

A Clinical Audit on Identification of Medication Errors in a Tertiary Care Hospital, Lahore

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Abstract

Medication errors have serious effects on patient care, and it is important to detect them instantly to reduce clinical practice errors and prevent their adverse outcomes. Even though error reporting techniques are less expensive, there may be considerable impediments for a nurse to notify an error due to the obvious possibility of negative repercussions. The present study was undertaken to determine the incidence and percentage of medication errors and medicine dispensing errors. Records were maintained by the hospital quality assurance department, according to National Accreditation Board of Hospitals (NABH) standards, from January 2021 to December 2022. This data was collected by the authors and analyzed for the percentage of medication errors which included medicine dispensing errors. In this study, the incidence of medication errors was 2.77, 3.55, 3.88, 2.13, 6.45, 4.83, 1.65, 2.99, 2.27, 2.12, 1.18, and 2.11 in January, February, March, April, May, June, July, August, September, October, November, and December 2021, respectively, versus 3.69, 3.12, 4.51, 2.20, 2.06, 4.80, 2.68, 4.03, 4.12, 2.66, 1.66 and 3.30 during the same months of 2022, respectively. Although medication errors occur frequently, they are rarely reported. In order to accurately assess the contributing factors and take preventative action to make sure they do not recur in the future, reporting is essential.

Keywords: prescription errors, medication error, NABH.

Introduction

Any preventable incident that may cause or contribute to improper pharmaceutical usage or patient damage, while the medicine is within the control of the healthcare provider, is referred to as a medication error (Alqenae et al., 2020). Medication errors occur at any point of the medication management process involving prescribing, transcribing, dispensing, administering and monitoring. According to the World Health Organization (WHO), medication errors cost an estimated US\$42 billion annually worldwide, which is 0.7% of the total global health expenditure (Manias et al., 2020). There are two major types of errors:

1. Errors of omission occur as a result of actions not taken. Examples are not strapping a patient into a wheelchair or not stabilizing a journey before patient transfer.

2. Errors of the commission occur as a result of the wrong action taken. Examples include administering a medication to which a patient has a known allergy or not labelling a laboratory specimen that is subsequently ascribed to the wrong patient (Mroz et al., 2019).

There are many potential reasons for medication errors to happen at hospitals. Patients commonly receive new drugs or have alternate drugs due to drug formulary limitations which could limit certain medications during the hospitalization. In addition, the lack of communication, understanding, and collaboration among providers is a significant factor in preventable medication errors after the hospital (Almalki et al., 2021). Medication is the most widely used medical intervention. Harm caused by medication is referred to as an adverse drug event (ADE), and includes medication errors, adverse drug reactions, allergic reactions and overdoses (Elliott et al., 2021). There are several types of medication errors, including prescription errors, wrong time, unauthorized drug, improper dose, wrong dose prescription/wrong dose preparation, administration errors (comprising incorrect route of administration, giving the drug to the wrong patient, extra dose, wrong rate) (Alqenae et al., 2020).

Study Purpose

The present study aimed to determine the incidence of medication errors and medication dispensing errors. The main objective was to determine the effect of clinical audits.

Study Objectives

1. To identify the incidence of medical errors
2. To identify the percentage of medical errors
3. To determine the effects of clinical audits

Criteria for Evaluation

Nurses in General Medical Wards should adhere to the seven out of ten rights of medicine administration when administering medications to patients to reduce errors.

Clinical Audit Standard

Nurses in General Medical Wards should adhere to the seven out of ten rights of medicine administration when administering medications to 80% of patients to reduce errors.

MEDICATION CHART REVIEW CHECKLIST					
Patient name:		Age:		Reg. #	
	Antibiotic 1	Antibiotic 2	Antipyretic	Analgesic	Steroid/Anti-inflammatory
Nurses					
Wrong route					
Wrong dose					
Wrong patient					
Wrong drug					
Wrong time					
Wrong duration					
Improper dose					
Wrong administration					
Dose omission					
Improper documentation					
Pharmacy					
Wrong drug dispensed					
Wrong dose dispensed					
Wrong formulation dispensed					
Delay in dispense					
Wrong labelling					
Audit Date:			Auditor Signature:		

Methodology

The medication errors were analyzed through a retrospective observational study. Data was collected from the Jinnah Hospital Lahore, a specialized teaching hospital with 1650 beds, from January 2021 to December 2022. The data for the present study was collected from medication error forms, reported and updated daily by authorized people, mainly nursing staff and clinical pharmacists. The annual admission ratio of patients in the general ward is approximately 30,000 patients. The sample size for the clinical audit was calculated by utilizing the WHO calculator with a 95% confidence interval, 5% margin of error, and population proportion of medication error in developing countries which is 18.2% (AssuncaoCosta, Sousa, et al., 2022) and calculated sample size for clinical audit 228. To conduct the audit, documents of 227 consecutive patients undergoing receiving medications were systematically reviewed.

Procedure for documenting medication errors

- Patient demographics (name, Age and Registration No)
- Accurate description of the incident by observation and by enquiring about every patient documenting the complaints

The checklist was used to document the incidence (Table 1).

Audit criteria

1. Incidence of medication errors
2. Incidence of medication dispensing errors

$$\left[\left(\frac{\text{Total number of medication errors}}{\text{Number of patient days}} \right) \times 1000 \right]$$

Medication dispensing errors

The incidence of medication dispensing errors was assessed for the years 2022 and 2023 (Table 4 and Figure 3) and it was calculated according to the following formula:

$$\left[\left(\frac{\text{Total number of medication dispensing errors}}{\text{Number of patient days}} \right) \times 1000 \right]$$

The percentage of medication dispensing errors was assessed for the years 2022 and 2023 (Table 5 and Figure 4) and it was calculated according to the following formula:

$$\left[\left(\frac{\text{Total number of medication errors}}{\text{Number of patient days}} \right) \times 100 \right]$$

Data obtained from the audit was meticulously coded, entered, and cleaned using SPSS version 26. A descriptive analysis was performed. Results were expressed in frequencies and percentages, providing insights into the completeness, accuracy, and documentation practices of the pre-anesthesia evaluation process.

Results

The comparison of medication error incidence rates in a healthcare setting for the years 2021 and 2022 is provided in **Table 1**. The incidence rates are calculated per 1000 patient days for each month. In 2021, the medication error incidence rates varied throughout the year, with the highest rate of 6.45 occurring in May and the lowest rate of 1.18 in November. The overall incidence rate for the year was 2.77 per 1000 patient days. In contrast, the medication error incidence rates for 2022 showed a different pattern. While the rates remained relatively low in the first few months, they increased notably in April and July, with peaks of 4.51 and 4.80, respectively. The lowest incidence rate for the year was 1.66 in November. Overall, the incidence rate for 2022 was higher than that of 2021, with a rate of 3.30 per 1000 patient days. The data indicates a fluctuation in medication error incidence rates over the two years, highlighting the need for ongoing monitoring and improvement efforts to enhance patient safety in the healthcare setting.

Table 1: Incidence Rate of Medication Errors in Dispensing of Medication in Jinnah Hospital Lahore for the Years 2021 and 2022

Year			Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2021	No of medication error	X 1000	10	8	11	7	13	11	6	7	8	4	3	6
	No of patient days		3600	2251	2833	3275	2013	2275	3619	2337	3511	1880	2540	2832
	Incidence		2.77	3.55	3.88	2.13	6.45	4.83	1.65	2.99	2.27	2.12	1.18	2.11
2022	No of medication error	X 1000	8	9	10	8	8	9	7	9	9	5	3	7
	No of patient days		2164	2881	2216	3624	2612	1872	2605	2233	2180	1876	1803	2117
	Incidence		3.69	3.12	4.51	2.20	2.06	4.80	2.68	4.03	4.12	2.66	1.66	3.30

Table 2 presented the data on medication dispensing errors in a pharmacy for the years 2021 and 2022, with incidence rates calculated per 1000 patient days for each month.

In 2021, the number of medication dispensing errors varied, with the highest number of errors (3) occurring in June and the lowest number (0) in March, May, September, and November. The overall incidence rate for the year was 0.70 per 1000 patient days.

In 2022, the number of medication dispensing errors showed a different pattern. The highest number of errors (4) was recorded in July, while the lowest number (0) occurred in September and October. The overall incidence rate for the year was 0.92 per 1000 patient days.

The data indicates that while the number of medication dispensing errors fluctuated over the two years, there was a slight increase in the overall incidence rate from 2021 to 2022. This highlights the importance of continued efforts to improve medication dispensing practices and minimize errors in pharmacy settings.

Table 2: Incidence Rate of Medication Errors in Dispensing of Medication in Pharmacy of Jinnah Hospital Lahore for the Years 2021 and 2022

Year			Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2021	No of medication dispensing errors	X 100 0	1	1	0	2	0	3	2	1	0	2	1	2
	No of patient days		3600	2251	2833	3275	2013	2275	3619	2337	3511	1880	2540	2832
	Incidence		0.27	0.44	0	0.61	0	1.31	0.55	0.42	0	1.06	0.39	0.70
2022	No of medication dispensing errors	X 100 0	2	1	3	2	0	3	4	1	0	1	3	2
	No of patient days		2164	2881	2216	3624	2612	1872	2605	2233	2180	1876	1803	2117
	incidence		0.92	0.34	1.35	0.55	0	1.60	1.53	0.44	0	0.53	1.66	0.94

The comparison of medication dispensing errors percentage and their incidence rates over the years 2021 and 2022 is presented in **Table 3**.

In 2021, the number of medications dispensing errors in January, February, March, etc., was X, 1, 1, 0, 2, 0, 3, 2, 1, 0, 2, 1 and 2, respectively. When converted to a percentage by dividing by the number of patient days and multiplying by 100, the incidence rates for these months were 0.02%, 0.04%, 0%, 0.061%, 0%, 0.13%, 0.05%, 0.04%, 0%, 0.10%, 0.03%, and 0.07%, respectively.

Moving on to 2022, the number of medications dispensing errors in January, February, March, etc., was X, 2, 1, 3, 2, 0, 3, 4, 1, 0, 1, 3, and 2, respectively. After converting to a percentage based on the number of patient days, the incidence rates for these months were 0.09%, 0.03%, 0.13%, 0.05%, 0%, 0.16%, 0.15%, 0.04%, 0%, 0.05%, 0.016%, and 0.09%, respectively.

Overall, it appears that the incidence rates of medication dispensing errors fluctuated over the two years, with some months showing an increase or decrease compared to the previous year. It would be important to analyze the reasons behind these variations and implement measures to reduce medication errors in healthcare settings.

Table 3: Percentage of Medication Errors in Jinnah Hospital Lahore for the Years 2021 and 2022

Year			Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2021	No of medication dispensing errors	X 100	1	1	0	2	0	3	2	1	0	2	1	2
	No of patient days		3600	2251	2833	3275	2013	2275	3619	2337	3511	1880	2540	2832
	Incidence		0.02	0.04	0	0.061	0	0.13	0.05	0.04	0	0.10	0.03	0.07
2022	No of medication dispensing errors	X 100	2	1	3	2	0	3	4	1	0	1	3	2
	No of patient days		2164	2881	2216	3624	2612	1872	2605	2233	2180	1876	1803	2117
	Incidence		0.09	0.03	0.13	0.05	0	0.16	0.15	0.04	0	0.05	.016	0.09

Table 4 provides data on medication dispensing errors and their incidence rates in a pharmacy for 2021 and 2022.

In 2021, the number of medication dispensing errors in January, February, March, etc., was X, 0, 1, 0, 1, 0, 2, 3, 1, 0, 1, 2, and 1, respectively. When converted to a per 1000 rate by dividing by the number of patient days and multiplying by 1000, the incidence rates for these months were 0, 0.04, 0, 0.03, 0, 0.08, 0.11, 0.02, 0, 0.03, 0.05, and 0.02, respectively.

In 2022, the number of medication dispensing errors in January, February, March, etc., was X, 1, 3, 2, 1, 0, 3, 4, 2, 1, 0, 2, and 1, respectively. After converting to a per 1000 rate based on the number of patient days, the incidence rates for these months were 0.03, 0.14, 0.06, 0.03, 0, 0.10, 0.2, 0.06, 0.03, 0, 0.07, and 0.04, respectively.

The data shows some fluctuation in the incidence rates of medication dispensing errors over the two years, with some months showing an increase or decrease compared to the previous year. It would be important for the pharmacy to analyze the reasons behind these variations and implement measures to reduce medication errors.

Table 4: Percentage of Medication Errors in dispensing of medicine in Pharmacy Jinnah Hospital Lahore for the Years 2021 and 2022

Year			Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2021	No of medication dispensing errors	X 100	0	1	0	1	0	2	3	1	0	1	2	1
	No of patient days		3900	2251	3233	3275	3013	2275	2619	3337	2511	2880	3540	3832
	Incidence		0	0.04	0	0.03	0	0.08	0.11	0.02	0	0.03	0.05	0.02
2022	No of medication dispensing errors	X 100	1	3	2	1	0	3	4	2	1	0	2	1
	No of patient days		3164	2081	3216	2655	2642	2872	2000	3233	3180	2876	2703	2007
	incidence		0.03	0.14	0.06	0.03	0	0.10	0.2	0.06	0.03	0	0.07	0.04

Discussion

Medication errors have serious consequences, ranging from prolonged hospital stays and expenditures to excessive suffering and disabilities, as well as higher mortality (Bhat, 2017). Establishing a safer health system, learning from past mistakes, reducing human and financial costs, and ensuring patient safety must be the primary priority in every hospital environment. A clinical audit is often performed by a multidisciplinary team after the occurrence of near-miss incidents, or unfavourable or catastrophic events. The team's interaction is discreet, blame-free, and anonymous, intending to keep track of crucial occurrences, examine care that has already been given, and make improvements for the future. Auditing is also a mode of education that promotes high-quality treatment and thus should be done regularly (McVey et al., 2020). The clinical audit could be used to prevent pharmaceutical mistakes or adverse events that have not happened yet but have been mentioned in surveillance alerts. Medication errors have serious consequences for patient care, and identifying them is a critical goal in reducing current clinical errors and preventing adverse outcomes; also, they are not evenly distributed in the population in terms of frequency and severity. Medication errors were classified as prescription, transcription, indenting, dispensing, and administration errors (Panca et al., 2018). The majority of medication errors do not result in serious harm, but some do, leading to unintended consequences such as temporary or permanent damage to patient's well-being, enhanced duration of hospital stay, greater treatment costs, people losing confidence in the health sector, and sometimes even deaths (Bhat, 2017). In the current study, the incidence of medication errors was 2.77 per 1000 patient days in 2021 with a rate of 3.30 per 1000 patient days in 2022. India found that medication errors had an incidence of 6.1% in critical care units of tertiary care settings. Also, in studies carried out in West Ethiopia and India, the reported incidence of medication errors was 46% and 42.85%, respectively. Underreporting is the primary reason for low medication error rates (Paul *et al.*, 2023).

Proper monitoring and capturing of medication error data has been initiated and the Staff has been counseled and sensitized regarding safe medication practices and proper reporting of medication errors (Ghosh et al., 2020). None of the 2043 clinical medication administration errors identified during direct observation were reported by staff to the incident systems. This included 209 clinically important errors observed. Flynn et al. also found a very low rate at which observed

medication administration errors were reported, with one report (0.4%) across 36 US hospitals. Husch et al. investigating errors associated with the use of intravenous pumps in a US hospital, identified 55 rate deviations and wrong medication errors during 9 hours of observation. They noted that in the previous 2 years, only 48 of these error types had been reported to the hospital's incident system, suggesting significant under-reporting (Westbrook et al., 2015). A dispensing error occurs when there is a mismatch between a prescription and the medicine that the pharmacy delivers to the patient or distributes to the ward based on the prescription, such as dispensing a medicine of poorer pharmaceutical or informational quality. Prescription errors are well-known in general practice, but estimates of their occurrence vary greatly, and little is known about the frequency of different types of errors or the contributing variables. The of medication dispensing errors was 0.70 per 1000 patient days and 0.92 per 1000 patient days. A study in the UK showed a prescription error of 36%. Another study, which aimed to evaluate the prevalence of medication errors and adherence to WHO guidelines, showed that the incidence of medication errors in the community was 20%. Dispensing errors are mistakes that occur during the medication dispensing process, posing serious health risks to patients. They can happen at any stage, including prescribing, transcribing, dispensing, and administration. Examples include dispensing the wrong dose or drug, giving medication to the wrong patient, or using the incorrect diluent for reconstitution. These errors can lead to drug interactions, adverse effects, allergic reactions, or even death. To prevent such errors, healthcare providers must be vigilant, ensure proper training, and maintain a safe dispensing environment. Factors like high workload, similar drug names, interruptions, and poor handwriting can contribute to these errors (Paul *et al.*, 2023). A were more likely to be detected by pharmacists and doctors, while errors were more likely to be detected by pharmacists and nurses at Hospital B. Doctors at Hospital A detected a greater proportion of errors at their hospital than their peers at Hospital B. Pharmacists at Hospital B detected more errors than their colleagues at Hospital A (Westbrook et al., 2015). Risk factors for serious pharmaceutical mistakes such as administering medication to the wrong patient. It is critical to mention the patient's age in every prescription. This will aid in the selection of an exact dose of any medicine for patients as well as the distribution of the drug in the proper dosage form. Pharmacists can also assist physicians in reducing prescription errors by recognizing at-risk patients (based on checks of the physician's computer system) and supporting the proper management of any issues discovered by them. Any inconsistencies or variations from the prescription order, such as dispensing the erroneous medicine, dose, dosage form, or amount, or improper, inaccurate, or inadequate labeling, contribute to dispensing errors, which include unclear or insufficient instructions for usage as well as faulty or unsuitable preparation, packing, or storage of medication before distribution. Medication dispensing errors are usually linked to chemists' reconsidering of illegible and/or unclear prescriptions, non-standard abbreviations, acronyms, decimals, and call-in prescriptions. It is critical to contact the doctor whenever questions or concerns about the medication arise. The physician clarification should be notified immediately. Patients' engagement in their health care is increased when they are educated about how to use their medicine safely and effectively, which will likely minimize medication errors. Patient counseling, being the final point of interaction between the patient, pharmacist, and drug during the distribution process, is by far the most significant method for reducing dispensing mistakes. Furthermore, noting problems as they occur will aid in learning from them and, ultimately, prevent similar errors in the future.

Conclusion

Medication errors are frequently encountered but are often underreported. Reporting is crucial for thoroughly assessing contributing factors and implementing preventive measures to avoid recurrence. Human error plays a significant role in many medication errors and adverse drug events, and technology can play a vital role in preventing them. With the administration of

medication to a patient, electronic medical records can help detect potential drug interactions and accurately track and calculate doses. Medication error is now calculated as rate.

Recommendations of First Audit

- 1.Enhance training programs for healthcare providers to focus on medication safety protocols and error prevention strategies.
- 2.Foster effective communication among healthcare team members to minimize errors stemming from misunderstandings.
- 3.Invest in advanced electronic health record systems and medication management software to streamline processes.
- 4.Conduct regular clinical audits to assess medication error rates and evaluate preventive measures' effectiveness.
- 5.Emphasize adherence to medication administration standards and monitor compliance rigorously.
- 6.Provide comprehensive medication counselling to empower patients in their medication management.
- 7.Foster a culture of continuous quality improvement by encouraging feedback and implementing corrective actions.

Action Plan

The clinical audit on medication errors will entail establishing a confidential and non-punitive reporting system to encourage nurses and healthcare staff to report errors, coupled with comprehensive education and training programs to enhance medication safety practices. Fostering a culture of safety within the facility through transparent communication, teamwork, and recognition of error reporting is pivotal, alongside regular audits and monitoring to identify trends and root causes. Documentation and reporting of audit findings, interventions, and outcomes, coupled with accountability measures, sustain the momentum for error reduction and will enhance patient safety.

Re-Audit Plan

The re-audit was conducted in June 2023, 6 months after the first audit. Looking at 200 consecutive patients during six months from the end of December 2022. If any error occurred at the time, the reporting was done to change the practice.

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