

## ORIGINAL RESEARCH

# The effect of pharmacy information management system on safety medication use: A study from private hospitals in İstanbul

Gonca Mumcu<sup>1</sup>, Leyla Köksal<sup>1</sup>, Nur Şişman<sup>1</sup>, Ramazan Özgür Çatar<sup>1</sup>, Mehveş Tarım<sup>1</sup>

**ABSTRACT:** Pharmacies located in hospitals are important units for the healthcare system. The aim of the study was to evaluate pharmacy information management system (PIMS) in the perspective of patient safety in private hospitals. In the study, PIMS related with medication safety and communication among health professionals and global patient safety were evaluated by manager pharmacists (n=104) working in private hospitals. Data was collected by the questionnaire for PIMS functions related with medication safety and communication among health professionals in the perspective of patient safety. In linear regression analysis, four items regarding “clinical warning system about medication interactions”, “supporting collaboration between physician and pharmacists”, preventing prescribing errors” and “increasing in reliability of patient’s data” were found to be predictive factors for patient safety in PIMS. Consequently, a PIMS improves patient safety by preventing medication error.

**KEY WORDS:** Pharmacy information management system, patient safety, private hospitals

## INTRODUCTION

Pharmacies are an important part of the health system that is highly complex environment involving many special trained health professionals working together effectively (1). Medications are essential for the prevention and treatment of disease (2) whereas they can also cause harm due to their adverse effects, medication errors and medication complexity (2) in health services (3). Preventable medication errors are prominent factors in patient safety since improving patient safety and quality of care has become a major focus in healthcare (4-6).

Patient safety could be improved by e-prescribing in the system (7) since errors with handwritten prescriptions such as difficulties with legibility and risk of misinterpretation are common problems in patient safety. Moreover, e-prescribing reduces medical errors such as selection of incorrect medication, dose, route, and formula-

tion and phone calls between physician and pharmacists (8). When pharmacies adopt a patient care orientation by using information technologies based documentation, patient data are accessed and shared rapidly. Therefore, underuse of the current information technologies is the weakness for pharmacies. However, changes in communication patterns and workflow for health professionals, overdependence on technology, continuous demands for system upgrades, and negative emotions toward the technology are difficulties in the system (8). Although the occurrence of medication dispensing errors is risk factor for patient safety in pharmacies, the evaluations of patient safety related variables were limited in the frame of pharmacists using pharmacy information management system (PIMS) having positive effect on patient safety (9). Pharmacists as health care professionals focus on safe and effective medication use. They directly communicate physicians and other healthcare profession-

## AFFILIATIONS

<sup>1</sup>Marmara University, Faculty of Health Sciences, Department of Health Management, İstanbul, Turkey

## CORRESPONDENCE

Gonca Mumcu

E-mail: goncamumcu@marmara.edu.tr

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als during patient care in the hospitals. Therefore, the aim of the study was to evaluate the relationship between patient safety and PIMS in the perspective of pharmacists in private hospitals.

## SUBJECTS AND METHODS

In this cross-sectional study, 104 pharmacists [F/M: 68/36, the mean age: 34.29 (SD:11.55) years] working in private hospitals (n=104) in Istanbul, Turkey, were included in the study. According to data of Social Security Institution, the number of private hospitals was found as 142. Response rate was calculated as 72.3% since the participation was voluntary in the study. One pharmacist was select in each hospital. The population of Istanbul, a province of Turkey is 18.3% of the total (13854740/75627384) (10). In Istanbul, the hospital bed capacity was 33.3 % of private hospitals (11).

Data was collected by a 10-item questionnaire examining PIMS functions related with medication safety and communication among health professionals. Patient related PIMS functions were searched from the literature and textbooks. Ten items were reviewed by our study group. Moreover, patient safety was also evaluated by an item "PIMS improves patient safety in medication therapy". All items related with both PIMS and patient safety were coded by a 5-point Likert scale (1: strongly disagree; 2: disagree; 3: neutral; 4: agree; 5: strongly agree).

Pearson correlations were carried out on the scores between PIMS items and an item for patient safety. Then, significant items were selected for linear multiple regression analysis. Chronbach-alpha value as internal reliability for PIMS item was found to be 0.835 that was high in the study group. Data was analyzed by using an SPSS 11.5 program (SPSS Inc, Chicago, IL).

## RESULTS

Hospital bed capacity of private hospitals was 101.68(122.46) in the study group. The mean working time of pharmacists was 56.09(65.71) months in the study group. The number of prescription processed by pharmacists [90.52(99.00)/day] was weakly correlated with bed capacity (r: 0.3 p=0.025).

Scores of patient related PIMS functions were presented in Table 1. The highest three scores were seen in "It provides accessing general medication list [4.51(0.53)]", "It supports effective communication among healthcare units [4.23(0.87)]" and "It increases reliability of patient's data" [4.21(0.73)] among functions of PIMS. Score of patient safety was found to be 4.21(0.89) in the group. In multiple regression analysis, four items regarding "clinical warning system about medication interactions", "supporting collaboration between physician and pharmacists", preventing prescribing errors" and "increasing in reliability of patient's data" were found to be predictive factors for patient safety. These items together could predict 83.1% of patient safety (R<sup>2</sup>:83.1) which was very high (Table 2).

## DISCUSSION

Patient safety is a critical point in health services and quality of healthcare (12). This approach is based on Hippocratic Oath that the main principle is "no harm". One of the most common types of medical errors threading patient safety is preventable medication error that is considered as an indicator of the patient safety in hospitals (13).

**TABLE 1:** Function scores of PIMS

	Mean	SD
1. It is well organized for patient's information	4,19	0,76
2. It provides general view about medication list	4,03	0,95
3. It provides clinical warning system about medication interactions.	3,7	1,22
4. It provides accessing general medication list	4,51	0,53
5. It increases time period for patient's care.	3,85	0,96
6. It supports effective communication among healthcare units	4,23	0,87
7. It supports collaborative activities among health professionals	3,94	0,94
8. It supports collaboration between physician and pharmacists	3,91	1,03
9. It prevents prescribing error	4,14	0,94
10. It increases reliability of patient's data	4,21	0,73

**TABLE 2:** Results of linear regression analysis for patients safety

PIMS Items	$\beta$	p
3. It provides clinical warning system about medication interactions.	0,116	0,027
8. It supports collaboration between physician and pharmacists	0,368	0,000
9. It prevents prescribing error	0,236	0,006
10. It increases reliability of patient's data	0,286	0,003
Constant	-0,286	0,130
R <sup>2</sup> :0.831		

In the present study, the highest patient safety related scores were observed in accessing medication list, effective communication system and reliability of patient's data among PIMS items as a part of hospital information management system. Moreover, patient safety was related with warning medication interaction, collaboration between physician and pharmacists, preventing prescribing error, increasing reliability of patient's data in the study.

Medication safety, health professional collaboration and design of care processes in the system are important parameters for pharmacists (14). In hospital information management system, computerized physician order entry is an application in which physicians write prescriptions online (12). Electronic prescribing is the direct computer-to-computer interaction of prescription information from physician offices to pharmacies in the system (7, 8, 15). In the pharmacist perspective, a PIMS makes the practitioners aware of non-safety medication usage, the prescribed overdose, the potential effect of the prescription of two drugs concurrently (9). The system can improve patient safety by reducing dispensing errors (e.g., incorrect medication, dose, or formulation or expired medication) (16) and inadequate doses, improper medication viewing medication interaction (17) in the hospital.

Patient safety could improve by using information technology and continuous control monitoring systems regarding re-engineering process in the medication ordering and delivery system (17). Physician ordering, transcription, dispensing and administration may originate medication errors steps (17). The highest incidence of error is seen in the medication ordering and administration stages (18). Therefore, collaboration of health professionals and increase in communication among

health professionals are critical points in patient safety. In this frame, organisational changes by using the technologies could affect that both the way work is done and how information is obtained and controlled. Therefore, change in work routines could be predicted among health professionals (17).

The main shortcoming of the study was that other healthcare professional' perspective was not included because the main objective was to evaluate the system and safe medication use

in the frame of pharmacist's perspective in private hospitals. Since the participation of the study was voluntary, results were assessed in the study limits.

Consequently, it can be concluded that the PIMS improves patient safety by preventing medication error and increasing communication among physicians and pharmacists in the studied hospitals. These identifying factors are vital roles in daily practice for pharmacists in the limits of the study.

## Eczane bilgi yönetim sisteminin güvenli ilaç kullanımına etkisi: İstanbul'daki özel hastanelerde bir çalışma

**ÖZET:** Hastane eczaneleri sağlık sistemi içinde yer alan önemli birimlerdir. Bu çalışmanın amacı özel hastanelerdeki eczane bilgi yönetim sistemlerinin hasta güvenliği perspektifinden değerlendirilmesidir. Çalışmada ilaç güvenliği, sağlık profesyonelleri arasındaki iletişim ve hasta güvenliği ile ilişkili eczane bilgi yönetim sistemi fonksiyonları özel hastanelerde çalışan 104 yönetici eczacı tarafından değerlendirilmiştir. Veriler sağlık profesyonelleri arasındaki iletişim ve ilaç güvenliği ile ilişkili eczane bilgi yönetim sistemi fonksiyonlarını hasta güvenliği perspektifinden değerlendiren anket formu ile toplanmıştır. Yapılan lineer regresyon analizinde "ilaç etkileşimleri ile ilgili klinik uyarı sistemi", "eczacı ile hekim arasında işbirliğini artırma", "reçeteleme hatalarını önleme" ve "hasta bilgilerinin güvenliğini artırma" eczane bilgi yönetim sisteminde hasta güvenliği için belirleyici faktörler olarak belirlenmiştir. Sonuç olarak eczane bilgi yönetim sistemleri ilaç hatalarını önleyerek hasta güvenliğini arttırmaktadır.

**ANAHTAR SÖZCÜKLER:** Eczane bilgi yönetim sistemleri, hasta güvenliği, özel hastaneler

## REFERENCES

1. Norden-Hagg A, Sexton JB, Kalvemarm-Sporrong S, Ring L, Kettis-Lindblad A. Assessing safety culture in pharmacies: the psychometric validation of the Safety Attitudes Questionnaire (SAQ) in a national sample of community pharmacies in Sweden. *BMC Clin Pharmacol* 2010;10:8.
2. Robbins CM, Stillwell T, Johnson D, Wilson S, Fitzgerald L. Integrating patient safety and clinical pharmacy services into the care of a high-risk, ambulatory population: a collaborative approach. *J Patient Saf* 2013;2: 110-7.
3. Teichert M, Luijben SN, Wereldsma A, Schalk T, Janssen J, Wensing M, de Smet P. Implementation of medication reviews in community pharmacies and their effect on potentially inappropriate drug use in elderly patients. *Int J Clin Pharm* 2013;35:719-26.
4. Pringle J, Weber RJ, Rice K, Kirisci L, Sirio C. Examination of how a survey can spur culture changes using a quality improvement approach: a region-wide approach to determining a patient safety culture. *Am J Med Qual* 2009;5: 374-84.
5. Aspden P, Wolcott J, Bootman JL, Cronenwett LR. Preventing Medication Errors: Quality Chasm Series. National Academies Press, Washington. 2006.
6. Desikan R, Krauss MJ, Dunagan WC, Rachmiel EC, Bailey T, Fraser VJ. Reporting of Adverse Drug Events: Examination of a Hospital Incident Reporting System Findings. 2005.
7. Odukoya OK, Chui MA. E-prescribing: A focused review and new approach to addressing safety in pharmacies and primary care. *Res Social Adm Pharm* 2013;9:996-1003.
8. Westerling AM, Haikala V, Airaksinen M. The role of information technology in the development of community pharmacy services: visions and strategic views of international experts. *Res Social Adm Pharm* 2011;4:430-7.
9. Isfahani SS, Raeisi AR, Ehteshami A, Janesari H, Feizi A, Mirzaeian R. The Role of Evaluation Pharmacy Information System in Management of Medication Related Complications. *Acta Inform Med* 2013;1:26-9.
10. [http://www.tuik.gov.tr/PreIstatistikTablo.do?istab\\_id=1590](http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=1590)
11. T.M.H. Turkish Ministry of Health, Statistical yearbook of health care institutions in 2006 Ankara2006 [16.12.2009]; Available from: [www.saglik.gov.tr](http://www.saglik.gov.tr).
12. Bedouch P, Tessier A, Baudrant M, Labarere J, Foroni L, Calop J, Bosson JL, Allenet B. Computerized physician order entry system combined with on-ward pharmacist: analysis of pharmacists' interventions. *J Eval Clin Pract* 2012;4: 911-8.
13. Bahadori M, Ravangard R, Aghili A, Sadeghifar J, Gharsi Manshadi M, Smaeilnejad J. The factors affecting the refusal of reporting on medication errors from the nurses' viewpoints: a case study in a hospital in iran. *ISRN Nurs* 2013; 876563.
14. Westerling AM, Hynninen JT, Haikala VE, Airaksinen MS. Opinion comparison concerning future information technology in Finnish community pharmacies. *Pharm World Sci* 2010;6:787-94.

- 15.** Clyne B, Bradley MC, Hughes C, Fahey T, Lapane KL. Electronic prescribing and other forms of technology to reduce inappropriate medication use and polypharmacy in older people: a review of current evidence. *Clin Geriatr Med* 2012;2:301-22.
- 16.** Cheng CM. Hospital systems for the detection and prevention of adverse drug events. *Clin Pharmacol Ther* 2011;6:779-81.
- 17.** Escobar-Rodriguez T, Monge-Lozano P, Romero-Alonso MM, Bolivar-Raya MA. Deploying information technology and continuous control monitoring systems in hospitals to prevent medication errors. *HIM J* 2012;1:17-25.
- 18.** Cafazzo JA, Trbovich PL, Cassano-Piche A, Chagpar A, Rossos PG, Vicente KJ, Easty AC. Human factors perspectives on a systemic approach to ensuring a safer medication delivery process. *Healthc Q* 2009;12:70-4.