Trends in Office-Based Treatment of Adults With Stimulants in the United States

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ABSTRACT

Objective: The authors investigated trends and patterns in stimulant treatment of adults visiting office-based medical practices in the United States.

Method: A time series analysis of data from the 1994 to 2009 National Ambulatory Medical Care Surveys (no. of visits = 372,702) was performed, focusing on adult (aged ≥ 18 years) visits in which stimulant medications (amphetamine salts, methylphenidate, or pemoline) were prescribed. The authors computed trends in the percentage of visits in which a stimulant was prescribed stratified by background and clinical patient characteristics. Results are reported as odds ratios (ORs) over the 1994 to 2009 period. The authors also compare visits to psychiatrists and nonpsychiatrist physicians that yielded a stimulant prescription to an adult.

Results: The percentage of visits in which stimulants were prescribed increased from 0.11% (1994–1997) to 0.70% (2006–2009) (OR = 13.72, 95% confidence interval [CI], 9.40–20.03). Among adults aged 18 to 29 years, the corresponding increase in stimulant visits was from 0.17% to 1.83% (OR = 30.14, 95% CI, 15.84–57.36). Stimulant prescriptions increased significantly more rapidly among visits without a clinical ADHD diagnosis (OR = 11.86, 95% CI, 7.49–18.80) than among visits with such a diagnosis (OR = 5.45, 95% CI, 2.96–10.04) (interaction $P = .04$) and among visits to nonpsychiatrist physicians (OR = 21.54, 95% CI, 12.84–36.12) than psychiatrists (OR = 10.64, 95% CI, 6.72–16.86) (interaction $P = .03$). By 2006–2009, nonpsychiatrist physicians provided most (57.7%) of the stimulant prescriptions linked to adult office-based visits. As compared with psychiatrists, nonpsychiatrist physicians diagnosed ADHD in a significantly smaller proportion of their adult visits in which stimulants were prescribed (62.5% vs 34.4%, $P < .0001$).

Conclusions: Between 1994 and 2009, there was a substantial increase in stimulant prescriptions during adult outpatient visits, especially during visits of younger adults. The increase in stimulant treatment occurred significantly more rapidly in the practices of nonpsychiatrist physicians than in those of psychiatrists.

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Stimulants such as amphetamines and methylphenidate are primarily used for the treatment of attention-deficit/hyperactivity disorder (ADHD).[1] Less commonly, they are used in the treatment of narcolepsy,[2] depression,[3,4] and cognitive impairment.[5,6] In 2004, the US Food and Drug Administration (FDA) approved mixed salts of amphetamine for the treatment of adult ADHD. Over the next few years, approved indications for dexmethylphenidate (2005), lisdexamfetamine (2008), and osmotic-release oral system methylphenidate (2008) were extended to include adult ADHD. With these FDA approvals, renewed academic attention has been devoted to the epidemiology,[7,8] screening,[9,10] clinical evaluation,[11,12] and management[13–15] of adult ADHD.

As the treatment of adult ADHD with stimulants has become more firmly established in clinical practice, concern has developed over the potential of stimulant use for nonmedical purposes, especially among young adults.[16,17] An estimated 12.3% of Americans aged 21 to 25 years report a lifetime history either of using stimulants that were not prescribed for them or of using them for their euphoric effects.[18] Approximately 4.3% of young adults, aged 18 to 25 years, report taking stimulants in the past year under similar circumstances, and 19.8% of these individuals indicate receiving stimulants by misrepresenting symptoms to physicians.[19] Concern over adults' using prescription stimulants for nonmedical purposes focuses attention on evolving community prescribing practices.

Little is known about trends and patterns in stimulant prescription to adults. In a large US commercially insured population, stimulant and atomoxetine use among adults rose from 0.4 to 0.8 per 100 between 2000 and 2005.[20] The fastest growth in stimulant use occurred among younger adults and among women.[20] In New South Wales, Australia, a marked increase in adult stimulant use between 1993 and 2003 has also been reported.[21] The clinical diagnostic profile of adults who receive stimulants is unknown.

The present study examines nationally representative survey data from office-based medical visits in 1994 to 2009, focusing on adult stimulant treatment. Prior to performing these analyses, we expected significant overall growth in the proportion of visits that yielded stimulant prescriptions and especially rapid growth in visits that yielded stimulant prescriptions among younger adults. Because community psychotropic prescribing practices often broaden beyond initial clinical targets,[22,23] we further expected that increased stimulant use would extend beyond patients diagnosed with ADHD. Finally, because nonpsychiatrist physicians, as compared with psychiatrists, tend to treat individuals who have less severe psychopathology,[24] we anticipated that a larger proportion of stimulant prescriptions for adults written by psychiatrists than by their other physician colleagues would be to patients diagnosed with ADHD.

METHOD

Data were drawn from the National Ambulatory Medical Care Survey.[25] The National Ambulatory Medical Care Survey, which is

Clinical Points

- Stimulant treatment of adults is increasing, especially among young adults, a population at increased risk of nonmedical stimulant use.
- Roughly one-half of adult visits to nonpsychiatrist physicians that yield a stimulant prescription include no mental disorder diagnosis.
- Physicians should consistently document the conditions for which they prescribe stimulants to adults and remain vigilant regarding risks of nonmedical stimulant use.

conducted annually by the National Center for Health Statistics (NCHS), samples a nationally representative group of visits to physicians in office-based practice. Following NCHS recommendations, data from contiguous survey years were combined to derive more stable estimates (1994–1997, 1998–2001, 2002–2005, and 2006–2009). Across the 16 survey years, response rates varied between 58.9% (2006) and 72.8% (1995) with a mean of 66.1%.[26] For each visit (no. = 372,702), the treating physician or member of the physician's staff provided information about patient sociodemographic and clinical characteristics as well as the medications prescribed or supplied to the patient.

Diagnosis

Diagnoses were made by treating physicians according to the *International Classification of Diseases, Ninth Revision, Clinical Modification*. Visits were first grouped by the occurrence of any mental disorder (*ICD-9-CM*: 290–319) or no mental disorder. Among visits with a mental disorder, visits were classified by the presence of ADHD (314.00–314.99), a mood disorder (296.00–296.99, 300.4, 301.10–301.19, or 311), an anxiety disorder (293.84, 300.00–300.02, 300.09, 300.20–300.29, 300.3, 300.7, 308.0–308.9, or 309.81), a substance use disorder (291–292, 303–305), or another mental disorder diagnosis. A separate category for depression (296.2, 296.3, 300.4, or 311) was also considered. Each visit includes up to 3 diagnoses, and the diagnostic groups were not mutually exclusive. Supplementary analyses evaluated the percentage of visits in which stimulants were prescribed in 2005 to 2009 to patients with a diagnosis of narcolepsy (347.00–347.99), obesity (278, V77.8), and stroke (430–438).

Psychotropic Medications

Visits in which psychotropic medications were either supplied or prescribed were classified into 5 medication groups: (1) stimulant medications, which are the primary focus of the analyses, (2) antipsychotics, (3) antidepressants, (4) anxiolytics/hypnotics, and (5) mood stabilizers. Stimulants included methylphenidate, dexmethylphenidate, mixed salts of amphetamine, methamphetamine, and pemoline. The antipsychotic medication group excluded prochlorperazine and promethazine, because they are commonly used for nonpsychiatric indications. Anxiolytics/hypnotics included benzodiazepines and nonbenzodiazepine sedatives and anxiolytics. Mood stabilizers included lithium, carbamazepine, divalproex/valproate/valproic acid, and lamotrigine. All antidepressants, including those such as bupropion, duloxetine, and trazodone, which are also used for non–mental health indications, were included.

Primary Source of Payment

Data were collapsed into 4 hierarchically mutually exclusive categories: (1) private insurance such as Blue Cross/Blue Shield and other commercial insurance, (2) Medicare, (3) Medicaid and other government insurance, and (4) a residual category (self-pay/other) that combined patients with self-payment, no charge, workers' compensation, those whose source of insurance was unknown, and those who received uncompensated care. In visits with more than 1 source of payment, assignment was hierarchical, with visits assigned to private, public, and self-pay/other insurance groups in descending order.

Other Characteristics

Visits were also classified by patient sex, race/ethnicity (white, nonwhite), specialty of the treating physician (psychiatrist, nonpsychiatrist), whether psychotherapy was provided by the physician at the visit, and visit duration, which indicates the total number of minutes that the patient spent in face-to-face contact with the treating physician.

Analytic Strategy

The proportions of office-based visits that included stimulant treatment were determined overall and stratified by patient age (18–29, 30–49, 50+ years), sex, race/ethnicity, primary payment source, physician specialty, mental disorder group, coprescribed psychotropic medication, and presence of psychotherapy for each time period (1994–1997, 1998–2001, 2002–2005, 2006–2009). Logistic regression models were used to assess time trends in the probability of stimulant visits. A study year period variable was defined to assess the strength of the association of year with stimulant treatment across the entire period (1994–2009). In these analyses, for example, an odds ratio (OR) of 2.0 denotes twice the odds that a visit included a stimulant at the end (2009) as compared with the start (1994) of the study period. Separate regression analyses were constructed for each level of visit characteristics of interest. An interaction term was added to each regression to assess whether trends in stimulant use significantly differed across these groups. The *P* values associated with these interaction terms are presented in Tables 1 and 2.

The difference in proportion test was used to compare the background and clinical characteristics of visits by adults in which stimulant prescriptions were provided by psychiatrists and nonpsychiatrist physicians during the 2005 to 2009 period, and the *t* test was used to compare visit duration in the 2 provider groups. Separate analyses compared trends in the proportion of visits that yielded stimulant prescriptions provided by psychiatrists and nonpsychiatrists and trends in the proportion of such visits in which ADHD was diagnosed.

Table 1. Trends in the Proportion of Adult Office-Based Physician Visits in Which Stimulants Were Prescribed, Overall and Stratified by Background Patient Characteristics, United States (1994–2009)[a]

Characteristic[b]	1994–1997, %	1998–2001, %	2002–2005, %	2006–2009, %	OR[c] (95% CI)	Interaction[d] *P*
Total ($no._1$ = 104,236; $no._2$ = 79,712; $no._3$ = 86,986; $no._4$ = 101,768)	0.11	0.16	0.24	0.70	13.72 (9.40–20.03)	
Age, y						
18–29 ($no._1$ = 13,682; $no._2$ = 9,357; $no._3$ = 9,484; $no._4$ = 12,113)	0.17	0.25	0.56	1.83	30.14 (15.84–57.36)	
30–49 ($no._1$ = 35,681; $no._2$ = 25,246; $no._3$ = 25,961; $no._4$ = 29,146)	0.16	0.24	0.31	0.96	13.13 (7.94–21.72)	.03
50+ ($no._1$ = 54,873; $no._2$ = 45,109; $no._3$ = 51,541; $no._4$ = 60,509)	0.06	0.08	0.14	0.35	10.77 (6.21–18.69)	.007
Sex						
Male ($no._1$ = 41,097; $no._2$ = 32,604; $no._3$ = 35,987; $no._4$ = 40,641)	0.14	0.20	0.36	0.76	9.97 (6.20–16.04)	.03
Female ($no._1$ = 63,139; $no._2$ = 47,108; $no._3$ = 50,999; $no._4$ = 61,127)	0.09	0.13	0.17	0.66	18.22 (11.46–28.97)	
Race/Ethnicity						
White ($no._1$ = 81,659; $no._2$ = 49,705; $no._3$ = 66,319; $no._4$ = 17,575)	0.13	0.18	0.30	0.68	8.52 (4.80–15.11)	.04
Nonwhite ($no._1$ = 18,240; $no._2$ = 11,715; $no._3$ = 15,931; $no._4$ = 6,425)	0.02	0.04	0.08	0.36	64.26 (9.79–421.82)	
Primary Source of Payment						
Private ($no._1$ = 53,839; $no._2$ = 44,475; $no._3$ = 47,926; $no._4$ = 61,058)	0.11	0.16	0.27	0.70	12.83 (8.19–20.09)	
Medicare ($no._1$ = 20,508; $no._2$ = 20,041; $no._3$ = 22,716; $no._4$ = 17,604)	0.11	0.08	0.10	0.27	4.61 (1.71–12.38)	.04
Medicaid or other public ($no._1$ = 5,228; $no._2$ = 3,768; $no._3$ = 5,021; $no._4$ = 8,101)	0.06	0.15	0.15	0.99	73.47 (14.43–374.06)	.04
Self-pay/other ($no._1$ = 24,661; $no._2$ = 10,895; $no._3$ = 9,668; $no._4$ = 13,872)	0.11	0.31	0.50	1.20	17.37 (9.75–30.92)	.38
Specialty						
Psychiatrist ($no._1$ = 5,813; $no._2$ = 4,742; $no._3$ = 5,505; $no._4$ = 4,727)	1.58	2.82	4.01	9.58	10.64 (6.72–16.86)	.03
Nonpsychiatrist ($no._1$ = 98,423; $no._2$ = 74,970; $no._3$ = 81,481; $no._4$ = 97,041)	0.05	0.07	0.13	0.42	21.54 (12.84–36.12)	

[a]Data, from the National Ambulatory Medical Care Survey,[25] are presented as weighted percentages unless noted otherwise. [b]For each variable, $no._1$ refers to number of surveyed visits in 1994–1997 with the row characteristic, $no._2$ refers to number in 1998–2001, $no._3$ refers to the number in 2002–2005, and $no._4$ refers to the number in 2006–2009. [c]Odds ratio associated with the transformed survey year variable: (survey year – 1994)/14. [d]Interaction term refers to characteristic group × time interaction.

Analyses were adjusted for visit weights, clustering, and stratification of data using design elements provided by the NCHS. When adjusted for these elements, survey data represent annual visits to US office-based physicians.[26] Analyses were conducted using SUDAAN software (Research Triangle Institute, Research Triangle Park, North Carolina), all analyses were 2-sided, and α was set at .05. We withheld multiple comparison corrections, because we prefer to explore leads that may turn out to be wrong rather than miss possibly important findings.[27,28]

RESULTS

Trends in Stimulant Use among Adult Visits

Total stimulant use increased from 0.11% (1994–1997) to 0.70% (2006–2009) of adult visits, with a particularly marked increase between 2002 to 2005 and 2006 to 2009 (Table 1). Growth in visits in which stimulants were prescribed was significantly greater among younger than among middle aged and older adults, among females than among males, and in visits to nonpsychiatrist physicians than to psychiatrists. Stimulant visits increased significantly faster among Medicaid than privately insured or Medicare-insured patients (Table 1).

Over time, a significantly larger proportion of visits by patients with ADHD diagnoses included a stimulant medication. Among ADHD visits, stimulant treatment increased from 31.3% (2002–2005) to 67.4% (2006–2009), although the increase was not monotonic. In addition, the rate of increase in stimulant use was significantly greater among visits with than those without an ADHD diagnosis (interaction $P = .04$) (Table 2). An increasing proportion of visits in which substance use disorders were diagnosed also included a stimulant prescription. During the years 2006 to 2009, stimulants were prescribed in 2.77% of visits in which substance use disorders were diagnosed (Table 2).

Stimulants were more frequently prescribed to patients who were also prescribed other classes of psychotropic medications than to patients who were prescribed no other classes of psychotropic medications. Nevertheless, a great majority of visits in which other classes of psychotropic medications were prescribed did not include a stimulant prescription. Stimulant use also increased significantly more quickly among visits without prescriptions for other

Table 2. Trends in the Proportion of Adult Office-Based Physician Visits in Which Stimulants Were Prescribed Stratified by Clinical Characteristics, United States (1994–2009)[a]

Clinical Characteristic[b]	1994–1997, %	1998–2001, %	2002–2005, %	2006–2009, %	OR[c] (95% CI)	Interaction[d] *P*
Mental disorder group						
Any mental disorder ($no._1$ = 9,056; $no._2$ = 7,297; $no._3$ = 8,941; $no._4$ = 9,511)	1.07	1.62	2.20	6.15	11.61 (7.58–17.78)	.13
No mental disorder ($no._1$ = 95,180; $no._2$ = 72,415; $no._3$ = 78,045; $no._4$ = 92,257)	0.03	0.04	0.08	0.24	20.41 (10.92–38.18)	
ADHD ($no._1$ = 152; $no._2$ = 233; $no._3$ = 479; $no._4$ = 607)	51.65	38.07	31.31	67.44	5.45 (2.96–10.04)	.04
No ADHD ($no._1$ = 104,084; $no._2$ = 79,479; $no._3$ = 86,507; $no._4$ = 101,161)	0.06	0.09	0.13	0.37	11.86 (7.49–18.80)	
Mood disorder ($no._1$ = 4,871; $no._2$ = 4,173; $no._3$ = 5,024; $no._4$ = 5,175)	1.41	1.80	1.83	5.38	6.84 (4.19–11.16)	.0004
No mood disorder ($no._1$ = 99,365; $no._2$ = 75,539; $no._3$ = 81,962; $no._4$ = 96,593)	0.06	0.09	0.17	0.49	20.48 (12.87–32.58)	
Anxiety disorder ($no._1$ = 2,005; $no._2$ = 1,675; $no._3$ = 2,343; $no._4$ = 2,613)	0.50	0.59	1.30	4.07	24.75 (10.01–61.22)	.14
No anxiety disorder ($no._1$ = 102,231; $no._2$ = 78,037; $no._3$ = 84,643; $no._4$ = 99,155)	0.10	0.15	0.22	0.62	12.42 (8.47–18.22)	
Substance use disorder ($no._1$ = 893; $no._2$ = 608; $no._3$ = 683; $no._4$ = 1,124)	0.08	0.58	1.26	2.77	28.07 (9.25–85.19)	.21
No SUD ($no._1$ = 103,343; $no._2$ = 79,104; $no._3$ = 86,303; $no._4$ = 100,644)	0.11	0.15	0.24	0.68	13.39 (9.14–19.61)	
Other mental disorder ($no._1$ = 2,754; $no._2$ = 2,072; $no._3$ = 2,527; $no._4$ = 2,104)	0.31	0.95	1.31	2.84	8.76 (3.95–19.45)	.21
No other mental disorder ($no._1$ = 101,482; $no._2$ = 77,640; $no._3$ = 84,459; $no._4$ = 99,664)	0.10	0.14	0.23	0.67	14.58 (9.87–21.55)	
Other psychotropic medication						
Any ($no._1$ = 9,878; $no._2$ = 9,255; $no._3$ = 11,754; $no._4$ = 17,961)	0.66	0.78	1.22	2.37	6.06 (3.95–9.29)	.002
None ($no._1$ = 94,358; $no._2$ = 70,457; $no._3$ = 75,232; $no._4$ = 83,807)	0.05	0.08	0.11	0.37	16.02 (9.34–27.46)	
Anxiolytic ($no._1$ = 4,420; $no._2$ = 3,731; $no._3$ = 5,143; $no._4$ = 8,559)	0.30	0.61	1.04	2.08	9.33 (5.17–16.84)	.39
No anxiolytic ($no._1$ = 99,816; $no._2$ = 75,981; $no._3$ = 81,843; $no._4$ = 93,209)	0.10	0.13	0.20	0.57	12.37 (8.23–18.58)	
Antidepressant ($no._1$ = 6,072; $no._2$ = 6,109; $no._3$ = 7,391; $no._4$ = 11,088)	0.98	1.05	1.45	2.81	4.78 (3.02–7.57)	< .0001
No antidepressant ($no._1$ = 98,164; $no._2$ = 73,603; $no._3$ = 79,595; $no._4$ = 90,680)	0.06	0.09	0.14	0.47	18.90 (11.65–30.66)	
Mood stabilizer ($no._1$ = 1,091; $no._2$ = 1,146; $no._3$ = 1,424; $no._4$ = 1,711)	1.42	2.02	2.49	4.92	5.28 (1.88–14.89)	.06
No mood stabilizer ($no._1$ = 103,145; $no._2$ = 78,566; $no._3$ = 85,562; $no._4$ = 100,057)	0.10	0.14	0.22	0.65	14.44 (9.82 –21.23)	
Antipsychotic ($no._1$ = 1,032; $no._2$ = 1,006; $no._3$ = 1,523; $no._4$ = 2,229)	0.35	1.83	1.70	5.00	13.81 (5.64–33.82)	.82
No antipsychotic ($no._1$ = 103,204; $no._2$ = 78,706; $no._3$ = 85,463; $no._4$ = 99,539)	0.11	0.14	0.23	0.63	12.45 (8.52–18.20)	
Psychotherapy						
Present ($no._1$ = 3,745; $no._2$ = 3,194; $no._3$ = 3,758; $no._4$ = 2,818)	1.72	2.10	3.19	9.31	13.09 (7.14–24.01)	.48
Absent ($no._1$ = 100,491; $no._2$ = 76,518; $no._3$ = 83,228; $no._4$ = 98,950)	0.07	0.11	0.17	0.55	17.24 (10.83–27.45)	

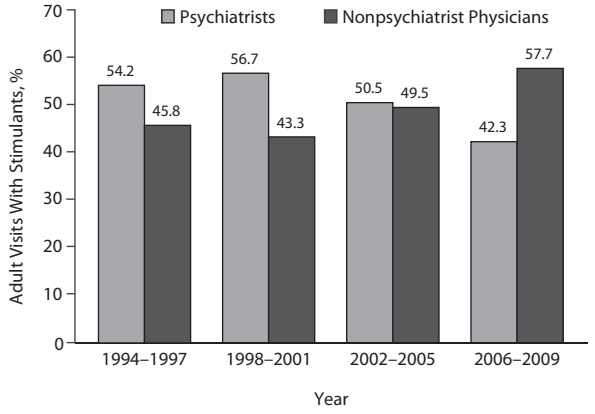
[a]Data, from the National Ambulatory Medical Care Survey,[25] are presented as weighted percentages unless noted otherwise. [b]For each variable, $no._1$ refers to the total number of surveyed visits in 1994–1997 with the row characteristic, $no._2$ refers to number in 1998–2001, $no._3$ refers to the number in 2002–2005, and $no._4$ refers to the number in 2006–2009. [c]Odds ratio associated with the transformed survey year variable: (survey year – 1994)/14. [d]Interaction term refers to characteristic group × time interaction.

psychotropic medications than those with such prescriptions (Table 2).

Stimulant Use in Visits to Psychiatrists and Nonpsychiatrists

During the study period, visits to psychiatrists accounted for a declining share of the visits by adults in which stimulants were prescribed. During the years 2006 to 2009, nonpsychiatrist physicians rather than psychiatrists accounted for most stimulants prescribed in office-based practice (Figure 1). As compared with visits to psychiatrists that yielded stimulant prescriptions, visits to nonpsychiatrist physicians that yielded stimulant prescriptions were significantly less likely to include a mental disorder diagnosis. While nearly two-thirds (62.5%) of visits to psychiatrists that yielded stimulant prescriptions included an ADHD diagnosis, only about one-third (34.4%) of corresponding visits to nonpsychiatrist physicians included an ADHD diagnosis. Over time, there were no significant changes in the proportion of stimulant visits to psychiatrists (P = .13) or nonpsychiatrist

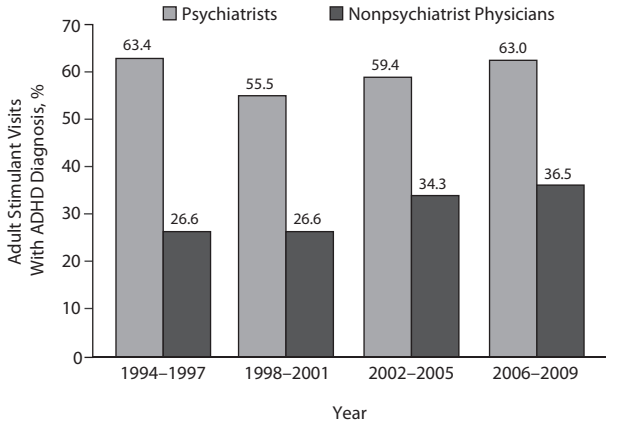
Figure 1. National Trends in Proportion of Office-Based Visits With Stimulant Medications Provided to Adults by Psychiatrists and Nonpsychiatrist Physicians[a]



[a]Data, from the National Ambulatory Medical Care Survey,[25] are presented as weighted percentages. Overall time trend has an odds ratio of 0.43 (95% CI, 0.24–0.80; $P = .008$), indicating a significant increase over time in the proportion of office-based visits by adults with stimulants that were provided by nonpsychiatrist physicians as compared with psychiatrists.

Abbreviation: CI = confidence interval.

Figure 2. National Trends in Proportion of Office-Based Visits With Stimulant Medications Provided to Adults by Psychiatrists and Nonpsychiatrist Physicians in Which ADHD Was Diagnosed[a]



[a]Data, from the National Ambulatory Medical Care Survey,[25] are presented as weighted percentages. Time trend for psychiatrist visits has an odds ratio of 1.70 (95% CI, 0.85–3.40; $P = .13$), and the time trend for nonpsychiatrist physician visits has an odds ratio of 1.79 (95% CI, 0.72–4.45; $P = .21$), indicating no significant change over time in the proportion of adult stimulant visits to each physician specialty group in which ADHD was diagnosed.

Abbreviations: ADHD = attention-deficit/hyperactivity disorder, CI = confidence interval.

physicians ($P = .21$) in which ADHD was diagnosed (Figure 2). The 2 physician groups did not significantly differ in the proportion of stimulant visits in which a substance use disorder was diagnosed (Table 3). Visits to psychiatrists in which stimulants were prescribed were considerably longer in duration than the corresponding visits to nonpsychiatrists and were significantly more likely to include psychotherapy (Table 3).

Amphetamines were prescribed in a larger proportion of visits to nonpsychiatrists that resulted in stimulant prescriptions than in corresponding visits to psychiatrists. As compared with visits to nonpsychiatrist physicians that included stimulant medications, stimulant visits to psychiatrists more commonly included each of the other classes of psychotropic medications (Table 3).

Other Patterns in Adult Stimulant Use

In post hoc analyses, only a small proportion of adult visits in 2005 to 2009 that resulted in stimulant prescriptions included a diagnosis of narcolepsy (0.8%), obesity (0.8%), or stroke (1.0%). During this period, a comparable proportion of adult ADHD visits to nonpsychiatrist physicians (63.5%) and psychiatrists (60.8%) included a stimulant prescription ($\chi^2_1 = 0.30$, $P = .59$).

The nonstimulant atomoxetine, which is also used to treat ADHD, was uncommonly prescribed. Between 2005 and 2009, stimulants were prescribed in an estimated 24,626,000 adult visits, while atomoxetine was prescribed in an estimated 2,416,000 visits.

DISCUSSION

Over the last several years, there has been a marked increase in stimulant prescriptions to US adults in office-based medical settings. This increase occurred within the context of increased prescriptions of other psychotropic medications, including antipsychotics,[29] antidepressants,[30] and mood stabilizers.[31] The increase in stimulant use was especially evident in the treatment of young adults. During the years 2006 to 2009, nearly 2% of all office-based medical visits by individuals aged 18 to 29 years included a stimulant medication. Stimulant prescriptions increased far more rapidly in the practices of nonpsychiatrist physicians than psychiatrists. As a result, primary care physicians and other nonpsychiatrist physicians have assumed a more prominent role in stimulant treatment of adults in office-based practice. While nearly all adult visits to psychiatrists that include a stimulant medication include a mental disorder diagnosis, and nearly two-thirds include a diagnosis of ADHD, only about one-half of the corresponding visits to nonpsychiatrist physicians include a mental disorder diagnosis, and roughly one-third include an ADHD diagnosis.

The large and growing extent to which adult patients of primary care physicians and other nonpsychiatrists receive stimulants without a mental disorder diagnosis raises concerns over potential unfocused stimulant prescribing practices. In visits that include stimulant prescriptions but not mental disorder diagnoses, we unfortunately have no means of evaluating the target symptoms of the stimulant medications. Without a diagnostic code for *cognitive enhancement*, for example, we cannot assess the extent to which stimulants are prescribed to improve memory or other aspects of cognitive performance in ostensibly healthy adults facing work or academic demands.[32] Similarly, we are unable to assess how commonly stimulants are prescribed

Table 3. Demographic and Clinical Characteristics of Adult Office-Based Physician Visits With Prescription of Stimulant Medications by Provider Specialty, United States, 2005–2009[a]

Characteristic	Adult Stimulant Medication Visits to Psychiatrists (no. = 497)	Adult Stimulant Medication Visits to Nonpsychiatrists (no. = 404)	χ^2 Statistic	*P* Value
Age, y				
18–29	24.8	32.9	1.61	.20
30–49	42.9	36.8		
50+	32.3	30.3		
Sex				
Male	44.7	41.7	0.46	.50
Female	55.3	58.3		
Race/ethnicity				
White	92.4	86.4	1.53	.22
Nonwhite	7.6	13.6		
Primary source of payment				
Private insurance	56.2	72.3	6.46	.0002
Medicare	9.5	6.5		
Medicaid or other public source	6.5	9.7		
Self-pay/other	27.8	11.6		
Mental disorder diagnosis				
Any mental disorder	97.6	45.3	70.47	< .0001
ADHD	62.5	34.4	33.40	< .0001
Any mood disorder	61.8	10.8	60.65	< .0001
Depression	38.1	8.8	33.39	< .0001
Anxiety disorder	23.6	5.3	25.62	< .0001
Substance use disorder	4.7	2.8	1.68	.20
Other mental disorder	12.5	1.4	26.86	< .0001
ADHD medication				
Methylphenidate	49.2	40.9	3.32	.07
Amphetamine	50.8	59.6	4.12	.04
Pemoline	0.0	0.6	1.04	.31
Other psychotropic medication				
Any psychotropic medication	72.6	45.6	28.51	< .0001
Anxiolytic	33.2	21.2	9.82	.002
Antidepressant	55.0	29.1	24.69	< .0001
Mood stabilizer	13.9	3.3	14.57	.0001
Antipsychotic	22.1	5.1	21.21	< .0001
Psychotherapy				
Provided	55.3	0.3	57.38	< .0001
Duration of visit, mean (SE), min			*t* Statistic	
	31.1 (1.3)	19.5 (0.8)	7.70	< .0001

[a]Data, from the National Ambulatory Medical Care Survey,[25] are presented as weighted percentages unless noted otherwise.
Abbreviation: ADHD = attention-deficit/hyperactivity disorder.

for weight control in the absence of an obesity diagnosis.[33] Deeper inquiries are needed into the nature of stimulant treatment of adults in routine primary care practice. Specifically, detailed practice-based research is needed to probe the clinical intentions, diagnostic profile of patients, effectiveness, and safety of contemporary practice in this area. Some potential safety concerns include risks of adverse psychiatric events,[34] cardiovascular risks in vulnerable individuals (as reported by the FDA),[35] combining stimulants with alcohol and other sedatives,[36] and a potential for abuse.[37] A low rate of substance use diagnoses in visits by patients treated with stimulants provides at least some reassurance that prescription to known high-risk patients is relatively uncommon. However, the proportion of adult visits with substance use disorders that include stimulants has increased over time alongside the general increase in adult stimulant use.

Absence of mental disorder diagnoses in administrative and billing data is sometimes attributed to physicians intentionally seeking to protect their patients with known mental health problems from stigma, adverse legal or occupational consequences, or insurance plans that offer scant coverage of mental health treatment. Although the identities of patients and physicians are protected in the National Ambulatory Medical Care Survey, it is nevertheless possible that some diagnostic codes used for billing were simply transcribed to the survey form and clinically detected psychiatric diagnoses were withheld. It is therefore not possible to determine the causes of the expanding gap between stimulant treatment and clinically relevant diagnoses in the survey data. Even without more detailed information, the evolving pattern of stimulants prescribed without related relevant diagnoses suggests that stimulant prescribing practices merit closer scrutiny. The trends suggest that primary care physicians and other nonpsychiatrist physicians should more consistently document the conditions for which they prescribe stimulants to adults. Educational efforts, including dissemination of practical clinical information and tools,[38] may be helpful to assist nonpsychiatrist physicians with the evaluation and documentation of the specific conditions for which they prescribe stimulants to adults.[38] It also important to balance concerns of stimulant overprescription against epidemiologic evidence indicating that a substantial proportion of adults who meet criteria for ADHD receive no treatment for their symptoms.[8,9]

The role of primary care physicians in the management of adult ADHD has received little academic attention. One record review published in 2004 found that many adult primary care patients who are diagnosed and treated for ADHD (40%) had not been initially referred to primary care for the treatment of ADHD. In most of these cases (78%), the primary care physician did not seek outside consultation before arriving at an ADHD diagnosis.[39] In the management of ADHD in children and adolescents, child and adolescent psychiatrists tend to believe pediatricians should promptly refer rather than treat children with ADHD, while most pediatricians view themselves as capable of diagnosing and treating ADHD.[40] Whether analogous professional tensions exist with regard to the management of adult ADHD is not

known. The recent expansion of nonpsychiatrist physicians in stimulant treatment of adults may open opportunities for collaboration between primary care physicians and psychiatrists. Specifically, collaborative care models that have been successfully applied to the primary care management of depression[41] and anxiety disorders[42] may be able to be adapted to the management of adult ADHD.

Psychiatrists also play a major role in the office-based management of adults with ADHD. Clinical[39] and epidemiologic[9] research indicates that people with ADHD often do not receive mental health treatment for their symptoms until they are adults. In the large National Epidemiologic Survey on Alcohol and Related Conditions study, for example, the average age of first mental health treatment contact for persons with ADHD was 18.4 years and the average age of first taking medication for ADHD was 20.6 years.[8] As adult psychiatrists extend their clinical involvement with this patient population, they will need to acquire the necessary clinical skills to manage adults with ADHD who have not previously received treatment for their condition. National practice trends affirm the importance of training adult psychiatrists with a lifetime developmental perspective in the management of ADHD.[43]

These analyses have several important limitations. First, the National Ambulatory Medical Care Survey samples visits rather than patients. Because there is an unknown quantity of patient duplication in the surveys, it is not possible to derive estimates of the number of unique people who are treated in office-based practice with stimulants each year. However, because each physician is randomly assigned to 1 of 52 weeks in the survey year, this duplication is likely to have only a limited effect on national estimates of unduplicated visits. Second, physician nonresponse may have biased the observed pattern of stimulant prescribing. Third, recent amelioration of concerns over the short-term risk of cardiovascular events associated with stimulant treatment of adults[44,45] may have further increased stimulant prescribing to adults following the study period. Fourth, although each National Ambulatory Medical Care Survey visit solicits information on medications prescribed and clinical diagnoses, the survey does not directly link individual medications to specific diagnoses. Fifth, the survey does not provide sufficient information to examine various possible causes of the observed trends in stimulant visits to psychiatrist and nonpsychiatrist physicians including differential pharmaceutical marketing across the 2 physician groups, changes in mental health service reimbursement of nonpsychiatrist physicians, or shifts in access to psychiatric services. Finally, the sample is restricted to office-based visits and therefore does not capture visits to community mental health centers, hospital outpatient clinics, and various other outpatient settings or any inpatient settings where mental health care is provided.

An impressive increase has occurred over the last several years in stimulant medication prescriptions to adult patients in office-based practice. While much of this increase likely reflects an appropriate response to new evidence that stimulants are effective for adult ADHD,[46] stimulant use has increased especially rapidly among adults without ADHD diagnoses. In light of widespread nonmedical stimulant use, particularly among young adults,[34] these prescribing trends suggest a need for heightened clinical vigilance regarding nonmedical stimulant use. Although abuse of prescription stimulants is considerably less common than nonmedical stimulant use, a persistent clinical focus on early detection of abuse of prescription stimulants is also necessary.

Drug names: atomoxetine (Strattera), bupropion (Wellbutrin, Aplenzin, and others), carbamazepine (Carbatrol, Equetro, and others), dexmethylphenidate (Focalin XR, Focalin, and others), divalproex (Depakote and others), duloxetine (Cymbalta), lamotrigine (Lamictal and others), lisdexamfetamine (Vyvanse), lithium (Lithobid and others), methylphenidate (Focalin, Daytrana, and others), prochlorperazine (Compro and others), trazodone (Oleptro and others), valproic acid (Depakene, Stavzor, and others).

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Author contribution: Dr Wang had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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