

# Availability of Antibiotics for Purchase Without a Prescription on the Internet

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## ABSTRACT

**PURPOSE** Reducing inappropriate use of antibiotics is key to many antibiotic resistance initiatives. Most initiatives, however, focus almost exclusively on controlling prescribing by health care clinicians and do not focus on patient self-medication. The purpose of this study was to examine antibiotics available to patients without a prescription, a phenomenon on the Internet.

**METHODS** We conducted an Internet search using 2 major search engines (Google and Yahoo) with the key words "purchase antibiotics without a prescription" and "online (English only)." Vendors were compared according to the classes of antibiotics available, quantity, shipping locations, and shipping time.

**RESULTS** We found 138 unique vendors selling antibiotics without a prescription. Of those vendors, 36.2% sold antibiotics without a prescription, and 63.8% provided an online prescription. Penicillins were available on 94.2% of the sites, macrolides on 96.4%, fluoroquinolones on 61.6%, and cephalosporins on 56.5%. Nearly all, 98.6%, ship to the United States. The mean delivery time was 8 days, with 46.1% expecting delivery in more than 7 days. Among those selling macrolides ( $n = 133$ ), 93.3% would sell azithromycin in quantities consistent with more than a single course of medication. Compared with vendors that require a medical interview, vendors who sell antibiotics without a prescription were more likely to sell quantities in excess of a single course, and the antibiotics were more likely to take more than 7 days to reach the customer.

**CONCLUSIONS** Antibiotics are freely available for purchase on the Internet without a prescription, a phenomenon that encourages self-medication and low quality of care.

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## INTRODUCTION

Antibiotics serve a useful therapeutic purpose in treating and controlling the impact of pathogens. Antibiotic resistance is a global problem, however, and has been described with numerous pathogens and in varying contexts.<sup>1</sup> Because of its effect on morbidity and mortality, antibiotic resistance is considered a threat to US public health and national security by the Institute of Medicine and the Infectious Diseases Society of America.<sup>2,3</sup>

Although excessive use of antibiotics has contributed to the spread of antibiotic resistance,<sup>4-6</sup> most initiatives regarding inappropriate direct human consumption of therapeutic antibiotics focus almost exclusively on controlling prescribing by health care clinicians.<sup>1,4,7-10</sup> As a result, most estimates of the reservoir of antibiotics in the community are based on evaluations of clinician-prescribing behavior.

Unfortunately, this strategy of focusing on prescribing practices does not address the behavior of self-medication with antibiotics. Self-administration of antibiotics occurs in all countries, but it is particularly problematic where the use of antimicrobials without a prescription is encouraged by the lack of laws restricting antibiotic sales or a failure to enforce the

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laws.<sup>11-15</sup> This practice also occurs in the United States even though the United States regulates the acquisition of antibiotics to be limited to prescription only. Recent evidence in ethnic communities in the United States indicates a high level of self-medication with antibiotics either obtained without a prescription in a foreign country and imported into the United States or acquired in the United States without a prescription at stores in ethnic communities.<sup>16-19</sup>

Patients are increasingly using the Internet not only to access health information but also to obtain medication.<sup>20-22</sup> Some prescription medication is sold without a valid prescription, which is a violation of the Federal Food, Drug, and Cosmetic Act.<sup>23</sup> Other vendors attempt to circumvent this law by providing online diagnoses and prescriptions based on health histories without a physical examination and without an ongoing relationship between patient and physician, practices that are not considered an appropriate standard of care.

Some Internet vendors also attempt to skirt US regulations by operating in countries outside the United States but marketing to US consumers. The US Food and Drug Administration forbids ordering prescription drugs from outside the United States: "Thus, in virtually all instances, individual citizens are prohibited from importing prescription drugs into the United States."<sup>24</sup> The extent to which antibiotics are available for purchase without a prescription through the Internet is unknown.

The purpose of this study was to examine the availability of antibiotics without a prescription to patients over the Internet and to characterize the types of antibiotics available, the quantity of drugs available in a single purchase, and shipping times.

## METHODS

To examine the types of Web sites and vendors dispensing antibiotics on the Internet, we conducted a search using 2 major search engines (Google and Yahoo) and the key words "purchase antibiotics without prescription" and "online (English only)." This search yielded 290,000 Google sites and 2,000,000 Yahoo sites. The first 300 search results of on both sites were examined to identify vendors for antibiotics that did not require a prescription. The frequency of relevant Web sites declined substantially after the first 300. In some cases the URL did not take the reader to an actual medication vendor; rather, the Web site contained multiple advertisements and links to other sites for purchasing antibiotics. The links to these advertised sites were also investigated. Our final list of URLs included 184 links to single vendors of antibiotics. Because some vendors have multiple URLs to reach

their company, we checked the mailing address, header, and telephone number to avoid double counting. We found 138 unique vendors from which antibiotics could be purchased without a prescription. We limited our sample to English-language Web sites. Because Web sites appear and disappear with relative frequency, the search and classification were conducted during 1 week of September 2008.

We classified Web sites of vendors according to several variables. First, although all of the included vendors would sell antibiotics without a prescription, we assessed whether the vendor would sell antibiotics without any form of a prescription or whether the site required a prescription created for the purchase based on completion of an online health history. For this second group, no prescription from a doctor or clinician was necessary before accessing the site. After completion of an online health history, the customer would be given a prescription that would allow the purchase to be completed.

Second, we examined whether the vendor would ship prescription antibiotics to a buyer in the United States, as well as several other countries (Canada, United Kingdom) where antibiotics are available only by prescription. Third, we categorized the classes of antibiotics available for purchase. We assessed whether individuals could purchase penicillins, macrolides, fluoroquinolones, and cephalosporins, because the availability of multiple classes of antibiotics would affect additional selective pressure in the community.

Fourth, we categorized whether a person could purchase antibiotics, particularly broad-spectrum antibiotics, in quantities greater than what would be considered appropriate for 1 course of treatment of an acute respiratory tract infection. Specifically, we classified a single course of azithromycin as 6 pills, 250 mg each. We considered more than 6 pills to be excessive and could lead to future self-medication with the unused pills.

Fifth, we assessed the expected delivery time to receive the antibiotics. In the case of online histories to justify a prescription, we assumed that individuals are primarily purchasing antibiotics for an acute problem. In usual face-to-face health care visits for respiratory tract infections during which antibiotics are prescribed, more than 90% of prescriptions are filled on the day of the office visit.<sup>25</sup> We therefore wanted to find out whether the amount of time between online evaluation and receipt of medication was substantially longer. An extended lag between diagnosis and receipt of treatment has implications for resolution of self-limited conditions and storage of unused medication. Because the Web sites offered a range of days for expected receipt of the medication, we used the median to represent the expected delivery time.

Finally, in an effort to determine whether these sites actually deliver the product that they purported to sell without a prescription, we submitted an online order to 1 vendor for 6 tablets of azithromycin, 500 mg each. No prescription was required, and no online consultation was necessary.

Our analysis consisted of describing the overall sample of vendors and then comparing the vendors who sell antibiotics without a prescription with those who provide online prescriptions. We used  $\chi^2$  analysis to compare the characteristics of the 2 groups.

## RESULTS

When we looked at the antibiotic classes available online, penicillins were available on 94.2% of the sites, macrolides on 96.4%, fluoroquinolones on 61.6%, and cephalosporins on 56.5%. Among all vendors, 98.6% would sell to clients in United States, 79.7% to clients in Canada, and 84.0% to clients in the United Kingdom. The mean wait for delivery of the medications was 8 days with 46.1% waiting longer than 7 days. Among those selling macrolides ( $n = 133$ ), 93.3% would sell azithromycin in quantities consistent with greater than a single course of medication.

Among the 138 unique vendors, 36.2% would sell antibiotics without a prescription, whereas 63.8% provided an online prescription based on an online health history (Table 1). As displayed in Table 1, vendors who sold antibiotics without a prescription were more likely to sell in quantities greater than a single course and more likely to take more than 7 days for the antibiotics to reach the customer than were those that required a medical interview.

In our proof-of-concept test of buying 6 tablets of azithromycin, 500 mg each, the medication arrived 28 days from the order date. Our purchase arrived from Mexico with no information on instructions for use of the medication.

## DISCUSSION

The findings described in this study suggest that there is a potentially large pool of antibiotics in the United States that is not affected by initiatives to change physician-prescribing practices and may be contributing to antibiotic resistance. As part of this study we bought broad-spectrum antibiotics without a prescription. This reservoir of antibiotics is likely to be used inappropriately—the Web sites promote self-diagnosis and self-medication, and antibiotics are likely to be used in inappropriate dosages. Furthermore, the quantities available and the interval between ordering and receiving the medication suggest that these transactions will likely be used by individuals storing the drugs for future self-diagnosis and treatment or for sale.

The medical community and the public health and regulating agencies, as well as pharmaceutical companies, need to expand efforts to control antibiotic resistance beyond initiatives centered on prescribing behavior to include self-medication and sources of antibiotics obtained without prescription. Clinicians assessing the use of patient's self-medication when taking a medical history can function as an important opportunity to educate patients about not only antibiotic resistance but also potential interactions between antibiotics and other prescription medicines. Although, more than one-half of the identified sites provided

online consultation for a prescription, the lack of interaction between patient and physician resulted in no opportunity for patient education. If those who self-medicate are taught that they are putting their own health at risk, they may be less likely to use these online pharmacies.

Unfortunately, other disturbing evidence suggests that this problem may not be easily fixed through education, a troubling issue in controlling antibiotic use. Previous research suggests that a patient's past experience of care seeking and treatment use influences future expectations for treatment of respiratory tract infections.<sup>26,27</sup> European countries have grappled with the issue of self-medication with antibiotics and found that a belief in the appropriateness of self-medication with antibiotics for bronchitis and the

**Table 1. Characteristics of Web Sites Where Antibiotics Are Available Without a Prescription ( $n = 50$ ) and Web Sites Requiring an Online Health History ( $n = 88$ )**

Characteristics	Available Without Prescription %	Available With Online Prescription %	P Value <sup>a</sup>
Penicillins available	94.0	94.3	.94
Macrolides available	96.0	96.6	.86
Fluoroquinolones available	96.0	42.0	<.01
Cephalosporins available	74.0	46.6	<.01
Azithromycin in quantities larger than a single course (among those selling macrolides)	100.0	89.8	.02
Sell to United States	96.0	100.0	.06
Sell to Canada	90.0	75.0	.03
Sell to United Kingdom	98.0	77.3	<.01
Usual delivery time >7 days	60.0	37.1	.02

<sup>a</sup>  $\chi^2$  used to test for differences of observed differences.

perceived availability of antibiotics without a prescription were related to an increased probability of self-medication.<sup>28</sup> Thus, once patients obtain antibiotics without a prescription and self-medicate self-limited illnesses, such as uncomplicated upper respiratory tract infections, they are likely to assume the antibiotic was effective and self-medicate in the future.<sup>17</sup> Increased regulation of Internet sites beyond controlled substances to include antibiotics appears warranted and necessary. Moreover, pharmaceutical companies may need to monitor who is selling their products and through what mechanisms.

Several studies suggest that antibiotic prescribing for viral illnesses, respiratory tract infections being one example, has declined in the last decade.<sup>29,30</sup> This decline has been interpreted as evidence that overall antibiotic use also has been reduced. Our study suggests that the opposite might be the case. If patients who are now being denied antibiotics through their physician can access the medications without a prescription, the overall rate of antibiotic use in the general population may, in fact, be increasing and thereby have a considerable impact on microbial resistance rates.

The vendors identified in this study do not appear to be fearful of prosecution. Although providing medications without a prescription is illegal in the United States, failure to enforce US laws likely encourages these companies to market their products to patients. Additionally, the ability of Internet-based companies to exist with no identifiable physical location or ownership makes locating and enforcing FDA regulations extremely difficult. That these companies can be located in countries outside US jurisdictions complicates enforcement of US laws. All of these obstacles promote the illegal acquisition of antibiotics by patients.

There are several limitations to this study. First, this study represents a sample of Web sites and vendors and thus may not be indicative of all of the vendors selling antibiotics without a prescription. This study was not meant to be an exhaustive census of these sites, primarily because with the questionable legality of some of these practices, these sites rapidly come and go.

Moreover, we discovered that some URLs were attached to servers at educational institutions, apparently without their knowledge or consent. For example, we found that servers at Dartmouth College, East Carolina University, University of Pittsburgh, Carnegie Mellon University, and San Francisco State University all were used, most likely without their knowledge, for redirection to Internet pharmacies. This activity suggests that some vendors are aware of the questionable legitimacy of their business. Second, there was a considerable repetition in the Web sites, which made an accurate determination of unique vendors from the 184

different sites difficult, an effort that may have led to some error. We compared identifying telephone numbers, street addresses, and site headers for each site as a way to sort out duplication. Even with these strategies, however, it was difficult to know whether one corporation still owns and controls multiple sites.

Third, we could not determine how often pharmaceuticals purchased over the Internet were not genuine, inactive, out of date, or adulterated. Fourth, we limited our count to English language Web sites. Although the great majority of Web sites were in English, some were in other languages. Thus, vendors targeting foreign-language speakers in the United States would have been missed. Finally, and potentially the biggest limitation to the importance of this study, is that we were unable to describe how much this Internet-based purchasing strategy was used for acquiring antibiotics by individuals in the United States. Our study is the first to document this phenomenon, and we describe the mechanism for purchasing antibiotics online; future studies will need to document the scope of antibiotics purchased through this mechanism to better understand its direct implications for antibiotic resistance.

In conclusion, antibiotics are freely available for purchase on the Internet without a prescription, and the general structure of the transactions encourages self-medication and low quality of care. This phenomenon has not been the focus of initiatives to control antibiotic resistance. Additional education directed to patients and the community, as well as increased regulation and enforcement of existing regulations, may help in controlling this potentially vast reservoir of antibiotics.

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**Key words:** Health care delivery; quality of health care; infectious disease; antibiotics; drug resistance, bacterial

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