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Chapter

Stakeholders of the Online Pharmaceutical Market

András Fittler, Márton Fittler and Róbert György Vida

Abstract

During the past two decades, the pharmacy supply chain has developed a new segment besides traditional “brick and mortar” pharmacies. The expansion of the internet, consumer experience in online purchases, the ease of mail order trade, and distance selling have facilitated the growth of the internet pharmacy landscape. Changes in health-seeking behavior, patient empowerment, and openness to self-diagnosis and self-treatment have also contributed to the phenomenon and were further facilitated by the pandemic. Various types of online medicinal product sellers have been published previously, however, authors have classified online pharmacies mainly according to legality and patient safety considerations. As online pharmacies show great diversity, no distinct categories can be specified, rather pharmacies on the web can be categorized by multiple aspects. Admittedly, consumer preferences, regulatory environment, and legitimacy of operation are key influencing factors. In this chapter, key aspects of categorization and nomenclature are discussed to profile different vendors on the internet.

Keywords: internet pharmacies, illegal online pharmacies, drug supply chain, patient safety

1. Introduction

Internet today is not only a resource for health information but a real opportunity to obtain medical services and pharmaceuticals due to changes in health-seeking behavior, patient empowerment, and openness to self-diagnosis and self-treatment. During the past decades, the internet has become an accepted means to procure various products, especially during the pandemic, and the pharmacy supply chain has developed a new segment beside traditional brick-and-mortar pharmacies. The main motivation lurking behind internet procurement of medications is convenience, the potential to save money, and assure client privacy. The pandemic has caused changes regarding the demand and access to medications and has facilitated self-care and self-medication behaviors among the public worldwide. Likely the experience in online purchases, the ease of mail-order trade, and distance selling has further facilitated the growing market of online pharmacies. Recent reports and a representative sample of Hungarian outpatients suggest the use of internet pharmacies and the number of individuals obtaining medications and various health products online is increasing [1], international literature data indicate the prevalence of buying prescription drugs

online in the population ranges from 1 to 32% [2]. Admittedly, the COVID-19 pandemic has impacted consumer behavior and changed consumer preferences, further integrating pharmacy e-commerce in healthcare delivery [3].

Internet pharmacy is an umbrella term, while online pharmacy, e-pharmacy, e-commerce pharmacy, or cyber pharmacy often being used as synonyms. Although there is no internationally accepted definition, internet pharmacies are entities that offer and dispense nonprescription and prescription medicines direct to patients and offer products and services through an internet website [3, 4]. Distant selling of medicinal products by mail-order pharmacies has existed in the United States for more than a century [5] and during the past decades, it has extended its services online, becoming online retail mail-order pharmacies. The first legitimate internet pharmacy started its operation in 1999, however, during the past two decades rapid proliferation has been observed with the penetration of e-commerce, digital service offerings, and direct-to-consumer healthcare [3, 6].

Due to the intangible nature of the internet, the actual size of the online pharmacy market is yet relatively unknown. Thousands of internet pharmacies are accessible on the web; and as the internet is an immeasurable and low-controlled environment, a vast number of illegitimate vendors overwhelm the market of online pharmaceuticals [7, 8]. It is difficult and nearly impossible to determine the total number of active internet pharmacies, the volume of medicines sold or the actual public health impact [9], as data is not aggregated, and insights are difficult to derive from this channel [10]. This is mainly because the illegal market segment is an uncontrolled environment, with practically no restrictions regarding vendors, consumers, or products. Nearly anyone can purchase any type of medication without a prescription, medical supervision, or appropriate diagnosis, consequently compromising patient and medication safety. Hence, the globalization regarding e-commerce has enabled the creation of a “digital pharmaceutical gray market” separate and far beyond the legitimate supply chain [6]. In addition to the benefits perceived by patients, several patient safety risks are linked to the procurement of medicines outside the traditional supply chain, including questionable sourcing, poor product quality, improper storage, and transportation [11], while cybercrime including consumer fraud and data privacy issues can be noted as potential nonhealth-related risks [12]. Illegitimate online pharmacy

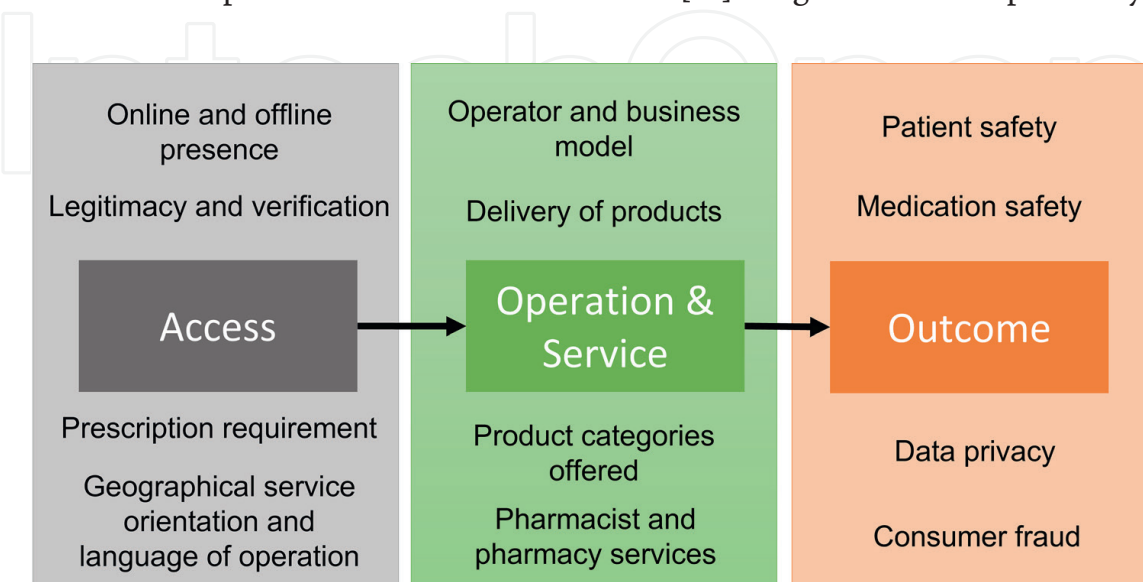


Figure 1.
Elements of evaluating internet pharmacy websites.

websites are considered the major source of substandard and falsified medications in developed countries [6, 13, 14]. Illegal actors have been using the internet as a channel of distribution and the problem of online prescription drug sales has been escalating since the mid-1990s [15]. Although, probably, it would be better to reserve the term “internet pharmacy” only for licensed legitimate websites providing legitimate professional pharmacy services, in our current chapter for simplicity, we will refer to online vendors of medicinal products as internet pharmacies.

Cyberspace is global and not local, websites can be viewed globally, and e-commerce crosses jurisdictional boundaries, consequently, internet pharmacies and purchasing of medications via the internet make regulation and governance problematic [16]. In the case of trans-border trade, the country of operation determines the licensing regulations and the quality assurance standards. Concurrently, delivery must be performed in accordance with the destination country’s regulations on distance sale of pharmaceuticals. As many, likely illegal, websites are reluctant to reveal their real-world location, consumers cannot bear the responsibility of illegitimate purchases as they cannot be sure of the regulatory framework under which the website is operating [17].

Due to the lack of internationally standardized regulations the control and law enforcement of medications moving across the border is an issue, often making national authorities powerless outside their own borders. Safety issues related to online pharmacies originate from a lack of regulation. According to the FIP global survey on online pharmacy operations and distribution of medicines, more than half (n = 37, 51%) of the responding countries indicated that they had no regulations for online pharmacies, while nearly all in Africa and South-East Asia were lacking laws regulating online pharmacy operations [3].

Despite the national legal differences, there are a few internationally accepted norms. These include that prescription-only medicines cannot be dispensed without a valid physician order, and that pharmacies shall adhere to the regulations on the distant sale of medications in the destination country. Further, controlled substances (narcotics, psychotropics) and unauthorized medicines or ones not approved for sale by the national drug authority cannot be distributed, meanwhile, the sale of substandard and falsified medicines is considered a crime.

As internet pharmacy websites show great diversity, online medicine vendors can be categorized by multiple aspects. In the above, simplified process scheme, the most influential aspects of internet pharmacies are illustrated. The method of how consumers contact vendors and online availability, further regulatory framework regarding the distant sale of medicinal products are important elements of accessibility of internet pharmacy websites. The degree of interaction with customers and patients impacts the services provided by operators of the website. Finally, treatment outcome and patient safety are the primary outcome parameters of internet pharmacies (see **Figure 1**).

2. Categorization aspects of internet pharmacies and online vendors of medicinal product

2.1 Legitimacy and verification

Although sometimes used synonymously, the distinction between legal-illegal and legitimate-illegitimate online sales and purchases of pharmaceuticals must be

discussed. Legitimate internet pharmacies are *registered* and possess a pharmacy license to dispense medications, further these websites are monitored and adhere to national regulations. These websites comply with the regulations of the country of operation and the country of destination where the products are shipped [7]. Websites adhering to their national jurisdictions may trade medications transborder to consumers in countries with different domestic laws. It may occur that in the destination country where a consumer is located, the online pharmacy is not registered and/or the medication is not legally sold. In these circumstances, the consumer is engaged in unauthorized or illegitimate online purchase. Even though the selling prescription drugs without valid prescription violates regulations consumers may not be aware they are obtaining drugs illegally [16]. According to LegitScript's data on a global scale, approximately 5% of online pharmacies operate in full compliance with applicable jurisdictions [18].

Illegal/rogue online pharmacies intentionally fail to comply with national or international standards and regulations. The most common and noticeable indicator of these online vendors is the sale of prescription-only medication without a valid prescription, not to say controlled (addictive) prescription drugs. These websites account for approximately 92% of all online vendors, and operators do not have legally required pharmacy licenses and sell unapproved and unregulated medications [18].

Verification is of key importance, however, may not necessarily correlate with patient- and/or medication safety issues. Unfortunately, in a relatively large proportion (n = 21, 38%) of the countries participating in a global survey, there is no established method to verify the authenticity of online pharmacies [3]. At once, verification systems are not mutually recognized internationally. The main issue related to verification systems is that they require consumer awareness, without consumer knowledge of the dangers of illegal medicines sales and the existence of verification systems, their impact on protecting patients is relatively low. Additionally, nonprofessional and unofficial verification systems may exist and the seals used to differentiate legitimate websites from illegal ones can be faked.

However, there are numerous web-based verification/accreditation/certification systems worldwide. Unfortunately, verification systems are generally not accepted internationally. Further, parallel to national and international systems approved or maintained by drug authorities, private agencies also certify that drug-selling websites and nonreputable verification services may also exist. These services differ in certification standard, coverage, business model, and certification outcome [19]. Website seals or logos provided by certificate agencies, commercially available verification services, and top-level domain names are currently available solutions for providing reliable information for consumers regarding the legal status of an online pharmacy. These methods rely on and require consumer awareness and participation at the point-of-sale [8].

Accredited or legitimate vendors display website seals as images and links acquired from national or regional agencies or authorities. The National Association of Boards of Pharmacy (NABP) initiated the Verified Internet Pharmacy Practice Site (VIPPS) program in 1999, the program is voluntary and requires payment verification. This rigorous inspection program expects mainly US-based online pharmacies to comply with relevant regulations, right to privacy, authenticate and secure prescription orders, adhere to quality assurance policy, and provide meaningful consultation with pharmacists. The majority of accredited websites (currently less than 100) in the NABP's database are open to all customers, including chain pharmacies and pure

online pharmacies. The remaining are membership-only sites that belong to pharmacy benefit managers. The NABP reviews fraudulent operators and publishes a not recommended sites list as well. A European regulation applicable to the legal sale of medications via the internet was implemented in the Falsified Medicines Directive 2011/62/EU (FMD) and all EU states follow the model described by the regulation. Since 2015 internet pharmacies in the EU must be registered by national authorities and display the common recognizable security logo [16]. Additional European voluntary registers of online medicine retailers officially authorized for the mail order trade were available before the FMD for example the DIMDI logo in Germany or the Registered Pharmacy in the UK. The common EU online seal verification requires visitors to click on the image, the logo takes the visitors to registers on the authority's website where the retailers' details are displayed.

LegitScript.com is the commercial leader private company for website verification services partnering with search engines, e-commerce platforms, payment companies, and regulatory agencies. In addition to internet pharmacies, telemedicine providers, and other healthcare merchants can get certified in the healthcare merchant certification program. The website permits free public searches for consumers to check online pharmacy legitimacy. PharmacyChecker is a verification agency established in 2003, requiring voluntary application and certification fees for Canadian and international online pharmacies. The website allows price comparison among verified members that meet the standards and guidelines for pharmacy accreditation. However, a complete list of searchable database of approved members or unapproved illegal sites is not available on the company's website. It has been published that the private agency has less stringent requirements and has certified suspect online drug sellers previously [20].

The ".pharmacy" generic top-level domain was launched by NABP in the USA as an ultimate identification for safe, legal, and ethical internet pharmacy websites. As the highest level of the internet namespace, it is a built-in verification tool for credible and safe websites, and as opposed to verification/certification logos, there is no possibility to fake the .pharmacy extension. Evidently, the benefits are limited if consumers are not aware of this top-level domain while navigating in the online space [8].

2.2 Online and offline presence

The click-and-brick pharmacies offer online and offline services, these websites are the virtual representation of an individual pharmacy store, chain, or grouping, for example, Boots in the UK or CVS in the USA. Meanwhile, internet-only internet pharmacies do not have a physical store that patients can enter thus websites are not linked to brick-and-mortar pharmacies. Such pure-play online pharmacies include DocMorris in Germany. Regardless of the type of operation, it is a mandatory requirement for a legitimate online pharmacy to have a physical address and the contact information must be clearly presented on the websites.

2.3 Prescription requirement

Prescription-only pharmacies request valid prescriptions, including e-prescriptions, faxed or scanned versions, written by independent medical doctor to be submitted. There are two forms of online health status evaluation methods. Prescribing/online consultation pharmacies require individuals to consult with health professionals (physician or pharmacist) employed by or affiliated to the online pharmacy

to obtain prescription drugs. Some internet pharmacy websites supply medications following the completion of an online questionnaire; however, this method appears to give consumers a false sense of health assurance than providing an actual health status assessment. Although online patient questionnaires can identify certain contraindications or prevent medication errors, these instruments can be bypassed by consumers, filled with inappropriate data, or include pre-selected answers [2]. No-records online pharmacies dispense prescription drugs without any prior documentation necessary [9]. Electronic prescriptions, implemented in the jurisdictions of many countries according to a recent FIP survey [3] will further facilitate the growth of the legitimate online market.

2.4 Operator and business model

Stakeholders of the pharmaceutical e-commerce market can be further classified according to the operator of the website. Legitimate internet pharmacies (e-pharmacies) are directly linked to and operated by a licensed pharmacy business. Depending on national regulations the operator may be a local independent community pharmacy, a pharmacy/drugstore chain, or a mail-order pharmacy (USA) extending its service online. Central pharmacy portals are operated by a trade association, distributor, or franchise partner involving independent pharmacies that offer orders online and collect in-local store service.

Affiliate and aggregator websites are often listed in search engine results and can be considered dominant players in promotion of medicinal and consumer health products. These sites are operated by individuals or companies and do not deal with products listed on their websites, rather than only market another company's products by diverting customers to the merchant's site for an agreed commission fee. Aggregator websites provide the opportunity to compare products from multiple merchants and direct users to the selected page. Websites engaged in an affiliate internet pharmacy program act as influencers and receive a commission for sending traffic and sales to online merchant websites. Interestingly, only a minority of the websites in the illegal internet marketplace operate independently as 97% of rogue websites are part of an affiliate network or other grouping indicating common control [18].

2.5 Product categories offered

Distant selling of medicinal products may be limited to consumer healthcare products including nonprescription or over-the-counter (OTC) medicines, dietary supplements, and patient- and personal-care products. By default, legitimate online pharmacies offer these products without medical prescription in several countries (e.g., Hungary and Russia) [21]. However, online sale of nonprescription medications is not allowed in 19% of countries participating in a survey published by the FIP in 2021 [3]. Subject to national regulations remote retail trade of prescription-only (Rx) medicines is also available from verified internet pharmacies in numerous countries (e.g., China, Germany, India, Lithuania, USA, Sweden) [10]. Although restrictions apply to selling certain Rx pharmaceuticals remotely, such as controlled drugs (narcotics, psychotropic medicines). The development and acceptance of online sales of medicines are illustrated by the fact that high-cost specialty medicines requiring special handling and/or clinical assessment are also supplied by online outlets linked to brick-and-mortar pharmacies in most regions of the world [3].

Due to complicated global differences in medicine regulations, nonprescription medications can be further classified as pharmacist-only medicines sold by licensed outlets and requiring consultation with a pharmacist, and general sales list medicines also available from nonpharmacy outlets [16]. The majority of countries limit the supply of pharmacist-only medicines if the website is linked to a brick-and-mortar pharmacy [3]. Accordingly, the majority of the internet pharmacies can be categorized as nonprescription-only e-pharmacies or extended product portfolio OTC + Rx e-pharmacy websites. Additional stakeholders selling consumer healthcare products with no direct connection to licensed pharmacies are present on the internet. These nonpharmacy webshops include general outlets (e.g., supermarkets) and parapharmacies (e.g., druggists) offering healthcare products including nutrients, herbal products, patient- and personal-care goods. Although in some countries consumers can purchase non-prescription medicines from non-pharmacy retailers, in most instances no authorized or licensed medicines are offered by operators not holding a pharmacy license.

Some online medicinal product vendors may not sell a vast range of products and brands, but rather specialize in a single specific brand or therapeutic area. Such dedicated websites may deal only with vitamins, lifestyle and embarrassment drugs (erectile dysfunction, hair loss, obesity, etc.), dental or veterinary products, controlled drugs (e.g., alprazolam, oxycodone), and steroids.

2.6 Delivery of products

Online pharmacies may offer in-pharmacy pick-up or cooperate with nonpharmacy pick-up points (e.g., retail druggist chains). For distance sales, the logistical function can be provided by mail or courier delivery. Delivery time and cost are important aspects of online purchases and distant sales of medicinal products. In general, purchasing medications from internet pharmacies can be lengthy as the delivery may require several days or even weeks depending on the county of origin. Additional implicit or explicit expenses should be considered, as shipping costs can have a significant impact on the total expenses for low-cost item purchases. Further, in the case of transborder trade, customs fees or taxes may also apply.

2.7 Geographical service orientation and language of operation

Pharmacies can provide their services to the local community to domestic customers within a country, or trans-border to reach international markets. Websites focusing on domestic customers are monolingual, while others serving international markets can be multilingual. Legitimate internet pharmacies typically offer their services and target their sales in the national and regional jurisdiction where they are licensed [18]. Disclosure of the website operator's geographical location and contact information is an essential element of transparency and legitimacy. However, such information may be biased as several studies have demonstrated the declared physical location may not correspond to the area of domain registration [9].

Numerous websites modify the language of operation based on the geolocation of the visitor or enable international visitors to select the language of operation. As illegal online vendors are willing to ship to locations where they are not licensed and/or where they are not allowed to sell prescription drugs, multilingualism and global market orientation may be linked to illegal activity.

2.8 Pharmacist and pharmacy services

Although in most countries pharmacists are not able to access shared patient health records [3], as the level of access (e.g., medication history, laboratory results) and rights (reading or writing) increase the complexity of pharmacy services offered offline and online will further develop. The minimum “service” available on websites is basic information about the product offered, including instructions, composition, price, etc.

3. Issues related to illegitimate online vendors

The risks to humankind require a global approach and international multidisciplinary cooperation. Most importantly, (a) national regulatory frameworks are heterogeneous regarding the distance sale and online marketing of medicines, (b) national authorities are typically powerless beyond their continental borders, (c) the effectiveness of public campaigns is limited, and (d) uninformed consumers are unlikely to be able to differentiate legitimate websites from illegitimate perpetrators. Consequently, illegitimate operators provide fraudulent online services and disregard safe pharmacy standards without legal or commercial consequences worldwide [6, 9].

A comprehensive risk assessment and test purchase methodology have been developed and published by our research group culminating in a decade of robust research (Vida et al., 2020). Our findings usher beneficial, descriptive evidence regarding issues related to the uncontrolled online market, including (a) unsubstantiated health claims lacking scientific evidence and missing warnings on contraindicated conditions and drug-interactions, (b) wide availability and easy access to biological and oncological medications, and (c) quality issues due to unprofessional distribution and handling [11, 22, 23]. Several review articles (Mackey and Nayyar, 2016; Nayyar et al., 2019) support that uncontrolled perils associated with the illicit online pharmaceutical market are persistent and current legislation and law enforcement actions seemly are ineffective to battle the complex globalized illicit online pharmaceutical market. In particular, vendors of the illegal internet market utilize abusive “underground” marketing techniques including e-mail spam, manipulation of search engine results, and development of large affiliate networks [18, 24, 25].

In the case of counterfeiting and online marketing, the traditional quality assurance measures supporting medications in the legal supply chain (e.g., audits and analytical measurements), leave gaps between the manufacturing and the product use, as it is not possible to assess the quality of a drug sold online until purchased. Furthermore, normal consumers (patients) do not own laboratory instruments and professional knowledge to determine the safety and efficacy of a specific medication. Product quality issues are likely recognized later as the unwanted effects occur or the lack of desired pharmaceutical effects becomes obvious [26].

Patient safety harm associated with counterfeit or illegal medicine use can be categorized based on the quality issue and content of the products. These products may contain toxic doses of a component (e.g., glibenclamide, metformin) or a dangerous component (e.g., diethylene glycol and/or chromium) and can result in poisoning. Additionally, the poor quality of these medicines may compromise the treatment of chronic and infectious diseases (e.g., β -lactam antibiotics), causing disease progression and drug resistance. Falsified medicines may also carry

microbes from other geographical locations in the world and lead to unexpected infectious diseases [14, 26].

In consideration of the manufacturing and distribution of drugs becoming more complex, modern technology-based solutions are needed to protect patients. Emerging technologies focusing on supply chain elements are under development (e.g., radio frequency identification, blockchain technologies, and edible noncloneable functions) or being implemented during the past years (e.g., serialization and the Falsified Medicines Directive in Europe and mobile-based verification of products in developing countries) [8]. However, as described in our recent research paper their efficacy outside the legitimate supply chains, such as the illegal online pharmacy market, is questionable even in developed countries [27]. Numerous publications emphasize the interdiction of internet sales of falsified and substandard medicine requires strategies yet to be developed [28]. It must be noted that several attempts to regulate the online pharmacy market (website verification databases, online logos, top generic domain name) have been introduced during the past decade, both in the USA and throughout the EU, but with limited effect upon the globalized illicit e-market of pharmaceuticals [29, 30].

Accordingly, due to the limitations of previously applied or generally used methodologies, novel approaches and methods are necessary and further research is required to develop standardized protocols to address the intrusion techniques, the prevalence, health consequences, and economic burden of substandard and falsified medicines distributed via the internet [28]. Developing technologies, such as the use of machine learning and competitive intelligence tools for market research, show a great promise in detecting and preventing the sale and distribution of substandard and falsified medicines, especially via online platforms [6].

4. Multistakeholder approach in the online pharmaceutical market

Stakeholders who can contribute to the integrity of the supply chain include organizations representing health professionals, patients and consumers, manufacturers, distributors, authorities, prevention and enforcement services (police, customs, justice), media and governments, and medicines providers (community and hospitals pharmacies). Further, search engine providers have a decisive role in evaluating and moderating search engine result pages, for example, by excluding unfair online marketing practices of illegitimate vendor sites [31]. All parties would benefit from a safe and regulated internet pharmacy market segment. Consumers and patients could take advantage of the benefits of e-commerce without evident dangers associated with illegal sellers and dubious products sold online. Pharmaceutical supply chain participants would also benefit from a safe internet pharmacy market, as infiltrated supply chains, illegal manufacturers, and distributors displace sales from legitimate pharmaceutical companies and retailers. In addition to loss of revenue, illegal and counterfeit products damage the reputation of brands, firms, and in general the perception of safety and efficacy attributed to medicines. An uncontrolled environment impacts governments and healthcare systems by diverting resources from limited health budgets due to direct and indirect health costs associated with patient harm, regulatory and enforcement actions, and patients' loss of confidence in healthcare systems.

As we aim to envision the online pharmaceutical market as a safer place for consumers and patients, multiple stakeholders should be kept in mind. This chapter gives

an opportunity to the readers to familiarize themselves with the complexity of the online market segment of the pharmaceutical supply chain, a continuously developing segment with significant potential threats to healthcare systems and individuals as well. The multistakeholder aspect and various participants and services utilized by the legal and illicit actors give an uneven, rugged nature to this market that seems to be difficult to control. Admittedly, we have described and evaluated the characteristics of the surface web, however, one should not forget the additional threat associated with the uncontrolled and illegal sale of medicinal products on the deep and dark web. In this ecosystem transnational organized crime syndicates use legal services like Internet Service Providers (e.g., search engines, social media platforms, payment procedures, transportation services, and domain name registries), highlighted by the 2016 review from Mackey and Liang [6].

Seemingly, there's no golden bullet or ultimate measure that will solve the international issues related to uncontrolled online medicine sales. National regulatory approaches can decrease patient safety risks by providing an opportunity for the legal sector to grow and fighting against illegal actors. Although there are multistakeholder approaches and initiatives like Operation Pangea including law enforcement, pharmaceutical and wholesales industries, internet service sector, credit card companies, health regulators, and customs agencies; however, their regular and continuous operation would be required to increase the efficacy of their actions. Active participation of healthcare workers, including pharmacists, general practitioners, nurses, and the patients' organizations is required in this field, as the point of care interventions can easily and efficiently increase consumer awareness [7, 32, 33].

5. Conclusions

Internet pharmacies are trending in most countries and have become popular participants in the pharmaceutical supply chain, especially for consumer healthcare products. The global market size is estimated to be more than US\$50 billion and is growing at an impressive rate [10]. Depending on national regulations majority of legitimate and verified websites offer non-prescription, herbal products, dietary supplements, cosmetics, etc., meanwhile, in some countries, prescription-only medicines are also available via distant selling. Unfortunately, benefits are hindered by patient safety concerns due to illegal vendors overwhelming the online pharmacy landscape.

Preferably, internet pharmacy websites should adhere to regulations set by the country of operation and the country where the products are shipped to. Internationally harmonized legal frameworks and a global internet pharmacy verification system would facilitate quality assurance and law enforcement of the transborder trade of pharmaceutical products. Physical location and contact information of the seller must be clearly stated on the website, and consultation with a licensed healthcare professional should be available for customers. If the regulatory environment permits, online vendors must require a valid medical prescription from a licensed prescriber for prescription-only medicines. Similarly, to offline interactions between the patient and the pharmacists, online vendors shall evaluate the health status of consumers prior to purchase. Website content must contain all essential information (indication and effects, dosage, contraindications, storage, etc.) required for the safe use of the products.

Although the internet pharmacy landscape is constantly developing, a better understanding of online vendors and e-pharmacy shoppers is required to maximize benefits and limit potential harms associated with online medicinal product purchases.

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Conflict of interest

The authors declare no conflict of interest.

Notes and other declarations


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