0, 301.2-307.59, 307.8-309, 309.8, 309.82-310.9, 313, 313.2-313.8, 313.82-313.9, 330-331.9, V66.3, V67.3, V71.0

References

- Cooper WO, Arbogast PG, Ding H, et al. Trends in prescribing of antipsychotic medications for US children. *Ambul Pediatr*. 2006; 6:79–83. [PubMed: 16530143]
- Patel NC, Crismon ML, Hoagwood K, et al. Trends in the use of typical and atypical antipsychotics in children and adolescents. *J Am Acad Child Adolesc Psychiatry*. 2005; 44:548–556. [PubMed: 15908837]
- Correll CU. Antipsychotic use in children and adolescents: minimizing adverse effects to maximize outcomes. *J Am Acad Child Adolesc Psychiatry*. 2008; 47:9–20. [PubMed: 18174821]
- Patel NC, Hariprasad M, Matias-Akthar M, et al. Body mass index and lipid profiles in hospitalized children and adolescents exposed to atypical antipsychotics. *J Child Adolesc Psychopharmacol*. 2007; 17:303–311. [PubMed: 17630864]
- Wonodi I, Reeves G, Carmichael D, et al. Tardive dyskinesia in children treated with atypical antipsychotic medications. *Mov Disord*. 2007; 22:1777–1782. [PubMed: 17580328]
- McNicholas F, Motala F. Transient ischemic attack with risperidone and clonidine. *J Am Acad Child Adolesc Psychiatry*. 2007; 46:1530–1531. [PubMed: 18030076]

7. Wieck A, Haddad PM. Antipsychotic-induced hyperprolactinemia in women: pathophysiology, severity and consequences. Selective literature review. *Br J Psychiatry*. 2003; 182:199–204. [PubMed: 12611781]
8. Findling RL, Steiner H, Weller EB. Use of antipsychotics in children and adolescents. *J Clin Psychiatry*. 2005; 66:29–40. [PubMed: 16124839]
9. Patel NC, Kistler JS, James EB, et al. A retrospective analysis of the short-term effects of olanzapine and quetiapine on weight and body mass index in children and adolescents. *Pharmacotherapy*. 2004; 24:825–830.
10. Correl CU, Carlson HE. Endocrine and metabolic adverse effects of psychotropic medications in children and adolescents. *J Am Acad Child Adolesc Psychiatry*. 2006; 45:771–791. [PubMed: 16832314]
11. Harrison-Woolrych M, Garcia-Quiroga J, Ashton J, Herbison P. Safety and usage of atypical antipsychotic medicines in children: a nationwide prospective cohort study. *Drug Saf*. 2007; 30:569–579. [PubMed: 17604408]
12. McIntyre RS, Jerrell JM. Metabolic and cardiovascular adverse events associated with antipsychotic treatment in children and adolescents. *Arch Pediatr Adolesc Med*. 2008; 162:929–935. [PubMed: 18838645]
13. Sikich L, Frazier JA, McClellan J, et al. Double-blind comparison of first- and second-generation antipsychotics in early-onset schizophrenia and schizoaffective disorder: findings from the Treatment of Early-Onset Schizophrenia Spectrum Disorders (TEOSS) study. *Am J Psychiatry*. 2008; 165:1420–1431. [PubMed: 18794207]
14. Sanford M, Keating GM. Aripiprazole: in adolescents with schizophrenia. *Paediatr Drugs*. 2007; 9:419–423. [PubMed: 18052412]
15. Luby JL, Stalets M, Belden A. Psychotropic prescriptions in a sample including both healthy and mood and disruptive disordered preschoolers: relationships to diagnosis, impairment, prescriber type, and assessment methods. *J Child Adolesc Psychopharmacol*. 2007; 17:205–215. [PubMed: 17489715]
16. Nagaraj R, Singhi P, Malhi P. Risperidone in children with autism: randomized, placebo-controlled, double-blind study. *J Child Neurol*. 2006; 21:450–455. [PubMed: 16948927]
17. Tohen M, Kryzhanovskaya L, Carlson G, et al. Olanzapine versus placebo in the treatment of adolescents with bipolar mania. *Am J Psychiatry*. 2007; 164:1547–1556. [PubMed: 17898346]
18. McClellan JM. Olanzapine and pediatric bipolar disorder: evidence for efficacy and safety concerns. *Am J Psychiatry*. 2007; 164:1462–1464. [PubMed: 17898331]
19. Sporn AL, Vermani A, Greenstein DK, et al. Clozapine treatment of childhood-onset schizophrenia: evaluation of effectiveness, adverse effects, and long-term outcome. *J Am Acad Child Adolesc Psychiatry*. 2007; 46:1349–1356. [PubMed: 17885577]
20. Kronenberger WG, Giauque AL, Lafata DE, Bohnstedt BN, Maxey LE, Dunn DW. Quetiapine addition in methylphenidate treatment-resistant adolescents with comorbid ADHD, conduct/oppositional-defiant disorder, and aggression: a prospective, open-label study. *J Child Adolesc Psychopharmacol*. 2007; 17:334–347. [PubMed: 17630867]
21. Snyder R, Turgay A, Aman M, et al. Effects of risperidone on conduct and disruptive behavior disorders in children with subaverage IQs. *J Am Acad Child Adolesc Psychiatry*. 2002; 41:1026–1036. [PubMed: 12218423]
22. Findling RL, Reed MD, O'Riordan MA, et al. A 26-week open-label study of quetiapine in children with conduct disorder. *J Child Adolesc Psychopharmacol*. 2007; 17:1–9. [PubMed: 17343549]
23. Strawn JR, Delbello MP. Olanzapine for the treatment of bipolar disorder in children and adolescents. *Expert Opin Pharmacother*. 2008; 9:467–474. [PubMed: 18220496]
24. US Department of Health and Human Services. [Accessed July 27, 2009] FDA approves risperdal for two psychiatric conditions in children and adolescents. *FDA News*. Aug 22. 2007 <http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/2007/ucm108969.htm>
25. US Department of Health and Human Services. [Accessed July 27, 2009] FDA approves the first drug to treat irritability associated with autism, risperdal. *FDA News*. Oct 6. 2006 <http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/2006/ucm108759.htm>

26. Patel NC, Crismon ML, Shafer A. Diagnoses and antipsychotic treatment among youths in a public mental health system. *Ann Pharmacother*. 2006; 40:205–211. [PubMed: 16434563]
27. Curtis LH, Masselink LE, Østbye T, et al. Prevalence of atypical antipsychotic drug use among commercially insured youths in the United States. *Arch Pediatr Adolesc Med*. 2005; 159:362–366. [PubMed: 15809391]
28. Rani F, Murray ML, Byrne PJ, Wong ICK. Epidemiologic features of antipsychotic prescribing to children and adolescents in primary care in the United Kingdom. *Pediatrics*. 2008; 121:1002–1009. [PubMed: 18450906]
29. Martin A, Sherwin T, Stubbe D, et al. Use of multiple psychotropic drugs by Medicaid-insured and privately insured children. *Psychiatr Serv*. 2002; 53:1508. [PubMed: 12461205]
30. Sturm R, Ringel JS, Andreyeva T. Geographic disparities in children's mental health care. *Pediatrics*. 2003; 112:e308–e315. [PubMed: 14523217]
31. Hermann RC, Yang D, Ettner SL, et al. Prescription of antipsychotic drugs by office-based physicians in the United States, 1989–1997. *Psychiatr Serv*. 2002; 53:425–430. [PubMed: 11919355]
32. Cooper WO, Hickson GB, Fuchs C, et al. New users of antipsychotic medications among children enrolled in TennCare. *Arch Pediatr Adolesc Med*. 2004; 158:753–759. [PubMed: 15289247]
33. Olfson M, Blanco C, Liu L, et al. National trends in the outpatient treatment of children and adolescents with antipsychotic drugs. *Arch Gen Psychiatry*. 2006; 63:679–685. [PubMed: 16754841]
34. Guevara J, Lozano P, Wickizer T, Mell L, Gephart H. Psychotropic medication use in a population of children who have attention-deficit/hyperactivity disorder. *Pediatrics*. 2002; 109:733–739. [PubMed: 11986429]
35. Mandell DS, Morales KH, Marcus SC, Stahmer AC, Doshi J, Polsky DE. Psychotropic medication use among Medicaid-enrolled children with autism spectrum disorders. *Pediatrics*. 2008; 121:e441–e448. [PubMed: 18310165]
36. dosReis S, Zito JM, Safer DJ, Gardner JF, Puccia KB, Owens PL. Multiple psychotropic medication use for youths: a two-state comparison. *J Child Adolesc Psychopharmacol*. 2005; 15:68–77. [PubMed: 15741788]
37. Zito JM, Safer DJ, Devadatta S, et al. Psychotropic medication patterns among youth in foster care. *Pediatrics*. 2008; 121:e157–e163. [PubMed: 18166534]
38. Rapaport MD, Eneli IU, Mullan PB, et al. Patterns of psychotropic medication use in very young children with attention-deficit hyperactivity disorder. *J Dev Behav Pediatr*. 2002; 23:23–29. [PubMed: 11889348]
39. Bussing R, Levin GM. Methamphetamine and fluoxetine treatment of a child with attention deficit hyperactivity disorder and obsessive-compulsive disorder. *J Child Adolesc Psychopharmacol*. 1993; 3:53–58. [PubMed: 19630596]
40. Gammon GD, Brown TE. Fluoxetine and methylphenidate in combination for treatment of attention deficit disorder and co-morbid depressive disorder. *J Child Adolesc Psychopharmacol*. 1991; 3:1–10. [PubMed: 19630593]
41. Parraga HC, Kelly DP, Parraga MI, Cochran MK, Maxim LT. Combined psychostimulant and tricyclic antidepressant treatment of Tourette's syndrome and comorbid disorders in children. *J Child Adolesc Psychopharmacol*. 1994; 4:113–122.
42. Findling RL. Open-label treatment of comorbid depression and attentional disorders with co-administration of serotonin re-uptake inhibitors and psychostimulants in children, adolescents, and adults: a case series. *J Child Adolesc Psychopharmacol*. 1996; 6:165–175. [PubMed: 9231310]
43. Hawkrigge S, Stein DJ, Bouwer C. Combined pharmacotherapy for TS and OCD (letter). *J Am Acad Child Adolesc Psychiatry*. 1996; 35:703–704. [PubMed: 8682749]
44. Safer DJ, Zito JM, Dosreis S. Concomitant psychotropic medication for youths. *Am J Psychiatry*. 2003; 160:438–439. [PubMed: 12611822]
45. Gerardin P, Cohen D, Mazet P, et al. Drug treatment of conduct disorder in young people. *Eur Neuropsychopharmacol*. 2002; 12:361–370. [PubMed: 12208553]

46. Glick ID, Murray SR, Vasudevan P, et al. Treatment with atypical antipsychotics: new indications and new populations. *J Psychiatr Res.* 2001; 35:187–191. [PubMed: 11461715]
47. Cheng-Shannon J, McGough JJ, Pataki C, et al. Second-generation antipsychotic medications in children and adolescents. *J Child Adolesc Psychopharmacol.* 2004; 14:372–394. [PubMed: 15650494]
48. McCracken JT, McGough J, Shah B, et al. Risperidone in children with autism and serious behavioral problems. *N Engl J Med.* 2007; 347:314–321. [PubMed: 12151468]
49. Shekelle, P.; Maglione, M.; Bagley, S., et al. [Accessed July 27, 2009] Efficacy and comparative effectiveness of off-label use of atypical antipsychotics. Comparative effectiveness review No 6. http://effectivehealthcare.ahrq.gov/repFiles/Atypical_Antipsychotics_Final_Report.pdf. Published January 2007
50. Aman MG, De Smedt G, Derivan A, et al. Risperidone Disruptive Behavior Study Group. Double-blind, placebo-controlled study of risperidone for the treatment of disruptive behaviors in children with subaverage intelligence. *Am J Psychiatry.* 2002; 159:1337–1346. [PubMed: 12153826]
51. Croonenberghs J. Risperidone in children with disruptive behavior disorders: a 1-year, open-label study of 504 patients. *J Am Acad Child Adolesc Psychiatry.* 2005; 44:64–72. [PubMed: 15608545]

Figure 1. Total number of psychiatric diagnoses coded during the study period in children prescribed atypical antipsychotics

Diagnoses of Children and Adolescents Prescribed Atypical Antipsychotics by Age Group for the Entire Study Period (2002-2005)

Table 1

	Age (years)				
	All (n = 172 766)	2-4 (n = 28 806)	5-9 (n = 46 931)	10-14 (n = 50 848)	15-18 (n = 46 181)
Atypical antipsychotic use					
Number prescribed	2194	60	426	854	854
Diagnostic category					
Disruptive behavior	1466 (67%) ^a	39 (65%)	337 (79%)	645 (76%)	445 (52%)
Mood	1428 (65%)	15 (25%)	181 (43%)	561 (66%)	671 (79%)
Anxiety	947 (43%)	14 (23%)	156 (37%)	380 (45%)	397 (47%)
Psychoses	398 (18%)	16 (27%)	85 (20%)	139 (16%)	158 (19%)
Developmental delay	312 (14%)	28 (47%)	107 (25%)	117 (14%)	60 (7%)
Other	743 (34%)	11 (18%)	88 (21%)	243 (29%)	401 (47%)

^aPercentage of children in each age group who had a specified diagnosis during the study period.

Table 2
Unadjusted Odds Ratios for Receiving Atypical Antipsychotics for Each Specified
Psychiatric Diagnosis Across Age Groups^a

Psychiatric Diagnosis	Age (years)		
	5-9	10-14	15-18
Disruptive behavior	1.4 (1.0, 2.0)	2.1 (1.5, 2.9) ^b	2.5 (1.8, 3.5) ^b
Mood	1.0 (0.6, 1.8)	1.1 (0.6, 1.9)	0.7 (0.4, 1.3)
Anxiety	2.1 (1.2, 3.6) ^c	3.6 (2.1, 6.2) ^b	3.4 (2.0, 5.9) ^b
Psychoses	2.6 (1.4, 4.7) ^c	3.8 (2.1, 6.8) ^b	4.5 (2.5, 7.9) ^b
Developmental delay	3.7 (2.4, 5.7) ^b	7.0 (4.6, 10.7) ^b	9.7 (6.1, 15.6) ^b
Other	4.3 (2.3, 8.1) ^b	8.1 (4.4, 15.0) ^b	7.3 (4.0, 13.3) ^b

^aReference group 2- to 4-year-olds.

^b $P < .001$.

^c $P < .01$.