



Identification of Content Information and Functionalities to Design an Online Pharmacy: A Systematic Review

Mohammad Hossein Pourasad ¹, Somayeh Norouzi¹ and Reza Khajouei^{1,*}

¹Student Research Committee, Faculty of Management and Medical Information Sciences, Kerman University of Medical Sciences, Kerman, Iran

*Corresponding author: Student Research Committee, Faculty of Management and Medical Information Sciences, Kerman University of Medical Sciences, Kerman, Iran. Telefax: +98-3431325165, Email: r.khajouei@yahoo.com

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Abstract

Context: Many pharmacies provide pharmaceutical services through information technology. Many people also prefer online pharmaceutical services to face-to-face services. Online pharmacies can facilitate access to pharmaceutical services. When designing an online pharmacy system, designers need to know the content information, features, characteristics, and facilities of online pharmacies.

Objectives: The present study aimed to systematically collect and provide content information, features, characteristics, and facilities of online pharmacy systems.

Data Sources: We searched PubMed, Web of Science, Embase, and Scopus until July 2021.

Study Selection: Two authors independently reviewed and evaluated the primary studies and examined the content information, features, characteristics, and facilities in three categories: Study characteristics, system attributes, functionality and services.

Data Extraction: From 2005 to July 2021, related keywords were found. Books, animal studies, conference papers, and letters to editorial were excluded. Only English-language papers were included.

Results: From 3,028 extracted papers, 16 met the inclusion criteria and entered the study. After screening the papers, 35 content information, features, characteristics, and facilities were examined. None of the plentiful content information, features, characteristics, and facilities found in this study followed the same rules and regulations.

Conclusions: The present findings showed that online pharmacy systems are somewhat different in terms of content information and other properties. Depending on some circumstances, some parameters may or may not be used in an online pharmacy system. If international standards and rules are developed in the design of online pharmacy systems, which ultimately makes it easier to use. Also The design process will be easier for designers.

Keywords: Online Pharmacies, Internet Pharmacy, Online Pharmaceutical Services, Online Medicines, Systematic Review

1. Context

In recent decades, the increasing use of information and communication technologies has had a major effect on the healthcare delivery (1, 2). The number of internet users in the world increased significantly from 22.7% in 2008 to 59.7% in 2018 (3). In sub-Saharan Africa, estimates showed a five-year increase in Internet users from 35 to 50 percent (4). Over the time, advanced technology has caused changes in the pattern of shopping, including changes in purchases from pharmacies. This condition is a business opportunity for pharmacy entrepreneurs to grow business using online systems (5). New online sales methods and media are also used by pharmacies (6). Changes in consumer behavior advance in information technology, and the Internet is a critical factor in the emergence of vir-

tual healthcare services, including online pharmacies. The annual increase in online purchases of consumer goods and services, which account for a significant proportion of drugs and health-related products, has been reported in the literature (7-9). Online pharmacies refer to online service providers and retailers of medicines, goods, and health-related services. These services offer considerable benefits including convenience and efficiency, competitive price, accessibility, privacy, and door-to-door delivery without geographical restrictions unlike traditional pharmacies (10). Local pharmacy websites are becoming more and more prevalently known as an online "healthcare center", where patients can submit electronic prescriptions, order prescribed and over-the-counter medications, consult pharmacists about a chronic disease, get a prescription for a minor illness, and download the software. Check

their health and order personal and home care products (11). A pharmacist's role is to provide drugs sourced from an authorized distributor, verify the appropriateness of the prescription, and provide further support and guidance to the patient. Online pharmacies monitor or verify that the patient has a prescription or make evaluation themselves. They provide medicine from a reliable source and make recommendations if necessary (12).

There are many online pharmacies worldwide each with different content information, features, characteristics, facilities and properties. Including the content information, features, characteristics and facilities required by designers to design online pharmacy systems makes it possible to optimize system performance, collect standard data, recognize these systems, and facilitate their implementation. Prashanti et al. (13) discussed some advantages and disadvantages of online pharmacies compared with national pharmacies. In similar studies, the focus was more on design models and marketing topics. No systematic research collected the content information, features, characteristics and facilities required to design an online pharmacy system. To our knowledge, this is the first study to present the content information used, features, characteristics, and properties of online pharmacy systems.

2. Objectives

This study reviewed the literature to identify online pharmacies' content information, features, characteristics and facilities. The present findings can be used as a model to design an online pharmacy system.

3. Data Sources

The review followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) (14) guidelines. The steps taken to conduct this review are summarized below:

3.1. Eligibility Criteria and Search Strategy

Initially, all articles describing the online pharmacy system were eligible and were considered for inclusion. Articles whose content information, capabilities and facilities were related to the provision of online pharmaceutical services. Books, animal studies, conference papers, commentaries, presentations, and letters to editorial were excluded. Only English-language papers were included.

3.2. Data Sources and Search Strategy

The four electronic databases PubMed, Scopus, Web of Science, and Embase were searched. A systematic review of papers was conducted on studies that report the content information, features, characteristics and facilities of online pharmacy. For this purpose, from 2005 to July 2021, a set of related keywords were found and selected. The keywords associated with online pharmacies were words meaning these systems and online pharmaceutical services provision. Box 1 shows the keywords used to identify the relevant papers. All these keywords were combined using the OR operator. Search strategy in all 4 databases is presented in Appendix 1.

Box 1. Keywords Used in the Search Strategy

Keywords
1- Virtual pharmacy
2- Virtual pharmacies
3- E-pharmacy
4- E-pharmacy
5- Online pharmacy
6- Online pharmacies
7- Internet pharmacy
8- Internet pharmacies
9- Online medication
10- Electronic pharmacy
11- Electronic pharmacies
12- Online pharmaceutical services
13- Online pharmaceutical service
14- Remote pharmacy
15- Tele-pharmacy
16- Websites selling prescription drugs
17- Online pharmacy practice
18- Online pharmacy service
19- Online pharmacy services
20- Web-based pharmacy
21- Web-based pharmacies
22- Online drug distribution
23- Online pharmaceutical care
24- Online medication dispensing
25- Internet pharmacy services

4. Study Selection

Initially, all studies were selected without considering the addition criteria to the study. At first, Mendeley identi-

fied duplicate papers imported from different databases. Then an Internet-based systematic review software platform (Rayyan QCRI)(15) was used to add search results electronically from databases to find and remove the remaining duplicates. The two authors (MHP, SN) independently reviewed the titles and abstracts found in the search process with eligibility criteria. Then, the full text of the articles was reviewed by the same two previous reviewers to select related articles. Any disagreement between the reviewers was resolved through meetings and discussion. If no agreement was made, a third reviewer (RKH) was consulted. In addition, the reference lists of relevant articles were evaluated for the relevant publications.

5. Data Extraction and Analysis

The data were extracted from papers selected by two reviewers (MHP, SN) independently using a Microsoft Excel data extraction form developed by (MHP). The third reviewer reviewed the extracted data to ensure that the data were accurate and complete. An email was also sent to the authors of two unavailable articles to access the text of those articles, but we did not receive any response. The data extracted from the articles were: Author's name, year, type of study, objective, commercial/clinical, system platform, chain/community, System attributes, functionality and services (Table 1, Figure 1 and 2). These data elements and features were derived from the text, tables, figures, URLs, and screenshots available in the papers. content information, features, characteristics, facilities and properties related to the online pharmacy software system were available in the final extracted studies.

6. Results

We first identified 3,028 records by searching the literature databases (Figure 1). Then, 1,515 duplicate papers deleted. The initial screening of titles and abstracts of the remaining 1,513 papers was done. In the next step, 1,455 papers were deleted, and 58 eligible papers were selected for a full-text review. Finally, 16 papers that remained, met our inclusion criteria and were used for a detailed analysis. The main characteristics of these papers are summarized in Table 1 and Figure 2.

Table 1 shows that out of 16 papers, 11 papers were published from 2015 onwards (11-13, 16, 18, 19, 24-28). Apart from one (20), 15 others addressed the issue only from a commercial perspective. None of the studies provided services on the application platform, but all were web-based. Three papers reviewed community (single) and chain pharmacies (11, 15, 20). Also three papers examined only community

(single) pharmacies (17, 18, 27). The results are shown in Table 1.

Figure 2 shows the characteristics and attributes of online pharmacy systems. In 11 papers, the geographical location and address of the pharmacy were mentioned on the website (11, 12, 15-19, 21, 24, 25, 30). The pharmacy contact number was mentioned in 10 papers (15-19, 21-25). Out of 17 papers, only six mentioned the registration code or activity license (12, 15-17, 19, 20). The logo was another parameter addressed in only four paper (15, 16, 19, 21). Out of 16 papers, four provided services 24 hours a day (12, 16, 18, 27). The personnel profile was another feature uploaded on the website in only two papers (12, 15).

In 14 papers, prescriptions were required to provide pharmaceutical services (11, 12, 15, 16, 18, 26, 28).

Figure 3 lists the facilities, operations, and services reported in the reviewed papers. Limitation on the number of orders for pharmaceutical items by the customer was a feature reported in only one paper (16). Distribution and delivery services were another feature introduced in 14 papers except for two (11, 12, 15, 16, 18-27). The ability of the online physician to order prescription drugs was also reported in two papers (11, 15). Three also provided services in the field of medical equipment (11, 12, 18). The ability to provide additional information about drugs was also a feature mentioned in fourteen papers (11, 12, 27, 28).

7. Discussion

The present study identified and reviewed the content information, features, characteristics and facilities of online pharmacy systems. This study showed a high variety in the use of features, services and capabilities of online pharmacy systems.

Most online pharmacy systems became popular after 2015. Most of them were web-based and for business purposes. Depending on the rules and regulations of each country, some features of these systems were mandatory and some optional. For example, prescriptions were required for pharmaceutical items in some and optional in others. Some pharmacies distributed and sent drugs via postal companies to customers, but others did not.

Out of 16 papers, only 1 indicated a limit on the number of orders (16). It shows that the commercial dimension has received more attention than the clinical dimension. A lack of restrictions on ordering some drugs can create opportunities for disruptors in the drug market.

In 14 of the 16 the cases analyzed, the parameters of sending services and pharmaceutical items through postal companies and receiving additional information about drugs were found to be the most common parameters. It

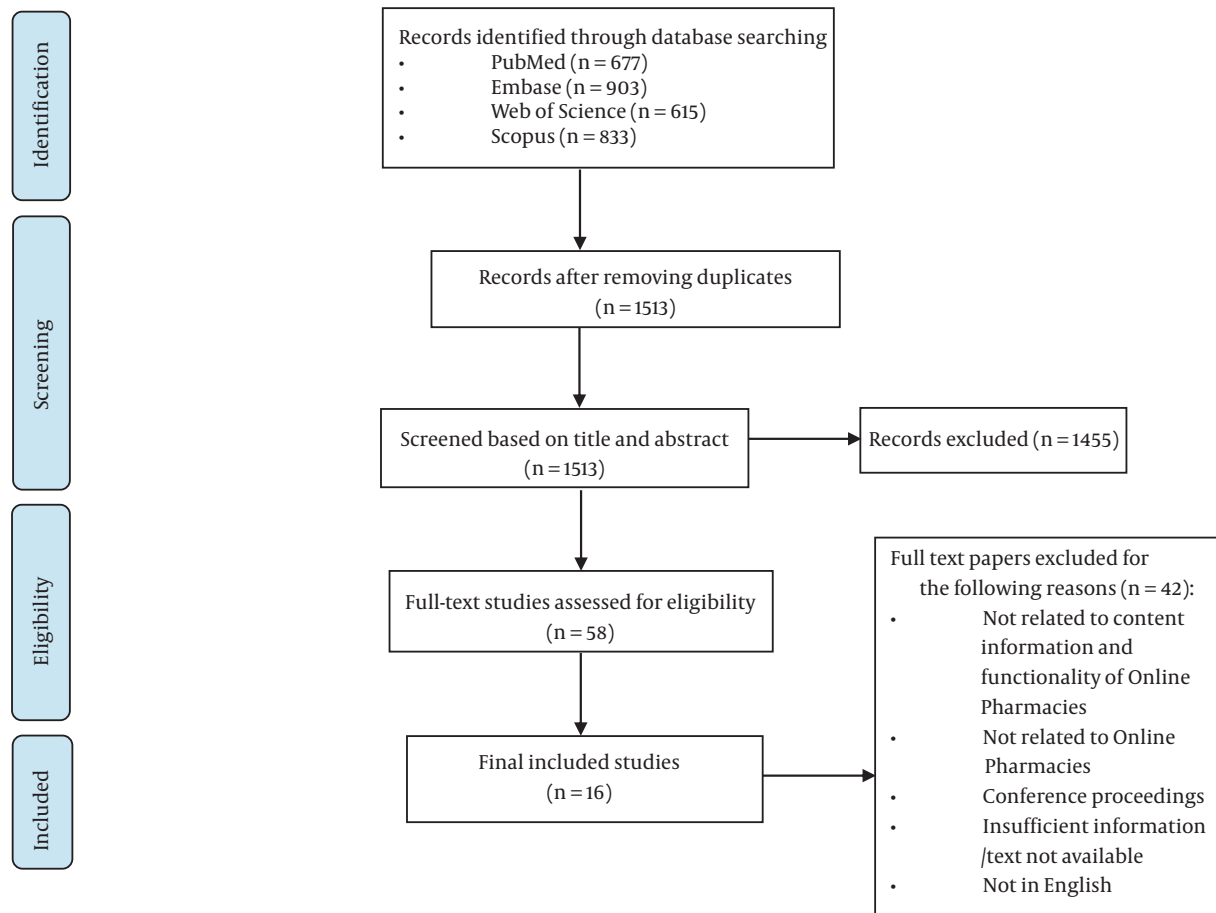


Figure 1. PRISMA flow diagram

points to the customers' desire to receive services and purchase pharmaceutical items remotely. The online pharmacy system can also be used as a reference for people to receive medical information.

Easy access to services can be the main reason for choosing an online pharmacy (29). In this study, all the papers submitted were web-based and there were no application-based papers, which could affect the easy access to services. In some, the physical address of the pharmacy, contact number, activity license details, and pharmacist and staff details were not mentioned. In contrast, according to the existing rules of most countries, these details should be available in the online pharmacy system (31). This could show that such online pharmacies are illegal (30). Illegal pharmacies can pose direct and indirect risks to patients and shoppers (10). It shows inconsistency in the use and compliance with international standards and rules in online pharmacies. In some coun-

tries, regulatory agencies established some rules and regulations to further monitor the delivery of pharmaceutical services based on online platforms, which must be used as required (32). Some online pharmaceutical systems are licensed only to provide services within a country, but some are available worldwide in most countries. These internal rules may not be helpful, but may restrict global free access to certain pharmaceutical services. Thus, domestic rules may not meet all the needs of such systems, and there is a need to set rules and standards on a global scale (33, 34).

The papers reported in this study were examined without considering the national rules and regulations. The present findings can be used for designers of such systems, who choose the aforementioned items in future designs. The next step could be to study how to provide technical solutions to facilitate communication and data exchange between such systems.

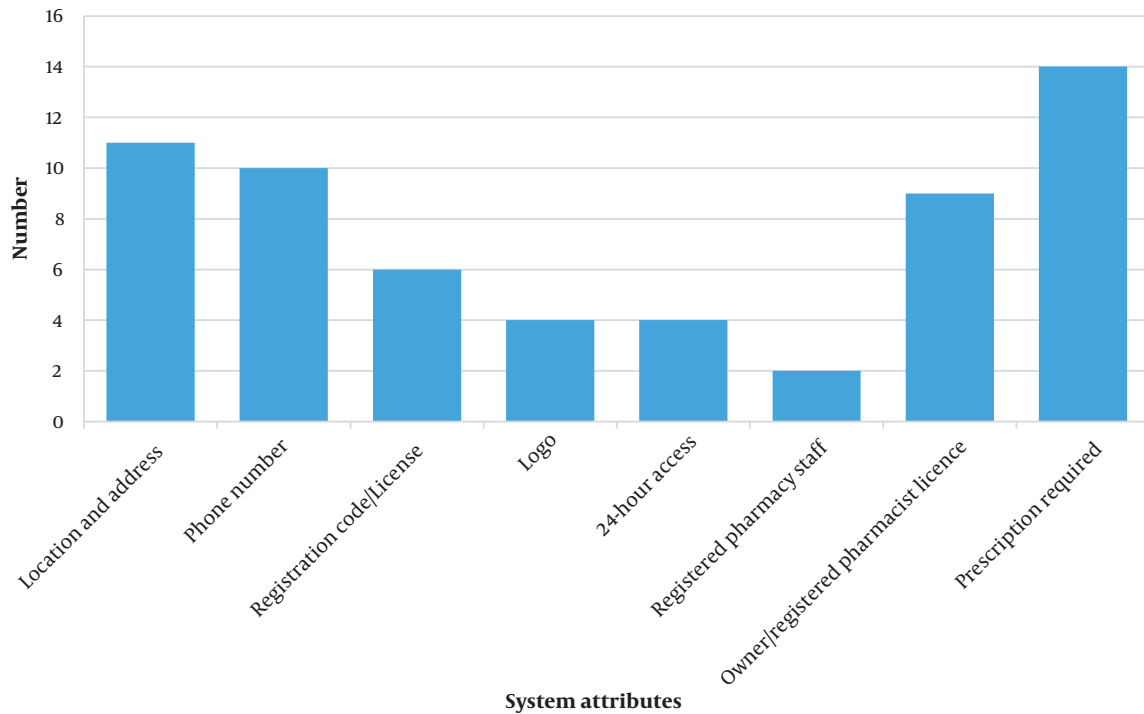


Figure 2. System attributes

7.1. Limitation and Future Research

In the present study, there were 3 limitations. At first, two papers could not be accessed despite further search and sending emails to authors. Due to the limited number, their absence had no effect on the results of this study. Secondly, this study covered papers published until July 2021. Therefore, no subsequent study was reported in this study. Future studies may include gray literature.

8. Conclusions

This study showed that online pharmacy systems differ in content information, features, characteristics, facilities and properties. Some features were mentioned in some studies but not in others. Depending on some circumstances, some parameters may or may not be used in an online pharmacy system. The design process will be easier for designers if international standards and rules are developed in the design of online pharmacy systems which ultimately makes it easier to use and share data.

Supplementary Material

Supplementary material(s) is available [here](#) [To read supplementary materials, please refer to the journal web-

site and open PDF/HTML].

Footnotes

Authors' Contribution: Mohammad Hossein Pourasad and Somaye Norouzi were the major contributors in writing the manuscript and screening the papers. Reza KHAjouei was the research supervisor and final editor. The study design and final version of the manuscript were agreed on and confirmed by all authors.

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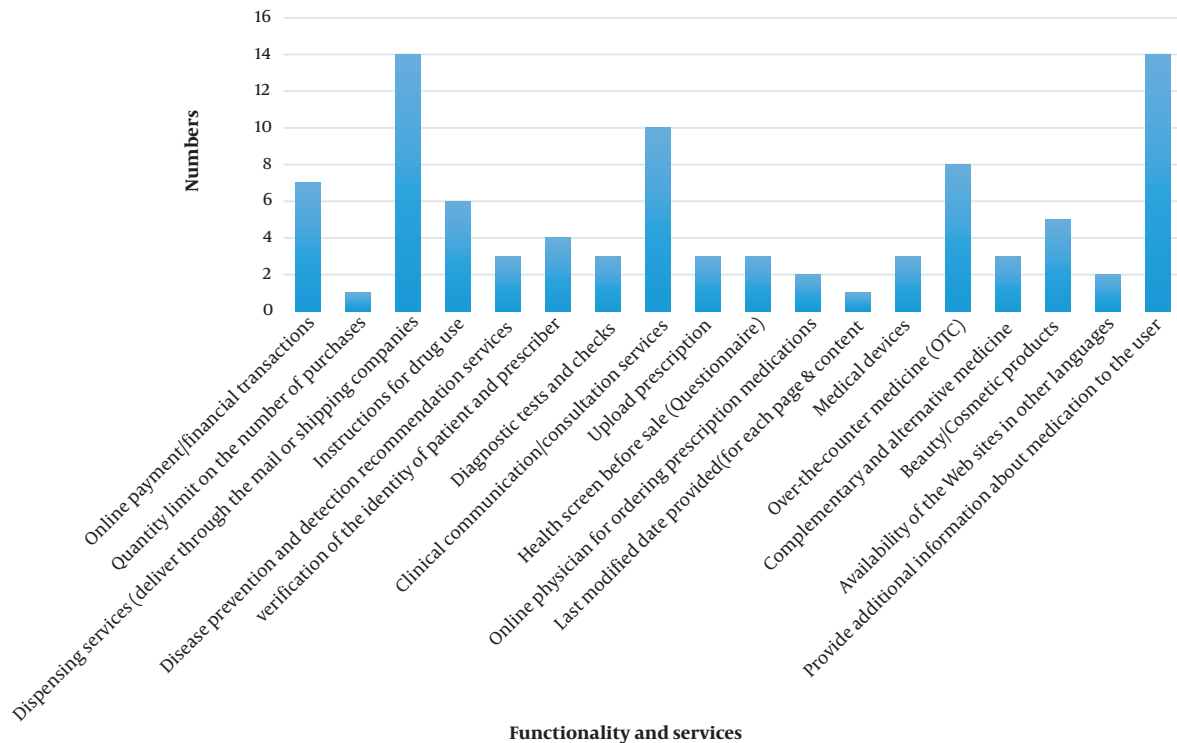


Figure 3. Functionality and services

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Table 1. Study Characteristics Included (n = 16)

Author's Name	Year	Type of Study	Objective	Commercial	Clinical	System Platform	Chain/Community (Single)
Zwier (11)	2017	Qualitative study	Filling the gap in the combination of clinical and commercial services presented on the websites of licensed community pharmacies	Yes	Yes	Web based	Chain & community
Divekar and Gaud (16)	2016	Comparative paper	Describing the use of online pharmacies and comparing the rules prevalent in the USA and UK for the operations of online pharmacies	Yes		Web based	Chain & community
Alwon et al. (12)	2015	Observational methodology	Determining the quality of approximately 100 online pharmacies and comparing this between regulated and unregulated sites	Yes		Web based	N/A
Parikh et al. (17)	2019	Observational analytical study	Evaluating online pharmacy websites for compliance with regulatory criteria and comparing the prices of medicines sold by these pharmacies	Yes		Web based	N/A
Yegenoglu et al. (18)	2008	Qualitative study	Finding all the existing web sites of Turkish community pharmacies and evaluating their "quality" in terms of Health on the Net (HON) Code of conduct principles	Yes		Web based	Community
Su et al. (19)	2011	Qualitative study	Assessing the 32 qualified online pharmacies in China, and introducing the business model of 25 online pharmacies which are initiating an online business	Yes		Web based	Community
Fittler et al. (20)	2021	Complex risk assessment method	Providing evidence for increased demand, online availability and consumer accessibility of Ivermectin, an anthelmintic agent, without substantiated indications in reference to SARS-CoV-2	Yes		Web based	N/A
Roshini et al. (21)	2021	Descriptive study	Describing the fundamental issues and challenges of online pharmacies			Web based	Chain & community
Fittler et al. (22)	2013	Evaluation study	Selecting, evaluating and following 136 Internet pharmacy websites to identify indicators of professional online pharmacy services and online medication safety.	Yes		Web based	N/A
Gondim and Falcao (23)	2007	Descriptive study	Evaluating Brazilian online pharmacies to assess the validity and potential gaps in the information provided	Yes		Web based	N/A
Mazer et al. (24)	2012	Review	Determining the frequency and characteristics of online pharmacy used by ED patients	Yes		Web based	N/A
Kumaran et al. (25)	2020	Evaluation study	Describing desirable characteristics and regulations	Yes		Web based	N/A
Gabay (26)	2015	Evaluation study	Evaluating verified Internet Pharmacy Practice Sites	Yes		Web based	N/A
Shaikh et al. (27)	2019	Mini-review article	Expounding on the historical development of internet pharmacies, their rapid growth during recent times, their advantages, concerns and regulatory actions to keep them under control; containing advice to customers to avoid monetary and physical harm from illegal online pharmacies	Yes		Web based	N/A
Abanmy (28)	2017	Evaluation study	Exploring the extent of use of online pharmacies in Saudi Arabia which will be useful for the scientific community and regulators	Yes		Web based	Community
Jiang et al. (29)	2020	Cross-sectional survey	Employing the simulated client method to investigate the sale of antihypertensive drugs by online pharmacies across China	Yes		Web based	N/A