

ORIGINAL ARTICLE

Wrong Time Medication Administration Errors and Its Association with Demographic Variables among Nurses in Tertiary Care Hospitals, Karachi

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ABSTRACT

Objective: To determine the frequency of wrong time medication administration errors and find out its association with demographic variables.

Methods: A hospital based cross sectional analytical study was accomplished at Dow University Hospital and Dr. Ruth K. M. Pfau Civil Hospital, Karachi from November 2017 to June 2018. validated questionnaire was adapted for data collection. Demographic questionnaire was filled through interview and followed by direct observation of the subjects while nurses were administering medication to the patients.

Results: Out of total 204 subjects, 106 (52%) were male participants. Large number 168 (82.3%) of the study participants age was less than 35 years. Almost half 97 (47.5%) had working experience of less than 5 years. Frequency of wrong time medication administration error was found 56/204 (27.5%). Wrong time medication administration error was statistically associated with Hospital (p-value 0.019) and working area of the nurses (p-value 0.023). On the comparison of wrong time medication administration error between the hospitals, education (p-value 0.025) and time of medication administration (p-value 0.038) found statistically significant in Dow University Hospital. While, significant association was established in working Area (wards) of the nurses (p-value 0.010) and time of medication administration (p-value <0.001) in Dr. Ruth K.M. Pfau Civil Hospital, Karachi.

Conclusion: High frequency of wrong time medication administration error was found among nurses. Hospital and nurses working area (wards) were found statistically significant with wrong time medication administration error.

Keywords: Wrong time medication administration errors, Associated factors, Nurses, Tertiary Care Hospitals, Karachi.

INTRODUCTION

Medication administration error (MAE) is the leading risk factor for the patient's safety. It has severe deleterious effects including prolonged hospital stay, excessive cost, discomfort, harm, and death.^{1,2} MAE may happen at any point, from prescription to administration. Nurses play vital role in medication administration because it is a prime and routine responsibility of nurses. Furthermore, nurses spent 40% of their working period on medication administration.³ For patient safety, nurses are accountable to administer the "right drug in the right dose at the right time to the right patient by the right route".

Therefore, nurses double and triple-check the medicine, its dosage, and patient identification, to administer the medication by the right time and right route and thoroughly monitor the patient.⁴

Recent research study has revealed that at minimum one medication error occurs on the hospitalized patients per day.⁵ It has been documented by the National Patient Safety Agency that globally wrong time medication administration error (WTMAE) is the 2nd most common type of error, which may be life-threatening to the patients.⁶ Consequently, due to medication administration error, more than 4 million patients examine at the health care

sectors, and 117,000 hospitalized yearly.⁷ In addition, thousands of admitted patients die annually in America only, ranging from 44,000 to 98,000. Besides, for this reason, around 77 million dollars as extra expenditures are wasting on such type of effects annually.^{8,9} Whereas, almost half of the medication-related adverse effects are preventable.¹⁰

The rationale of this study is that varying findings results are reported in literature regarding the WTMAE both nationally and internationally.⁶⁻¹¹ Therefore, the present study was conducted with the aim to determine the frequency of wrong time MAEs and its association with demographic variables.

METHODS

This cross-sectional analytical study was conducted at Dow University Hospital and Dr. Ruth K. M. Pfau Civil Hospital, Karachi. Time period of this study was eight months of periods from November 2017 to June 2018. Nurses having one-year clinical working experience and registered with Pakistan Nursing Council were approached for the study. Subjects having less than one-year clinical experience and students' nurses were excluded from the study. Data were gathered through non-probability purposive sampling method.

Validated proforma was used to collect data and which tool was adopted from previous published research, which was conducted in Ethiopia¹. The reliability of the tool was (r) = 0.72 computed by Cronbach's alpha test. The study protocol was approved by Institutional Review Board of Dow University of Health Sciences, Karachi (IRB-968/DUHS/Approval/2017/11). Moreover, data collection permission was granted from both respective hospitals. Informed written consent was taken from all participants prior to the data collection. Secrecy of the data collection was also guaranteed. Demographic questionnaire was filled by principle investigator (PI) through interview and followed by direct observation of the participants while nurses were administering medication to the patients. During the observation the participants were assessed for exact time of medication administration, after

that it was validated with the doctors' order to identify the WTMAE. Subjects were assessed working in morning, evening and night shift during the entire week.

Statistical package for Social Sciences (SPSS) version 21.0 was utilized for data entry and data analysis. Qualitative variables such as educational status, gender, working area, duty shift were computed in frequency and percentages. Whereas, quantitative variables like working experience, age of the participants, nurse to patients ratio were presented in mean and standard deviation. Chi-square test was applied to determine the association of WTMAE with demographic variables. Significance level was considered at a p-value ≤ 0.05 .

RESULTS

A total of 204 nurses were included for the study. There were 106 (52%) males and 98 (48%) females. Large number 168 (82.3%) of the subjects had age less than 35 years. Majority of 133 (65.2%) of study participants had graduated in nursing diploma. With respect to experience, 97 (47.5%) of the subjects had experience up to 5 years. Most of 109 (53.4%) the subjects were working in morning shift duty. Nearly one-third 80 (39.2%) of the subjects had administered medication to more than 15 patients.

Figure 1 exhibits frequency of wrong time medication administration errors among nurses. 56 (27.45%) nurses committed WTMAE while 148 (72.55%) did not do WTMAE.

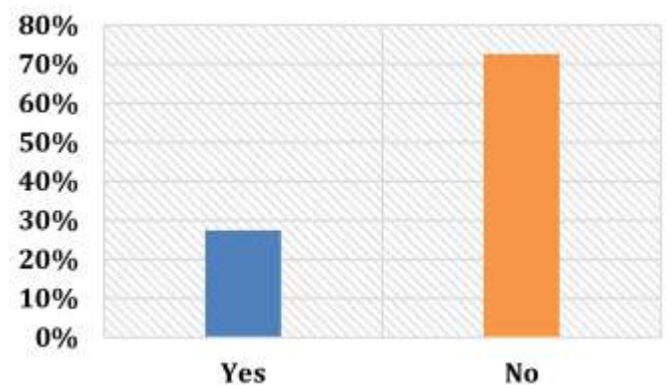


Figure 1: Frequency of Wrong Time Medication Administration Errors (n= 204)

The association of WTMAE with socio-demographic characteristics showed that age group ≥ 36 years age committed more 15 (41.67%) WTMAE. However, association of variable age with WTMAE was not statistically significant, (p-value 0.053).

In gender, more wrong time medication administration errors 30 (30.62%) have been

reported in female nurses. Whereas, WTMAE was not found significantly associated with gender variable (p-value 0.207).

As for as education is concerned, more WTMAE 24 (33.80%) was found in nursing graduates. However, it was not statistically significant (p-value 0.094). (Table 1)

Table 1: Association of wrong time medication administration error with socio-demographic factors (n= 204)

	Error		No Error		Chi-Square	p-value
	n	%	n	%		
Age (year)						
25-30	18	20.45	70	79.55	5.8	0.053
31-35	23	28.75	57	71.25		
≥ 36	15	41.67	21	58.33		
Gender						
Male	26	24.53	80	75.47	0.350	0.207
Female	30	30.62	68	69.38		
Education						
Diploma in Nursing	32	24.24	101	76.52	0.143	0.094
BS. Nursing	24	33.80	47	66.20		
Hospital						
DUH	7	14.90	40	85.10	0.039	0.019
CHK	49	31.21	108	68.79		
Experience						
1- 5 years	21	21.65	76	78.35	4.589	0.088
6- 10 years	13	26.54	36	73.46		
> 10 years	22	38	36	62		
Working Area (wards)						
Surgical ward	23	39.00	36	61.00	14.395	0.013
Medical ward	23	33.80	45	66.20		
ENT ward	5	18.50	22	81.50		
Ortho ward	1	6.30	15	93.80		
Gynae ward	3	14.30	18	85.70		
Private room	1	7.70	36	61.00		
Patients ratio						
1 - 10	16	22.86	54	77.14	1.250	0.535
11 - 15	17	31.48	37	68.52		
>15	23	28.75	57	71.25		
Time of medication administered						
10 am	45	41.28	64	58.72	3.317	0.190
2 pm	10	22.73	34	77.27		
10 pm	1	2	98.0	98		

CHK: Civil Hospital Karachi, DUH: Dow University Hospital, n: number
Chi-square test applied, p-value <0.05 taken as significant

Regarding WTMAE in hospitals, hospital "B" experienced most of the WTMAE 49 (31.21%). Moreover, the significant association of WTMAE was observed with hospital variable (p-value 0.019).

When compared on the basis of experiences, more error 22 (38%) was found in nurses who had more than 10 years working experiences. While its significant association was not established with experience variable (p-value 0.088).

Majority of 50 (50%) errors was happened in pediatric ward. Furthermore, significant association of errors was determined with working area of nurses (p-value 0.013). In patient's ratio, nurses who administered medication 11 to 15 patients committed many of errors 17 (31.48%). Conversely, the significant association of error was not confirmed with patient ratio variable.

Most of the 45 (41.28%) WTMAE was occurred at time 10am by nurses during medication administration. On the other hand, its significant association was not proven with time of medication administered variable (p-value 0.190). The comparison of errors with socio-demographic factors between the hospitals showed that age variable is also insignificant with WTMAE. Age variable represents that more errors done by younger nurses in both hospitals. Similarly, more errors found in less experienced participants. Association of WTMAE with age and experience found insignificant (p-value ≥ 0.05). Most of the medication errors committed by male nurses rather than female nurses in both Dow University Hospital and Dr. Ruth K.M. Pfau Civil Hospital. While, association with gender were also found statistically insignificant (p-value ≥ 0.05). Higher errors were noted among diploma passed nurses in either hospital. Moreover, the association of WTMAE and education was found significant (p-value 0.025) in Dow University Hospital but insignificant in Dr. Ruth K.M. Pfau Civil Hospital. Higher errors recorded in the gynae ward of both hospitals. On the other hand, the significant association was established in Dr. Ruth K.M. Pfau Civil Hospital (p-value 0.010) but not in Dow University Hospital with wrong time. Majority of

errors were noted in those nurses who administered medication to more than fifteen patients. However, the significant association of patient ratio and WTMAE was not confirmed. Mostly errors were happened at night time by study participants during medication administration. Along with, its significant association was confirmed with WTMAE in both hospitals (p-value 0.039 and < 0.001). (Table 2)

DISCUSSION

Medication error is a major risk factor for patient safety. The findings of this study showed that 27.5% of the nurses administered medication on wrong time. Somewhat similar finding was reported in a study in which dose error has been documented most common error that accounts for 34.8%.¹¹ Although, another study showed that WTMAE is a foremost type of error, which accounts 72.6%, and followed by the missed dose error and unauthorized medicine error.¹² Large number of 53.6% WTMAE has been documented in a study accomplished in Ethiopia.¹ Causal factors which may leads to the MAEs are the shortage of nursing staffs, lack of pharmacological knowledge, unexperienced nurses and improper communication between nurses, un-understandable doctors writing and inappropriate work division.¹³⁻¹⁵

Research study conducted in Pakistan, shown that error rate is 21%, amongst; WTMAE was reported as a major type of error.¹⁶ One more updated research study determined very high frequency of MAE that is 82.1%. Among them, missed dose error was the most common and after that wrong time medication administration.¹⁷ In Karachi, Pakistan, 17% of medication doses administered on wrong time while 7.5% missed doses have been recorded in a private health care organization.⁶ Another study revealed that, MAEs usually carried out by nurses because who they directly involved in medication administration process.¹⁸ This finding is not very far from the study conducted in Netherlands 25.4%.¹⁹ However, a study conducted in Iran disclosed that 41.7% and 47.7% administered medication on wrong time.^{20,21} Percentage of such types of error may be

Table 2: Comparison of wrong time medication administration error between the hospitals (n= 204)

Variables	DUH		p-value	CHK		p-value
	Error n (%)	No Error n (%)		Error n (%)	No Error n (%)	
Age (year)						
25-30	3 (16)	16 (84)	0.053	15 (22)	54 (78)	0.073
31-35	2 (8)	22 (92)		21 (37)	35 (63)	
≥36	2 (50)	2 (50)		13 (41)	19 (59)	
Gender						
Male	5 (16)	26 (84)	0.741	21 (28)	54 (72)	0.406
Female	2 (13)	14 (87)		28 (34)	54 (66)	
Education						
Diploma	1 (4)	24 (96)	0.025*	31 (29)	77 (71)	0.314
BS. Nursing	6 (27)	16 (73)		18 (37)	31 (63)	
Experience						
1- 5 years	3 (9)	31 (91)	0.059	18 (29)	45 (71)	0.355
6- 10 years	4 (31)	9 (69)		9 (25)	27 (75)	
> 10 years	0 (0)	0 (0)		22 (38)	36 (62)	
Patients ratio						
1 - 10	7 (15)	39 (85)	0.672	9 (38)	15 (62)	0.739
11 - 15	0 (0)	0 (0)		17 (31)	37 (69)	
>15	0 (0)	1 (100)		23 (29)	56 (71)	
Time of medication administered						
10 am	2 (10)	18 (90)	0.039*	43 (48)	46 (52)	<0.001*
2 pm	5 (33)	10 (67)		5 (17)	24 (83)	
10 pm	0 (0)	12 (100)		1 (3)	38 (97)	

CHK: Civil Hospital Karachi, DUH: Dow University Hospital, n: number
Chi-square test applied, *p-value significant

reduced if nurses follows the proper protocol of medication administration.²² Hence, continue nursing education (CNE) regarding medication administration should be provided to the nurse because nurses are the last person in the medication process to rectify any error before it happening. Thus, determining the causes of wrong time MAE and their solution should be the utmost importance for every health care organization.

Result of current study showed that 80 (39.21%) of the study subjects administered medication to more than 15 patients. Working area (wards) of the nurses was found to be statistically significant with wrong time medication administration errors. In contrast, a Malaysian study revealed that nurses working in ICU committed less medication errors.²³ This might be due to the patient's ratio. In wards wrong time

errors may happens because of high workload that's why nurses are more prone to medication errors. In this study, we haven't found statistically significance between wrong time medication administration errors and nurse's age, gender, work experience and education. Similarly, the research studies accomplished in different areas of the Iran also not found statistically significance with stated demographics.²⁴⁻²⁶

In present study, most of participants age was between 25-30 years, the results are similar to a study conducted in South Korea, where age group 25-29 years were 143 (45.9%).³ In current research study nearly half 97/204 (47.54%) participants work experience were less than 5 years. Likewise, a study conducted in Iran, where 65% of the study participants work experience was less than 5 years.²⁷

The finding of this study could be highlighted in the light of limitation that this study was conducted in urban setting; result may not be representing the nurses working in rural setting. Secondly, this study is a descriptive study; therefore, interventional study may be conducted to minimize the risk of MAEs. On the basis of result it is recommended that CNE related to medication administration should be conducted for the nurses to update the knowledge. Organizational factors like error reporting systems and regular checks may help in tackling the problem of medication administration errors. Hire more qualified and skilled nurses. Minimize the distraction and interruptions during medication administration by using no interruptions zones and “No-Talk”.

CONCLUSION

WTMAE is highly prevalent among nurses working in public sector organization and it was found statistically significant with hospital and nurses working areas (wards).

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REFERENCES

1. Feleke SA, Mulatu MA, Yesmaw YS. Medication administration error: magnitude and associated factors among nurses in Ethiopia. *BMC Nurs* 2015; 14:53.
2. Biftu BB, Dachew BA, Tiruneh BT, Beshah DT. Medication administration error reporting and associated factors among nurses working at the University of Gondar referral hospital, Northwest Ethiopia, 2015. *BMC Nurs* 2016; 15:43.
3. You MA, Choe MH, Park GO, Kim SH, Son YJ. Perceptions regarding medication administration errors among hospital staff nurses of South Korea. *Int J Qual Health Care* 2015; 27:276-83.
4. Saleh AM, Awadalla NJ, El-Masri YM, Sleem WF. Impacts of nurses' circadian rhythm sleep disorders, fatigue, and depression on medication administration errors. *Egypt J Chest Dis Tuberc* 2014; 63:145-53.
5. Cebeci F, Karazeybek E, Sucu G, Kahveci R. Nursing students' medication errors and their opinions on the reasons of errors: A cross-sectional survey. *J Pak Med Assoc* 2015; 65:457-62.
6. Taufiq S. Prevalence and Causes of Wrong Time Medication Administration Errors: Experience at a Tertiary Care Hospital in Pakistan. *Can J Nurs Res* 2015; 10:1-8.
7. Al-Faouri IG, Hayajneh WA, Habboush DM. A five years retrospective study of reported medication incidents at a Jordanian teaching hospital: patterns and trends. *Int J Humanit Soc Sci* 2014; 4:280-87.
8. Ehsani SR, Cheraghi MA, Nejati A, Salari A, Esmailpoor AH, Nejad EM. Medication errors of nurses in the emergency department. *J Med Ethics Hist Med* 2013; 6:11.
9. Agrawal P, Sachan A, Singla RK, Jain P. Statistical Analysis of Medication Errors in Delhi, India. *Indo Glob J Pharm Sci* 2012; 2:88-97.
10. Westbrook JI, Li L, Lehnbohm EC, Baysari MT, Braithwaite J, Burke R, 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; 27:1-9.
11. Alsulami Z, Conroy S, Choonara I. Medication errors in the Middle East countries: a systematic review of the literature. *Eur J Clin Pharmacol* 2013; 69:995-1008.
12. Berdot S, Sabatier B, Gillaizeau F, Caruba T, Prognon P, Durieux P. Evaluation of drug administration errors in a teaching hospital. *BMC Health Serv Res* 2012; 12:60-5.
13. Tabatabaee SS, Kohpeima Jahromi V, Asadi M, Kalhor R, Sharifi T. Ranking factors contributing to medication error incidents in private hospital: A nurse's perspective. *Int J Hosp Res* 2013; 2:187-94.
14. Salmasi S, Khan TM, Hong YH, Ming LC, Wong TW. Medication errors in the Southeast Asian countries: a systematic review. *PloS one* 2015; 10:e0136545.
15. Alsulami Z, Conroy S, Choonara I. Medication errors in the Middle East countries: a systematic review of the literature. *Eur J Clin Pharmacol*. 2013; 69:995-1008.
16. Sajjad S, Gowani A, Kazmi A, Mansoor S. Factors Contributing to Medication Errors in a Tertiary Care Private Hospital, Karachi. *I-manager's J Nurs* 2017; 7:28.
17. Ahmed T, Haq N, Minhas M, Iqbal Q, Mehmood S, Waqas M, et al. Medication Administration Errors Evaluation in Pediatric Ward by Pharmacist. *Int J Sci Res in Biological Sciences* 2017; 4:1-6.
18. Raban MZ, Westbrook JI. Are interventions to reduce interruptions and errors during medication

- administration effective? A systematic review. *BMJ Qual Saf* 2014; 23:414-21.
19. Van Den Bemt PM, Robertz R, De Jong AL, Van Roon EN, Leufkens HG. Drug administration errors in an institution for individuals with intellectual disability: an observational study. *J Intellect Disabil Res* 2007; 51:528-36.
 20. Mirzaei M, Khatony A, Faramani RS, Sepahvand E. Prevalence, Types of Medication errors and Barriers to Reporting Errors by Nurses in an Educational Hospital in Kermanshah. *Hayat* 2013; 19:1-10.
 21. Ebrahimipour H, Hosseini E, Haghighi H, Tabatabaee SS, Badiie S, VafaeNajar A, et al. Evaluation of medication errors by nurses in hospitals affiliated with Mashhad University of Medical Sciences, Mashhad, Iran. *J Patient Saf Qual Improv* 2016; 4:40-0-4.
 22. Schutijser B, Klopotowska JE, Jongerden I, Spreeuwenberg P, Wagner C, de Bruijne M. Nurse compliance with a protocol for safe injectable medication administration: comparison of two multicentre observational studies. *BMJ open* 2018; 8:e019648.
 23. Ong WM, Subasyini S. Medication errors in intravenous drug preparation and administration. *Med J Malaysia* 2013; 68:52-56.
 24. Cheragi MA, Manoocheri H, Mohammadnejad E, Ehsani SR. Types and causes of medication errors from nurse's viewpoint. *Iran J Nurs Midwifery Res* 2013; 18:228-31.
 25. Ehsani SR, Cheraghi MA, Nejati A, Salari A, Esmaeilpoor AH, Nejad EM. Medication errors of nurses in the emergency department. *J Med Ethics Hist Med.* 2013; 6:6-11.
 26. Shahrokhi A, Ebrahimpour F, Ghodousi A. Factors effective on medication errors: A nursing view. *J Res Pharm Pract* 2013; 2:18-23.
 27. Musarezaie A, Momeni GG, Zargham BA, Haj SE. Survey of the medication errors and refusal to report medication errors from the viewpoints of nurses in hospitals affiliated to Isfahan University of medical sciences, Iran. *J Health System Res* 2013 ;9:76-85.

