Al-Rafidain J Med Sci. 2023;5(Suppl 1):S57-63.
DOI: https://doi.org/10.54133/ajms.v5i1S.319

Research Article

Appraising the Role of Pharmacists in Medication Reconciliation at Hospital Discharge: A Field-Based Study

Melad Mohammed Ali[1], Ali Azeez Al-Jumaili[2,3,4]*

[1] Department of Clinical Pharmacy, Al-Zahraa Teaching Hospital, Wasit, Iraq; [2] Department of Clinical Pharmacy, College of Pharmacy, University of Baghdad, Baghdad, Iraq; [3] University of California, Davis School of Medicine, PHS Department, CA, USA; [4] College of Pharmacy, University of Iowa, IA, USA

Received: 22 September 2023; Revised: 25 October 2023; Accepted: 30 October 2023

Abstract

Objective: To measure the effect of the pharmacist-led medication reconciliation service before hospital discharge on preventing potential medication errors. ***Methods***: This behavioral interventional study took place in a public teaching hospital in Iraq between December 2022 and January 2023. It included inpatients who were taking four or more medications upon discharge from the internal medicine ward and the cardiac care unit. The researcher provided the patients with a medication reconciliation form and reconciliation form (including medication regimen and pharmacist instructions) before discharging them home. Any discrepancies between the patients' understanding and the actual medication recommendations prescribed by the physician were identified and solved. ***Results***: Fifty inpatients received a pharmacist-led medication reconciliation review before hospital discharge. Out of 50 patients, 44% had a clear understanding of their medications before the intervention. In contrast, 56% of the patients had at least one potential medication error before the reconciliation, which was addressed by the pharmacist's intervention. Approximately two-thirds (89.4%) of the potential medication errors were clinically significant, and 5.3% of these errors were serious. The most frequent potential error that prevented this was duplication (31.5%) (the patient was about to duplicate the same medication from different manufacturers or different medications from the same pharmacological class). ***Conclusion***: Lack of medication reconciliation can cause significant medication errors, which might be serious and cause harm to patients. This study has the potential to shape policies and practices that prioritize medication safety and optimize patient outcomes during transitions of care.
Keywords: Clinical pharmacist, Duplication error, Hospital discharge, Iraq, Medication discrepancy, Medication reconciliation.

تقييم دور الصيدلي في عملية مراجعة واعادة ترتيب أدوية المريض عند الخروج من المستشفى: دراسة ميدانية

الخلاصة

الهدف: قياس تأثير خدمة مراجعة الأدوية التي يقودها الصيدلي قبل الخروج من المستشفى على منع الأخطاء الدوائية المحتملة. **الطريقة**: أجريت هذه الدراسة التداخلية السلوكية في مستشفى تعليمي عام في العراق بين ديسمبر 2022 ويناير 2023. وشملت المرضى الداخليين الذين كانوا يتناولون أربعة أدوية أو أكثر عند الخروج من جناح الطب الباطني ووحدة رعاية القلب. قام الباحث بتزويد المرضى بنموذج مراجعة الدواء ونموذج التسوية قبل إخراجهم إلى المنزل. تم تحديد وحل أي تناقضات بين فهم المرضى وتوصيات الأدوية الفعلية التي يحددها الطبيب. **النتائج**: تلقى خمسون مريضا داخليا مراجعة تسوية الأدوية بقيادة الصيدلي قبل الخروج من المستشفى. من بين 50 مريضا، كان لدى 44٪ فهم واضح لأدويتهم قبل التدخل. في المقابل، كان لدى 56٪ من المرضى خطأ دوائي محتمل واحد على الأقل قبل التعديل، والذي تمت معالجته من خلال تدخل الصيدلي. ما يقرب من ثلثي (89.4٪) من الأخطاء الدوائية المحتملة كانت مهمة سريريا، و 5.3٪ من هذه الأخطاء كانت خطيرة. كان الخطأ المحتمل الأكثر شيوعا الذي منع ذلك هو الازدواجية (31.5٪) (تكرار نفس الدواء من مصنعين مختلفين أو أدوية مختلفة من نفس الفئة الدوائية). **الأستنتاج**: يمكن أن يؤدي عدم التوافق بين الأدوية إلى حدوث أخطاء دوائية كبيرة، والتي قد تكون خطيرة وتسبب ضررا للمرضى. هذه الدراسة لديها القدرة على تشكيل السياسات والممارسات التي تعطي الأولوية لسلامة الأدوية وتحسين نتائج المرضى أثناء الخروج من المستشفى.

* ***Corresponding author***: Ali A. Al-Jumaili, Department of Clinical Pharmacy, College of Pharmacy, University of Baghdad, Baghdad, Iraq; Email: ali.baraak@copharm.uobaghdad.edu.iq

Article citation: Ali MM, Al-Jumaili AA. Appraising the role of pharmacists in medication reconciliation at hospital discharge: A field-based study. *Al-Rafidain J Med Sci*. 2023;5(Suppl 1):S57-63. doi: https://doi.org/10.54133/ajms.v5i1S.319

INTRODUCTION

Medication reconciliation by pharmacists during patient discharge is a critical process that aims to ensure the safe and effective transition of care from the hospital to the patient's home [1]. It involves a comprehensive review and comparison of the medications the patient was taking prior to admission with the medications prescribed at the time of discharge. The pharmacists play a key role in this process, as they work closely with the healthcare team to identify and resolve any discrepancies, such as dose errors, omissions, or duplications [1,2]. During the patient discharge process, medication reconciliation by pharmacists serves multiple purposes. Firstly, it helps prevent adverse drug events and medication-related problems that can occur when patients receive conflicting prescriptions [3]. By carefully reviewing the medication list, the pharmacist can identify any potential drug interactions, allergies, or contraindications, ensuring that the prescribed medications are safe and appropriate for the patient's condition and that the way of taking medications is fully understood by the patient [3–5]. Secondly, medication reconciliation facilitates effective communication and coordination among healthcare providers, as it is a team-based work requiring the expertise and time of multiple health care providers to prevent medication errors and help the patient and his caregivers determine what the newly added and discontinued medications need to be after discharge [6,7]. The Joint Commission (TJC) has identified five major steps for medication reconciliation, which include: 1) Make a list of each medication that the patient is taking; 2) Make a list of all medications that have been prescribed; 3) Compare medications on the two medication lists; 4) Base clinical decisions on the comparison; and 5) Convey the revised medication list to the patient, caregivers, and providers [8]. Medication reconciliation as a medication safety strategy has been championed by several healthcare organizations. It was first adopted in 2005 as a National Patient Safety Goal (NPSG) by the Joint Commission, and later, the WHO and collaborators involved themselves in endorsing this strategy across many countries [9,10]. In a review of recent literature about medication reconciliation during discharge, it was implied that medication reconciliation accuracy improves when performed by a well-trained pharmacist [7]. Another review published in 2019 focused on studies related to medication reconciliation and medication history during care transition performed by pharmacy students and pharmacy technicians and concluded that both groups can identify and resolve discrepancies effectively and accurately when completing medication histories and medication reconciliation at care transition [11]. In a study conducted in Lebanon (2019) about the effect of medication reconciliation during patient admission, it was revealed that admission counseling identified 195 unintended discrepancies in 204 patients. medication omission was the most common discrepancy identified [12]. The medication discrepancies can occur at any point during discharge from a healthcare setting, including prescribing, dispensing, and patient counseling. At hospital discharge, patients are probably prescribed different medications compared to those they had at admission [13]. In Iraq, medication reconciliation during discharge is advised but not enforced. Additionally, studies related to this topic are not yet available. To the best of our knowledge, this is the first study in Iraq to evaluate pharmacist-led medication reconciliation at hospital discharge. The study findings would draw the attention of health officials to the essential role of pharmacists in discharge medication reconciliation. It can provide valuable insights and evidence to drive improvements in patient safety, healthcare quality, and health system effectiveness. It has the potential to shape policies and practices that prioritize medication safety and optimize patient outcomes during transitions of care. To the best of our knowledge, this is the first study in Iraq to evaluate pharmacist-led medication reconciliation at hospital discharge. The study findings would draw the attention of health officials to the essential role of pharmacists in discharge medication reconciliation. It can provide valuable insights and evidence to drive improvements in patient safety, healthcare quality, and health system effectiveness. It has the potential to shape policies and practices that prioritize medication safety and optimize patient outcomes during transitions of care. This study aimed to evaluate the effect of the pharmacist-led medication reconciliation service in an Iraqi public hospital during discharge to identify and address potential medication discrepancies.

METHODS

Study design

This prospective behavior-interventional study was conducted at the Internal Medicine ward and Cardiac Care Unit at a Teaching Hospital in Iraq during December 2022 and January 2023.

Inclusion criteria

The inclusion criteria were patients who were discharged from the above two wards, received a written discharge prescription from the physician, and had four or more medications within their discharge medications. The study included patients with four or more medications when discharged who could be at high risk for medication-related problems and drug-drug interactions since including all patients requires more human resources [14,15]. The patients were interviewed after obtaining their verbal consent to record their demographics, discharge medications, medical history, medication history, and diagnosis. The patients were

then either included or excluded according to the inclusion criteria. In order to assess and recognize the importance of the discharge prescription ordered by the physician when it is written comprehensively, patients who have received a comprehensive written discharge medication order from the physician were considered to have received discharge reconciliation from the physician.

Pharmacist-led medication reconciliation

In collaboration with the institution's pharmacists and physicians, a clinical pharmacist (researcher) carried out the counseling and reviewing of the intervention. The intervention included comparing the patient's medication use before or during hospitalization with the medications newly prescribed upon discharge, preparing a new medication list, contacting the healthcare providers (physicians and pharmacists) when needed, and communicating the new list to the patients or their caregivers. The researcher (a pharmacist) contacted physicians to clarify the reasons behind prescribing any questionable medications. The pharmacist-led medication reconciliation service included tracking patients with four or more medications at discharge time, reviewing their discharge medication list, identifying any potential medication errors, and solving them in collaboration with physicians when needed. Additionally, the pharmacist provided a discharge form with a comprehensive medication list and instructions. The unintended discrepancies identified were considered potential medication errors. These unintended discrepancies between the patient's understanding of their medications and the actual discharge prescription were addressed. When needed, the doctor was contacted, and a correction was made based on a clinical decision. The number, type, and severity of those errors and discrepancies were documented. The study relied on previous studies' classification of medication discrepancies severity at two different hospitals in Spain and Canada. They identified unintended discrepancies and evaluated their severity upon admission, discharge, and only admission, respectively [16,17]. After identifying those medication discrepancies, they were discussed with the prescribers when necessary and solved (Figure 1). Information on medication counseling for patients was provided by Medscape and UpToDate. The reconciliation form used was adopted from a US toolkit about medication reconciliation and translated into Arabic to match the language spoken by the patients in this study [18]. (available as a supplementary file)

Ethical consideration

The researchers followed all official means and sought all ethical approvals at multiple levels before conducting our study. We obtained ethical approval from the affiliated university, the local health directorate, the hospital administrative authority, and the heads of the study wards to conduct this study.

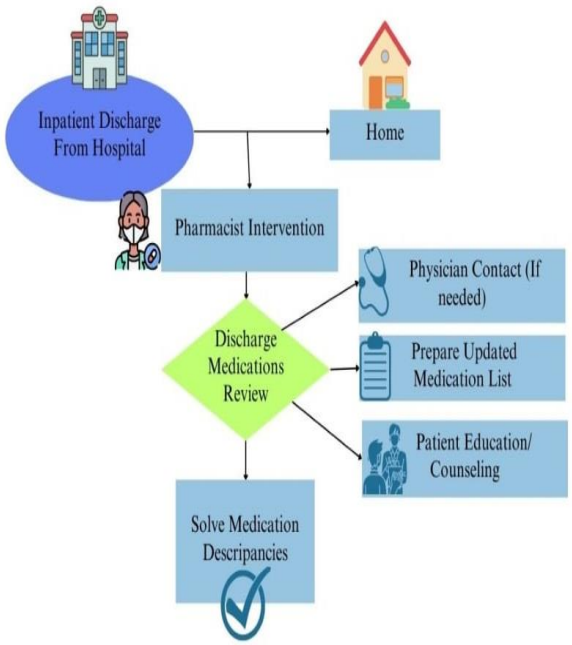

Figure 1: The study steps of pharmacist-led medication reconciliation before hospital discharge.

Additionally, the researcher introduced herself with a name badge (showing her name and the affiliated college) to the patients. She also explained the behavioral intervention (including the reconciliation form) (available as a supplementary file). The Ethics and Scientific Committees at the University of Baghdad, College of Pharmacy, approved this study with letter no. 7923 on December 20, 2022, and the Ethical and Scientific Committee of the Ministry of Health, Wasit Health Directorate, with letter no. 575 on December 13, 2022. Finally, the pharmacist intervention aimed to enhance patient medication safety without imposing a risk to patient health.

Statistical analyses

The data was analyzed using Statistical Package for the Social Sciences (SPSS) software version 25. Descriptive statistics were conducted for all study items. Continuous variables were expressed as means ± standard deviation (SD), whereas categorical variables were expressed as frequencies and percentages. The Chi-square and Fisher's exact tests were used to measure the difference in the incidents of medication errors according to physician reconciliation (categorical variables).

RESULTS

At discharge, 50 patients met the inclusion criteria and enrolled in this study. Patients' characteristics are listed in Table 1.

Table 1: The patient's characteristics

Variable		Mean±SD
Age (year)		60.88±19.3
Total number medications		9.4±18.12
Characteristics	***subcategories***	***Frequency(%)***
Gender	Male	23(46)
	Female	27(54)
Ward	Intern medicine ward	36(72)
	Cardiac care unit	14(28)
The system involved	Cardiovascular	24(48)*
	Respiratory	9(18)
	Endocrine	12(18)
	Neurology	13(26)
	Renal	2(4)

n=50; *The total number of systems involved is not 50, as patients could be discharged with more than one system involved in the diagnosis.

Thirty-nine out of the participating patients (78%) had received an initial physician-provided comprehensive prescription during discharge. On the other hand, 6.0% of the patients received medication reviews from the available hospital pharmacists. Of these 50 patients, 44% (*n*=22) had no medication discrepancies. The remaining 56% (*n*=28) had at least one potential error that needed the researcher-led reconciliation intervention (Table 2).

Table 2: The number of identified medication discrepancies by the researcher at the hospital discharge

Number of Potential errors per patient	Frequency (%)
0	22(44)
1	19(38)
2	7(14)
3	2(4)

Total number of potential errors = 38

The severity of these potential errors was classified based on their clinical significance and future impact on the patient according to their condition (Table 3). The definition of severity is adopted from previous studies about the severity of medication errors [19,20]. Approximately 89.4% of the potential errors identified were clinically significant, while 5.3% of these errors were serious (Table 3).

Table 3: The Severity of Identified Medication Errors by the Reconciliation with Examples

Severity	Harmfulness	*n* (%)	Examples
Clinically insignificant	The error that is unlikely to result in harm.	2(5.3)	The patient was taking a chlorpromazine tablet once a day for hiccups, while it was ordered twice daily in the prescription.
Significant	The error that has the potential to cause harm and may necessitate additional monitoring	34(89.4)	Valsartan was switched to valsartan/amlodipine/ hydrochlorothiazide, and it was probable that the patient could continue on both.
Serious	Error that has the potential to cause harm and will almost necessitate extra intervention or will result in a longer hospitalization.	2(5.3)	Glimepiride was within the patient's medication history before admission but was substituted with another anti-diabetic after discharge. It was probable that the patient would continue on both.

The most frequent potential error that prevented it was duplication (31.5%), followed by dose frequency error (18.4%) and omission (13.1%). Other potential errors were dosing error (7.9%), drug-drug interaction (7.9%), and treatment duration error (5.2%) (Table 4).

Table 4: The types of the identified potential medication errors at hospital discharge

Potential errors	Frequency (%)
The patient was about to duplicate an existing drug	12(31.5)
Dose frequency error	7(18.4)
The patient was about to continue a deleted drug	5(13.1)
The patient was about to omit an existing drug	5(13.1)
Drug- drug interaction	3(7.9)
Dosing error	3(7.9)
Treatment duration error	2(5.2)
Administration error	1(2.6)
Total	38(100)

All 22 patients with no medication discrepancies at discharge have received medication reviews from either a hospital physician or pharmacist (Table 5). On the other hand, 28 patients who had at least one medication discrepancy upon discharge were about to leave the hospital, knowing that nine of them had not received counseling or a medication review from a hospital pharmacist or physician (Table 5). Luckily, all 28 patients received medication reconciliation from the research pharmacist to address their medication discrepancies before hospital discharge. According to Fisher's exact test, there was no significant difference in the incidence of potential medication errors at the discharge and physician medication review/counselling. In other words, the regular comprehensive physician discharge prescription and review did not significantly reduce the incidence of medication errors at hospital discharge (Table 6).

Table 5: Medication discrepancies and healthcare providers' counselling

Discrepancies	Medication reconciliation status	*n*(%)
Patients with zero discrepancy (n=22)	Physician reconciliation	20(90.9)
	Pharmacist reconciliation	2(9.1)
	No reconciliation	0(0.0)
Patients with at least one discrepancy (n=28)	Physician reconciliation	19(67.8)
	Pharmacist reconciliation	1(3.5)
	No reconciliation	9(32.14)*

* Some patients may receive counselling from both physician and pharmacist; thus, total % > 100%.

The physicians have been reached 11 times. The researcher contacted permanent physicians eight times, rotating physicians twice, and specialists only once.

Table 6: The association between the physician regular medication review and the incidence of potential medication error at hospital discharge

Incidence of medication error			Physician reconciliation		*p*
			No	Yes	
Medication error	No	Count	2	20	0.085
		%	18.2	51.3	
	Yes	Count	9	19	
		%	81.8	48.7	

Non-significant according to Fisher's Exact Test

DISCUSSION

The term "medication reconciliation" is still not familiar among Iraqi hospital pharmacists. This service of pharmacist intervention (review, counseling and addressing) has been very well known in developed countries; However, it is still not widely implemented nor enforced in our healthcare settings. However, the Ministry of Health (MOH) in Iraq formally recommended in 2019 a medication review by the pharmacist before discharging as a part of fulfilling the requirements of the Post-Graduate Clinical Pharmacy Program, but it is still not fully implemented in all hospitals. It was the first field-based study tackling the medication reconciliation during hospital discharge in Iraq. Comprehensive medication reconciliation by a pharmacist during hospital discharging has been shown to be an effective process to reduce medication discrepancies and errors [7,13,21]. However, the method of medication reconciliation is not yet clear in Iraqi hospitals. The process is not straightforward and needs to be fully implemented. Our study focused on patients with four or more medications since those patients are at high risk of medication related problems, drug-drug interaction and possibility of low adherence [14,15]. Unlike other studies that have focused on the consequences after the discharge reconciliation service, like the rate of readmission, cost, and patient adherence [12,22,23], this study stressed the need for discharge reconciliation to address the medication errors on time. As in previous Iraqi studies [24,25], it demonstrated the importance of physician - pharmacist collaboration to prevent potential medication errors. Our study shows that the public hospital has not enforced pharmacist - led reconciliation process at discharge, and some hospital pharmacists may believe this review process is voluntary unless the patient is asking for it. According to the findings of this study, the pharmacist-led medication reconciliation program solved at least one medication discrepancy for 56% (28/50) of the participating patients. The other 44% were discrepancy-free. Several prior studies conducted in the United States and Lebanon revealed similar results [12,22]. A previous Iraqi study showed that clinical pharmacists identified prescribing medication errors during hospitalization and reported them to the physicians to be addressed, but, the physicians accepted only about one-third (37.4%) of the pharmacist-recommendations [13]. Another study conducted in southern Sweden, which included collecting discharge summaries by five pharmacists from 150 different departments, revealed that medication discrepancies were identified in more than one-third of the patients, with an increasing discrepancy with increasing the number of medications [26]. Medication discrepancies at discharge can occur due to several factors, such as communication gaps among healthcare providers, documentation errors, and pharmacy-related issues. The results of our study also showed that 49% of the patients who received medication reviews by physicians (39 patients) developed at least one medication discrepancy to be addressed by the researcher-led medication reconciliation. This could indicate that physician counseling alone may not be sufficient to prevent medication discrepancies and enhance the need for collaboration and teamwork. Clinical pharmacist collaboration in medication error identification, solving, and management has a positive impact on patient outcomes [27,28]. Three patients (6%) only received medication reconciliation by hospital pharmacists, and one of them experienced medication discrepancies that were solved by the study intervention. This low percentage of patients receiving counseling from the pharmacist upon discharge might be associated with a lack of enforcement or low job satisfaction among pharmacists in Iraq. A recent Iraqi study in 2022 found that half of the participating pharmacists were not satisfied with their job for multiple reasons [29]. Similarly, a multi-country study assessing job satisfaction among Arabic pharmacists concluded that pharmacists' satisfaction in Iraq is one of the lowest among other Arabic countries [30]. Approximately 89.4% of the potential errors had significant severity, and 5.3% were serious errors. This finding is consistent with findings from a previous study in the U.S. about

pharmacist involvement in discharge reconciliation, which revealed that the most common errors during discharge were of significant severity [22]. Our findings revealed different reasons for unintended medication discrepancies identified during discharge. The most common medication discrepancy was duplication (31.5%), either duplication of the same medication with different manufacturers or different medications from the same pharmacological class. This might be associated with limited health literacy in Iraq [31]; when patients cannot recognize the medication names of different manufacturer companies and think that a different pack is a different medication. Additionally, this could be due to the involvement of multiple healthcare providers in the prescribing process and a lack of communication between them [32]. Pharmacy-related issues can also occur during the dispensing process by an external community pharmacy, such as substitution errors since most discharge medications are not available in public hospitals. According to a systematic review that included 15 studies about medication reconciliation after hospital discharge, the most common discrepancies detected during discharge were omissions [33] (the patient stopped or discontinued a continuing drug), which was the third most prevalent in our study (5/38). Similarly, another observational study conducted in a Saudi hospital revealed that the most prevalent medication discrepancy during discharge was omission [34]. A study in Sweden found that the most common medication discrepancy is the unintentional addition of a drug [26]. The most common duplicated medications were statins, proton pump inhibitors, and combination antihypertensive drugs. This could happen during drug switching or because of trade names. Writing trade names can cause more confusion at the prescribing and dispensing stages compared to generic names [35]. Additionally, this could be due to multiple healthcare providers or a lack of communication or counseling. The physicians have been reached 11 times. The researcher contacted permanent physicians eight times who were mostly accessible and cooperative. Rotating physicians were always available and contacted twice. However, they could not answer all the questions since they do not always attend the morning tour especially when all physicians come at the same time. Additionally, the rotating doctors are changing every day which makes it difficult to know everything about the patient's medical history and condition. The researcher contacted the specialist once because they usually leave the ward right after finishing their morning tour. Most of the time, access to specialists was not feasible. The higher percentage of patients were discharged from the intern medicine ward (72%) compared to the lower percentage of patients discharged from the cardiac care unit (28%) was due to the lower number of beds at the cardiac care unit. In other words, there were 13 beds only at Cardiac Care unit compared to more than 45 beds at the intern medicine ward. The intern medicine ward beds were equally distributed between female and male which could also explain the nearly equal number of both genders. We focused on the reconciliation intervention to be offered to patients with multiple medications in this study since multiple medications could increase the risk of medication discrepancy incidence [8,26]. Nevertheless, this is not the only trigger that makes reconciliation crucial. Other triggers are chronic diseases, age, and non-availability of medications [8].

Limitations of the Study

The study had some limitations. The study was limited to the Internal Medicine ward and Cardiac care unit at a single hospital in Iraq, which may restrict the study's generalizability. Furthermore, the sample size was relatively small. However, the sample included patients with multiple medications, who might be particularly prone to discrepancies during the transition of care. Future studies can include all patients in the reconciliation service, which needs more human resources. In other words, covering more patients needs a larger number of pharmacists and more pharmacist time dedicated for this service.

Conclusion

The existing counseling service provided to patients upon discharge is inadequate and needs to be improved. Medication reconciliation by a pharmacist is pivotal to resolving potential medication errors throughout the care transition from hospital to home, especially for patients with multiple medications, and in collaboration with the medication counseling or education performed by the physician. Theoretically, medication reconciliation is adopted by public hospitals, but it needs to be enforced as routine work for hospital pharmacists since it enhances patient medication safety.

Conflict of interests

No conflict of interest was declared by the authors

Funding source

The authors did not receive any source of fund.

Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

REFERENCES

1. National Patient Safety Goals® Effective July 2023 for the Hospital Program Goal 2023. Available at: https://www.jointcommission.org/-

/media/tjc/documents/standards/national-patient-safety-goals/2023/npsg_chapter_hap_jul2023.pdf
2. Reeder TA, Mutnick A. Pharmacist- versus physician-obtained medication histories. *Am J Health-Sys Pharm*. 2008;65(9):857-860. doi: 10.2146/ajhp070292.
3. Herledan C, Baudouin A, Larbre V, Gahbiche A, Dufay E, Alquier I, et al. Clinical and economic impact of medication reconciliation in cancer patients: a systematic review. *Support Care Cancer*. 2020;28:3557-3569. doi: 10.1007/s00520-020-05400-5.
4. Singh D, Fahim G, Ghin HL, Mathis S. Effects of pharmacist-conducted medication reconciliation at discharge on 30-day readmission rates of patients with chronic obstructive plmonary disease. *J Pharm Pract*. 2021;34(3):354-359. doi: 10.1177/0897190019867241.
5. Studer H, Imfeld-Isenegger TL, Beeler PE, Ceppi MG, Rosen C, Bodmer M, et al. The impact of pharmacist-led medication reconciliation and interprofessional ward rounds on drug-related problems at hospital discharge. *Int J Clin Pharm*. 2023;45(1):117-125. doi: 10.1007/s11096-022-01496-3.
6. Bouchand F, Leplay C, Guimaraes R, Fontenay S, Fellous L, Dinh A, et al. Impact of a medication reconciliation care bundle at hospital discharge on continuity of care: A randomised controlled trial. *Int J Clin Pract*. 2021;75(8). doi: 10.1111/ijcp.14282.
7. Patel E, Pevnick JM, Kennelty KA. Pharmacists and medication reconciliation: a review of recent literature. *Integr Pharm Res Pract*. 2019;8:39-45. doi: 10.2147/iprp.s169727.
8. National Patient Safety Goals® Effective January 2022 for the Hospital Program, 2022. Available at: https://www.jointcommission.org/-/media/tjc/documents/standards/national-patient-safety-goals/2022/npsg_chapter_hap_jan2022.pdf
9. Catalano K. JCAHO'S National Patient Safety Goals 2006. *J Perianesth Nurs*. 2006;21(1):6-11. doi: 10.1016/j.jopan.2005.11.005.
10. Medicines optimization: the safe and effective use of medicines to enable the best possible outcomes NICE guideline. 2015. Available at: https://www.nice.org.uk/guidance/ng5/resources/medicines-optimisation-the-safe-and-effective-use-of-medicines-to-enable-the-best-possible-outcomes-pdf-51041805253
11. Champion HM, Loosen JA, Kennelty KA. Pharmacy students and pharmacy technicians in medication reconciliation: A review of the current literature. *J Pharm Pract*. 2019;32(2):207-218. doi: 10.1177/0897190017738916.
12. Karaoui LR, Chamoun N, Fakhir J, Abi Ghanem W, Droubi S, Diab Marzouk AR, et al. Impact of pharmacy-led medication reconciliation on admission to internal medicine service: Experience in two tertiary care teaching hospitals. *BMC Health Serv Res*. 2019;19(1). doi: 10.1186/s12913-019-4323-7.
13. Jabri AM, Assad HC, Al-Jumaili AA. Pharmacist role to enhance the prescribing of hospital discharge medications for patients after heart attack. *Saudi Pharm J*. 2020;28(4):473-479. doi: 10.1016/j.jsps.2020.02.009.
14. Maher RL, Hanlon J, Hajjar ER. Clinical consequences of polypharmacy in elderly. *Exp Opin Drug Safe*. 2014;13:57-65. doi: 10.1517/14740338.2013.827660.
15. Rollason V, Vogt N. Reduction of polypharmacy in the elderly a systematic review of the role of the pharmacist. *Drugs Aging*. 2003;20. doi: 10.2165/00002512-200320110-00003.
16. Climente-Martí M, García-Mañón ER, Artero-Mora A, Jiménez-Torres NV. Potential risk of medication discrepancies and reconciliation errors at admission and discharge from an inpatient medical service. *Ann Pharmacother*. 2010;44(11):1747-1754. doi: 10.1345/aph.1p184.
17. Cornish PL, Knowles SR, Marchesano R, Tam V, Shadowitz S, Juurlink DN, et al. Unintended medication discrepancies at the time of hospital admission. *Arch Intern Med*. 2005;165(4):424-429. doi: 10.1001/archinte.165.4.424.
18. For Healthcare Research A. Medications at Transitions and Clinical Handoffs (MATCH) Toolkit for Medication Reconciliation. Available at: https://www.ahrq.gov/patient-safety/settings/hospital/match/index.html
19. Classen DC, Pestotnik SL, Evans RS, Lloyd JF, Burke JP. Adverse drug events in hospitalized patients. Excess length of stay, extra costs, and attributable mortality. *JAMA*. 1997;277(4):301-306. PMID: 9002492.
20. Folli HL, Poole RL, Benitz WE, Russo JC. Medication error prevention by clinical pharmacists in two children's hospitals. *Pediatrics*. 1987;79(5):718-722. PMID: 3575028.
21. Daliri S, Bouhnouf M, van de Meerendonk HWPC, Buurman BM, Scholte op Reimer WJM, Kooij MJ, et al. Longitudinal medication reconciliation at hospital admission, discharge and post-discharge. *Res Social Adm Pharm*. 2021;17(4):677-684. doi: 10.1016/j.sapharm.2020.05.022.
22. Sebaaly J, Parsons LB, Pilch NA, Bullington W, Hayes GL, Easterling H. Clinical and financial impact of pharmacist involvement in discharge Medication reconciliation at an academic medical center: A prospective pilot study. *Hosp Pharm*. 2015;50(6):505-513. doi: 10.1310/hpj5006-505.
23. Phatak A, Prusi R, Ward B, Hansen LO, Williams MV, Vetter E, et al. Impact of pharmacist involvement in the transitional care of high-risk patients through medication reconciliation, medication education, and postdischarge call-backs (IPITCH Study). *J Hosp Med*. 2016;11(1):39-44. doi: 10.1002/jhm.2493.
24. Abbood SK, Assad HC, Al-Jumaili AA. Pharmacist intervention to enhance postoperative fluid prescribing practice in an Iraqi hospital through implementation of NICE guideline. *Pharm Pract (Granada)*. 2019;17(3). doi: 10.18549/pharmpract.2019.3.1552.
25. Al-Jumaili AA, Al-Rekabi MD, Doucette W, Hussein AH, Abbas HK, Hussein FH. Factors influencing the degree of physician–pharmacist collaboration within Iraqi public healthcare settings. *Int J Pharm Pract*. 2017;25(6):411-417. doi: 10.1111/ijpp.12339.
26. Caleres G, Modig S, Midlöv P, Chalmers J, Bondesson Å. Medication discrepancies in discharge summaries and associated risk factors for elderly patients with many drugs. *Drugs Real World Outcomes*. 2020;7(1):53-62. doi: 10.1007/s40801-019-00176-5.
27. Mergenhagen KA, Blum SS, Kugler A, Livote EE, Nebeker JR, Ott MC, et al. Pharmacist- versus physician-initiated admission medication reconciliation: impact on adverse drug events. *Am J Geriatr Pharmacother*. 2012;10(4):242-250. doi: 10.1016/j.amjopharm.2012.06.001.
28. Khazal AA, Jamal MY. Pharmacist intervention to address drug related problems in patients with decompensated liver cirrhosis. *Al-Kindy Coll Med J*. 2023;19(1):121-126. doi: 10.47723/kcmj.v19i1.888.
29. Al-Jumaili AA, Mohammed ZA, Yawuz MJ, Ahmed KK. Exploring work satisfaction and characteristics of Iraqi pharmacist workforce. *Braz J Pharm Sci*. 2022;58. doi: 10.1590/s2175-97902022e19929%20.
30. Al-Jumaili AA, Sherbeny F, Elhiny R, Hijazi B, Elbarbry F, Rahal M, et al. Exploring job satisfaction among pharmacy professionals in the Arab world: a multi-country study. *Int J Pharm Pract*. 2022;30(2):160-168. doi: 10.1093/ijpp/riac011.
31. Al-Jumaili AA, Al-Rekabi MD, Sorofman B. Evaluation of instruments to assess health literacy in Arabic language among Iraqis. *Res Social Adm Pharm*. 2015;11(6):803-813. doi: 10.1016/j.sapharm.2015.02.002.
32. Mosah HA, Sahib AS, Al-Biati HA. Evaluation of Medication Errors in Hospitalized Patients. *Al-Kindy Coll Med J*. 2012;8(2):75-79.
33. Michaelsen M, McCague P, Bradley C, Sahm L. Medication reconciliation at discharge from hospital: A systematic review of the quantitative literature. *Pharmacy*. 2015;3(2):53-71. doi: 10.3390/pharmacy3020053.
34. Alanazi AS, Awwad S, Khan TM, Asdaq SMB, Mohzari Y, Alanazi F, et al. Medication reconciliation on discharge in a tertiary care Riyadh Hospital: An observational study. *PLoS One*. 2022;17(3):e0265042. doi: 10.1371/journal.pone.0265042.
35. Moriarty F, Bennett K, Fahey T. Fixed-dose combination antihypertensives and risk of medication errors. *Heart*. 2019;105(3):204-209. doi: 10.1136/heartjnl-2018-313492.