Trends in the Use of Psychotropic Medications Among Adolescents, 1994 to 2001

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Objectives: **Few psychotropic medications are approved for use among children younger than 18 years. Yet previous studies have shown an increase in the use of psychotropic medications among school-age children and adolescents. Most previous studies examined data only up to 1997; therefore, the results predate any impact of changing federal policies and newly marketed medications. This study examined trends in the prescription of psychotropic medications to adolescents aged 14 to 18 years in office-based care in the United States from 1994 to 2001.** ***Methods:*** **Data from the National Ambulatory Medical Care Survey (NAMCS) were used to determine visit rates and prescribing patterns from 1994 to 2001 for psychotropics that were prescribed in office-based treatment settings to adolescents aged 14 to 18 years. Rates of visits that resulted in a prescription for psychotropic medication were calculated for two-year periods. Analyses were conducted by type of medication, gender, and the prescribing physician's specialty.** ***Results:*** **Rates of visits that resulted in a psychotropic prescription increased from 3.4 percent in 1994–1995 to 8.3 percent in 2000–2001. These trends were evident for males and females. The average annual growth rates for psychotropic prescriptions were much higher after 1999. Trends were also significant across drug classes. By 2001, one out of ten office visits by adolescent males resulted in a prescription for a psychotropic medication.** ***Conclusions:*** **Average annual growth rates for the prescription of psychotropics to adolescents increased from 1994 to 2001, with especially rapid acceleration after 1999. This increase may be associated with changing thresholds of diagnosis and treatment, availability of new medications, and changes in federal regulatory policies concerning promotion of medications by the pharmaceutical industry. (*Psychiatric Services* 57:63–69, 2006)**

Only a few psychotropic medications have been approved for use among children younger than 18 years. However, it has become increasingly common to use these medications to treat a variety of mental health disorders among children. Despite employing different methods and study populations, previous studies have consistently reported an increase in the prescription rates of psychotropics among school-age and preschool children through 1997, with especially rapid increases after 1991 (1–7). This trend has been demonstrated since the 1980s for the use of stimulants for attention-deficit hyperactivity disorder (ADHD) and for the use of selective serotonin reuptake inhibitors (SSRIs) for depression and other disorders (8,9). These studies have stimulated debate about the off-label use of such medications, particularly for young children (10,11).

Although much of this debate has centered on young children, adolescents are an important, understudied part of the pediatric population. Many mental health disorders are first identified during adolescence, and depression is a serious problem in this age group (12). Current estimates of the prevalence of psychiatric disorders among adolescents range from 13 to 21 percent (13,14). By the time adolescents reach the age of 16 years, the proportion who have ever experienced at least one psychiatric disorder has been estimated to be 31 percent for girls and 42 percent for boys (13). ADHD, a mental health disorder often associated with younger children, is increasingly diagnosed among adolescents. For example, Olfson and colleagues (8) recently showed a significant increase in visits for ADHD among a national sample of more than 3,500 youths aged 12 to 18 years (.5 percent in 1987 compared with 3.0

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percent in 1997). Interestingly, during that decade, the percentage of psychotherapy visits for ADHD decreased, whereas the percentage of visits that resulted in a prescription for a stimulant did not change (8).

Although adolescents had relatively low prescription rates for psychotropics before the 1990s (1,2,8), several recent studies have noted that adolescents as an age group show one of the highest rates of increase in psychotropic use, particularly in the use of SSRIs (5,15,16). One limitation of these previous studies is that most do not extend beyond 1997, the year that the Food and Drug Administration Modernization Act and additional FDA directives were enacted, allowing for looser restrictions on off-label drug promotion and direct-to-consumer advertising (17). Furthermore, numerous new psychotropics have been approved and marketed since 1996 (for example, citalopram hydrobromide, venlafaxine, a combination of dextroamphetamine and amphetamine, fluvoxamine maleate, and mirtazapine), or have received expanded indications (for example, sertraline).

Two studies of commercially, privately insured children younger than 18 years have examined whether earlier trends are continuing or have changed since 1997. One demonstrated a 9.2 percent annual growth of antidepressant use through 2002 (15). The second used claims data from 1997 to 2000 to show a 12.1 percent growth in medication costs per outpatient with concomitant declines in outpatient treatment (16). In 2000, nearly half (42.9 percent) of the costs for outpatient psychiatric treatment for youths aged 13 to 17 years was for medications, and this age group was the only one that showed significant trends in medication-related costs (16). However, despite the evidence showing that trends in medication use are particularly important for adolescents, no studies, to our knowledge, have used a nationally representative sample to focus on trends in the prescribing of psychotropics to adolescents.

The study presented here used data from the National Ambulatory Medical Care Survey (NAMCS) to investigate the prescription rates for a range of psychotropic medication classes (stimulants, SSRIs, and other classes of psychotropic drugs) among adolescents aged 14 to 18 years. We examined trends in psychotropic prescribing rates over an eight-year period (1994 to 2001), by sociodemographic characteristics, class of medication, and prescribing physicians' specialty (generalist or psychiatrist). We hypothesized that there would be significant increases in the proportion of visits that resulted in a prescription for psychotropic medication and that this increase would be especially marked after 1997. We also hypothesized that these increases would be seen regardless of the patients' gender or the prescribing physicians' specialty.

Methods

Data for this study were drawn from NAMCS, an office-based survey that has been conducted annually since 1989. The survey provides a nationally representative sample that reflects office visits by both public-sector and private-pay patients. Each year 3,000 physicians who are primarily engaged in direct patient care are randomly selected to provide data on a standard encounter form. Data from the physician-patient encounter are obtained during a randomly selected week for each responding physician and are weighted to reflect annual visit rates. Information is collected on medication therapy, services provided, and demographic characteristics of patients. Visits exclude those made to anesthesiologists, pathologists, and radiologists. During the study period (1994 to 2001), no significant changes were made to the survey variables associated with the prescribing practices that were examined. Further details on NAMCS's design, implementation, and stratification approach are available from NAMCS's Web site (18). Our analytic sample included 8,841 visits to office-based physicians. The research reported herein was deemed exempt from human subjects review by the institutional review board at Brandeis University.

Variables

Drug class. Drug data were coded by using a classification scheme developed at the National Center for Health Statistics, and the therapeutic class was based on the National Drug Code. We took a conservative approach and included only those drug classes specific to the treatment of psychiatric disorders, excluding, for example, anticonvulsants. The psychotropic drugs evaluated in this study include all drugs in antianxiety, antipsychotic, and antidepressant classes. Because NAMCS's drug class for stimulants includes drugs for many indications, including obesity (such as diethylpropion or phentermine), we included the drugs from this class that are indicated primarily for the treatment of ADHD. These were dextroamphetamine, a combination of dextroamphetamine and amphetamine, methylphenidate, and pemoline. A listing of the specific drugs included in each drug class is also available on NAMCS's Web site (18).

Provider type. NAMCS groups physicians into 15 specialties on the basis of definitions from the American Medical Association and the American Osteopathic Association. Physician specialty is self-reported. For this analysis, we created the categories of generalist (family practitioners, internists, and pediatricians), psychiatrist, and other (other specialists and subspecialists—for example, neurologists and urologists).

Visit-associated diagnoses. NAMCS requests that physicians provide up to three diagnoses for each visit. These diagnoses are then coded by NAMCS according to the *International Classification of Diseases*. In the case of the study years, the ninth clinical modification was used (*ICD-9-CM*). Mental health diagnoses include codes 290–319. Of note, we did not include diagnosis-related information for 1994–1995, because in 1995 a number of changes in diagnosis recording and reporting were instituted, including a change in coding conventions and the treatment of blanks. The proportion of visits with no diagnosis made in this period was comparable to those in the next three two-year combined time periods.

Sociodemographic characteristics. On the basis of the physician's observation, each patient's race and gender were categorized on the survey forms.

Analytic method

The data were combined into four two-year periods from 1994 to 2001 in

Table 1

Annual office-based visits and psychotropic prescriptions among adolescents aged 14 to 18 years, 1994 to 2001[a]

	Visits									
	1994–1995 (unweighted N=2,734)		1996–1997 (unweighted N=2,179)		1998–1999 (unweighted N=1,850)		2000–2001 (unweighted N=2,078)			Total percentage growth (1994–2001)
	N	%	N	%	N	%	N	%	t[b]	
Visits										
Total	29,199,400	100.0	31,721,321	100.0	32,889,403	100.0	34,672,627	100.0		18.7
Male	13,361,683	45.8	13,215,148	41.7	14,265,729	43.4	15,893,816	45.8		19.0
Female	15,837,717	54.2	18,506,174	58.3	18,623,674	56.6	18,778,811	54.2		18.6
Visits that resulted in a prescription for a psychotropic medication										
Total	982,606	3.4	1,296,831	4.1	1,741,471	5.3	2,866,103	8.3	5.42***	191.7
Male	510,901	3.8	661,558	5.0	902,374	6.3	1,592,227	10.0	4.62***	211.7
Female	471,704	3.0	635,272	3.4	839,096	4.5	1,273,877	6.8	4.36***	170.1
Visits that resulted in a prescription for a non-psychotropic medication	16,526,860	56.6	17,319,841	54.6	17,694,499	53.8	17,544,349	50.6	3.21**	6.2
Outpatient visits that resulted in a prescription for a psychotropic medication per 1,000 adolescents aged 14 to 18 years										
Total	54.2		68.3		89.5		141.8			161.6
Male	54.8		67.7		90.2		155.1			183.0
Female	53.6		68.9		88.8		131.3			145.0

[a] All numbers represent two-year totals annualized. Numbers are weighted to reflect population estimates.
[b] For linear contrast with SUDAAN proc descript; trend measured between 1994–1995 and 2000–2001
**p<.01
***p<.001

order to increase cell size for analysis of trends in prescribing patterns. Combining data was necessary because the National Center for Health Statistics regards cell sizes less then 30 to be unreliable. Also for this reason, antianxiolytics, mood stabilizers, and antipsychotics were combined into one category, "other," leaving three broad categories of medications for analysis: antidepressants, stimulants, and other. The "other" category includes at least 23 antipsychotics and 17 antianxiety medications. Small sample size also precluded analysis of prescribing trends for the "other physician specialty" category.

Among all office-based visits for adolescents, we calculated the proportion of visits that resulted in a prescription for a psychotropic medication. We considered using for our denominator only visits that were designated as generating mental health diagnoses. However, we found that a considerable proportion of visits that resulted in a prescription for a psychotropic medication (more than 15 percent across combined years) did not include a diagnosis that could be categorized as mental health. We concluded that if we limited our study to mental health visits, we would miss a considerable proportion of all prescriptions. As a result, our denominator is all visits. This method has the added benefit of not calling into question the validity of the reported diagnosis.

Using the July population estimates from the U.S. Census Bureau for the relevant periods (19), we created population-based rates for annual office visits and annual office visits that resulted in a prescription for psychotropic medication. We repeated this analysis by gender. In order to provide a context for trends in the prescription of psychotropics, we also identified all visits for the same age group that resulted in a prescription for nonpsychotropic medications during the same period and assessed overall trends in prescription patterns among youths aged 14 to 18 years.

Descriptive analyses were conducted with the Statistical Package for Social Services, version 11.0 (20). Statistical significance testing for trends was performed with SUDAAN to account for the complex design of NAMCS and to create robust standard errors. Unless otherwise noted, trends were assessed across the four periods with the "proc descript" command that specifies a linear polynomial, which computes a t test. Numbers presented in the tables were weighted to reflect population-based statistics. In cases in which the number of visits for a single period was too small to test for trends, we combined two periods. This was the case for the "other psychotropic medication" category in 1994–1997 and 1996–1997.

Results

Table 1 shows that the proportion of office-based visits that resulted in a

Table 2

Percentage growth of office-based visits and psychotropic prescriptions among adolescents aged 14 to 18 years, 1994 to 2001[a]

Variable	Average annual percentage growth			Total percentage growth (1994–2001)
	1994/1995–1996/1997	1996/1997–1998/1999	1998/1999–2000/2001	
Visits	8.6	3.7	5.4	18.7
Visits that resulted in a prescription for a psychotropic medication	32.0	34.3	64.6	191.7
Visits that resulted in a prescription for a nonpsychotropic medication	4.8	2.2	–.8	6.2
Visits that resulted in a prescription for a psychotropic medication per 1,000 adolescents aged 14 to 18 years	26.0	31.0	58.4	161.6

[a] Numbers are weighted to reflect population estimates.

psychotropic prescription rose from 3.4 percent in 1994–1995 to 8.3 percent in 2000–2001 ($p<.001$). The U.S. population-adjusted rate of physician visits that resulted in the receipt of a psychotropic prescription increased from 54.2 to 141.8 per 1,000 youths aged 14 to 18 years in the same period (a 161.6 percent increase); this rate of increase was greatest after 1999—that is, the average annual percentage growth for 1998–1999 to 2000–2001 was twice that of the growth from 1994–1995 to 1996–1997 or from 1996–1997 to 1998–1999 (58.4 percent, 26.0 percent, and 31.0 percent, respectively) (Table 2). Although the proportion of visits that resulted in a prescription for psychotropic medication increased during this period, the proportion of these visits with an associated mental health diagnosis did not. In 1996–1997, no mental health diagnosis was given for 25.9 percent of visits in which a psychotropic medication was prescribed; in 1998–1999 this proportion was 14.4 percent and in 2000–2001 it was 20.9 percent.

The trends in the rates of prescriptions for psychotropic medication contrast with prescribing trends for all other medications (Table 1). During the eight-year period, there was a 191.7 percent increase in the number of office visits that resulted in a prescription for psychotropic medication; however, the number of visits in which medications other than psychotropics was prescribed increased only by 6.2 percent.

Table 1 also shows the prescription patterns for psychotropics stratified by gender. Trends toward increasing prescriptions for psychotropic medication were significant for both males and females ($p<.001$). Overall for the eight years combined, the proportion of office-based visits that resulted in a prescription for psychotropic medication was lower for females than for males (4.5 percent compared with 6.5 percent; $p<.001$; data not shown in table), but the rate of growth was not significantly different for the two genders (211.7 percent for males compared with 170.1 percent for females). During the most recent period (2000–2001), one in ten office visits to a physician by adolescent males resulted in a prescription for psychotropic medication.

Table 3 shows prescription trends by individual drug classes. Increases in prescriptions of both antidepressants and stimulants were significant in the total population ($p<.01$). After 1999 the increases in prescription trends for both stimulants and antidepressants were much greater than in the previous periods. Prescribing rates also increased significantly during the study years for the category of "other psychotropic medications"; although for this category, the two earlier periods were combined to test trends because of small numbers.

In each of the periods, about one-third of the visits in which a psychotropic medication was prescribed were associated with a diagnosis of ADHD. Other diagnoses—including depressive disorder, affective psychoses, and neurotic disorder—ranged from 12.6 to 24.2 percent of the visits that resulted in a prescription for psychotropic medication.

As expected, a much greater proportion of visits to psychiatrists than generalists resulted in a prescription for a psychotropic medication (data not shown). Before 1996, just over half (57 percent) of the visits to a psychiatrist resulted in such a prescription; by 2001, 76 percent of such visits resulted in such a prescription (34 percent increase; $p<.01$). We did not test trends for visits to generalists for statistical significance, because the unweighted numbers of visits to generalists in the four time periods were too small: 31, 26, 28, and 36, respectively. As noted earlier, analysis of "other physician specialty" was also precluded by small sample size.

Discussion

These data demonstrate a 2.5-fold growth between 1994 and 2001 in the proportion of office visits that resulted in a prescription for psychotropic medication among adolescents. Dramatic increases in prescription rates were seen after 1999. By providing a nationally representative sample, our data extend previous work (1–5) that showed increasing trends in the prescription of psychotropic medications among insured and uninsured children and adolescents throughout the mid- and late 1990s and among commercially insured children up to 2002 (15,16). Our findings, which include both public-sector and private-pay patients, support those from a study of a national study of prescription drug claims representing 500,000 employer-insured children younger than 20 years that examined data from 1995 to 1999; the study found

Table 3

Prescriptions for psychotropic medication among adolescents aged 14 to 18 years, 1994 to 2001[a]

Medication	Prescriptions									
	1994–1995 (unweighted N=150)		1996–1997 (unweighted N=152)		1998–1999 (unweighted N=191)		2000–2001 (unweighted N=331)			
	N	%	N	%	N	%	N	%	t[b]	Total percentage growth (1994–2001)[c]
Antidepressants										
Total	93	2.1	78	2.5	98	2.7	168	5.5	4.62**	206.1
Male	44	2.0	30	2.4	44	2.4	77	5.2		
Female	49	2.2	48	2.5	46	3.0	91	5.8		
Stimulants										
Total	36	1.1	48	1.5	48	1.9	92	2.9	3.75**	208.7
Male	28	2.0	35	2.6	35	3.0	66	4.9		
Female	8	.4	13	.7	13	1.1	26	1.3		
Other psychotropic medications[d]										
Total	21	.4	26	.6	45	1.4	71	1.7	3.54**	385.4
Male	11	.3	12	.7	24	1.7	41	2.3		
Female	10	.5	14	.5	21	1.2	30	1.1		

[a] All numbers represent two-year totals annualized. Numbers are unweighted and percentages are weighted to reflect population estimates.
[b] For linear contrast with SUDAAN proc descript; trend measured between 1994–1995 and 2000–2001
[c] Based on weighted Ns
[d] Includes antianxiolytics, mood stabilizers, and antipsychotics. The years 1994–1997 and 1998–2001 have been combined for the test for significance of trend.
**p<.01

the largest increase for both stimulants and SSRIs among youths aged 15 to 19 years (5). Our findings also support those from a recent study by Delate and associates (15) that reported a dramatic increase from 1998 to 2002 in SSRI prescriptions among a nationally representative sample of more than 300,000 commercially insured youths aged 15 to 18 years (females, 3.74 to 6.36 percent; males, 3.00 to 4.23 percent). However, the study by Delate and colleagues did not include other types of psychotropic medications.

The prescription trends found in our study were present regardless of gender, and the data suggest that they are occurring among both psychiatrists and generalists. We found that psychiatrists, who had considerably higher prescribing rates than generalists at baseline, had significantly increased prescribing rates over time. Although we could not determine whether the trend among generalists was significant or whether the trend was significant for other specialists, such as neurologists, because of small cell size, the general patterns of the increasing and accelerating rate of prescriptions are strong.

It is worth noting that in each of the study periods a diagnosis of ADHD was recorded for about one-third of the psychotropic medication–related office visits. Also, between 14 and 26 percent of visits in which psychotropic medications were prescribed were not associated with a mental health diagnosis. Although we cannot speculate why nearly one-fifth of the visits that resulted in a prescription for a psychotropic medication excluded a mental health diagnosis, we believe that such usage of psychotropics is worthy of further investigation. Examination of specific diagnoses associated with such a prescription with a data set that is appropriate for the purpose is also warranted, given the rapidly increasing prescribing rates and similar rates of diagnoses in each period.

Among the most noteworthy findings is the sharp increase in visits that resulted in a prescription for psychotropic medication after 1999. This increase (64.6 percent) is approximate to the combined growth from the previous years. After 1999 several new drugs and new preparations of older drugs were introduced and marketed, such as citalopram hydrochloride (Celexa; September 1998), methylphenidate extended release (August 2000), and venlafaxine hydrochloride extended release (March 1999). The accelerated rate in the later years of our study suggests that this finding warrants continued investigation as new medications emerge and more generic medications are approved. Also noteworthy are the high rates of increase specific to the "other" psychotropic medications, which include mostly antipsychotics. Although these medications may be used for aggression, mood disorders, and conduct disorders, the current data do not allow for systematic analysis of which of the specific disorders that are being treated with psychotropics show an increasing trend.

We showed that trends in increased prescriptions for psychotropics contrast with trends in prescriptions for other medications. Antibiotics, the most commonly prescribed medication in this age group, probably contributed to the downward overall trend in prescription of medication among adolescents. During this time, in response to concerns about overuse of antibiotics among children, an educational campaign that included protocols for appropriate use was initiated by the Centers for Disease

Control and Prevention in partnership with the American Academy of Pediatrics. This effort to educate physicians and parents about the dangers of overprescribing antibiotics led to a substantial decrease in the use of antibiotics in this population in the late 1990s (21,22).

Although we cannot assess the appropriateness of increasing trends in the prescription rates for psychotropic medications, several concerns have recently been raised about prescribing these medications to children and adolescents. These concerns include potential adverse reactions, questions about the efficacy of many psychotropic medications, and concerns about SSRI use and the risk of suicide among adolescents (23,24). To the extent that these concerns are substantiated in future research, the growth in psychotropic prescribing practices may become an increasing concern. Conversely, recent studies have suggested that adolescents have high rates of psychiatric morbidity (13), and the trends found in this study may indicate that those in need of psychotropic medications are now more likely to receive them. From these data we cannot determine the extent to which the rapid increases in the prescription of psychotropics to youths aged 14 to 18 years represents a move toward greater access and more appropriate treatment or whether this represents overreliance on medications.

Although there are probably several reasons underlying the overall increase in the proportion of office-based visits by adolescents that resulted in a prescription for psychotropic medication, we posit five that might be particularly relevant: expanding definitions of psychiatric disorders (25), a greater acceptance by clinicians and the public of psychotropic medications in the wake of the "Prozac revolution" and the advent of new psychotropic medications with fewer adverse effects (26), an increased willingness of physicians to prescribe psychotropic medications to adolescents (27–29), the intended and unintended consequences of the 1997 Food and Drug Administration Modernization Act, and managed care incentives limiting the number of therapy visits, potentially leading to greater reliance on medication therapy (30).

Although all of the above factors likely contribute to this trend, we believe that direct-to-consumer advertising and other marketing strategies are key in encouraging greater use of psychotropics, particularly for the increased use found after 1999. Advertisements for medications for ADHD, social phobia, and depression are now common in various public media. Overall spending by the pharmaceutical industry on television advertising increased sixfold to $1.5 billion dollars between 1996 and 2000, with the trend accelerating after 1997 (31). Such drug industry promotion combined with the practice of detailing to physicians may affect both the public and physicians. Increasing numbers of patients come to physicians asking for particular medications (31), and drug industry detailing can promote off-label uses more aggressively. Surveys have suggested an increasing pressure on physicians to prescribe drugs that they may or may not feel are medically warranted (32), and the most common reason reported by physicians for inappropriate prescribing is patient demand (33).

One important factor facilitating increased marketing and awareness of psychotropics is various government policies enacted in the late 1990s. The Food and Drug Administration Modernization Act—which was passed in late 1997 but was not fully implemented until 1999—loosened restrictions on the promotion to physicians of the off-label use of medications (34). Additional FDA directives were issued in 1997 and 1998, which enabled the pharmaceutical industry to target consumers directly with their prescription medications (31,35–37). We suggest that further research is needed to determine the effect of regulatory changes and other factors, such as pharmaceutical promotion, which affect prescribing practices of psychotropics for adolescents. This type of research would allow for a greater understanding of the influence of marketing and regulation on the observed prescribing patterns, and it would determine whether medications are reaching an appropriate population.

It is important to recognize some limits to the NAMCS data. Because of a lack of adequate clinical information on visits, we were unable to fully analyze the context or presenting problems for which the prescriptions were written and thus cannot examine how the reasons for the visits may have changed over the study period. Also, because the data are encounter-level data, rather than individual-level data, it is possible that more frequent users of care are oversampled. This lack of longitudinal information also precludes our ability to analyze the extent to which our results reflect chronic use over time, with treatment initiated at earlier ages, extending over longer periods. Any inferences to number of patients associated with these visits should be made cautiously. Differences in visit patterns and frequency between generalists and psychiatrists preclude direct comparison of prescribing rates by visit. Additionally, small cell sizes preclude subgroup analyses for some populations. Despite these limitations, NAMCS is a well-established survey that enables the examination of medical treatment trends over time and has been used for similar research purposes by others (38,39).

Conclusions

Our study identified considerable growth in prescribing rates among adolescents for major classes of psychotropic medications from 1994 through 2001, with a significant acceleration after 1999. This increase was seen among male and female patients and among generalists and psychiatrists. This increase may be associated with changing thresholds of diagnosis and treatment, availability of new medications, and changes in federal regulatory policies concerning promotion of medications by the pharmaceutical industry. Although our study was not designed to identify which of these factors might be most important in contributing to the rapid acceleration seen after 1999, it documents dramatic increases in prescription rates that coincide with a period of increased marketing. Thus we suggest that changes in government regulatory

policies may have made an important contribution. The rapid growth in prescription rates, particularly if it is sustained beyond the years of this study, is a trend worthy of further examination to understand how these trends are influencing adolescent well-being.

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