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A detailed analysis of online pharmacy characteristics to inform safe usage by patients

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Abstract *Background* Evidence suggests that consumers potentially put themselves at risk when purchasing medicines on-line. Whilst logos provided by regulators may provide some level of reassurance there may be other indicators which could be used by consumers to identify those websites which may be safely used. *Objectives* Identify characteristics of on-line pharmacies which are related to whether websites are regulated or non-regulated and those characteristics which could be used by patients to increase the likelihood of accessing regulated sites. *Setting* Online pharmacies which supply diazepam, fluoxetine and simvastatin. *Methods* Using piloted search terms via Google and Yahoo search engines, identified websites were screened for regulatory status, adherence to regulatory standards, administrative requirements, clinical assessment requirements and additional details deemed to be of relevance to a user. Characteristics of regulated and non-regulated (defined as those with an absence of a correctly linked regulatory logo) websites were compared to identify differences which could be used to improve patient safety. *Main outcome measure* Regulatory status, adherence to regulatory standards, quality of information provision, barriers to medicines access. *Results* 113 websites sold diazepam, fluoxetine and simvastatin; were identified within the first 100 results. Less than quarter were found to be regulated online pharmacies. 80 websites were willing to sell the medication without a prescription. The unregulated internet pharmacy websites (defined as those with an absence

of a correctly linked regulatory logo) were found to adhere more closely to the clinical criteria, were less significantly likely to disclose a contact name and address, telephone number of the pharmacy or demand a prescription prior to sale ($P < 0.05$, Fisher's Exact). *Conclusions* The three prescription-only medicines which are liable to abuse, have potentially serious interactions and require counselling to ensure patient safety are readily available via the internet. When purchasing medicines via this route UK consumers should be made aware of the importance of regulatory logos and additionally should ensure that the seller can be meaningfully contacted by the contact details provided. The provision of clinical information should not be used alone as an indication of the seller's provenance.

Keywords Abuse · Consumer counselling · Internet · Online pharmacy · Regulations

Impact on practice

- Patients should be made aware of the role of regulatory logos on on-line medicine shops.
- Provision of clinical information within websites should not be used alone as an indicator of website provenance.
- Medicines selling websites, which do not provide contact details, should be avoided.
- Contact details should be checked for authenticity to ensure website provenance.

Introduction

Online pharmacies have become increasingly popular as they offer convenient home delivery, 24-h access, price

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comparison and enable consumers to bypass face-to-face contact with healthcare professionals regarding personal or sensitive conditions [1]. Two million UK citizens regularly purchase medicines online, many of which would be classified as requiring a prescription within the country of purchase [2].

Prescription-only medicines (POMs) can be defined as medicines that may “present a direct or indirect danger to human health, even when used correctly, if used without the supervision of a doctor” [3]. Any lack of personalised, well-informed professional healthcare advice, as is the case with most online pharmacies, is therefore a concern; this is particularly so with medicines which are known to interact, such as selective serotonin reuptake inhibitors, and medicines which are liable to abuse such as benzodiazepines. Moreover, should any problems arise from the ingestion of medications purchased online; many unverified online pharmacies have no legally recognised status, meaning that the patient is left with no recourse [4, 5].

The rationale for governments’ requesting prescriptions prior to supply of medicines is that it enables a healthcare professional to select the most appropriate treatment for the patient. Within this process they are ensuring that the diagnosis is correct and the medicine is appropriate when considering the patient’s medical condition and other medicines. Additionally, they can manage those medicines which are liable to abuse and provide requisite advice and support to the patient. The role of the pharmacist is to provide medicines which are from an appropriate wholesaler, confirm the appropriateness of the prescription and to provide additional support and guidance to the patient. Regulated on-line pharmacies will either confirm that the patient has a prescription or undertake the review and assessment themselves, provide the medicine from a reliable source and provide advice as necessary [3, 5].

In the UK, all online pharmacies must register with the General Pharmaceutical Council (GPhC) then they may display a ‘registered pharmacy’ logo that is designed to provide customers with confidence in their transactions. The logo is verifiable and may be checked against a list of GPhC registered pharmacies and pharmacists [2]. Similar procedures found in the USA with the National Association of Boards of Pharmacy (NABP) organising programme called Verified Internet Pharmacy Practice Sites (VIPPS) [6]. In Canada, the National Association of Pharmacy Regulatory Authorities (NAPRA) details a set of model internet pharmacy standards [7], which is supported by the Canadian International Pharmacy Association (CIPA) [8]. Table 1 compares recommendations for online pharmacies as prescribed by the UK, USA, Canadian and Australian pharmaceutical regulatory bodies.

Research has shown that POMs can be purchased through non-regulated on-line pharmacies when the medicine is

contraindicated [9]. Previous researchers have studied the availability of certain medicines on online websites; one such study was Raine et al. [9]; it investigated the availability of analgesics in the UK, finding that prescription-only analgesics and controlled opioids (e.g. codeine and buprenorphine) are readily available online, and can be purchased without a valid prescription [10]. Researchers have also found it was easy to obtain opioid medications without a prescription and medicines such as Viagra [11, 12].

In addition to concerns regarding the safe supply of medicines via on-line pharmacies, there is evidence of deaths from the receipt of counterfeit medicines via unregulated sites [7, 13]. The UK Medicines and Healthcare Products Regulatory Agency (MHRA) have warned that there are “no guarantees of the safety, quality or efficacy of medicines purchased in this way” [9]. The World Health Organisation (WHO) reported that almost 50 % of medicines sourced from online sites are counterfeit [14]. Further, there are valid concerns over financial and personal data security and the quality of healthcare information offered [15]. Consequently, there are a wide variety of reasons why patients should be directed away from unregulated sites.

Whilst the accessibility of medicines via on-line pharmacies has been described, the quality of regulated and non-regulated websites has not been ascertained. Such a comparison may enable the identification of website characteristics which can be used to inform patients purchasing medicines to make safe decisions when selecting websites. To provide a broad assessment of website quality we have chosen to use medicines which are either liable to abuse (diazepam), known to have a number of interactions (fluoxetine), or require careful counselling and monitoring (simvastatin). This study aims to determine the quality of approximately 100 online pharmacies and compare this between regulated and unregulated sites. This process should enable the generation of a set of guidelines which consumers can use when electing to purchase medicines from online pharmacies.

Aim of the study

A detail analysis of online pharmacies will be undertaken to assess the availability of three model medicines, the barriers to access, adherence to regulatory standards and the quality of information provided to identify characteristics of on-line pharmacies which are related to whether websites are regulated or non-regulated and those characteristics which could be used by patients to increase the likelihood of accessing regulated sites.

Ethical approval

No ethical approval was sought as there was no patient involvement.

Table 1 A comparison of the recommendations of different nations for online pharmacies

Recommendation	UK (22)	USA (23)	Canada (24)	Australia (25)
Registration with relevant regulatory body	✓	✓	✓	✓
Regulatory body logo linked to register	✓	✓	✓	
Name of owner/manager/superintendent	✓	✓	✓	
Address/location	✓	✓	✓	
Telephone number		✓	✓	

Methods

This study employed an observational methodology that assessed the selected websites anonymously. As a theoretical on-line exercise ethical approval was deemed not necessary after reviewing University guidelines. The researchers selected these commonly used medicines (diazepam, fluoxetine and simvastatin), but did not complete any purchases. Diazepam is liable to abuse and impose risk of tolerance, dependence and withdrawal symptoms to consumers therefore it should be used in short-term under close monitoring [10, 16]. Fluoxetine has significant interactions with other medicines [17, 18]. Simvastatin has a number of important counselling points which should be relayed to the patient before use [16, 19].

Data collection form

Data was collected on regulatory (based on Table 1), administrative and clinical criteria.

Administrative criteria assessed were:

- Payment option
- UK delivery
- Medicine availability
- Requirement for a prescription
- Questionnaire completion by patient required
- Telephone number working

Regulatory criteria assessed based on international regulatory standards were:

- Registration with relevant regulatory body
- Regulatory body logo linked to register
- Name of owner/manager/superintendent
- Address/location

Clinical assessment criteria [based on the British National Formulary (BNF)] were:

- Information provided on cautions and contraindications
- Warnings provided on interactions
- Identifiable controls on the amount of medicine which can be ordered

Additional information or images of interest identified during data capture was also recorded. These included

multiple-choice health check questions, certificates of authenticity or photographs of pharmacies and buildings purporting to be the pharmacy, and offers of free samples of medicines. Regulatory status was identified by the presence or absence of a correctly linked regulatory logo.

Development of search strategy

Google.co.uk and Yahoo.co.uk were selected as they are the most popular search engines [14]. Different search terms were tested to identify the largest number of hits. The search terms chosen were 'buy [generic name] [brand name]' found to produce the largest number of hits.

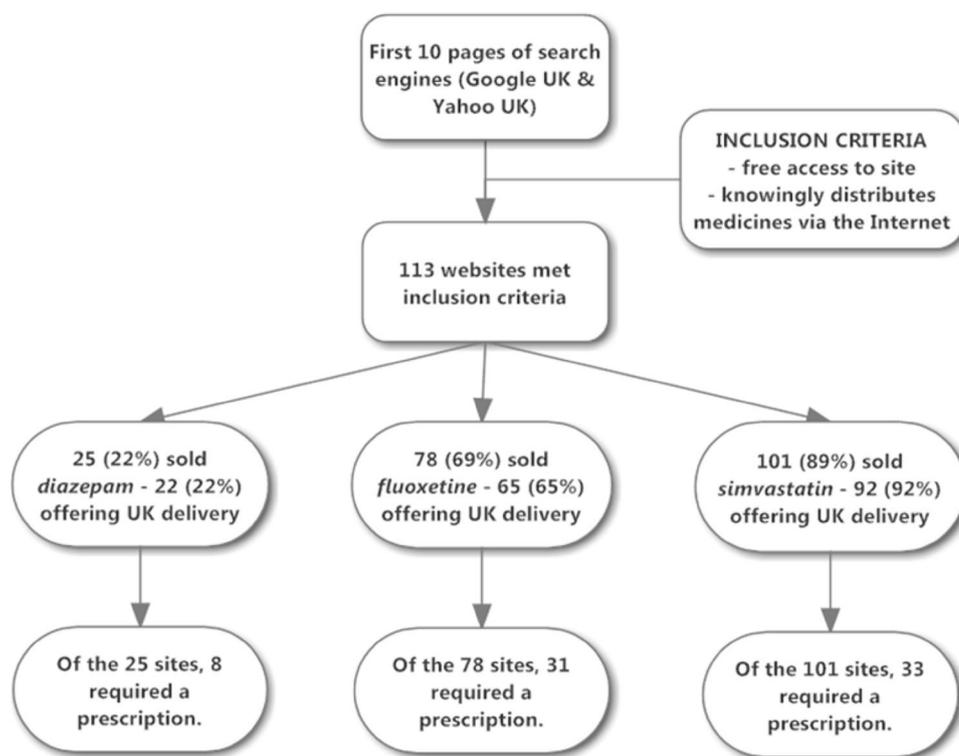
Pilot

The spreadsheet for assessing the websites was piloted on 11 websites resulting in some minor adjustments. Some websites were identified as sharing the same telephone number; however, these were not excluded as they had different URLs and site names. The pilot revealed just five websites selling diazepam; consequently, the search terms were reconsidered. Removal of the brand name broadened the search, and including the word 'pharmacy' also yielded more.

Process

The researcher conducted three separate searches using 'buy fluoxetine', 'buy diazepam' and 'buy simvastatin'; these were considered by the research team to be typical terms for a potential buyer. Only websites which met particular criteria were included: free access, listed within the first 100 hits, specifically designed to distribute medicines online. The first 100 hits comprised 10 pages of search results; this was deemed by the research team suitable as consumers are unlikely to look beyond this. All websites, including sponsored listings, satisfying the criteria were recorded in a spreadsheet. Any telephone numbers published were dialled to ensure that they were live. Based on the country in which the website stated it was located, its regulatory status was confirmed.

Fig. 1 Flowchart illustrating the general findings of the searches



Quality assurance

Two researchers conducted this experiment separately, and the data collected were then independently cross-checked to ensure that the results were consistent and satisfied all criteria.

Data analysis

The frequencies and percentages for each variable were calculated. Fisher's exact test was used to compare the adherence to criteria for regulated online pharmacies (those registered and linked with any national regulatory body) and non-regulated sites. Data analysis was performed using SPSS version 18.

Results

In total, 100 websites offered UK delivery out of 113 delivered by the search engines that satisfying the criteria identified, Fig. 1 details the findings.

It can be seen from Table 2, which summarises the data for all 113 websites, that whilst they all had at least one form of payment and most could deliver to the UK, a large proportion did not state the country of origin or the name of the owner of the pharmacy. Less than a third of the sites provided a logo to demonstrate that

they were regulated, and a fifth of these did not link to the regulatory body.

The adherence for the clinical criteria were compiled and a sample of the results is shown in Table 3; they fairly represent the full range of results derived from the 113 websites. The checking for interaction with other medication is an example of poor adherence to the clinical criteria. The websites asking the consumers for pregnancy status or other medical conditions were considered as examples of high adherence. However, even with high adherence websites; it is still adequate for patients' safety.

Of 25 sites offering diazepam, only eight imposed a quantity limit. For fluoxetine and simvastatin, it was possible to order 200 or more, with some websites offering a quantity-based discount.

Table 4 provides a comparison of website criteria for the regulated and non-regulated websites. The significant results are that the unregulated websites are less likely to include the name, owner, telephone number and address, and are less likely to request a prescription before sale. Working telephone numbers included in unregulated websites are slightly more than that in those regulated. Unregulated sites are more likely than regulated sites to offer e-checks (direct electronic transfer of money from consumer bank account) as a payment option as these do not require the pharmacy to declare an address.

Table 5 provides a comparison of clinical criteria between regulated and unregulated sites. Only results

Table 2 Frequencies for adherence to quality criteria

Criteria	<i>n</i> = number of online pharmacies (%)			
	Diazepam <i>n</i> = 25	Fluoxetine <i>n</i> = 78	Simvastatin <i>n</i> = 101	All <i>n</i> = 113
Payment				
Debit/credit card	22 (88)	71 (91)	94 (93.1)	104 (92)
Bank transfer	9 (36)	11 (14.1)	16 (15.8)	20 (17.7)
E-check ^a	6 (24)	27 (34.6)	30 (29.7)	32 (28.3)
Cheque	3 (12)	12 (15.4)	14 (13.9)	14 (12.4)
Country				
Not stated	12 (48)	26 (33.3)	38 (37.6)	44 (38.9)
UK	7 (28)	9 (11.5)	15 (14.9)	17 (15)
USA	1 (4)	8 (10.3)	7 (6.9)	10 (8.8)
Canada	1 (4)	22 (28.2)	22 (21.8)	22 (19.5)
Australia	0 (0)	0 (0)	1 (1)	1 (0.9)
Other	4 (16)	13 (16.7)	18 (17.8)	19 (16.8)
UK delivery available	22 (88)	65 (83.3)	92 (91.1)	100 (88.5)
Telephone number present	22 (88)	61 (78.2)	85 (84.2)	93 (82.3)
Telephone number live	18 (81.8)	53 (66.9)	76 (74.4)	82 (72.6)
Name of pharmacy	16 (64)	45 (57.7)	57 (56.4)	63 (55.8)
Address of pharmacy	10 (40)	41 (52.6)	53 (52.5)	55 (48.7)
Owner of pharmacy	5 (20)	7 (9)	14 (13.9)	14 (12.4)
Prescription required for sale	8 (32)	31 (39.7)	33 (32.7)	33 (29.2)
Faxed	2 (25)	23 (74.2)	24 (72.7)	24 (72.7)
Emailed	2 (25)	19 (61.3)	20 (60.6)	20 (60.6)
Posted	6 (75)	25 (80.6)	25 (75.8)	25 (75.8)
Health screen before sale	2 (8)	27 (34.6)	38 (37.6)	43 (38.1)
Free type	2 (100)	26 (96.3)	35 (92.1)	40 (93)
Set answers	2(100)	10 (37)	17 (44.7)	19 (44.2)
Registration logo present	6 (24)	29 (37.2)	35 (34.7)	35 (31)
General Pharmaceutical Council (GPhC)	5 (83.3)	6 (20.7)	11 (31.4)	11 (31.4)
Verified Internet Pharmacy Practice Sites (VIPPS)	1 (16.7)	1 (3.4)	1 (2.9)	1 (2.9)
Canadian International Pharmacy Association (CIPA)	0 (0)	20 (69)	21 (60)	21 (60)
Other	0 (0)	2 (6.9)	2 (5.7)	2 (5.7)
Logo is linked to regulatory body	5 (83.3)	23 (79.3)	28 (80)	28 (80)

^a A directly electronic transfer of money from current bank account

where significant differences were identified are included and these were found only for fluoxetine and simvastatin. It can be seen that unregulated sites seem to provide more clinical information than regulated sites.

Additional information of interest

It was noted by the researchers that screening questionnaires which included multiple-choice questions often had the 'right' answer pre-selected, thereby allowing the consumer to complete the questionnaire without reading it or

providing personal information. It was not possible to determine whether pre-screening questionnaires were scrutinised by a healthcare professional. Some sites offered customers free introductory samples of other types of medicine like 100 mg Viagra.

Moreover, Fig. 2 provides examples of certificates viewed after clicking a link embedded in a regulatory logo published on regulated online pharmacies' websites. A number of unregulated sites provided unverifiable photographs of the pharmacy to provide some legitimacy (Fig. 3).

Table 3 A sample of poor, middle and good adherence to criteria for diazepam, fluoxetine and simvastatin

	Criteria	<i>n</i> = number of online pharmacies (%)
Diazepam <i>n</i> = 25	Chronic psychosis	0 (0)
	Identified whether patient co-prescribed beta-blockers?	0 (0)
	Identified whether patient co-prescribed fluvoxamine	2 (8)
	Identified whether patient co-prescribed rifampicin	2 (8)
	Identified whether patient co-prescribed clozapine	3 (12)
	Asked for history of any respiratory disease	8 (32)
	Restriction on quantity that could be ordered per a transaction	8 (32)
	Asked for pregnancy status	9 (36)
Fluoxetine <i>n</i> = 78	Identified whether patient co-prescribed antiepileptics	0 (0)
	Identified whether patient co-prescribed nifedipine	0 (0)
	Identified whether patient co-prescribed tamoxifen	0 (0)
	Asked for history of mania	14 (17.9)
	Asked for alcohol consumption	15 (19.2)
	Identified whether patient co-prescribed carbamazepine	15 (19.2)
	Identified whether patient co-prescribed MAOIs	36 (46.2)
	Asked for diabetes mellitus	37 (47.4)
Simvastatin <i>n</i> = 101	Asked for pregnancy status	44 (56.4)
	Identified whether patient co-prescribed alitretinoin	0 (0)
	Identified whether patient co-prescribed amlodipine	0 (0)
	Identified whether patient co-prescribed dasatinib	0 (0)
	Identified whether patient co-prescribed myopathy	15 (14.9)
	Identified whether patient co-prescribed voriconazole	16 (15.8)
	Identified whether patient co-prescribed fibrates	24 (23.8)
	Identified whether patient co-prescribed ciclosporin	42 (41.6)
Identified whether patient co-prescribed coumarins	42 (41.6)	
	Asked for liver disease	64 (63.4)

Discussion

It is evident that the three POMs under consideration from 113 websites in this study (diazepam, fluoxetine and simvastatin) are obtainable with ease online and often without a valid prescription, health professional scrutiny or adherence to regulatory standards. There is also evidence of attempts made by some unregulated online pharmacies to legitimise their appearance by the use of registration logos that are not linked or registered with any national regulatory body, pictures and unfiltered clinical information. To improve safety of on-line purchases of medicines patients should be encouraged to use websites which are clearly regulated. If they are at all unsure then confirming that contact details are real and telephone lines are live may help. Websites which illegally use regulation logos should be actively closed down.

Whilst the data was confirmed by duplicate data collection, no medicine purchases were actually made and this may represent a limitation, as it is therefore not possible to

know if the consumer would have been provided with any extra clinical information about the medicine purchased, whether the products were counterfeit or even whether medicines would have been sold when they were clearly clinically inappropriate. The results of this study are based on three drugs only and therefore cannot be generalised beyond these.

Valid prescriptions

Despite the legal requirement for an authentic prescription in the UK [15] over two-thirds of the websites in this study were willing to supply consumers with POMs without a prescription. Of the remaining third of the websites, almost three-quarters would sell based on a faxed prescription, and approximately two-thirds with an emailed prescription. This is also alarming, as a consumer could fax or email the prescription to many different pharmacies, which contravenes the definition of a valid prescription [15].

Table 4 A comparison of adherence to quality criteria, between regulated and non-regulated websites

Criteria	<i>n</i> = number of online pharmacies (%)		<i>P</i> (Fisher's Exact)
	Regulated ⁺ <i>n</i> = 28	Non-regulated ⁺ <i>n</i> = 85	
Payment			
Debit/credit card	28 (100)	76 (89.4)	0.109
Bank transfer	2 (7.1)	18 (21.2)	0.151
E-check ^a	2 (7.1)	30 (35.3)	0.003
Cheque	11 (39.3)	3 (3.5)	<0.001
Diazepam available	5 (17.9)	20 (23.5)	0.609
Fluoxetine available	23 (82.1)	55 (64.7)	0.102
Simvastatin available	28 (100)	73 (85.9)	0.036
Country			
Not stated	0 (0)	44 (51.8)	
UK	10 (35.7)	7 (8.2)	
USA	1 (3.6)	9 (10.6)	
Canada	13 (46.4)	9 (10.6)	
Australia	0 (0)	1 (1.2)	
Other	4 (14.3)	15 (17.6)	
UK delivery available	26 (92.9)	74 (87.1)	0.513
Telephone number present	28 (100)	65 (76.5)	0.003
Working tel. no.	24 (85.7)	58 (89.2)	0.729
Name of pharmacy	27 (96.4)	36 (42.4)	<0.001
Owner of pharmacy	11 (39.3)	3 (3.5)	<0.001
Address of pharmacy	28 (100)	27 (31.8)	<0.001
Prescription required for sale	22 (81.5)	11 (12.9)	<0.001
Faxed	15 (68.2)	9 (81.8)	0.681
Emailed	11 (50)	9 (81.8)	0.132
Posted	21 (95.5)	4 (36.4)	0.001
Health screen before sale	13 (46.4)	30 (35.3)	0.370
Free type	12 (92.3)	28 (93.3)	1.000
Set answers	5 (38.5)	14 (46.7)	0.743

^a A directly electronic transfer of money from current bank account

Regulated⁺ means those registered and linked with any national regulatory body

Professional scrutiny and quantities

On some websites the consumer was requested to complete a questionnaire; this is intended to give confidence to consumers regarding regulatory standards. However, it is possible to bypass the questionnaire through following the default process (leaving the default responses in place) without entering any patient-specific information; hence this is a flawed process which can result in the consumer obtaining a medicine that is contra-indicated or that interacts with other medications. Furthermore, for these websites, it was not possible to confirm whether the screening process had been scrutinised by a qualified healthcare professional. It is again possible that such sales are automatically approved and questionnaires ignored; thus raising the prospect that such internet pharmacy sales are unsafe and could compromise patient health.

The websites assessed in this study often allowed the consumer to decide upon the quantities of the requested medicines. Long-term non-monitored consumption is not recommended [20]. Of the 25 sites selling diazepam, two-thirds did not impose any such limits on quantity. Thus, it is possible for consumers to continually self-medicate which, with benzodiazepines, could result in, or further contribute to, physical and psychological dependence and tolerance [20, 21].

Fluoxetine and simvastatin were also available online in large quantities and some offered discounts dependent on the volume purchased. Discount online purchasing encourages the consumer to stockpile medicines which facilitates over use.

Consumers are also induced to place an order by certain online pharmacies through the offer of free tablets (should they make a purchase). This represents an additional safety

Table 5 A comparison of adherence to clinical criteria, between regulated and non-regulated websites

Criteria	<i>n</i> = number of online pharmacies (%)		<i>P</i> (Fisher's Exact)
	Regulated ^a <i>n</i> = 28	Non-regulated ^a <i>n</i> = 73	
Simvastatin			
Prescribed boceprevir	3 (10.7)	0 (0)	0.020
Prescribed ciclosporin	7 (25)	35 (47.9)	0.044
Prescribed coumarins	7 (25)	35 (47.9)	0.044
Prescribed diltiazem	0 (0)	25 (34.2)	<0.001
Prescribed erythromycin	6 (21.4)	33 (45.2)	0.039
Prescribed fluconazole	0 (0)	18 (24.7)	0.003
Consumes grapefruit juice	3 (10.7)	34 (46.6)	0.001
Prescribed indinavir	0 (0)	15 (20.5)	0.010
Prescribed lopinavir	0 (0)	14 (19.2)	0.010
Prescribed rifampicin	0 (0)	11 (15.1)	0.032
Prescribed ritonavir	3 (10.7)	27 (37)	0.014
Prescribed telaprevir	3 (10.7)	0 (0)	0.020
Prescribed verapamil	1 (3.6)	29 (39.7)	<0.001
Prescribed voriconazole	0 (0)	16 (21.9)	0.005
	<i>n</i> = 23	<i>n</i> = 55	
Fluoxetine			
Prescribed clopidogrel	5 (21.7)	0 (0)	0.002
Prescribed duloxetine	3 (13)	0 (0)	0.023
Prescribed MAOIs	6 (26.1)	30 (54.5)	0.026

^a A site's regulation status was determined via the presence/absence of a correctly linked regulatory logo

concern, as neither their active ingredients nor their dosage are made clear to the consumer at the point of sale.

Regulatory standards and clinical criteria

The country of origin was not disclosed by over a third of the websites studied, which has ramifications for tracing the medicines' sources, potentially important as unregulated sites may follow lower quality assurance standards and supply medicines to countries that are struggling to maintain higher standards of safety and medical efficacy. Some of the websites, although outwardly different, gave the same addresses and photographs of headquarters to provide confidence to consumers.

A lack of a valid or live contact telephone number provides no recourse for consumers. It would therefore seem appropriate for patients to test any provided telephone numbers for authenticity prior to making a purchase. This in itself may not, however, provide any further reassurance as fraudulent suppliers could populate the line with an automated answering service. The fact that some websites shared the same telephone number indicates that perhaps a single company was operating under several different names to capture a greater market share.

Interestingly, the non-regulated sites appeared to try to satisfy the clinical criteria, often more than the regulated

ones. Although surprising, regulated online pharmacies tend to assume that the necessary criteria have been satisfied by the POM prescriber, whereas the non-regulated ones (in particular those not requiring a prescription) are more likely to offer safety information, listing cautions and side-effects. This approach may be utilised to provide the unwary consumer with greater confidence in the provenance of the site. Unfortunately, such information tends not to be prominent, presented in a font which is smaller than the rest of the text on the page and therefore is difficult to read. A lay consumer may therefore proceed with a purchase without sufficient clinical knowledge. Future work could focus on this information, in terms of ease of access and readability for the lay person.

This study has confirmed many findings documented in the literature, but it has also clarified how easily medicines (including POMs) may be obtained online with or without prescription. It has confirmed that many websites are reluctant to reveal their real-world location, which means that the consumer cannot be assured of the regulatory framework under which the pharmacy is operating. POMs are readily available online for UK consumers, whether or not they hold a valid prescription. Raine et al. [9] showed that controlled opioids can easily be bought online, and this study shows that medicines with other important clinical concerns can also be purchased with little difficulty or



Fig. 2 Certificates displayed on certain websites when clicking on their 'regulatory' logos

scrutiny. It also found that unsuitably large quantities of medicines (including POMs) can be ordered online with unverified patient questionnaires representing no obstacle to access. This concurs with the findings of Gallagher et al. [11], who investigated online sales of sildenafil; they too were unable to verify whether online questionnaires were scrutinised by healthcare professionals.

This study represents a contribution to the literature, as the criteria for screening these 113 websites, is based on the standards of well-recognised international regulatory bodies which enabled the current study to distinguish between unregulated and regulated websites. This study, as did Raine et al. [9] and Gallagher et al. [11], has highlighted certain safety issues. The availability of diazepam,

Headquarters

WikiPharmacy's headquarters is located in downtown San Francisco office.



101 California Street

101 California Street,
San Francisco, CA,
94111

Jacksonville Regional Office

Jacksonville Regional Office is responsible for delivering ord We also manage Customer Service Department here.



4651 Salisbury Road

4651 Salisbury Road,
Jacksonville, FL,
32256

Houston Regional Office

WikiPharmacy International Customer Service and Sales Departm customers, providing the best possible Customer Support Servic



1200 Smith Street

1200 Smith Street,
Houston, TX,
77002

Fig. 3 Photos shown on certain websites to illustrate their location

fluoxetine and simvastatin without prescription or adequate professional oversight represents a threat to the health and safety of uninformed consumers.

Recommendations for regulators and policymakers

Patient education regarding internet pharmacies as a whole should be targeted, emphasising the dangers of bypassing doctors or pharmacists; this has been highlighted and recommended in previous research [14, 17, 18, 22, 23]. This study was intended to rectify this health concern through

presenting a set of guidelines for UK consumers to facilitate safe online purchasing. This set of guidelines would ideally take the form of a checklist of website features, which the consumer could use to assess an online pharmacy (see Table 5, 'regulated' column). Furthermore, it has emphasised the importance to consumers of using sites bearing the GPhC Internet Pharmacy logo which, when clicked, shows proof of genuine registration. The awareness of the general public of the provenance provided by this logo is, however, unknown.

While the checklist should greatly assist consumers in purchasing medications with confidence online, it is also important for healthcare professionals to become more proactive and offer practical advice to patients. GPs and pharmacists should advise their patients not to purchase medicines from unregulated sites, not to be induced by discounts, and not to visit any site that sells POMs without a prescription. Such a checklist should be made available in pharmacies and GP surgeries, and the general public should be made aware of the GPhC register and its logo.

Conclusions

UK consumers can easily purchase diazepam, fluoxetine and simvastatin from online pharmacies, even without a prescription; these can be found through popular internet search engines. These medicines, which should not be consumed without proper supervision, are thus easy to access, despite having particular clinical implications. Furthermore, they are widely available from unregulated online pharmacies, which represent a particular health risk. Accredited and regulated pharmacies offer certain advantages to consumers, principally related to buying with confidence, but unregulated online pharmacies represent a danger to patients who, for various reasons, seek to manage their own medication. To address this, a checklist of guidelines, in plain language, should be compiled to aid UK consumers in making safe online purchases from web-based pharmacies; such a checklist could be derived from the findings of this study.

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