

“Sub is a Weird Drug:” A Web-Based Study of Lay Attitudes About Use of Buprenorphine to Self-Treat Opioid Withdrawal Symptoms

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Background: Illicit use of buprenorphine has increased in the U.S., but our understanding of its use remains limited. This study aims to explore Web-forum discussions about the use of buprenorphine to self-treat opioid withdrawal symptoms.

Methods: PREDOSE, a novel Semantic Web platform, was used to extract relevant posts from a Web-forum that allows free discussions on illicit drugs. First, we extract information about the total number of buprenorphine-related posts per year between 2005 and 2013. Second, PREDOSE was used to identify all posts that potentially contained discussions about buprenorphine and opioid withdrawal. A total number of 1,217 posts that contained these terms were extracted and entered into NVivo data base. A random sample of 404 (33%) posts was selected and content analyzed.

Results: Buprenorphine-related posts increased over time, peaking in 2011. The posts were about equally divided between those that expressed positive and negative views about the effectiveness of buprenorphine in relieving withdrawal symptoms. Web-forum participants emphasized that buprenorphine’s effectiveness may become compromised because of the “size of a person habit,” and/or when users repeatedly switch back and forth between buprenorphine and other illicit opioids. Most posts reported use of significantly lower amounts of buprenorphine (≤ 2 mg) than doses used in standard treatment. Concomitant use of other psychoactive substances was also commonly reported, which may present significant health risks.

Conclusions: Our findings highlight the usefulness of Web-based data in drug abuse research and add new information about lay beliefs about buprenorphine that may help inform prevention and policy measures. (*Am J Addict* 2015;XX:1–7)

INTRODUCTION

Buprenorphine, a semi-synthetic opioid, has very high affinity, but low intrinsic activity at mu receptors, which makes it an effective medication in the treatment of opioid dependence.^{1–3} Buprenorphine’s use in substance abuse treatment in the U.S. has expanded substantially since its approval in 2002.⁴ Simultaneously, U.S.-based reports about its illicit use have also increased.^{4–7} Research suggests that the use of illicit buprenorphine in the U.S. seldom represents an attempt to attain euphoria but is more commonly linked to self-treatment of opioid withdrawal symptoms.^{8–14} For example, a study conducted with individuals entering opioid addiction treatment programs in New England found that out of 51 interviewees, the majority (96%) had used buprenorphine illicitly to modulate opiate withdrawal symptoms.¹⁰ A study conducted in Providence, Rhode Island, with a community-recruited sample of 100 opioid users found that 74% reported lifetime use of diverted buprenorphine. Self-medication of withdrawal symptoms and inability to access treatment services were cited as common motives for illicit buprenorphine use, especially among injection drug users.¹¹ To design effective intervention and policy measures, more research is needed to understand lay attitudes about buprenorphine self-treatment practices.

There is a growing recognition that the Web provides unprecedented opportunities for drug abuse research.^{15,16} Increasing numbers of users rely on the Web to share their experiences and opinions about different drugs. Such user-generated content provides a rich source of data about lay knowledge, attitudes and behaviors related to illicit drugs.^{18,19} Prior studies have utilized such sources to explore emerging trends of illicit drug use, including mega-dosing with loperamide (Imodium)²⁰ and using Kratom²¹ to self-treat opioid withdrawal.

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The study builds on PREDOSE (PREscription Drug abuse Online Surveillance and Epidemiology) platform, a novel Semantic Web tool that was developed by our interdisciplinary research team to facilitate information extraction from Web-forums on illicit drugs.²² The study aims to explore Web-forum discussions about the use of buprenorphine to self-treat opioid withdrawal. First, we describe trends in the frequency of buprenorphine mentions on a Web-forum and compare them to two of the most commonly abused pharmaceutical opioids—oxycodone and hydrocodone. Next, we conduct content analysis of Web-forum posts to describe user attitudes about buprenorphine’s effectiveness in self-treatment, dosing practices, and concomitant drug use.

METHODS

A Web forum that allows for the free discussion of recreational drug use and is accessible for public viewing was selected for the study. The selected Web-forum was started in 2004, and focused primarily on illicit opioids and other drugs. It grew from 32 posts in 2004 to 1,356 in 2005, almost 10,000 in 2006, and about 50,000 posts per year in 2011 and 2012.

Wright State University IRB approved the study and determined that it meets the criteria for Human Subjects Research exemption 4, because it is limited to content analysis of publicly available Web postings that are made anonymously and intended for public viewing. To safeguard anonymity, pseudonyms used by forum contributors were anonymized during the data collection; the actual name of the website is not mentioned to assure confidentiality.³² Direct quotes were edited slightly (without altering the content) to make sure that they cannot be used to identify the website using internet search engines.³²

The PREDOSE platform retrieved posts (data collected through 09/2013) using Web crawlers and retained them in a text data base. To examine the frequency of buprenorphine-related discussions on the Web-forum, PREDOSE extract data on the number of posts per year that mentioned buprenorphine, including relevant brand and slang terms (eg, Suboxone, Subutex, bupe). For comparative purposes, data on the frequency of oxycodone and hydrocodone mentions were also extracted. To compare relative numbers of buprenorphine, hydrocodone and oxycodone mentions, occurrence ratios were calculated. An occurrence ratio is expressed as the proportion x/y where x is equal to the number of posts that mention selected drug (eg, buprenorphine) over a set time period, while the denominator y is equal to the number of all posts on the same website and over the same time period (eg, year 2011).²³

To analyze lay attitudes about buprenorphine use for self-treatment, we utilized information retrieval functions of PREDOSE and subsequent manual coding facilitated by NVivo. “Self-treatment” is defined as using buprenorphine in an attempt to alleviate opiate withdrawal symptoms for oneself

in the absence of authorization by a prescribing physician. The analysis proceeded in the following stages:

- i. PREDOSE was used to extract posts mentioning “buprenorphine” and “withdrawal,” including relevant brand and slang terms that are commonly used in the Web-based discussions (“Sub,” “bupe,” “WD,” “W/D,” etc.). The two terms co-occurring within a window of 20 word apart were treated as a possible association rule.²⁴ The PREDOSE platform identified and extracted 1,217 posts containing discussions about buprenorphine and opioid withdrawal (covering from 01/2005 to 09/2013).
- ii. A random sample of 404 posts (the numbers of posts by year 2005: 2; 2006: 9; 2007: 19; 2008: 18; 2009: 31; 2010: 30; 2011: 109; 2012: 114; 2013: 72) was selected for manual coding. The sample represented 33% of the total number of posts that contained mentions of both buprenorphine and withdrawal.
- iii. The random sample ($n = 404$) was manually coded using the Complementary Explorative Data Analysis framework, which integrates qualitative and quantitative methods in content analysis of media communications.²⁵ Using a qualitative approach and preliminary “open” coding of a subset of posts, a coding scheme was developed.²⁵ The coding scheme focused on the following key elements: if the post discussed buprenorphine to self-treat withdrawal (since co-occurrence of the two terms could be linked to other issues, such as withdrawal from buprenorphine); if it expressed views about buprenorphine’s efficacy in withdrawal management (positive/negative views and reasons for lack of efficacy); if it reported buprenorphine dosing practices (reported amount in mg in self-treatment of withdrawal); and concomitant buprenorphine and other drug use (Table 1). The coding scheme was then consistently applied to the entire body of 404 posts. Qualitative and quantitative approaches were used to analyze coded data.

Inter-coder reliability analyses using Cohen’s Kappa statistic were performed to assess coding consistency among coders.²⁶ Three samples of posts were selected to assess inter-coder reliability in relation to the three key themes. The first sub-sample was randomly selected to test for coding reliability to identify positive and/or negative opinions about buprenorphine’s effectiveness. It included 52 posts representing over 50% of posts that contained discussions related to buprenorphine’s efficacy. The other two sub-samples were selected to assess coding reliability in relation to buprenorphine’s dosing ($n = 50$), and concomitant drug use ($n = 35$). These sub-samples were purposefully selected to ensure that sufficient numbers of key characteristics were included in the reliability check. After reviewing, clarifying and pre-testing coding rules, the reliability sub-samples were independently coded by two coders (the first author and a research associate). SPSS was used to calculate Cohen’s Kappa. Kappa scores of 0.6–0.8 indicate moderate, and above 0.8, substantial agreement.^{26,35}

TABLE 1. Content analysis of web forum posts that mention buprenorphine and opioid withdrawal symptoms (*n* = 404)

Buprenorphine self-treatment related themes	Number of posts	Percentage
Buprenorphine effectiveness in self-treatment of opioid withdrawal	95	24
Positive views	72	76
Negative views	66	69
Mention of buprenorphine dose to self-treat opioid withdrawal	82	20
2 mg or less	58	71
More than 2 mg but less than 8 mg	23	28
More than 8 mg	8	10
Buprenorphine use in combination with other drugs when self-treating withdrawal	50	12
Other Illicit opioids	31	62
Benzodiazepines	15	30
Dextromethorphan	2	4
Loperamide	2	4
Tramadol	2	4
Cannabis	2	4
Alcohol	2	4

RESULTS

Trends in Buprenorphine-Related Posts

The overall number of buprenorphine-related posts increased from 46 in 2005 to 1,012 in 2009, 4,376 in 2011, and 3,546 in 2012. These numbers include all posts that contain at least one mention of buprenorphine or its slang/brand names, without taking into account that the same individual might have authored more than one posting. Figure 1 displays changes in the occurrence ratio of buprenorphine-related posts over time in comparison to two other commonly abused pharmaceutical opioids—oxycodone and hydrocodone. As shown in the figure, initially buprenorphine was less commonly discussed than hydrocodone or oxycodone. However, the frequency of

buprenorphine-related post increased substantially over time, overtaking not only hydrocodone, but also oxycodone-related posts in 2012 (Fig. 1).

Lay Attitudes About Buprenorphine Self-Treatment

Manual coding of 404 posts determined that 68% (249) of those posts discussed using buprenorphine to self-treat opioid withdrawal. The remaining 32% discussed other issues, most commonly, withdrawal from buprenorphine (“I am taking kratom to relieve Suboxone withdrawal symptoms....”).

Buprenorphine’s Effectiveness

Out of 404 coded posts, we identified 95 that contained discussions related to buprenorphine’s efficacy in alleviating

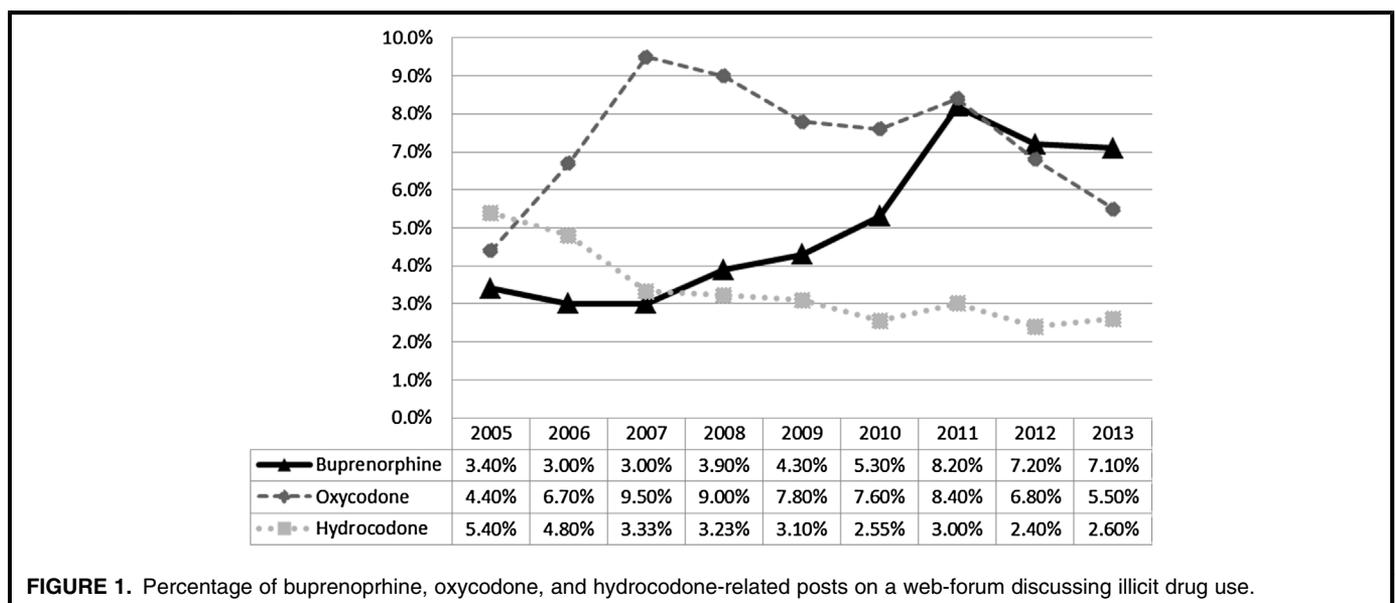


FIGURE 1. Percentage of buprenorphine, oxycodone, and hydrocodone-related posts on a web-forum discussing illicit drug use.

opiate withdrawal symptoms (Table 1). They comprised 25% of the total sample of coded posts ($n = 404$), and almost 40% of those that discussed buprenorphine use to self-treat withdrawal ($n = 249$). The coder reliability assessment indicated moderate agreement between coders in identifying positive ($\kappa = 0.70, p < .001$) and negative opinions (a $\kappa = .64, p < .001$) regarding buprenorphine's effectiveness. About 76% of these posts expressed positive views and 69% expressed negative views about buprenorphine's effectiveness in helping to relieve withdrawal symptoms (Table 1). For example, a positive opinion was expressed in the following way: "Buprenorphine has saved my ass from the sufferings of heroin withdrawal many times. It has been great to me during my breaks from heroin. It is my life jacket when I begin to drown." In contrast, another person shared a negative opinion: "If I'm in severe withdrawal, coming off a 3 g per day heroin habit, I'd rather have nothing, than bupe. That shit is awful..." About 45% of the coded posts contained accounts of both positive and negative experiences in terms of buprenorphine's effectiveness in self-treatment: "First time I took a sub it worked very well, but my tolerance was very low. Every time since...ugh, much rather deal with it cold turkey, because that shit sent me into horrible pain."

Those who expressed negative attitudes about buprenorphine's effectiveness typically complained that buprenorphine is not fully effective in alleviating all physical withdrawal symptoms and/or that "switch over" periods are too long, and it takes several days for buprenorphine to "kick in." As one person stated, "Now, when I stop doing dope and take subs, they hardly take away any of my withdrawal symptoms for at least 4 days..." A third negative theme indicated that buprenorphine is not very effective in controlling cravings: "Sub keeps me out of withdrawal. But my god! All I can think about is putting a needle in my arm and getting off. It drives me insane! Non-stop cravings!"

Many posts expressed a belief that buprenorphine might be ineffective because of the "size of a person's habit." For example: "If you've been using full agonists for years and years, especially potent ones like heroin, the sub just doesn't do it for you." Others emphasized that buprenorphine is a "weird" drug and its effectiveness declines when users repeatedly switch back and forth between buprenorphine and heroin or other opioids:

I agree that Suboxone is a life saver, but be careful! I had the attitude that because I had Suboxone, I could do as much dope as I wanted, because if I was gonna get sick, I could just take my subs.... What I didn't realize is the more times you switch between full agonists and subs, the less effective the subs become.

I spent a few years going back and forth from subs to heroin. This worked well for some time. About a year ago, I tried to get stable on Subutex again. It just wasn't working! I tried high doses, I tried low doses.... It was exactly like cold turkey WD. I mean the subs did nothing for me. I believe with the all

switching back and forth from subs to dope, it somehow made the subs completely ineffective for me.

Dosing

Out of 404 coded posts, 82 (20%) contained information about the specific amounts of the daily dose of buprenorphine used in self-treatment (Table 1). They comprised almost 33% of the posts that contained discussion of buprenorphine use to self-treat withdrawal ($n = 249$). The coder reliability assessment indicated moderate agreement between coders in identifying reports of dosing at or below 2 mg/day ($\kappa = 0.75, p < 0.001$) and above 2 mg per day ($\kappa = 0.79, p < 0.001$). Over 70% of coded posts advocated use of very low doses—2 mg and lower per day—when self-treating opioid withdrawal symptoms, and only 10% mentioned daily doses of 8 mg or greater (Table 1). In Web-forum discussions about "low dosing," buprenorphine was described as "a horse of different color at dosages 2 mg," as a "counterintuitive" drug that may be more effective at lower doses than at higher doses. For example:

Normally, I would try 6 mg+ of bupe for an attempt at relief of WD, but since I heard less is more, I decided to start low and add more if I needed it. Lucky me! 2 mg put me to sleep the first night, and it only got progressively better each day.

I cut the sub strip (2 mg) into about 24 tiny pieces, which is 1/12 of 1 mg each dose. I used one piece about every 4–6 hours, and it kept me well for almost a week. I was amazed!

Many of the dose-related discussions endorsed a view that physician-prescribed doses, typically averaging 16–24 mg per day, are too high for adequate management of opioid withdrawal symptoms, and thus, they can be "conserved" or shared with others. For example, one person stated: "You can conserve your Suboxone by taking 1 pill or even half a pill. I do not know why doctors insist on prescribing 16 mg, even 32 mg per day of bupe..."

Concomitant Drug Use

Manual coding identified 50 posts that contained discussions about the use of buprenorphine in conjunction with other psychoactive drugs, most commonly opioid agonists and benzodiazepines (Table 1). They comprised about 12% of the total sample of posts ($n = 404$) that were manually analyzed, and 20% of the posts that discussed buprenorphine use to self-treat withdrawal ($n = 249$). The coder reliability assessment indicated moderate to substantial level of agreement between coders in identifying reports of concomitant use of other opioids ($\kappa = 0.77, p < 0.001$) and benzodiazepines ($\kappa = 0.92, p < 0.001$). The timing of buprenorphine dosing in relation to the opioid of choice was one of the key discussion points on the Web-forum. Typically, buprenorphine, when taken too soon after an opioid agonist, may precipitate a withdrawal syndrome. It may also block the effects of other opioids if they are consumed too soon after using buprenorphine.²

Avoiding the pain of withdrawal and getting the most out of the drug of choice were the main motivators for spacing out buprenorphine and other opioid dosing. However, many Web-forum participants advocated use of a low amount of buprenorphine in conjunction with an opioid agonist to make the transitions from a full agonist to buprenorphine easier and less painful. Such recommendations were especially relevant for those who tended to switch back and forth between buprenorphine and their opioid of choice. For example:

I've low dosed bupe for months at a time and used huge amounts of heroin on top of it. As long as I kept a tiny daily dose of bupe in me, it was an insurance policy that I would never get dope sick, and could re-induct into full bupe maintenance without having to plunge into WD.

I have found the first day or two of induction it's often easier to use a bit of drug of choice on top of bupe to ease the transition, ie, 9 am: wake up in WD, take 1 mg bupe; 12 pm: do 0.2 heroin; 6 pm: 1 mg bupe; 12 am: 0.1 heroin; 9 am: 1 mg bupe.... Obviously you need to be in WD before you induct, but once you have bupe in your system, you can take a full agonist then dose bupe again even immediately after that without PWD (precipitated withdrawal)... Just make sure it is consistently in your system!

Benzodiazepines were also commonly endorsed drugs for use in combination with buprenorphine to help with sleep, anxiety or cravings. For example:

I would personally consider a benzodiazepine or some kind of sleeping or anxiety pill a must. Subs may take withdrawal away, but the cravings remain and you will still feel like shit.

Taking Xanax 15 minutes before you dose your bupe helps IMMENSELY. If I am on a 2 week run, my transition back to bupe is hell... even without the PWs (precipitated withdrawals) I still have nausea and terrible cold sweats on day 1, but if I take a few bars (Xanax), it makes such a difference! Hell, I'll go out and eat at a restaurant versus laying in a pile of my own sweat and puke.

Some other posts suggested the use of dextromethorphan, tramadol, loperamide, or cannabis to increase buprenorphine's effectiveness: "I find subs help with WD, but will not help me with the chills. For that, I use about 150 mg of DXM ... really does wonders...." "Take loperamide about 90 minutes after your bupe dose.... I did it and it took away all the WD symptoms the sub did not cuz of my huge tolerance to opiates...."

DISCUSSION

Our findings indicate that frequency of buprenorphine-related posts increased over time, peaking in 2011 and

overtaking oxycodone-related posts in 2012. These changes coincided with the release of tamper-resistant formulation of OxyContin in late 2010,²⁷ which contributed to decreases in OxyContin abuse, but was linked to the increases in abuse of other opioids.²⁷ Increases in Web-based mentions of buprenorphine are consistent with other data sources showing rising rates of illicit buprenorphine use.⁷ They also indicate that due to buprenorphine's complex pharmacological profile, or as Web-forum participants suggested, "weird" properties, individuals may have more questions and concerns about how to use it to increase its effectiveness and minimize unpleasant side effects.

Our results revealed some similarities and differences between the medical recommendations and lay views about buprenorphine. Prior research has shown that understanding the variation in lay and professional interpretations of drug use and other health-related behaviors and conditions is crucial for the development of effective interventions.^{17,34}

Consistent with the medical model, many Web-forum participants agreed that because of its "ceiling effect" buprenorphine may be less effective for people who are dependent on very high doses of opioids.^{1,2} However, many posts also linked its insufficient or decreased effectiveness to an unintended consequence of repeated "jumping" back and forth between buprenorphine and their opioids of choice.

The need for ancillary medications to assist with withdrawal symptoms, particularly during the induction and early stabilization period of buprenorphine therapy, has been recognized in the medical literature.²⁸ However, lay beliefs about the use of buprenorphine with other illicit opioids and benzodiazepines contrast with medical recommendations and may put users at increased risk for adverse health effects and overdose.¹ There is a need of further research as well as educational interventions for health care providers to address such lay attitudes and beliefs.

Web-forum participants endorsed use of significantly lower amounts of buprenorphine than conventional doses averaging between 16 and 24 mg per day. Lay attitudes that buprenorphine is more effective in lower doses contradict medical treatment protocols and prior research findings.^{1,2,29} The "less is more" approach to buprenorphine dosing, as advocated on a Web-forum, is linked to the complex pharmacological properties of buprenorphine.² In addition, these findings are meaningful in the context of patient-controlled analgesia research. Some studies suggested that when people are in control of their own dose, they may be able to tolerate lower doses and/or report better pain control.³⁰ Our findings indicate that the "less is more" approach to buprenorphine dosing was commonly discussed by Web-forum participants, although we currently don't have data on the prevalence of such beliefs in the community-recruited samples. Such conflicting beliefs about buprenorphine dosing may undermine effective treatment and contribute to buprenorphine diversion.

Although Web-based data provide new opportunities for drug abuse research, we recognize there are several

limitations inherent in analyzing Web data: 1) It is difficult to determine how representative Web data are of general drug user population. It has been noted that individuals who share drug-related information online are more likely to be young adults,³¹ and may represent trend-setters,¹⁸ a group that is very important for early identification of emerging trends. 2) Demographic and geographic metadata were unavailable or impossible to extract from Web-forums. 3) Our approach focused on the raw numbers of posts with specific drug mentions, without adjusting for multiple posts by the same poster. Although similar limitations are shared by other epidemiological sources (eg, Treatment Episode Data Set), we also recognize that future research should take into account repeat contributions by the same poster. 4) Our technical capabilities of automatically extracting complex themes are still in the developmental stages, and our approach might have missed relevant posts that would have been identified using manual, “open” coding (eg, use of different colloquial expression or mention of specific symptoms of withdrawal). In addition, Web-based data present significant challenges for automated analyses and even for human coders because of the high level of ambiguity, as illustrated by only moderate-levels of inter-coder agreement on some of the themes. 5) The number of posts that contained mentions of concomitant drug use or buprenorphine dosing were relatively small. Further enhancement of the information extraction techniques should help generate more robust findings. Validity and generalizability of Web-based findings can be improved by including a greater number Web-based sources, and by triangulating Web-based findings with data obtained from other sources, such as reports by clinical toxicologists, Web-based surveys and research with community recruited samples.³³ Our results add new information about use of diverted buprenorphine that may help inform prevention, intervention, and policy measures (eg, improved patient education and physician training) and warrant further research with community-recruited samples to understand longitudinal patterns and consequences of illicit buprenorphine use. It is clear that Web-forums are becoming an important source of information for illicit drug users. Active monitoring of such sources is needed to identify lay knowledge, attitudes, and behaviors that may lead to negative health outcomes.

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

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