

Challenges of Pharmacy Information System in Iran: A Systematic Literature Review

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Abstract

Aim: This study aims to identify the challenges of pharmacy information systems (PIS) in Iran.

Method: The present study is a systematic literature review. Initially, sources were retrieved using a search strategy and via Persian sites such as SID, Iranmedex, and Magiran, and databases like Embase, WOS, PubMed, ProQuest, and Scopus. Then, the sources related to the research were selected and examined using inclusion, and exclusion criteria, and finally, the findings were classified in the form of the challenges of the PIS.

Results: 16 studies were entered into this research. The results of evaluations displayed that the challenges of PIS included four parts: 1) documentation challenges, 2) lack of support for clinical decisions 3) standard policies and rule-related challenges, 4) challenges regarding non-compliance of designed plans to the responsibilities of a pharmacy

Conclusion: Due to the main goal of the pharmacy information system regarding the increase clients' satisfaction along with cost reduction, and developing a PIS, removing challenges and problems is necessary.

Keywords: Pharmacy Information System; Hospital Information System; Challenge; Systematic Review

Nowadays, information and communication technology has affected human knowledge. The Healthcare sector has also enjoyed this technology due to the high amount and variety of produced information (1). The healthcare sector has increasingly relied on information systems to obtain information (2). In the realm of healthcare, pharmacists are responsible for providing medical services, and to a large degree, deal with prescription medication to different hospital units and treatment centers. They have to complete reports and cooperate with physicians to provide safe and high-quality care. Pharmacists make sure of safe and sufficient use of drugs; they keep physicians, nurses, and patients informed about drugs to prevent medication errors (3). Therefore, pharmacy services are complicated and are an important part of any care center. Investigations illustrated that improvement of the design, and management of pharmacies through the application of pharmacy information system (PIS) is essential for the improvement of the healthcare system (4).

PIS as one of the main sources of information technology plays an increasing role in efficiency, effectiveness, service quality, and finally, patient satisfaction.

For this purpose, having an effective PIS sounds necessary to provide coherent healthcare services to outpatients and inpatients (5).

PIS is a computer system that supports drug management and distribution activities such as inventory, reports, and cost tracking. In many cases, it includes a central database (drug-related data) and makes connections to access information (like reports of stock), and supports clinical decisions. PIS might act as an independent system (only pharmacy staff has access to it), or might be integrated with a computerized register system of medical instructions (6). Using PIS in many models of medication care (for example, outpatient, inpatient, pharmacy clearance, and related services) is beneficial. Generally, PIS helps pharmacists with handling medication services, improving financial management, and enhancing scientific knowledge (7). It also gives credit to policies related to drug application procedures (8).

Franklin et al, in their study, showed that if the relations among pharmacists, physicians, and nurses improve, there would be significant positive results such as improvement in quality of health care, spending less time, removing redundancy, decreasing medication errors, and confirming patients' identity (9). However, studies have indicated that the efficient use of information systems is a challenge in Iran's health system (10, 11). Like every technical upheaval, updating PIS to fulfill the rising needs of patients is necessary. This is to help pharmacists to provide better services (7). Despite attempts done in this area, the application of PIS entails challenges (8, 12-14). Therefore, this review study aims to provide a comprehensive understanding of the challenges based on previous studies. It is conducted to provide strategies to address challenges and benefit from PISs more efficiently.

Method

To achieve the aim of this study, promote its

accuracy, and understand it comprehensively, this systematic review study was done in five stages: literature search, literature selection, data evaluation, data extraction, and data classification. The inclusion criteria were being conducted in Iran, having keywords in the title / abstract, having access to the printed full texts until 2021, September 30th, and being in Persian or English. Unscientific studies, studies without a name and date, abstracts presented in the conferences, and letters to the editor were excluded.

To access the related studies, the authors used keywords including PIS, pharmacy, hospital information system, information system, pharmacy, and Iran. To find related studies regarding desk studies, Persian authentic databases such as SID, Magiran, and Iranmedex, and authentic international databases like ProQuest, Scopus, Embase, WOS, and PubMed were used.

After the initial search, 228 papers were downloaded. Based on the inclusion criteria, 24 studies were deleted due to repetition. In the second step, 125 papers were extracted due to their title and a different aim. In the third step, 26 studies were put aside after evaluation of their abstract, and 39 studies were extracted because of having inappropriate content. Meanwhile, the sources of selected studies were examined to find related papers. Then, two papers were added to the study reference. Finally, 16 studies were included in the study. (Figure1). For research validity, two authors (H.F and A.A) independently reviewed the papers by their titles and abstracts, and subsequently, unrelated studies were excluded. The same authors, then, independently reviewed the full text of the papers.

For data extraction, researchers developed a data extraction form. The extracted data items for each paper included the author(s) name, year of publication, and challenges. Two authors independently extracted data for each

study. Any disagreement between the two authors was resolved through discussion among all authors. For data classification, researchers classified similar challenges

empirically and/or conceptually under a specific category. To ensure the accuracy of the classification process, the themes were cross-examined and discussed by all authors.

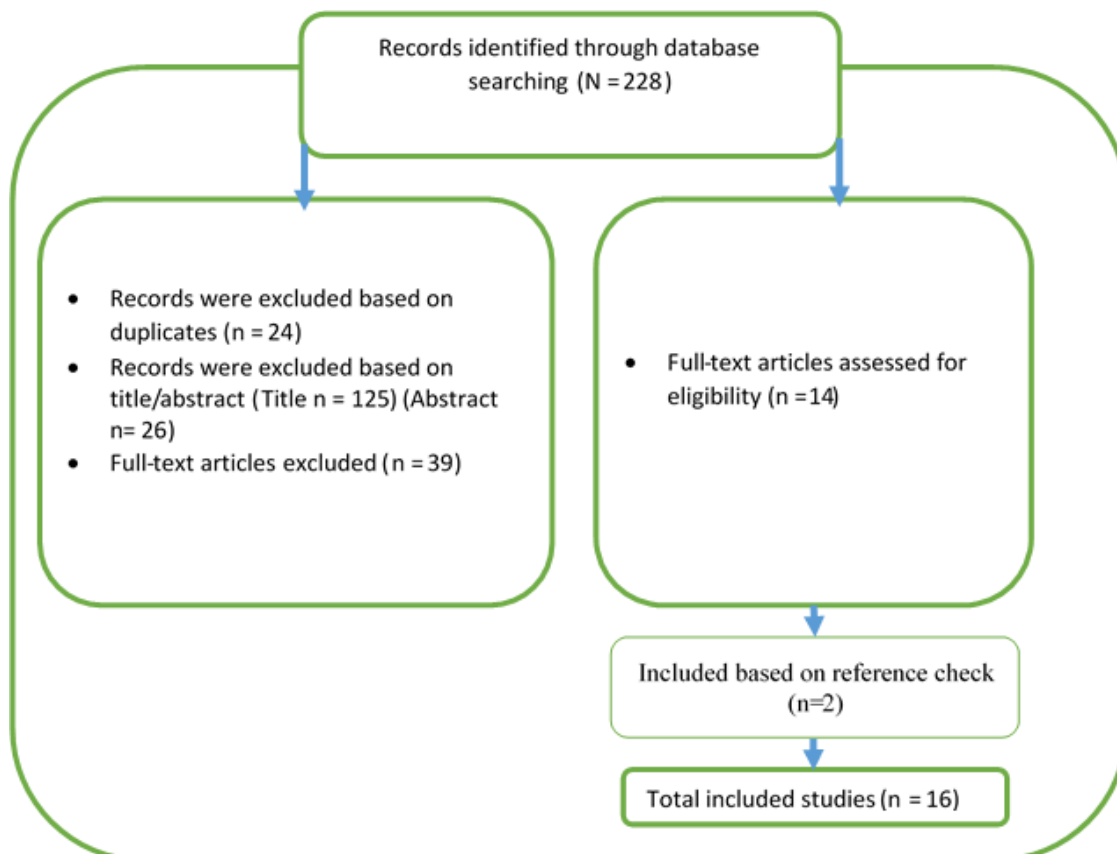


Figure 1: Flow chart of the study selection

Results

According to the aim of this study, findings demonstrated that there are numerous challenges in PISs. After evaluation and repetitive comparison of concepts, challenges were classified into four parts: 1.

documentation challenges, 2. lack of support for clinical decisions 3. Standards, policies, and rule-related challenges, 4. Challenges regarding non-compliance of designed plans to the responsibilities of pharmacy. Results have been presented in Table 1.

Table 1: Challenges for the PIS

The subject of the Challenge	Challenge	Source
Documentation	Inappropriate recording of information elements	Asadi et al. (2010) Saqaieian Nejad Isfahani et al. (2013) Isfahani, Raeisi et al. (2013) Bayati et al. (2017) Meraji et al. (2017) Khademian et al. (2019)
	Inappropriate, non-upgraded, and inflexible in reports	Asadi et al. (2010) Saqaieian Nejad Isfahani et al. (2013) Bayati et al. (2017) Shokohyar et al. (2017) Bastani et al. (2019)
	Imperfect insertion or non-insertion of the drug's therapy-related information	Isfahani, Raeisi et al. (2013) Isfahani, raeisi, Jannesari et al. (2013) Meraji et al. (2017)
	Non-compliance with documentation instructions	Saqaieian Nejad Isfahani et al. (2013) Mirzaeian et al. (2014)
	Inadequate training for users to use the system	Yasemi et al. (2018) Shokohyar et al. (2017)
	Not using proper passwords	Kazemi et al. (2016)
	Non-compliance with confidentiality instructions	Isfahani, raeisi, Jannesari et al. (2013)
	Not recording drug orders online	Asadi et al. (2010)
	Not providing medication management file	Asadi et al. (2010)
	Lack of attention to patient's safety	Kazemi et al. (2016)
	Lack of electronic equipment	Asadi et al. (2010)
	Not providing scientific back-up	Saqaieian Nejad Isfahani et al. (2013)
	No guidance to fill out the forms	Yasemi et al. (2018)
Lack of support for clinical decisions	Not supporting drug interactions, side effects, and warnings	Asadi et al. (2010) Isfahani, Raeisi et al. (2013) Bayati et al. (2017) Meraji et al. (2017) Farzandipour et al. (2017) Isfahani, raeisi, Jannesari et al. (2013) Bastani et al. (2019)
	Lack of a backup system in personal decision	Bayati et al. (2017) Isfahani, raeisi, Jannesari et al. (2013) Farzandipour et al. (2017)
	inability to diagnose problems	Bayati et al. (2017) Isfahani, raeisi, Jannesari et al. (2013)
	No support treatment activities	Asadi et al. (2010)
	Lack of drug processing including drug indicators calculation	Asadi et al. (2010)
	Lack of intelligent clinical capabilities	Bayati et al. (2015)
	Not supporting store management and keeping drug procedure	Bayati et al. (2017)

The subject of the Challenge	Challenge	Source
Standards, policies, and rule-related responsibilities	Improper standards, instructions, and directions	Asadi et al. (2010) Isfahani, Raeisi et al. (2013) Isfahani, raeisi, Jannesari et al. (2013) Mirzaeian et al. (2014) Khademian et al. (2019)
	Improper interacted standards	Meraji & et al. (2017) Isfahani, raeisi, Jannesari et al. (2013)
	Improperly processed standards	Saqaeian Nejad Isfahani et al. (2013) Mirzaeian et al. (2014)
	Mismatch of system features with standards	Bayati et al. (2017)
	Improper standard of information register	Isfahani, Raeisi et al. (2013)
	Lack of protection laws for pharmacists' roles and duties	Bastani et al. (2019)
	Not using international standards	Isfahani, raeisi, Jannesari et al. (2013)
Non-compliance with designed plans regarding the responsibilities of the pharmacy	Putting more emphasis on the design and financial and PIS process than on clinical information	Asadi et al. (2010) Saqaeian Nejad Isfahani et al. (2013) Isfahani, Raeisi et al. (2013) Bayati et al. (2017) Kazemi et al. (2016) Meraji et al. (2017) Sadoughi & et al. (2017) Isfahani, raeisi, Jannesari et al. (2013) Khademian et al. (2019) Sadoughi, Shams Elahi, et al, (2014)
	Lack of attention to the needs of users and their expectations from the system Disengagement of users in execution of information system	Saqaeian Nejad Isfahani et al. (2013) Isfahani, Raeisi et al. (2013) Sadoughi et al. (2017);9 Isfahani, raeisi, Jannesari et al. (2013) Bastani et al. (2019)
	No access to patient's clinical information via other subsystems of the hospital	Meraji et al. (2017) Isfahani, raeisi, Jannesari et al. (2013) Bastani et al. (2019)
	Not correlate with drug information database	Isfahani, Raeisi et al. (2013) Kazemi et al. (2016) Isfahani, raeisi, Jannesari et al. (2013)
	Lack of integration with other systems	Shokohyar et al. (2017)
	Lack of most subgroups of organizational components or servers in PIS	Meraji et al. (2017);8
	Electronic disconnection to producers and distributors of drugs	Bayati et al. (2017) Kazemi et al. (2016)
	System designers' lack of attention to standards and available principles	Yasemi et al. (2018)
	No guidance regarding the system	Yasemi et al. (2018)
	Lack of attention to information infrastructure while designing the system	Sadoughi et al. (2017)
	Not correlate with drug companies	Khademian et al. (2019)
	Non-compliance of system characteristics with standards	Isfahani, Raeisi et al. (2013)

Discussion

This study aims to identify challenges in PIS and provide suggestions to eliminate these challenges. Then, these systems are implemented to promote and improve the healthcare process.

Based on their needs, pharmacists must get new directions for their intended reports. Reporting is one of the basic and key indicators of a PIS (15, 12). Results revealed that most systems are only able to provide routine statistics and inventory management and are not flexible enough (12, 13). In this area, Asadi's study showed that existing information in the PIS plays an important part in pharmacy management. Moreover, despite the importance of the information available in the medical information database in decreasing medical errors and management of inventory lists, this information is incompletely registered in the PIS of the hospitals included in the study (5). Another study suggested that heuristic help and documentation are not defined in the PIS. The lack of this method can make users confused (14).

According to the studies, the most important challenges of electronic documentation in a pharmacy include incomplete insertion or non-insertion of drug-related information, not saving the drugs' diagnostic information, and demographic elements, and insufficient training of users to use the system (5, 8, 12, 14-21). Thus, it is important that system designers not ignore standards and principles in designing the system and use policies and obvious instructions and ongoing training. Lack of training of the users, the use of the advice in documentation and systems seems necessary. It enhances the usability of the system. To ensure facilitating of processing data and the use of the appropriate composition of elements, the authors suggest choosing and gathering data and collecting them in a meaningful way, and in case of need, new definitions for data

proportional to PIS should be made.

Some systems do not support clinical decisions. This was another challenge. Support of healthcare activities from pharmacies plays a crucial role in the reduction of medication errors and controlling drug interactions. This is viewed as an important responsibility of the PIS (5). The results of the study by Bayati showed that none of the systems were able to define the side effect of the drug in the main table. Moreover, it did not support drug interactions with other drugs, diseases, or food in case of requests for forbidden drugs (16). Other results illustrated that inability to diagnose, drug interaction reports and warnings, and the impossibility of defining side effects led to inappropriate use of PIS (12, 5, 16-18, 20, 22). In other words, due to such conditions, physicians have been confined to their information. Consequently, medication errors are predictable challenges in health care. Therefore, to improve patient safety, the authors suggest that PISs be integrated with clinical decision support systems.

Another challenge of PIS is related to standardization. Lack of cooperation between systems prevents building an effective and united information system (17, 20). Some challenges mentioned in the studies were a lack of observing the confidentiality of data exchange standards and information, instructions and directives, processed standards, system features inconsistency with standards, and not using international standards such as the American Society of Clinical Pharmacists' standards (5, 8, 12, 16-19, 23). That is why the use of instructions and standards in the development of PIS is a fundamental step to upgrading cooperation. Furthermore, the standard-setting must be built based on the main aspects of PIS.

Results revealed that the designed systems do not correspond with pharmacy (5, 8, 12, 13-20, 22). In this area, Mahmoodzadeh reported

that pharmacists need to have access to history, diagnostic, Para clinical, general information, and other clinical information via PIS. This is while the current system does not provide pharmacists with this information (12). Disconnection between PISs and the drug information database of Iran might increase the number of errors, decrease patients' safety levels, and lack accurate information about the cost of the drug (15). Current PISs are not in a satisfactory condition as well. The role of these systems in hospitals is only limited to drug service management, and related financial matters and clinical aspects have been ignored (5, 8, 15, 13, 16-20, 22). Therefore, these systems should be considered clinical systems and not just technical ones (8, 17, 24). Due to a lack of concern for users' needs and expectations and participation in the process, PIS could not play its vital part in upgrading the treatment process and reduction of medication errors (8, 12, 17, 18, 22). The gap between users' expectations and given conditions can be due to inattention to information infrastructures during PIS function (24). Different conditions of information technology infrastructure in various health sectors and different software programs for supporting pharmacy actions increase PIS's complexity. Thus, due to upheavals in the healthcare sector, if these changes are ignored, it can lead to incompatibility between PIS and other health information systems. It is recommended to design a PIS with the participation of specialists such as health information managers, medical informatics experts, and pharmacists. In addition, authorities need to consider users' information requirements and their expectations, infrastructures needed, and having enough determination at the macro decision-making level to make integrated PIS.

This review has several limitations that can be considered essential suggestions for future studies. First, only the papers in the six main databases, published in English and three main

databases, published in Persian, were reviewed. Therefore, it did not include other potential studies. Second, since the purpose of the present study was to identify and classify all the relevant challenges, the authors did not assess the quality of the included studies. Third, some types of documents were excluded from this review. For future studies, researchers can provide appropriate solutions for challenges in the field of PIS to increase the use of such systems in the medical profession.

Conclusion

Finding PIS problems and challenges is vital to taking corrective measures in the future. This review has suggested that due to the multifaceted nature of challenges, the use and implementation of these systems are not easy-to-implement and require a wide range of interventions. When PIS is used, challenges are more in interaction, data interactions between PIS and national information database are improved, and the PIS flexibility and integrity with other information systems are increased. Regarding the design of current PISs, researchers highlighted pharmacy management to provide clinical information and support clinical decisions.

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