EGYPTIAN JOURNAL OF ANAESTHESIA
2024, VOL. 40, NO. 1, 334–341
https://doi.org/10.1080/11101849.2024.2359148

Decreasing medication errors in Alexandria Main University Hospital Critical Care Unit 3 using sensitization program

Ahmed Ezeldin[a], Tayseer Zaytoun[a], Mohamed Megahed[a], Heba Othman Shaker[b] and Mohammed Elsalamouny[a]

[a]Department of Critical Care Medicine, Faculty of Medicine, Alexandria University, Alexandria, Egypt; [b]Department of Clinical pharmacy, Alexandria Main University Hospital, Alexandria, Egypt

ABSTRACT

Introduction: The occurrence of medication errors in hospital settings presents considerable public health challenges, as they significantly affect patient morbidity and mortality, especially with an increasing frequency in critical care units.

Material and methods: A prospective before-and-after study conducted in Critical Care Unit 3 at Alexandria Main University Hospital involved 1440 observations of medication errors in 16-bed units over three months, encompassing 181 patients using a checklist. After implementing a sensitization program, a follow-up study was conducted with 1472 observations involving 185 patients over another three months. The comprehensive study focuses on the impact of the sensitization program on medication errors and its reporting, employing a prospective before-after design.

Results: No statistically significant difference in mortality was observed between Control and Postintervention groups ($p = 0.258$). Prescription errors accounted for 52.0%, transcription errors 19.2%, dispensing errors 1.2%, preparation errors 13.9%, and administration errors 13.6% of total medication errors. In the Control group, 38.7% experienced at least one medical error, compared to 21.6% in the Postintervention group ($p < 0.001$). There were 396 medication errors (27.5% of observations) in the Control group versus 250 errors (17.0% of observations) in the Postintervention group ($p < 0.001$). Errors reporting increased from 3.8% to 30% ($p < 0.001$).

Conclusions: The non-technological sensitization program effectively reduced medication errors in our resource-limited unit and improved error reporting.

ARTICLE HISTORY
Received 9 December 2023
Revised 15 May 2024
Accepted 18 May 2024

KEYWORDS
Medication; errors; sensitization; program

1. Introduction

Medication errors have the potential to give rise to preventable adverse drug events, causing harm to patients and incurring significant financial costs. Even when not directly causing harm, these errors can lead to negative consequences, such as inefficiency and inappropriate resource utilization, contributing to the overall economic burden [1]. The medication use process involves various stages, including drug prescription, transcription, preparation, dispensing, and administration [2]. Definitions of medication errors vary in the literature, and they can occur at any point in the medication use process. The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) has offered a comprehensive definition: "A medication error is any avoidable incident that has the potential to result in inappropriate medication use or harm to the patient, occurring while the medication is under the supervision of a healthcare professional, patient, or consumer." [3] The origin of medication errors encompasses five stages in the medication process: prescription, transcription, preparation, dispensing, and administration [4].

In our study, we employed the classification of medication errors outlined by the National Coordinating Council for Medication Error Reporting and Prevention [3]. The likelihood of experiencing medication errors rose by 30% in patients who were prescribed five or more drugs and by 38% in individuals aged 75 years or older [5]. The medication-related admissions were double in older patients (65 years or above) as compared to the younger ones [6].

Improved medication safety can be accomplished by optimizing the safety of the medication process, eliminating situational risk factors, and providing strategies to intercept errors and mitigate their consequences. Several interventions have been shown to decrease medical error in the ICU, including technological interventions(computerized physician order entry, Bar code technology) [7] and non-technological intervention, which was used in our study (sensitization program) [8]. The non-technological interventions

CONTACT Ahmed Ezeldin A_Yusuf00@alexmed.edu.eg; ahmednader1980@gmail.com Department of Critical Care Medicine, Department of Critical Care Medicine, Alexandria University, Champollion Street, Alexandria 21521, Egypt

suit limited resources in critical care units in developing countries like Egypt [9].

The importance of a clinical pharmacist in critical care units to monitor drug treatment and prevent medication errors is well-established in some countries [10]. Clinical pharmacists' oversight of medication orders has the potential to avert over half (58%) of all errors, encompassing 72% of potentially harmful errors. Additionally, their involvement may enhance communication between doctors and pharmacists, leading to the prevention of 47% of all errors [11].

Critically ill patients admitted to an Intensive Care Unit (ICU) encounter an average of 1.7 medical errors per day, and a significant number of patients endure potentially life-threatening errors throughout their stay [12]. The most prevalent category of serious medical errors in the Intensive Care Unit (ICU) is medication errors, constituting 78% of such incidents [13]. Thus, every effort should be made to decrease its incidence and increase the reporting rate to the hospital system so we can identify the root causes and try to fix them.

2. Materials and methods

2.1. Patients

This research involved 366 participants, with 181 individuals in the pre-intervention group and 185 in the post-intervention group. The study focused on patients admitted to Critical Care Unit 3 at Alexandria Main University Hospital during two distinct periods: 1 May 2022, to 29 July 2022, for the pre-intervention group, and 1 November 2022, to 31 January 2023, for the post-intervention group, as determined by sample size calculation. Ethical approval was obtained from the Medical Ethics Committee of Alexandria Main University Hospitals (IRB # 0201621) on 17th February; 2022. The trial adhered to EQUATOR guidelines for observational studies.

2.2. Eligibility criteria

All patients admitted during the study period were included without exclusion criteria.

2.3. Setting

Critical Care Unit 3 is a 16-bed critical care department at Alexandria's tertiary care public university hospital.

2.4. Study design

The present study is a single-centre, cohort, prospective observational research using a pre-post quasi-experimental design of a single treatment cohort and a non-equivalent comparator cohort.

3. Data collection

Data collection for the preintervention group occurred over 90 days, while the post-intervention group spanned 92 days. Clinical pharmacists, doctors, and nurses observed medication administration and preparation daily at 12 PM using the "direct" observation method (1440 observations in the control group versus 1472 in the intervention group). The 16 beds were divided among the observers, with each day's direct observation lasting 3 hours. Errors detected during observation were immediately communicated to doctors and staff nurses for correction, aiming to prevent patient harm. Residents and staff nurses were unaware of the purpose of the observation. During ICU visits, doctors' orders and nurses' transcription charts from the past 24 hours were examined for prescription, transcription, and dispensing errors. The same methodology was applied in the follow-up study after the intervention. The unit, overseen by an in-charge nurse, had a nurse-to-patient ratio of 1:2, with residents involved in patient care and prescription writing, nurses in patient care, transcription, medication administration process, and pharmacists monitoring all the medication process.

4. Parameters studied

Medication charts were examined for prescription, transcription, and dispensing errors during observations. In this study, instances where nurses executed verbal orders from clinicians but were unable to record them in the nurses' charts were not classified as medication errors. Also, the observers detected and wrote medication administration and preparation errors in a performed checklist made by the critical care medicine department.

The percentage of all types of errors was calculated from the total number of errors detected throughout the whole study period. Patients with at least one medical error were calculated from the total number of patients in each group. The incidence of medication errors was estimated from the total number of errors in each group and the total number of observations.

5. Sensitization program and elements covered in the program

A comprehensive intervention was implemented to raise awareness among all stakeholders about medication errors. All healthcare professionals in our unit were invited to participate in two 60–75-minute contact sessions, during which detailed data and observed medication process challenges with case scenarios were presented. The program covered fundamental information on medication errors, including definitions, types, factors contributing to errors, clinical

implications, reporting, and safety improvement methods. Common errors, such as incomplete prescriptions and illegible handwriting, were addressed. Case-based discussions in the ICU highlighted issues like a communication gap between doctors and nurses, leading to the continuation or omission of drugs due to updated orders. Identified problems included a lack of awareness and training on medication safety. Suggestions from healthcare professionals led to modifications in the ICU medication chart to eliminate transcription errors and enhance communication between the medical team. They were introducing a blame-free medication error reporting tool to encourage continuous reporting. A follow-up study after three months assessed the intervention's impact in the critical care unit, comparing results with baseline data.

6. Sample size calculation

A minimum required sample size of 170 patients admitted to the ICU achieves 80% power to detect a 32% reduction in the incidence of patients with at least one medication error in the ICU after applying a preventive interventions program to reduce medication errors. Based on a similar study. We assumed a similar reduction percentage of 32% with 7% absolute precision and 95% confidence.

7. The sample size was determined through a two-sided, binomial hypothesis test at a significance level 0.05, utilizing R software

7.1. Statistical analysis

Data was fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp). Categorical data were represented as numbers and percentages. The chi-square test was applied to compare between two groups. Alternatively, the Fisher Exact correction test was used when more than 20% of the cells have an expected count of less than 5. The significance of the obtained results was judged at the 5% level.

8. Results

We made 1440 observations of medication errors over three months involving 181 patients admitted during that timeframe. Following the implementation of a sensitization program, we repeated the observations, totaling 1472, involving 185 patients over another three months (Figure 1).

The demographic data comparison indicates no significant differences in age or gender distribution between the Control and Postintervention groups, enhancing the validity of subsequent analyses. In the Control group ($n = 181$), 45.9% experienced mortality, while the Postintervention group ($n = 185$) had a 40% mortality rate; however, the difference was not statistically significant ($p = 0.258$). Admission diagnoses were similar between the groups, suggesting comparable risk profiles. The nurse/patient ratio was consistent in both groups, aligning with ICU nursing policy. Overall, the study indicates well-matched groups and no substantial variations in key parameters. (Table 1)

We classified medication errors into distinct categories, and these findings were based on a comprehensive dataset encompassing 646 errors in the pre-and post-intervention period. Prescription errors were the most frequent, accounting for 52% of medication errors. Following were transcription errors, constituting 19.2% of the errors. Dispensing errors were relatively infrequent, making up only 1.2% of the total. Preparation errors comprised 13.9% of the cases, indicating challenges in the preparation process, while administration errors closely followed at 13.6% (Figure 2).

The Postintervention group had significantly fewer errors (17%) than the Control group (27%), as indicated by the chi-square test statistics and *p*-values. There were no statistically significant differences between the two groups for Dispensing, Preparation, and Administration, as the *p*-values were more than 0.05. (Table 2)

Seventy patients (38.7%) experienced at least one medical error in control group while in the postintervention group ($n = 185$), there were 40 patients (21.6%) who experienced at least one medical error (*p*-value <0.001).

In our study, we adopted an approach where we could not assess the harm caused by the errors we detected. This decision was rooted in ethical considerations, as we deemed it necessary to rectify errors once identified. However, we strongly acknowledge the impact of medication errors, whether in terms of medical outcomes or economic consequences. Significantly, there was a notable rise in incident report numbers in the postintervention group (30% compared to 3.8% in the control group) with a *p*-value <0.001, indicating a substantial change in reporting patterns. These findings highlight the impact of the intervention on reporting behavior across various individuals and roles. (Figure 3)

It appears that the distribution of errors varies across different routes of administration between the control and post-intervention groups.

For the intravenous route, there is a slight decrease in errors post-intervention (from 35.4% to 32.0%), although this difference was not statistically significant ($\chi2 = 0.767$, $p = 0.381$).

Similarly, for the enteral route, there is also a decrease in errors post-intervention (from 30.3% to 26.4%), but again, this difference was not statistically significant ($\chi2 = 1.139$, $p = 0.286$).

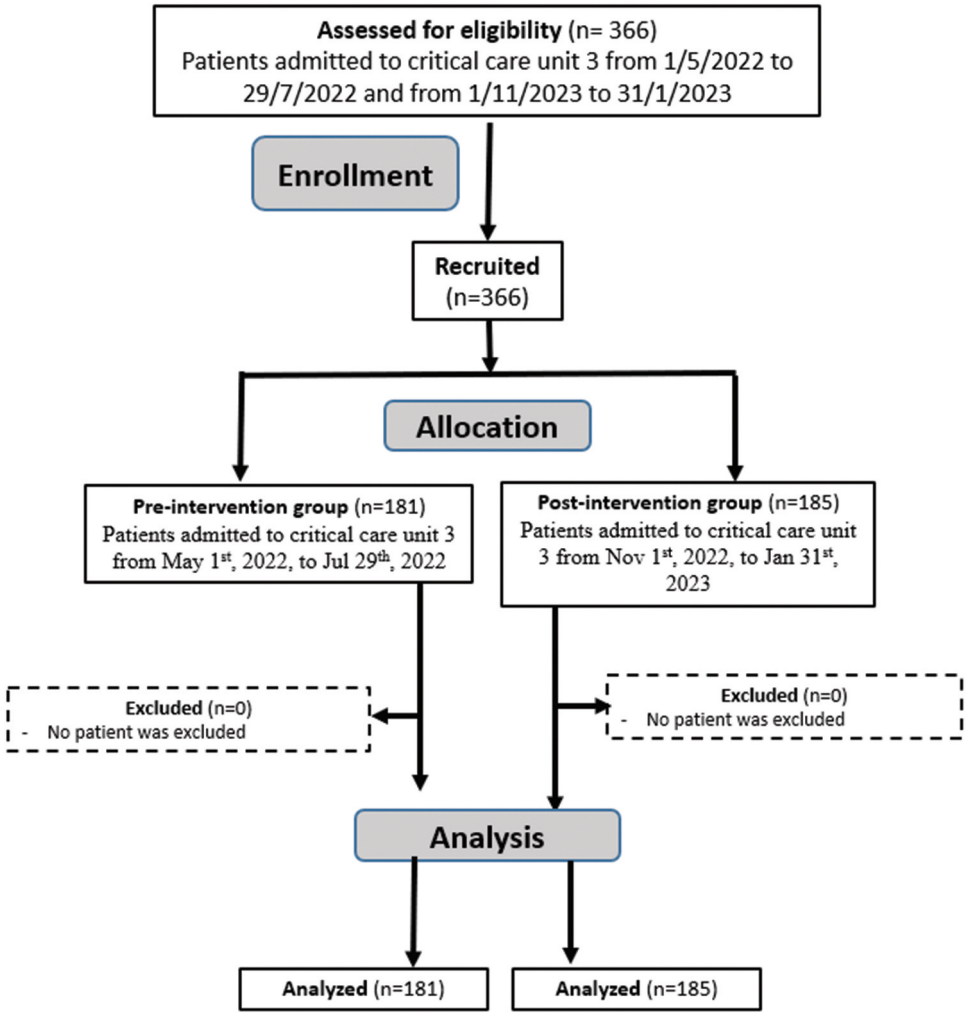

Figure 1. Study flow chart.

However, when considering intravenous infusion, there seems to be a notable increase in errors post-intervention (from 20.2% to 28.0%), and this difference was statistically significant ($\chi 2 = 5.227$, $p = 0.022$).

On the other hand, for the subcutaneous route, there is a slight decrease in errors post-intervention (from 14.1% to 13.6%), but this difference was not statistically significant ($\chi 2 = 0.037$, $p = 0.847$).

In conclusion, while there were no significant changes observed in error rates for the intravenous and enteral routes post-intervention, there was a significant increase in errors for the intravenous infusion route. (Table 3)

9. Discussion

In our study, medication errors were 27.5% out of 1,440 observations over 90 days. After the intervention, this percentage significantly decreased to 17% from 1,472 observations over 92 days. This aligns with the findings of Romero et al. [14], who reported an incidence of 34% in the pre-intervention group and 25.5% in the post-intervention group. However, it's worth noting that their study had fewer observations, with 194 in the pre-intervention group and 216 in the post-intervention group, compared to the larger sample size in our study (1,440 and 1,472 observations in the respective groups). Moreover, our study included 366 patients in both pre and post-intervention groups, whereas Romero et al. had 278 patients in their study [14]. Armin Eisa-Zaei et al. [15] reported a medication error incidence of 42.85% (300 medication errors out of 700 prescriptions collected over three months), which was slightly higher than the incidence observed in our study. The variance in error incidence is slightly higher but still aligns with our results.

In our study, the postintervention group had fewer patients with at least one medication error (21.6% vs. 38.7% in the control group). These results emphasize the success of the intervention in reducing patient harm. Comparatively, Romero et al. [14] reported comparable incidence in reducing patients with at least one medication error (from 41.9% before to 28.6% after the sensitization program).

In our study, prescription errors were the most frequent, accounting for 52.0% of the total medication errors. The following were transcription errors, constituting 19.2% of the mistakes. And this was due to our medication prescription and transcription process,

Table 1. Comparison between the two studied groups according to patient characteristics.

Patient Characteristics	Control (n** = 181)	Postintervention (n** = 185)	χ^2	*p*
Age, n (%)			1.978	0.577
0–20	22 (12.2%)	26 (14.1%)		
21–40	48 (26.5%)	39 (21.1%)		
41–60	49 (27.1%)	58 (31.4%)		
>61	62 (34.3%)	62 (33.5%)		
Sex, n (%)			0.164	0.686
Male	95 (52.5%)	101 (54.6%)		
Female	86 (47.5%)	84 (45.4%)		
ICU stay, n (%)			5.737	0.057
0-3 days	35 (19.3%)	48 (25.9%)		
4–10 days	88 (48.6%)	97 (52.4%)		
>10 days	58 (32.0%)	40(21.6%)		
Deaths, n (%)	83 (45.9%)	74 (40%)	1.281	0.258
Admission diagnosis, n (%)				
Cardiac	10 (5.5%)	11 (5.9%)	0.030	0.863
Neurological	40 (22.1%)	33 (17.8%)	1.041	0.308
Renal	7 (3.9%)	7 (3.8%)	0.002	0.967
Hepatic	4 (2.2%)	8 (4.3%)	1.290	0.256
Trauma	13 (7.2%)	14 (7.6%)	0.020	0.888
Toxicology	45 (24.9%)	37 (20.0%)	1.244	0.265
Respiratory	10 (5.5%)	9 (4.9%)	0.081	0.776
Hematology	7 (3.9%)	12 (6.5%)	1.275	0.259
Malignancy	6 (3.3%)	13 (7.0%)	2.561	0.109
Surgical	13 (7.2%)	11 (5.9%)	0.228	0.633
Near drowning	1 (0.6%)	0 (0.0%)	1.025	$^{FE}p = 0.495$
Multiple diagnosis	25 (13.8%)	30 (16.2%)	0.414	0.520
Nurse/patient ratio	1:2	1:2		

χ^2: Chi-square test.
FE: Fisher Exact.
p: p-value for comparing between the studied groups. **: Patient number.

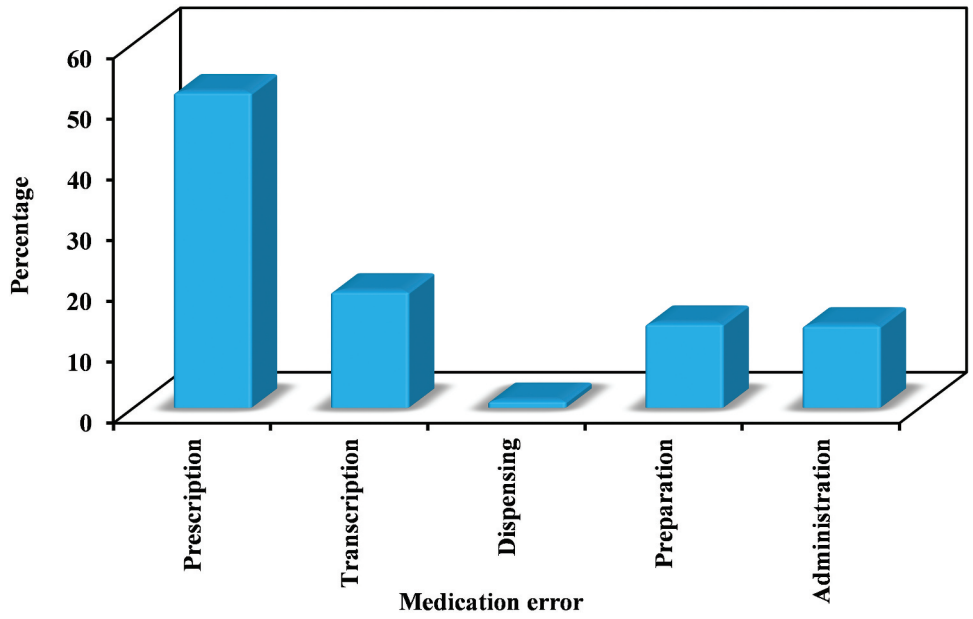

Figure 2. Distribution of the studied cases according to incidence of medication error.

which previously involved two separate forms for doctors and nurses. However, this process was modified following a sensitization program, consolidating it into a single form for doctors and nurses. Kapil G. Zirpe et al. [16] also reported high transcription and prescription errors. Transcription errors were the most prevalent at 44.1%, followed by prescription errors at 40%. These findings align with our data that the most common errors were prescription and transcription errors, but transcription errors were more prevalent for them. Kapil G. Zirpe et al. [16] stated that they had problems reporting errors. Also, doctors' and nurses' understanding and knowledge regarding medication error identification and reporting were minimal [16].

In our study, administration errors were 13.6%. Zirpe et al. [16] study documented a relatively low administration error rate of 14.1%, which is concise with our results of 13.6% and differs notably from the research conducted

Table 2. Comparison between the two studied groups regarding the timing and frequency of observations, patients who encountered at least one medication error, the incidence of medication errors, and the various categories of medication errors.

	Control (n** = 1440)		Postintervention (n** = 1472)			
Observations number once daily at 12 PM	No.	%	No.	%	χ^2	*p*
Days of observations	Days 90		Days 92		–	–
Patients with at least one medication error	70 (n*** = 181)	38.7	40 (n*** = 185)	21.6	12.655*	<0.001*
Medication error	396	27.5	250	17.0	46.633*	<0.001*
Prescription	204	14.2	132	8.96	19.278*	<0.001*
Transcription	100	6.9	24	1.6	50.419*	<0.001*
Dispensing	4	0.3	4	0.3	0.001	$^{FE}p = 1.000$
Preparation	40	2.8	50	3.4	0.931	0.335
Administration	48	3.3	40	2.7	0.942	0.387

χ^2: CChi-square test.
FE: Fisher Exact.
p: p-value for comparing between the studied groups.
*: Statistically significant at $p \leq 0.05$ **: Number of observations ***: Patient number.

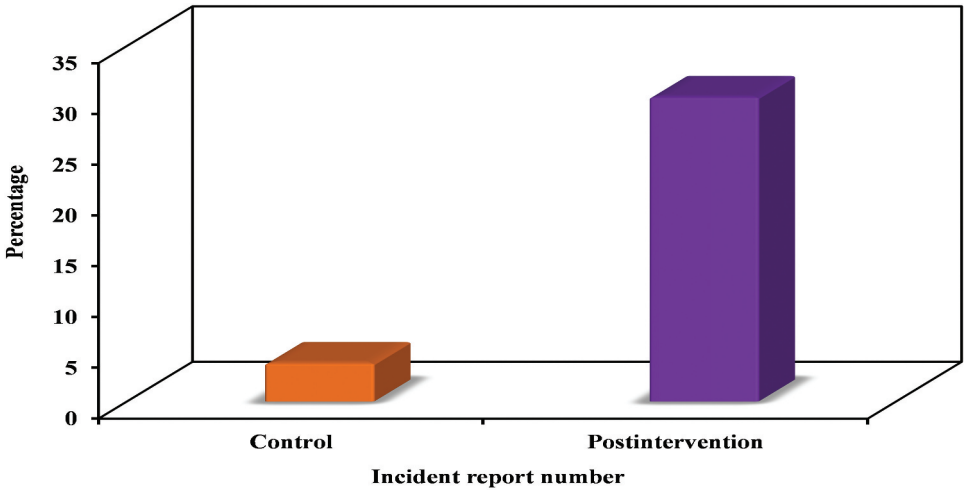

Figure 3. Comparison between the two studied groups according to incident report number.

Table 3. Comparative analysis of medication errors incidence according to administration routes and therapeutic groups in total number of errors.

	Control (n** = 396)		Postintervention (n** = 250)		χ^2	p
	No.	%	No.	%		
Route of administration						
Intravenous	140	35.4	80	32.0	0.767	0.381
Enteral	120	30.3	66	26.4	1.139	0.286
Intravenous infusion	80	20.2	70	28.0	5.227*	0.022*
Subcutaneous	56	14.1	34	13.6	0.037	0.847
Therapeutic groups						
Anti-infective	168	42.4	80	32.0	7.041*	0.008*
CNS	64	16.2	40	16.0	0.003	0.957
Cardiovascular	100	25.3	66	26.4	0.106	0.745
Others	64	16.2	64	25.6	8.593	0.003*

χ^2: Chi-square test.
p: p-value for comparing between the studied groups.
*: Statistically significant at $p \leq 0.05$ **: total number of errors.

by Patel et al. [17], who reported a higher rate of 31% administration errors. These variations are likely attributed to the specific circumstances and the methods employed for error detection during the observation periods across all these studies.

Our study observed a low incidence of medication errors in the dispensing stage. The percentage was 1.2%; the low incidence of dispensing errors can be attributed to the rigorous policy implemented by our pharmacy, which involves a triple-check process for dispensed medications. This practice aligns with the findings in existing literature like Zirpe et al.[16]

In our study, the highest percentage of errors was observed in the age group above 61 years, with 40.4% in the control group and 40.8% in the postintervention group. Conversely, the lowest percentage of errors was seen in the 0–20 age group,

with 11.1% in the control group and 9.6% in the postintervention group. These findings can be explained by the complicated nature of critical illness in those age categories and the requirements of multiple medications with different routes of administration.

Rasool et al. [18] revealed an elevated risk of medication errors in individuals aged 60 years or older, with an incidence of 36.98% (odds ratio, OR = 1.9; 95% confidence interval, CI = 1.3–3.1; p = 0.001). The risk of incidence of medication errors increased up to 38% in patients aged 75 years or older, as stated by Avery AA et al. [5]. Leone et al. [6] reported that medication-related admissions were nearly twice as high in older patients (65 years or above) compared to their younger counterparts. And both coincide with our findings with the same explanations. Armin Eisa-Zaei et al. [15] found that most errors were in the age group 30 to 60 years, 45.66%, and the lowest were in the age group above 80 years, 6.33%. They did not explain this distribution.

In our study, there was a significant increase in reports associated with incident report numbers (3.8% to 30%, $p \leq 0.05$) in the postintervention group, reflecting a substantial shift in writing mechanisms, which was encouraged in our sensitization program. We ensured that there would be no administrative consequences for staff reporting errors.

Westbrook et al. [19] stated that Only 1.3% of clinically critical prescribing errors that could cause patient harm were reported to the hospital incident systems. This was less than our reporting incidence as they only checked the clinically prescribing meaningful mistake.

Our study's ethical considerations made us avoid assessing the harm caused by identified errors, prioritizing prompt rectification. Despite this approach, we recognize the substantial impact of medication errors on medical outcomes and economic implications. We focused on main error types (prescription, transcription) without specifying subtypes (wrong doses, wrong timing, etc). Additionally, limited observers resulted in once-daily observations; assessing errors across different timings would enhance comprehensive analysis.

10. Conclusions

In summary, our non-technological sensitization program successfully decreased medication errors in our unit, fitting well with the resources of our developing country. Improved error reporting within our team was notable, attributed to fostering assurance and creating a blame-free environment. The crucial role of clinical pharmacists in overseeing the medication process and enhancing team awareness during the sensitization program was evident.

11. Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Ahmed Ezeldin http://orcid.org/0009-0004-5941-1784
Heba Othman Shaker http://orcid.org/0000-0002-9572-0291
Mohammed Elsalamouny http://orcid.org/0000-0002-3594-2060

References

[1] Walsh EK, Hansen CR, Sahm LJ, et al. The economic impact of medication error: a systematic review. Pharmacoepidemiol Drug Saf. 2017;26(5):481–497. doi: 10.1002/pds.4188
[2] Juneja D, Mishra A. Medication prescription errors in intensive care unit: an avoidable menace. Indian J Crit Care Med. 2022;26(5):541–542. doi: 10.5005/jp-journals-10071-24215
[3] Reporting NCCf ME, Prevention. NCC MERP index for categorizing medication errors. National Coordinating Council for Medication Error Reporting and Prevention; 2001.
[4] Hicks RW, Becker SC, Krenzischeck D, et al. Medication errors in the PACU: a secondary analysis of MEDMARX findings. J Perianesth Nurs. 2004;19(1):18–28. doi: 10.1016/j.jopan.2003.11.007
[5] Avery AA, Barber N, Ghaleb M, et al. Investigating the prevalence and causes of prescribing errors in general practice: the practice study, a report for the GMC. Nottingham: General Medical Council (GMC); 2012.
[6] Leone R, Magro L, Moretti U, et al. Identifying adverse drug reactions associated with drug-drug interactions: data mining of a spontaneous reporting database in Italy. Drug Saf. 2010;33(8):667–675. doi: 10.2165/11534400-000000000-00000
[7] Eslami S, de Keizer Nf, Abu-Hanna A, et al. The impact of computerized physician medication order entry in hospitalized patients—a systematic review. Int J Med Inform. 2008;77(6):365–376. doi: 10.1016/j.ijmedinf.2007.10.001
[8] Abukhader I, Abukhader K. Effect of medication safety education program on intensive care nurses' knowledge regarding medication errors. J Biosci Med. 2020;8(06):135–147. doi: 10.4236/jbm.2020.86013
[9] Gallagher J, Byrne S, Woods N, et al. Cost-outcome description of clinical pharmacist interventions in a university teaching hospital. BMC Health Serv Res. 2014;14(1):1–8. doi: 10.1186/1472-6963-14-177
[10] Otero P, Leyton A, Mariani G, et al. Medication errors in pediatric inpatients: Prevalence and results of a prevention program. Pediatrics. 2008;122(3):E737–E43. doi: 10.1542/peds.2008-0014

[11] Simpson JH. Reducing medication errors in the neonatal intensive care unit. Arch Dis Child-Fetal Neonatal Ed. 2004;89(6):F480–F2. doi: 10.1136/adc.2003.044438
[12] Donchin Y, Gopher D, Olin M, et al. A look into the nature and causes of human errors in the intensive care unit. Crit Care Med. 1995;23(2):294–300. doi: 10.1097/00003246-199502000-00015
[13] Rothschild JM, Landrigan CP, Cronin JW, et al. The critical care safety study: The incidence and nature of adverse events and serious medical errors in intensive care*. Crit Care Med. 2005;33(8):1694–1700. doi: 10.1097/01.CCM.0000171609.91035.BD
[14] Romero CM, Salazar N, Rojas L, et al. Effects of the implementation of a preventive interventions program on the reduction of medication errors in critically ill adult patients. J Crit Care. 2013;28(4):451–460. doi: 10.1016/j.jcrc.2012.11.011
[15] Eisa-Zaei A, Hiremath SRR, Prasad S. Comprehensive evaluation of medication errors incidence at a tertiary care hospital. Int J Pharm Sci Res. 2018;9(12):5315–5319.
[16] Zirpe KG, Seta B, Gholap S, et al. Incidence of medication error in critical care unit of a tertiary care hospital: Where do we stand? Indian J Crit Care Med. 2020;24(9):799–803. doi: 10.5005/jp-journals-10071-23556
[17] Patel N, Desai M, Shah S, et al. A study of medication errors in a tertiary care hospital. Perspect Clin Res. 2016;7(4):168. doi: 10.4103/2229-3485.192039
[18] Rasool MF, Rehman AU, Imran I, et al. Risk factors associated with medication errors among patients suffering from chronic disorders. Front Public Health. 2020;8:531038. doi: 10.3389/fpubh.2020.531038
[19] Westbrook JI, Li L, Lehnbom EC, et al. What are incident reports telling us? A comparative study at two Australian hospitals of medication errors identified at audit, detected by staff and reported to an incident system. Int J Qual Health Care. 2015;27(1):1–9. doi: 10.1093/intqhc/mzu098