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ASSESSMENT OF THE USERS' PERSPECTIVES ON THE PERFORMANCE OF ELECTRONIC PATIENT'S DRUG CHART IN THE PHARMACY INFORMATION SYSTEM

Farahnaz Sadoughi[1], Razieh Mirzaeian[*2], Masoud Jafarpishe[3], Parastoo Yarmohammadi[4]

[1] Ph.D. of Health Information Management, Professor, Health Management and Economics Research Center, Department of Health Information Management, School of Health Management and Information Sciences, Iran University of Medical Sciences, Tehran, Iran.
[2] Ph.D. Candidate of Health Information Management, Department of Health Information Management, School of Health Management and Information Sciences, Iran University of Medical Sciences, Tehran, Iran.
[3] IT Engineer in the Training hospital of Nour & Ali Asqar, Isfahan University of Medical Sciences, Isfahan, Iran.
[4] Department of Health Education, Research Expert, Shahrekord University of Medical Sciences,Shahrekord,Iran.

Abstract
Introduction:The targeted application of the technology for the record of the drug information may substantially assist the healthcare service providers supporting the drug-related decisions. This study intended to assess the performance of the electronic patient's drug chart integrated in the pharmacy information system [PIS] by comparing the users' viewpoints before and after its administration.
Methods: This study was conducted using applied and descriptive-analytical research method in 2016. Research population consisted of the nursing staff, pharmacy technicians as well as pharmacists from which a sample of 317 subjects was selected using purposive non-probability sampling method from Nour & Ali Asqar hospital of Isfahan city. Data collection tool was a self-designed questionnaire developed on the basis of American Society of Health System Pharmacists [ASHP] the validity of which was confirmed by both pooling the ideas of the respective well-known professors and estimating cronbach's alpha that was found to be 82%. The study was conducted in the following three steps: 1] exploring the viewpoints of the users on the development of the electronic patient's drug chart, 2] converting the current drug chart to the electronic format 3] re-assessing the users' viewpoints on the performance of electronic patient's drug chart. The collected data were analyzed using pretest-posttest and paired sample t-test with Spss16 software. As for quantitative variables, the measures of mean score, standard deviation and 95% confidence interval were used.
Results: As per the obtained results, there was a significant difference between the mean scores obtained for the viewpoints of the users on four domains in question including the rate of access to the patient drug's information [p <0.001], the patient's demographic information [p<0.005], the patient's complaints and signs information [p<0.001] and patient's medical information [p<0.001] before and after the implementation of electronic patient's drug chart.
Conclusion: Based on the results, it can be concluded that implementation of electronic patient's drug chart in the PIS would increase the users' access rate to the drug and medical information. This, in turn, has a positive effect on lowering the illegible handwriting errors, controlling the drug dosage administered and decreasing the medicine waste.
Keywords: Assessment, Pharmacy Information System, User, Patient's drug chart

Corresponding author:
Razieh Mirzaeian:
Ph.D. Candidate of Health Information Management,
Department of Health Information Management,
School of Health Management and Information Sciences,
Iran University of Medical Sciences, Tehran, Iran

QR code

INTRODUCTION:

Healthcare system provides some strategic plans for implementing the technology and promoting the quality of healthcare provision [1, 2]. Technology application in the hospital pharmacy is deemed as one of the major activities of healthcare system [3] assisting the service providers in the record of the drug orders and supporting them in the process of medicines dispensing [4, 5]. Like other medical services, the drug therapy process must be supported and assessed with high safety and quality [6, 7]. The PIS collects saves and processes all the patients' data; therefore, it involves a large volume of data [8, 9]. As one of the main components of the PIS, patient's drug chart serves as a linking bridge between the pharmacy and service providers [10]. Designed in the form of charts, the patient's drug chart is used for recording the patient's drug data by the nursing staff at the time of ordering by the physician [11]. Paper patient's drug chart contains only the name of the prescribed drugs with no separate space for recording the physician's signature or name. As a result, the nurse, physician and pharmacist may get confused when managing the drug data and checking their conformity with the patient's history [12]. Hence, the creation of electronic patient's drug chart may effectively contribute to resolving these problems promoting the service quality [13]. According to the results of one study conducted in The Erasmus University Medical Center [Erasmus MC] on the comparison of paper-based drug chart and electronic prescribing, the nursing staff working in this center, showed a higher level of satisfaction when using electronic prescription system enumerating the legibility and completeness of the orderings as its main advantages [P<0. 001] [14]. Electronic patient's drug chart plays a significant role in lowering the drug ordering and omission errors [4]. Based on the New York's Accident Reporting System, from among 108 cases of drug errors recorded, 58% of the errors were found to be made by the physician, 77% by the nursing staff and 18% by the pharmacist with 74% of the recorded errors being due to illegible handwriting [15]. The electronic patient's drug chart lowers the patient's costs [16] by allowing the revision of the deferred prescriptions and cancellation of the unnecessary ones. In this way, it clarifies the drug therapy process lowering the financial burden for the medical institutions, as well [17]. At the present time, PIS is being used as a component of the hospital information system [HIS] in both the public and private medical centers of Iran. However, despite the substantial potentialities of this system in the drug therapy process, due attention has not still been paid to some of its capabilities in Iran [18]. As a result of this, the nurses still use the traditional paper chart. Accordingly, in this study, firstly, the viewpoints of the users [including the pharmacists, pharmacy technicians and nursing staff] regarding the transformation of the paper drug chart into the electronic format were collected. Secondly, after exploring the current status in the hospital under study, the electronic drug chart was created in the PIS. Finally, after the implementation of the new system, the users' viewpoints were explored so as to assess the performance of the electronic drug chart. As per a review of the extant literature regarding the performance assessment of the HIS in use in Iran, none of the PISs -as an integral part of the HIS- uses an electronic patient's drug chart [19]. Furthermore, the one similar study tried to assess the performance of PISs in use in the hospitals of Isfahan city. On the basis of this research, from among 17 hospitals in question, *Nour & Ali Asqar* teaching hospital ranked highest in meeting the PIS's standards [18, 20]. For this reason, the researchers selected this hospital as the population for the purpose of the present research. To do so, they firstly obtained the consent of the hospital's manager, IT engineers and the operation company of HIS regarding the implementation of the electronic patient's drug chart. It was tried to use the results of the performance assessment of the designed electronic drug chart for paving the way towards the implementation of the electronic chart in all other hospitals of Iran.

METHODOLOGY:

Conducted in 2016, the present study was applied in nature conducted using descriptive-analytical method. Research population consisted of the nursing staff, pharmacy technicians as well as pharmacists. To conduct a case study, 317 subjects were selected using purposive non-probability sampling method. The selected sample had the following composition: 1 pharmacist, 3 pharmacy technicians and 313 nurses from *Nour & Ali Asqar* hospital of Isfahan city. Data collection tool was a self-designed questionnaire prepared on the basis of the guidelines released by the American Society of Health System Pharmacists [ASHP]. The validity of the questionnaire was assessed by pooling the ideas of the respective well-known professors in the following fields: Health Information Management [4 subjects], Computer [3 subjects] and pharmacists [3 subjects] among whom the questionnaire was distributed. The items of the prepared questionnaire were individually revised in terms of specialty area of the respondents and the conditions and capabilities of the PIS in use in Iran based on the responses. In the revised questionnaire, the repeated items were omitted while the ambiguous items were clarified. The internal validity of the questionnaire was confirmed by estimating the Cronbach's alpha and half-split test that was found to be 82% [21]. The questionnaire was developed by

considering the users' required data for managing the medication orderings from the ordering to administration time and the role of the electronic drug chart in this field [Standardize Medication Ordering]. The items incorporated in the questionnaire were as follows: 20 items on medication information, 8 items on the patient's demographic information, 5 items on the patient's complaints and signs, and 10 items on the patient's medical care information. The study was conducted in the following three distinct steps: 1] examining the viewpoints of the users regarding the creation of the electronic patient's drug chart, 2] converting the present chart to electronic format and 3] re-assessing the viewpoints of the users regarding the performance of the electronic drug chart. The collected data were analyzed based on pretest-posttest and paired t-test results with Spss v.16 software. As for the quantitative variables were assessed using the mean score and standard deviation at 95% confidence interval.

RESULTS:

The mean score for the job experience of the individuals present in the research population was found to be 9.9 ± 6.73 with 1 year and 28 years being the lowest and highest job experience, respectively [table1].

As per the results obtained on the viewpoints of the users before the implementation of the electronic patient's drug chart, the majority of the users [76.26%] believed that the transformation of paper patient's drug chart into the electronic version will make access to the patients' demographic data in the PIS easier. The minimum effect of the electronic patient's drug chart was reported for the rate of access to the information on the patient's complaints and signs [56.02%] [table2].

After the implementation of the electronic drug chart, the viewpoints of the users regarding the performance of the designed chart were collected. As per the results, 80.83% of the users stated that this chart had made access to the patients' demographic information easier while only 17.20% of the users reported that they could access the information on the complaints and signs when using the electronic chart [table3].

Furthermore, the results of the paired t-test revealed that there was a significant difference between the mean scores obtained for the viewpoints of the users on 4 variables in question including the rate of access to the patient's drug information [$p<0.001$], the rate of access to the patient's demographic information [$p<0.005$], the rate of access to the patient's complaints and signs [[$p<0.001$] and the rate of access to the patient's medical information [$p<0.001$] before and after the implementation of the electronic drug chart.

Table 1- Frequency distribution and percentage of the demographic characteristics in the hospital under study

Research Population	Frequency	Percentage
Male	63	19.9
Female	254	80.1
Age range [year]	Frequency	Percentage
20-29	92	29.0
30-39	176	55.5
40-49	49	15.5
Job	Frequency	Percentage
Pharmacist	1	0.3
Drug technician	3	0.9
Nurse	313	98.8
Total Sum	317	100.0

Table2. Mean scores obtained for the viewpoints of the users before the implementation of the electronic patient's drug chart

Viewpoints of the users before implementing the electronic patient's drug chart	*M[SD]*
Rate of accessibility to drug information	69.16[18.00]
Rate of accessibility to the patient's demographic data	76.26 [21.21]
Rate of accessibility to the information on the complaints, signs and progress course of the disease	56.02[20.50]
Rate of accessibility to the medical information	68.15[11.96]

M [SD]: Mean score and standard deviation

Table3. Mean scores obtained for the viewpoints of the users after the implementation of the electronic patient drug chart

Viewpoints of the users after implementing the electronic patient's drug chart	**M[SD]*
Rate of accessibility to drug information	35.37[17.38]
Rate of accessibility to the patient's demographic data	80.83 [17.40]
Rate of accessibility to the information on the complaints, signs and progression trend of the disease	17.20 [15.11]
Rate of accessibility to the medical information	25.16 [9.53]

*M [SD]: Mean score and standard deviation

DISCUSSION:

Given the capabilities of the PIS some of which were mentioned in this study and as per the comparison results of the users' viewpoints, it can be argued that on the basis of the ASHSP's standards, every PIS must make possible the access to the drug information components for the users. The components of drug information include the conditions of the drug maintenance, drug's commercial and generic name and drug's dispensing time intervals as well as the start and end dates of the drug dispensing [22]. In the same vein, as for the results of the performance assessment of the electronic patient's drug chart, it can be argued that although the electronic version of the chart has successfully removed the errors resulting from illegible handwriting, it has failed to fully meet the users' expectations. The gap observed between the users' expectations and the realized situation can be attributed to inattention to the informational infrastructure at the time of the operation of the PIS. One similar study in England revealed that just 40% of the informational requirements for the drugs are recorded in the PIS while the potential role of the system in supporting the management of the medication-related problems and lowering the drug interventions has not been given due attention [23].Access to patient's demographic information such as age, gender, patients' first and last name, identification number of the patient are among the minimum data that must be accessible for the users in the PIS. This capability has the greatest effect on lowering the incorrect ordering errors since one practical dimension of PIS before the drug administration is to ensure meeting 7 principles of providing "the right care, at the right time, for the right person, with the right dosage, in the right way, with right information and right documentation"[24]. Among the users, the nursing staff has the greatest association with the patient's drug chart. When recording the drug orderings in the patient's profile and the drug chart, some errors such as error in the drug dosage, patient's name or type of drug may occur. Electronic patient's drug chart both lowers the workload of manual registry of the orderings in the patient's history and drug chart and allows better management of the drug inventory and medicine waste. According to the results of one study on the comparison of the computerized registry of the orderings by the physician and nurse, the rate of the ordering's errors decreased from 10.3% to 4.6% [25].

In the electronic patient's drug chart that was implemented and assessed in the hospital in question, besides recording the information on the oral and injectable drugs, other information on other services such as different types of tests [their date and hour],

nursing care, management of the input and output fluids balance, the condition of the kidney and urinary tract of the patient, radiography and angiology are also recorded. Access to such information substantially assists the nurses and other users. However, according to the ASHSP's standards, access to the information on the patient's complaints, patient's complaints and signs and patient's disabilities and malfunctions is another category of information that must be checked and monitored. The information on the body safety status of the patient, patient's nutrition, drug misuse history, drug allergies and side-complications and the minimum usage of antibiotic are of high significance [26, 27].

Hence, what can be inferred from the analysis results of this research and other similar studies is that electronic patient's drug chart is something more than the change of the paper format into the electronic version. Given the policies and strategies adopted by the healthcare system, the electronic drug chart must satisfy the informational needs of all the users including the nursing staff for the registry of the orderings and management of the medication dispensing, the physician for the ordering process and the pharmacist for the medication therapy consultation and drug inventory management [27]. In line with the results of this study, one study examined 240 drug charts collected from 8 different departments of the Kathmandu Medical College's teaching hospital in Nepal in 2010. This study reported a high rate of error in the documentation of the drug allergies [77.5%], writing the name of the prescribers [89.6%] and the stop date of the drug [62.5%]. Besides, the rate of the illegible handwriting was found to be 49.2% [28]. Another study conducted on 29 hospitals in Saudi Arabia revealed that 51.9% of the hospitals were equipped with the electronic drug registry system [29].

In sum, the prolific research on the position of the technology and the attention to the role of PIS in the healthcare field implies that this system must be regarded as a clinical system rather than a technical system. Identification of the users' needs and their alignment with the information technology may facilitate the realization of the potentialities of the PIS promoting the productivity and quality of the services provision and omitting the repetitive works and preventing the medicine waste.

CONCLUSION:

The main purpose of this study was to implement the electronic patient's drug chart and assess its performance in terms of the users' viewpoints. Taking the results of the study into account, it can be concluded that PIS enjoys a lot of capabilities as far as the proper medication therapy process is concerned. As one of the capabilities of the PIS, the electronic patient's drug chart can play a substantial role in promoting the treatment quality and lowering different types of errors if implemented by taking the users' requirements into account. The results of this study will be very helpful for the field policy makers and practitioners making them aware of the necessity of paying attention to the informational substructure and users' requirements. As it is clear from the previous research, electronic patient' drug chart or electronic prescription has recently come into focus throughout the world. Hence, it is recommended to other medical centers of Iran to take more effective steps towards the healthcare service productivity by implementing the electronic patient's drug chart.

Conflict of Interest
There is no conflict of interest to be declared.

Authors' contributions:
All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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