



Pharmacy Practice

ISSN: 1885-642X

ISSN: 1886-3655

Centro de Investigaciones y Publicaciones Farmaceuticas

Lombardo, Simona; Marino, Franca; Cosentino, Marco  
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Pharmacy Practice, vol. 17, no. 4, 1593, 2019, October-December  
Centro de Investigaciones y Publicaciones Farmaceuticas

DOI: 10.18549/PharmPract.2019.4.1593

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## Original Research

# A nationwide web-based survey of a sample of Italian community pharmacists' perceptions and opinions about online sales of medicines and falsified drugs

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Received (first version): 15-Jun-2019

Accepted: 27-Oct-2019

Published online: 30-Nov-2019

## Abstract

**Background:** Throughout Europe, legal online pharmacies increasingly sell online drugs as well as other products such as dietary supplements. Online sale of pharmaceuticals however is closely connected to the phenomenon of drug falsification.

**Objective:** The aim of this study was to assess the opinions of a sample of Italian community pharmacists towards the sale of pharmaceuticals on the web, as well as their knowledge and experience with falsified drugs.

**Methods:** A self-administered questionnaire was distributed by means of an online platform between October 2016 and January 2017. Collected information included: demographics, workplace and role, opinions towards the online sale of pharmaceuticals, whether the pharmacy has a website, knowledge and opinions about falsified drugs.

**Results:** A total of 668 community pharmacists completed the questionnaire (mean age: 48.5, SD 12.4 years, 52.3% women). Favourable opinions about online sale of pharmaceuticals were expressed by 4.9% of participants for prescription drugs, 25.4% for nonprescription drugs, and 51.6% for other products. Favourable opinions occurred more often among males and owners/directors of pharmacies in comparison to females and employees, and among pharmacists working in pharmacies with websites doing e-commerce. Knowledge about falsified drugs was limited, with 24.5% of respondents failing to indicate that falsified drugs may contain less or different ingredients, 46.4% less and/or different excipients, and 72.3% ignoring that falsified drugs may be lethal. One in 3 respondents didn't know about falsified drugs in Italy, however 51 participants had previous experience with falsified drugs and 21 provided specific information.

**Conclusions:** Italian community pharmacists have low confidence in the online sale of pharmaceuticals, as well as alarmingly limited knowledge about falsified drugs, even if many of them reported previous experiences. Results may support targeted interventions to increase pharmacists' knowledge about pharmaceuticals and the web, as well as concerning falsified drugs, and suggest community pharmacies as key components of integrated systems aimed at monitoring falsified drugs.

## Keywords

Pharmaceutical Services; Online; Internet; Commerce; Counterfeit Drugs; Prescription Drugs; Nonprescription Drugs; Pharmacies; Pharmacists; Attitude; Attitude of Health Personnel; Surveys and Questionnaires; Italy

## INTRODUCTION

In July 2011, the Council of the European Union and the European Parliament adopted the Falsified Medicines Directive (Directive 2011/62/EU).<sup>1</sup> The directive introduced new unified measures to ensure medicine safety and rigorously control the trade in medicines, with the ultimate goal of protecting public health. Member states were expected to transpose Directive 2011/62/EU into national laws by 2 January 2013. Italy in particular implemented the EU directive in February 2014 with the Legislative Decree n. 17 which introduced substantial legislative changes about falsified drug, drug brokerage, drug shortage, intermediary distribution of drugs.<sup>2</sup> The same Decree also allowed legal online pharmacies to sell online non-prescription and over-the-counter (OTC) drugs, while the online sale of other products (e.g. dietary supplements) was already permitted.<sup>2</sup>

Before Directive 2011/62/EU, the European Union lacked common rules on the online sale of pharmaceuticals, and

individual countries regulated such sales independently. For example, in Italy online sales of prescription and over-the-counter (OTC) drugs were forbidden by the code of ethics of the Federation of Professional Associations of Pharmacists. Indeed, the sale of drugs online has usually been perceived in Italy as a public health risk, mostly because of the prevalence of misleading information and deceptive practices by unauthorized websites selling pharmaceutical products.<sup>3-6</sup>

Illegal websites indeed often sell falsified medicines.<sup>4-6</sup> Online sale of pharmaceuticals is closely connected to the phenomenon of drug falsification. Falsified medicines are fake medicines which may be contaminated, or contain any different or no active ingredient, or may contain the right active ingredient but at the wrong dose, being thus harmful for consumers.<sup>7</sup> According to a report released by the Centre for Medicines in the Public Interest, projects falsified drug sales to reach USD 75 billion in 2010 in USA alone, a 92 % increase from 2005.<sup>8</sup> In 2011, the rough estimated market size of falsified medicines was around USD 200 billion, ranking first place ahead of prostitution (USD 190 billion) and marijuana (USD 140).<sup>9</sup> High revenues on falsified medicines make them very more attractive to criminal networks. According to the International Institute of Research Against Counterfeit Medicines, for USD 1,000 invested, the trafficking of falsified currency or of heroin

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would bring a return of USD 20,000, of falsified cigarettes, USD 43,000, and falsified drugs, between USD 200,000 and USD 450,000.<sup>10</sup> In 2017, Interpol's Operation Pangea X involved 197 police, customs and health regulatory authorities from 123 countries, leading to 25 million illicit and falsified medicines seized worldwide, seizure of more than USD 51 million worth of potentially dangerous medicines, 3,584 websites taken offline and the suspension of more than 3,000 online adverts for illicit pharmaceuticals.<sup>11</sup> The close connection between traffic of falsified medicines and the Internet may therefore likely affect the public perception and opinions about online sale of drugs by legal online pharmacies.

In Italy, the number of legal online pharmacies raised from just 54 at the beginning of 2016 to 694 in July 2018.<sup>12</sup> Online pharmacies nonetheless still represent a very small fraction of Italian community pharmacies, which are about 18,000, possibly suggesting pharmacists' and/or consumers' distrust towards the online sale of medicines.<sup>13</sup> The present study was therefore undertaken to assess the opinions of a sample of Italian community pharmacists towards the online sale of prescription drugs, non-prescription drugs and other products, as well as their knowledge and experience with falsified drugs. The existence and characteristics of community pharmacy websites and pharmacists' beliefs regarding their customers' use of Internet to search for health related information and to buy medicines were also investigated.

## METHODS

### Participants

A survey was conducted between October 2016 and January 2017 in collaboration with the online newsletter Farmacista33 (<http://www.farmacista33.it/>). An online questionnaire was established (<https://it.research.net/r/W37MCMD>) and advertised through an online press release, which was e-mailed to all the about 35000 pharmacists subscribing the newsletter. The press release was included in five daily newsletters sent out over the study period. The survey was conducted according to the Italian Code regarding the protection of personal data (<http://garanteprivacy.it>) and all the participants consented to the use of the information, provided in anonymous form, for the purposes of the present study.

### Questionnaire

The questionnaire was developed from a previous one successfully used in a previous survey.<sup>14</sup> The questionnaire included three sections and collected data on the following:

- Respondents' age and sex, the role they play in their pharmacy, and the pharmacy type and location.
- Opinions towards the online sale of prescription drugs, non-prescription drugs and other products.
- Whether the respondent's pharmacy has a website and its characteristics.
- Knowledge and opinions about falsified drug.

In compliance with Italian rules regarding questionnaire-based surveys, all participants consented to the use of the information they provided.

### Analysis

Collected data were recorded in Microsoft Excel (Version 14.0.0 for Mac). Records were validated according to International Quality Standard ISO 2859 guidelines (ISO 2859-4:2002) and the data set was considered suitable for analysis. Before analysis, each record was checked for intra- and inter-section coherence. After a descriptive analysis of the data, a statistical approach was selected based on the distribution of responses. Proportions were compared using contingency table analysis by means of chi-square test and Fisher's exact test to estimate odds ratios with 95% confidence intervals. Calculations were performed using GraphPad Prism version 5 for Windows (GraphPad Software, San Diego, CA, USA).

## RESULTS

### Participants

A total of 668 community pharmacists completed the questionnaire. The respondents comprised 349 women (52.3%) and 318 men (47.7%). One respondent did not indicate the gender. The mean age was 48.5 (SD 12.4) years (range: 23–88 years). Most respondents were in the age range 31–40 (141, 21.1%), 41–50 (150, 22.6%), and 51–60 (209, 31.4%). Respondents <30 years old were 61 (9.2%), and >61 were 104 (15.6%). Three respondents did not indicate the age.

Regarding pharmacy type, 618 (92.5%) respondents worked in pharmacies and 49 (7.3%) in para pharmacies (pharmacies which sell only non-prescription and OTC drugs as well as nutritional supplements). One respondent did not indicate the pharmacy type. The respondent was a pharmacy owner/director in 375 cases (56.1%), and a pharmacist employee in 292 cases (43.9%). Pharmacy was located in a town with less than 5000 inhabitants in 162 cases (24.3%), with 5000–10000 inhabitants in 102 cases (15.3%), with 10000–20000 inhabitants in 180 cases (27.0%), and with more than 20000 inhabitants in the remaining 223 cases (33.4%). One respondent did not indicate personal position and inhabitants of town. Most pharmacies were in Northwest Italy (253, 38.4%) and in Northeast Italy (138, 21.0%). Pharmacies were in Central and South Italy respectively in 111 cases (16.9%) and 93 cases (14.1%). Pharmacies in Insular Italy were 63 (9.6%). Ten respondents did not indicate location of the pharmacy.

### Opinions towards the online sale of pharmaceuticals

Only 32 (4.9%) participants favourably viewed the online sale of prescription drugs. Participants who expressed favourable opinions towards the online sale of nonprescription drugs were 166 (25.4%), and towards the online sale of other products (e.g. dietary supplements) they were 337 (51.6%) ( $p < 0.0001$ ). There was therefore a trend towards increasing favourable opinions across the three categories of pharmaceuticals ( $p < 0.0001$ ).

Table 1. Favourable opinions towards the online sale of pharmaceuticals.

	prescription drugs			nonprescription drugs			other products		
	n (%)	p-value	odds ratio [95%CI]	n (%)	p-value	odds ratio [95%CI]	n (%)	p-value	odds ratio [95%CI]
All respondents (653) (a)	32 (4.9)			166 (25.4)			337 (51.6)		
Gender									
Female (340)	12 (3.5)	0.104	0.536 [0.257:1.116]	74 (21.8)	0.031	0.668 [0.469:0.952]	151 (44.4)	<0.001	0.545 [0.400:0.744]
Male (313)	20 (6.4)			92 (29.4)			186 (59.4)		
Age (years)		0.169 (b)			0.062 (b)			0.031 (b)	
≤30 (61)	6 (9.8)			23 (37.7)			37 (60.6)		
31-40 (141)	4 (2.8)			39 (27.6)			78 (55.3)		
41-50 (150)	9 (6.0)			30 (20.0)			72 (48.0)		
51-60 (209)	8 (3.8)			48 (23.0)			96 (45.9)		
≥61 (104)	3 (2.9)			25 (24.0)			52 (50.0)		
Role									
Owner/Director (369)	21 (5.7)	0.361	1.498 [0.710:3.160]	105 (28.4)	0.046	1.454 [1.012:2.089]	203 (55.0)	0.049	1.369 [1.004:1.867]
Employee (284)	11 (3.9)			61 (21.5)			134 (47.2)		
Location of pharmacy (town inhabitants)		0.815 (b)			0.239 (b)			0.201 (b)	
<5000 (159)	7 (4.4)			36 (22.6)			76 (47.8)		
5000-10000 (96)	5 (5.2)			19 (19.8)			45 (46.9)		
10001-20000 (178)	9 (5.0)			54 (30.3)			100 (56.2)		
>20000 (220)	11 (5.0)			57 (25.9)			116 (52.7)		
Location of pharmacy (region)		0.883			0.420			0.905	
Northwest (248)	11 (4.4)			62 (25.0)			126 (50.8)		
Northeast (132)	6 (4.5)			37 (28.0)			72 (54.5)		
Central (111)	3 (2.7)			21 (18.9)			57 (51.3)		
South (92)	5 (5.4)			27 (29.3)			44 (47.8)		
Insular (61)	2 (3.3)			14 (22.9)			31 (50.8)		

Notes: (a) 15 missing answers; (b) Chi-square test for trend.

Table 1 shows the association between favourable opinions towards the online sale of pharmaceutical products and respondent characteristics. Online sale of prescription drugs was not associated with any respondent characteristics. On the contrary, favourable opinions towards the online sales of nonprescription drugs and of other products were associated with male sex (29.4% vs 21.8% among females, and 59.4 vs 44.4% among females, respectively), and with being owner/director of the pharmacy (28.4% vs 21.5% among employees, and 55.0 vs 47.2% among employees, respectively). Favourable opinions towards the online sales of other products was also associated with younger age (<40 years old vs >41 years old,  $p=0.027$ , odds ratio [95%CI]: 1.467 [1.047-2.056]). Location of pharmacy had no association with personal opinions, either in terms of town inhabitants or in terms of Italian macro-regions (Table 1).

#### Pharmacy websites and e-commerce

Most of respondents (338, 50.6%) were working in a community pharmacy that had an official website. Among these respondents, 136 (40.2%) stated that their pharmacy's websites were updated at least weekly, 99 (29.3%) monthly, and 71 (21.0%) less than monthly. Only 29 (17.4%) respondents declared the website had never been updated. In 3 cases, no answers were provided to the question.

In 133 cases (20.4% of total respondents, 39.3% of respondents working in a pharmacy with a website), the website was developed for e-commerce purposes (in 3 cases [2.3%] for non-prescription/OTC drugs only, in 73 cases [54.9%] for other products only, and in 51 cases

[38.3%] for both categories of pharmaceuticals; answer was missing in 6 cases [4.5%]).

Respondents working in a pharmacy which used social networks were 273 (41.8%). Most popular social networks were Facebook (225, 82.4%) and Google+ (40, 6.0%). Social network contents were updated at least weekly in 165 cases (62.7%), monthly in 64 cases (23.4%), less than monthly in 29 cases (10.6%), and never in 13 cases (4.8%). In 2 cases, no answers were provided to the question.

Among respondents working in a community pharmacy with an official website, those who did e-commerce were more favourable to the online sale of any pharmaceuticals (Figure 1). Namely, the online sale of prescription drugs was approved by 12% of those who did e-commerce vs 3% of those who did not e-commerce, that of nonprescription drugs by 49% vs 16%, and of other products by 79% vs 48%.

#### Knowledge and opinions about falsified drug

When asked about most prominent characteristics of a falsified drug, respondents indicated that production and distribution occurs violating Good Manufacturing and Distribution Practices (85% of respondents) and that falsified drugs contain less and/or different active ingredient(s) (75.5%), and less or different excipients (57.6%). About one in 4 respondents (27.7%) suggested that falsified drugs may have lethal effects.

Based on their experience, respondents believed that in Italy falsified drugs are widespread (23.0% of respondents) or not so much widespread (43.7%), while one in 3 (33.3%) didn't know (Table 2). Respondents who didn't know were more frequently females (41.5% vs 24.3% males,  $p<0.001$ ),

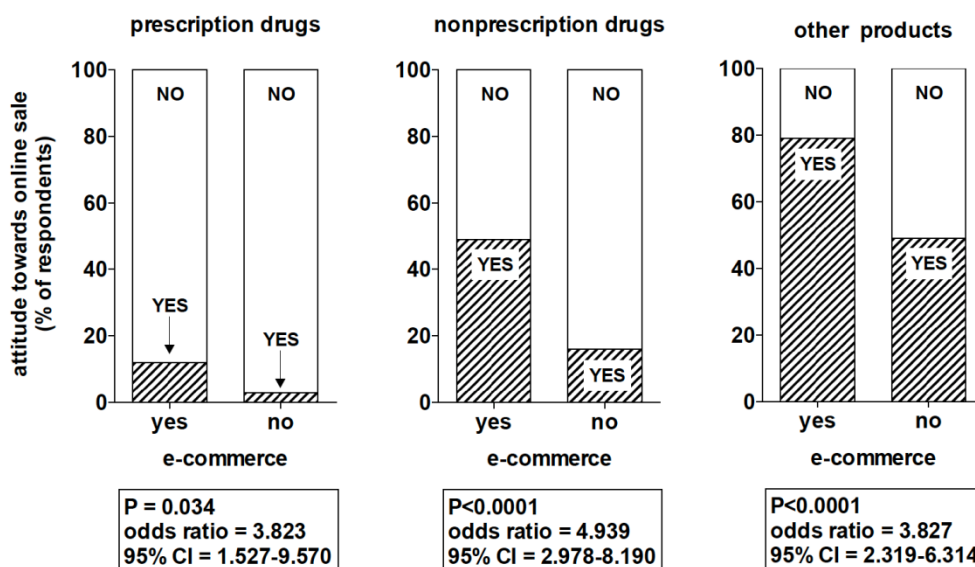


Figure 1. Favourable opinions towards the online sale of pharmaceuticals among respondents working in a community pharmacy with an official website.

On the X-axis of each graph, "yes" denotes answers provided by respondents working in pharmacies which do e-commerce, while "no" indicates answers from those working in pharmacies with websites but not doing e-commerce.

<30 years old (48.9% vs 31.6% of those >31 years old,  $p=0.042$ ), and employees (38.9% vs 28.9% owners/directors,  $p=0.044$ ).

Among participants, 51 (7.6%) reported previous experience with falsified drugs, however only 21 provided specific information (Table 3), including 7 cases of falsified

drugs identified by name, 10 cases of suspected falsified however without clear identification of the product(s), and 4 cases reported by patients.

Most respondents believed that customers of their pharmacies use the Internet to search for information about drugs or disease often (55.5% and 75.7% of

Table 2. Opinions and previous experiences about falsified pharmaceuticals.					
	widespread n (%)	uncommon n (%)	don't know n (%)	p-value (b)	odds ratio [95%CI]
A. Drugs					
All respondents (405) (a)	93 (23.0)	177 (43.7)	135 (33.3)		
Gender					
Female (212)	48 (22.6)	76 (35.9)	88 (41.5)	0.0003	0.454 [0.296:0.696]
Male (193)	45 (23.3)	101 (52.3)	47 (24.4)		
Age (years)				0.607 (c)	
≤30 (45)	8 (17.8)	15 (33.3)	22 (48.9)		
31-40 (90)	20 (22.2)	47 (52.2)	23 (25.6)		
41-50 (83)	17 (20.5)	37 (44.6)	29 (34.9)		
51-60 (121)	34 (28.1)	49 (40.5)	38 (31.4)		
≥61 (64)	13 (20.3)	28 (43.8)	23 (35.9)		
Role				0.044	1.566 [1.033:2.374]
Owner/Director (225)	53 (23.6)	107 (47.5)	65 (28.9)		
Employee (180)	40 (22.2)	70 (38.9)	70 (38.9)		
B. Other products					
All respondents (405) (a)	94 (23.2)	174 (43.5)	135 (33.3)		
Gender					
Female (212)	54 (25.5)	80 (37.7)	78 (36.8)	0.140	0.720 [0.475:1.092]
Male (193)	40 (20.7)	96 (49.7)	57 (29.6)		
Age (years)				0.268 (b)	
≤30 (45)	10 (22.2)	14 (31.1)	21 (46.7)		
31-40 (90)	15 (16.7)	49 (54.4)	26 (28.9)		
41-50 (83)	15 (18.1)	35 (42.2)	33 (39.7)		
51-60 (121)	43 (35.5)	48 (39.7)	30 (24.8)		
≥61 (64)	10 (15.6)	30 (46.9)	24 (37.5)		
Role				0.044	1.566 [1.033:2.374]
Owner/Director (225)	52 (23.1)	108 (48.0)	65 (28.9)		
Employee (180)	42 (23.3)	68 (37.8)	70 (38.9)		
Notes: (a) 262 missing answers; (b) "widespread"/"uncommon" vs "don't know"; (c) chi-square test for trend.					

Notes: (a) 262 missing answers; (b) "widespread"/"uncommon" vs "don't know"; (c) chi-square test for trend.



Table 3. Reported experiences involving falsified pharmaceuticals.	
<b>Falsified drugs</b>	Tadalafil (3 cases), sildenafil (2 cases), paracetamol, nandrolone
<b>Suspected falsified pharmaceuticals (no drug names)</b>	<ul style="list-style-type: none"> <li>• Cream tube with content lower than expected;</li> <li>• List of ingredients missing from the label of a galenic pharmaceutical;</li> <li>• Mineral (sodium/potassium) supplement;</li> <li>• Pharmaceuticals from Eastern Europe with additional labels and possibly not kept under proper conditions;</li> <li>• Pharmaceuticals bought in Africa with label reporting the wrong drug and/or without expected quality requirements;</li> <li>• Contraceptive pills with normal external packaging but modified internal blister;</li> <li>• Imported products, however apparently coming from an extra-EU country;</li> <li>• Dietary supplement for weight loss;</li> <li>• Falsified drug identified thanks to controls;</li> <li>• Para-pharmaceutical with altered colour.</li> </ul>
<b>Suspected cases reported by patients</b>	<ul style="list-style-type: none"> <li>• Patient reports contraceptive drug bought in another pharmacy, which contained a package insert written in Spanish;</li> <li>• Patient reports pharmaceutical products and parapharmaceuticals sold in a Chinese shop;</li> <li>• Patient shows a sildenafil-containing product bought on the web at low price and which was apparently produced in Morocco;</li> <li>• Patient shows a sildenafil-containing product bought on the web and apparently produced in Thailandia.</li> </ul>

participants, respectively) or sometimes (39.8% and 21%). Respondents also believed that pharmacy customers buy drugs on the Internet often (3.8% of participants) or sometimes (45.2%).

## DISCUSSION

The main findings of our survey are that:

- (i) only less than 5% of Italian community pharmacists favourably viewed the online sale of prescription drugs, about 25% had favourable opinions about the online sale of nonprescription drugs, and more than 50% was favourable to the online sale of other products;
- (ii) favourable opinions towards the online sale of nonprescription drugs and of other products (but not of prescription drugs) were more frequent in males and among owners/directors of pharmacies in comparison to females and employees;
- (iii) pharmacists working in pharmacies with websites doing e-commerce were more favourable to the online sale of any pharmaceuticals;
- (iv) knowledge about characteristics of falsified drugs was limited, with 25-50% of respondents failing to indicate that falsified drugs may contain less and/or different ingredients and less and/or different excipients, and only one in 4 respondents knowing that falsified drugs may be lethal;
- (v) about one in 3 respondents didn't know about circulation of falsified drugs in Italy, and they were more frequently female, <30 years old and employees, nonetheless 51 participants reported previous experience with falsified drugs and 21 were able to provide specific information.

Legal online sale of drugs in Italy has been regulated only recently. Indeed, Italy transposed Directive 2011/62/EU governing the online trade in pharmaceutical products into national law only in 2014, and allowed the online sale of nonprescription drugs, but not of prescription drugs.<sup>2</sup> This slow and cautious approach to regulation may reflect and possibly justify distrust for the Internet among pharmacists in Italy. Our survey was performed between October 2016 and January 2017, more than 2 years since the transposal of Directive 2011/62/EU into Italian law, when only 379 of the nearly 19,000 pharmacies in Italy were ready to sell drugs online.<sup>15</sup> Currently, Italian pharmacies selling drugs online are still only 694, suggesting Italian pharmacists remain distrustful towards the e-commerce.<sup>12</sup>

Anyway, circumstantial evidence may indicate that Italian pharmacists' confidence in the online selling of pharmaceutical products is nevertheless rising. In a previous survey conducted between July 2011 and February 2012 and including 239 community pharmacists in northern Italy, we found that no participants favourably viewed the online sale of prescription drugs, 10% favourably viewed the online sale of nonprescription drugs, and 28% favourably viewed the online sale of other pharmaceutical products.<sup>14</sup> Results of the present survey, performed more than 4 years later and 2 years after legalisation of online sale of pharmaceutical products in Italy, show that pharmacists' opinions became more favourable (25% favouring nonprescription drugs, 50% favouring other products, and up to 5% prescription drugs, even if in Italy they are not allowed so far). Interestingly, in the previous survey females were less favourable than males towards the online sale of pharmaceutical products, a finding which has been confirmed by the present study. Our results also show that favourable opinions towards the online sale of pharmaceuticals were associated with being owners/directors of pharmacies and working in a community pharmacy with an official website doing e-

commerce, possibly suggesting that many factors play a role in shaping opinions. Owners/directors may be motivated by direct interest in additional revenues as well as by willingness to increase visibility of their pharmacies through the use of novel technologies. On the other side, working in a pharmacy doing e-commerce likely provides direct experience of e-commerce mechanisms which in turn may result in increased confidence towards the Internet as an effective and safe tool for communication and marketing.

The Internet is increasingly used as a source of health-related information, and people using the Internet for health-related searches are estimated from 30% up to more than 70% in the United States and in Europe.<sup>16-18</sup> We previously showed that, in a sample of 1008 community pharmacy customers in Northern Italy, 26% reported used the Internet to search for information about medicines or dietary supplements, and 59% to search for information about disease.<sup>19</sup> More recently, another survey performed in Italy among a sample of 913 parents of public school students showed that more than 73% used the Internet to search for information about antibiotic use.<sup>20</sup> Use of the Internet to provide drug information may nonetheless also promote unconventional channels for drug purchase, negatively affecting the sales of traditional brick-and-mortar pharmacies.<sup>21</sup> The Internet indeed appears to contribute significantly to the abuse of prescription medications owing to the many websites offering such drugs for sale without a prescription; further, the number of people buying medicines online is steadily increasing.<sup>22,23</sup> In the present survey, when asked about their opinions concerning Internet use by customers of their pharmacies to search for information about drugs or disease, pharmacists answered that it occurred often (55.5% and 75.7% of participants, respectively) or sometimes (39.8% and 21%). Moreover, pharmacists believed that pharmacy customers buy drugs on the Internet often (3.8% of participants) or sometimes (45.2%). Results of a recent study conducted in Italy show that participants who had purchased pharmaceutical products online at least once were about 16%, while data from the "Fakeshare II" project show that in Italy about 5.8% buy habitually or often and 15.8% sometimes or rarely medicines online.<sup>24-25</sup> Community pharmacists appear therefore well aware of pharmacy customers' possible use of the Internet to retrieve disease- and drug-related information, and even to buy medicines online. They may even possibly get more insightful information on the purchase of medicines on the Internet. This finding is important especially in view of the potential key role of pharmacists to promote the appropriate use of the Internet for health-related purposes by the public, ultimately contributing to improve health outcomes.<sup>26</sup>

According to our results, Italian community pharmacists' knowledge about falsified drugs was limited. Basic characteristics of falsified drugs such as containing less and/or different ingredients and less and/or different excipients were correctly identified by only 50-75% of respondents, and only 25% included lethality among the potential risks of falsified drugs. In Italy, the Decree 17/20142 states that drugs may be falsified in relation to packaging, labelling, denomination and composition,

including dosage and excipients, origin and distribution. It is thus suggested that knowledge of regulatory references by Italian community pharmacists is at least limited. Studies addressing pharmacists' awareness about falsified drugs have been performed so far in several countries, including California, Jordan, Iran, Yemen, Sudan, and Lebanon, however to our best knowledge this is the first investigation in Italy.<sup>27-32</sup> Italian community pharmacists' need for more information and educational programmes about falsified drugs is also suggested by about 33% of our respondents (mainly younger and females) being unable to estimate the circulation of these products in Italy. Remarkably, the Italian Medicines Agency itself recently admitted that there is a dramatic lack of data about falsified drugs circulating in Italy, although circumstantial evidence suggests that they steadily raised over the last few years (from about 20000 falsified units confiscated over one week in 2010 up to about 90000 in 2017).<sup>33</sup>

On the other side, nonetheless, 51 participants to our survey reported previous experience with falsified drugs and 21 were able to provide information on specific cases, including direct observation of falsified drugs as well as suspected cases reported by patients (Table 3), suggesting that community pharmacies could effectively contribute to survey the circulation of falsified drugs. Experiences with identified falsified drugs as described by respondents included drugs for erectile dysfunction, androgenic anabolic preparations and analgesics, which are also listed (together with antiviral and anorectic drugs) among products most often confiscated in Italy during international operations against falsified drugs.<sup>34</sup>

The present survey is the first of its kind in Italy and its purpose was mainly exploratory. In particular, participants were not selected to provide a representative sample of all Italian community pharmacists. In 2016, Italian community pharmacists as a whole were about 57660, aged on average 47 years old, 69% female, and 35% pharmacy owners/directors.<sup>35</sup> The present study included 668 community pharmacists (thus about 1% of the whole reference population), aged 48.5, about 52% females, and 56% pharmacy owners/directors. Most respondents worked in pharmacies located in Northwest Italy (about 38%) and in Northeast Italy (21%). Pharmacists working in Central and South Italy were respectively about 17% and 14%, while those working in Insular Italy were nearly 10%. Distribution of community pharmacies in Italy is: Northwest 28%, Northeast Italy 18%, Central 19%, South 24%, Insular 11%.<sup>36</sup> In comparison to the reference population, our sample was thus of similar age, however with underrepresentation of females (52% vs 69%) and overrepresentation of pharmacy owners/directors (56% vs 35%). Moreover Northwest pharmacies were overrepresented (38% vs 28%), South pharmacies were underrepresented (14% vs 24%), while proportions in Northeast, Central and Insular regions were similar. Such differences should be taken in mind when applying results to specific contexts.

## CONCLUSIONS

The results of the present survey show that Italian community pharmacists still have limited confidence in the

online sale of pharmaceuticals, although favourable opinions are growing in comparison to the recent past. Fears concentrate on prescription drugs and are apparently affected by professional experience with the e-commerce. Knowledge about falsified drugs is alarmingly limited, however a significant proportion of pharmacists reported previous experience with falsified drugs. This study represent a basis for targeted interventions aimed at increasing pharmacists' knowledge and abilities about the online sales of pharmaceuticals as well as concerning falsified drugs. It is also suggested that community pharmacies should be considered as potential key components of any integrated system aimed at monitoring the circulation of falsified drugs.

## ACKNOWLEDGEMENTS

The authors are grateful to all the community pharmacists who participated in the survey and to the Edizioni Edra (<http://www.edizioniedra.it/>), which hosted the survey on its website and advertised it through its online newsletter Farmacista33 (<http://www.farmacista33.it/>).

## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

## FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## References

1. Council of the European Union and the European Parliament. Directive 2011/62/EU of the European Parliament and of the Council of 8 June 2011 amending Directive 2001/83/EC on the Community code relating to medicinal products for human use, as regards the prevention of the entry into the legal supply chain of falsified medicinal products. Official Journal of the European Union 2011; L 174: 74-87. Available at: <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:174:0074:0087:EN:PDF> (accessed Jun 15, 2019).
2. Decreto Legislativo n. 17, 19 febbraio 2014. Attuazione della direttiva 2011/62/UE, che modifica la direttiva 2001/83/CE, recante un codice comunitario relativo ai medicinali per uso umano, al fine di impedire l'ingresso di medicinali falsificati nella catena di fornitura legale. Gazzetta Ufficiale della Repubblica Italiana, Serie Generale 2014; Mar 7, 55. Available at: <http://www.gazzettaufficiale.it/eli/id/2014/03/07/14G00027/sq%20> (accessed Jun 15, 2019).
3. Levaggi R, Orizio G, Domenighini S, Bressanelli M, Schulz PJ, Zani C, Caimi L, Gelatti U. Marketing and pricing strategies of online pharmacies. *Health Policy*. 2009;92(2-3):187-96. <https://doi.org/10.1016/j.healthpol.2009.03.010>
4. Orizio G, Schulz P, Domenighini S, Caimi L, Rosati C, Rubinelli S, Gelatti U. Cyberdrugs: a cross-sectional study of online pharmacies characteristics. *Eur J Public Health*. 2009;19(4):375-377. <https://doi.org/10.1093/eurpub/ckn146>
5. Cordaro FG, Lombardo S, Cosentino M. Selling androgenic anabolic steroids by the pound: identification and analysis of popular websites on the Internet. *Scand J Med Sci Sports*. 2011;21(6):e247-e259. <https://doi.org/10.1111/j.1600-0838.2010.01263.x>
6. Orizio G, Merla A, Schulz PJ, Gelatti U. Quality of online pharmacies and websites selling prescription drugs: a systematic review. *J Med Internet Res*. 2011;13(3):e74. <https://doi.org/10.2196/jmir.1795>
7. U.S. Food & Drug Administration. Counterfeit Medicine. Available at: <https://www.fda.gov/Drugs/ResourcesForYou/Consumers/BuyingUsingMedicineSafely/CounterfeitMedicine/> (accessed Jun 15, 2019).
8. World Health Organization. Counterfeit medicines: the silent epidemic. Available at: <http://www.who.int/mediacentre/news/releases/2006/pr09/en/> (accessed Jun 15, 2019).
9. World Economic Forum, Global Risks, Sixth edition, An Initiative of the Risk Response Network, 2011, p. 23. IRACM 2015. Available at: <http://reports.weforum.org/global-risks-2011/> (accessed Jun 15, 2019).
10. Przyswa E. Counterfeit medicines and Criminal Organisations. International Institute of Research Against Counterfeit Medicines (IRACM), September 2013. Available at: <http://www.iracm.com/flip2/english/IRACM.html> (accessed Jun 15, 2019).
11. Interpol. Millions of medicines seized in largest INTERPOL operation against illicit online pharmacies. 25 September 2017. Available at: <https://www.interpol.int/News-and-media/News/2017/N2017-119> (accessed Jun 15, 2019).
12. Italian Ministry of Health. Soggetti autorizzati al commercio online di medicinali. Available: <http://www.salute.gov.it/LogoCommercioElettronico/CercaSitoEComm> (accessed Jun 15, 2019).
13. Federfarma. La farmacia italiana nel 2016. Available: [https://www.federfarma.it/Documenti/farmaci\\_italiana2016.aspx](https://www.federfarma.it/Documenti/farmaci_italiana2016.aspx) (accessed Jun 15, 2019).
14. Lombardo S, Cosentino M. [Pharmacy on line: evolution, regulatory and orientative framework normativo of the pharmacists working in Lombardia.] *RagiuFarm* 2013;137:14-22.
15. Burke A. Il flop delle farmacie online: pochi bollini rilasciati e ostacoli dalle regioni. *Farmacista 33* 2016, December 1. Available: <http://www.farmacista33.it/il-flop-delle-farmacie-online-pochi-bollini-rilasciati-e-ostacoli-dalle-regioni/politica-e-sanita/news--38250.html> (accessed Jun 15, 2019).
16. Sadasivam R, Kinney R, Lemon S, Shimada S, Allison J, Houston T. Internet health information seeking is a team sport: analysis of the Pew Internet Survey. *Int J Med Inform*. 2013;82(3):193-200. <https://doi.org/10.1016/j.ijmedinf.2012.09.008>
17. Ybarra M, Suman M. Help seeking behavior and the Internet: a national survey. *Int J Med Inform*. 2006;75(1):29-41. <https://doi.org/10.1016/j.ijmedinf.2005.07.029>
18. Andreassen HK, Bujnowska-Fedak MM, Chronaki CE, Dumitru RC, Pudule I, Santana S, Voss H, Wynn R. European citizens' use of E-health services: a study of seven countries. *BMC Public Health*. 2007;7:53. <https://doi.org/10.1186/1471-2458-7-53>



19. Lombardo S, Cosentino M. Internet Use for Searching Information on Medicines and Disease: A Community Pharmacy-Based Survey Among Adult Pharmacy Customers. *Interact J Med Res*. 2016;5(3):e22. <https://doi.org/10.2196/ijmr.5231>
20. Zucco R, Lavano F, Anfosso R, Bianco A, Pileggi C, Pavia M. Internet and social media use for antibiotic-related information seeking: Findings from a survey among adult population in Italy. *Int J Med Inform*. 2018;111:131-139. <https://doi.org/10.1016/j.ijmedinf.2017.12.005>
21. Holtgräfe C, Zentes J. Multifaceted determinants of online non-prescription drug information seeking and the impact on consumers' use of purchase channels. *Health Informatics J*. 2012;18(2):95-110. <https://doi.org/10.1177/1460458212439487>
22. Donaldson C. The number of people buying medicine online. *J R Soc Promot Health*. 2008;128(6):284. <https://doi.org/10.1177/14664240081280061203>
23. Jena AB, Goldman DP, Foster SE, Califano JA Jr. Prescription medication abuse and illegitimate internet-based pharmacies. *Ann Intern Med*. 2011;155(12):848-850. <https://doi.org/10.7326/0003-4819-155-12-201112200-00008>
24. Barbaranelli C, Podio Guidugli S, Di Giorgio D, Gramazio M. Personal determinants of purchasing of pharmaceuticals products online. *Test Psychometr Methodol Appl Psychol* 2015; 22: 1-19. <https://doi.org/10.4473/TPM22.1.1>
25. Barbaranelli C. Analysis of data on market/customers profiling. Deliverable 2.3 of the Fakeshare II Project Co-funded by the Prevention of and Fight against Crime Programme of the European Union (<http://www.fakeshare.eu/>) (accessed Oct 18, 2019).
26. Bell M, Douglas J, Cutts C. How pharmacy's adoption of social media can enhance patient outcomes. *Integrated Pharm Res Pract* 2014;3:39-47. <https://doi.org/10.2147/IPRP.S42774>
27. Law E, Youmans SL. Combating counterfeit medications: The California pharmacist perspective. *J Pharm Pract*. 2011;24(1):114-21. <https://doi.org/10.1177/0897190010380745>
28. Taleb YA, Madadha RA. Pharmacists' Awareness about Counterfeit Medications in Jordan. *J Roy Med Serv* 2013;20:57-70. <https://doi.org/10.12816/0000079>
29. Shahverdi S, Hajimiri M, Pourmalek F, Torkamandi H, Gholami K, Hanafi S, Ashrafi Shahmirzadi N, Javadi M. Iranian pharmacists' knowledge, attitude and practice regarding counterfeit drugs. *Iran J Pharm Res*. 2012;11(3):963-968.
30. Al-Worafi YM. Pharmacy practice and its challenges in Yemen. *Australas Med J*. 2014;7(1):17-23. <https://doi.org/10.4066/AMJ.2014.1890>
31. Alfadl AA, Hassali MA, Ibrahim MI. Counterfeit drug demand: perceptions of policy makers and community pharmacists in Sudan. *Res Social Adm Pharm*. 2013;9(3):302-310. <https://doi.org/10.1016/j.sapharm.2012.05.002>
32. Sholy L, Gard P, Williams S, MacAdam A. Pharmacist awareness and views towards counterfeit medicine in Lebanon. *Int J Pharm Pract*. 2018;26(3):273-280. <https://doi.org/10.1111/ijpp.12388>
33. Di Giorgio D. Il fenomeno del crimine farmaceutico e le attività di contrasto. Roma, 17 October 2017. Available: [http://www.salute.gov.it/portale/temi/documenti/usmaf/formazione2017/Il\\_fenomeno\\_del\\_crimine\\_farmaceutico\\_e\\_le\\_attivita\\_di\\_contrasto.pdf](http://www.salute.gov.it/portale/temi/documenti/usmaf/formazione2017/Il_fenomeno_del_crimine_farmaceutico_e_le_attivita_di_contrasto.pdf) (accessed Jun 15, 2019).
34. Agenzia Italiana del Farmaco. Operazione PANGAEA IX. 13 June 2016. Available at: <http://www.aifa.gov.it/content/operazione-pangea-ix> (accessed Jun15, 2019).
35. Federfarma. [Pharmacy is feminine – data from Federfarma]. *Farma7* 2017;9:23.
36. Federfarma. La farmacia italiana 2016. Available at: [https://www.federfarma.it/Documenti/farmaci\\_italiana2016.aspx](https://www.federfarma.it/Documenti/farmaci_italiana2016.aspx) (accessed Jun 15, 2019).