

Survey of medication error by nurses self-report in intensive care unit of Imam Khomeini hospital- Tehran

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ABSTRACT: The prevalence of medication error has a significant issue related to patient and healthcare system in recent years. The most common medical errors are medication errors that could raise concern about the quality of the health system. This study aimed to determine the type and frequency of medication error by nurses self-reporting in general intensive care unit of Imam Khomeini hospital that took place. Present study is a descriptive type and research society is all nurses working (n=40) in intensive care unit in 2014. The data were collected using questionnaire designed by the researcher then using by descriptive statistic, independent t-test and Kruskal-Wallis test were analyzed. We used SPSS version 20. According to information that obtained in this study the total number of error reported was 1426 and the average was errors per person 47.53. The highest rate of medication errors related to unauthorized drug (23.56 %), monitoring error (19.65 %) and wrong time administration medication. The result of statistical analysis data, indicated significant relationship between gender (p=0.001) and shift work (p=0.03) with of medication error. This study showed a significant number of medication errors, provided of training programs and performance monitoring of nurses and other healthcare team members, creating error record holding regular system and survey its definitely can be effective. Interventional studies related to error reduction strategies, such as the balance of nurse staff and patient and changing shift pattern recommended.

Keywords: Medication error, Intensive care unit, Nurses, Self-reporting

INTRODUCTION

The prevalence of medication error has a significant issue related to patient and healthcare system in recent years (Kalra 2004). But human error really is inevitable, especially in complex human systems, such as acute hospital care (Duwe et al. 2005). Because many of the Errors emanates the natural process of psychological and behavioral compatibility that creates correct behavior (Mottahedian Tabrizi E et al. 2010). Although determine prevalence rates of errors are very difficult, but there is a lot in the complex system such as the medical industry that is not unexpected. Many of medical error are not reported and this issue make it more difficult the exact prevalence of these errors. High rates of adverse events (AEs) in patients indicating the occurrence of errors that the majority of these are preventable. These errors are various, common and can occur at all levels of the system. Frequency and high potential medical errors has become constant issue in health care system (Kohn et al. 2000). Medical error affect 850,000 people in UK annually, And often leading to patients spending a long time in the care units or hospitals. These errors cost the National Health Service (NHS) more than 2 billion euros in additional treatments and clinical negligence costs is about 4 billion euros that is 2 times greater the cost of NHS (Lane et al. 2006). In the report of Institute Of Medical (IOM) "To Err is Human", medical errors called as public health risk (Kohn et al. 2000). Medical errors are the most common medication errors (Sanghera et al. 2007) that classified as one of five categories of medical errors by this institute (Mrayyan et al. 2007). Nowadays medication error due to

high prevalence and potential harm to patients is considered as index to determine the level of patient safety (Stratton et al. 2004). Medication errors are common unfortunate events in hospitals and patients admitted in the intensive care unit (ICU) are particularly vulnerable populations who has a changing medical condition, and laboratory and medications quantities are a particular challenge for physicians in every aspect of patients care. Medication error can occur at different stages of drug therapy process including of prescribing, documenting, dispensing, administering and monitoring which has a significant effect on mortality (Handler et al. 2007, Patel and Kane-Gill 2010). The recent epidemiological studies estimated that more than 1.3 million people involved unintentional injuries resulting from Intensive care In United States hospitals each year (Duwe et al. 2005) that thousands of people have died as a result of medication error and its costs nearly are 77 billion dollars per year (Grissinger and Kelly 2005). according to published statistics by Center of Registration and investigation of adverse effects of drugs in Iran since March 2004 to April 2006, the numbers of drug adverse events were 2093 where Tehran had 993 numbers (47.44%) and was on the top of other country provinces (Public report 1383-1385).

Three common failure in system related to medication error are Lack of medication knowledge, lapse or slips of memory and the incorrect identification of drug (Manias 2007). Investigation about the causes of errors by nurses showed that the medication errors are being made by experienced nurses less than junior nurses (Kazaoka et al. 2007). Lack of medication knowledge, difficulty existence in remembering and drug recognition have been introduced as three causes of medication error occurrence (Manias 2007). In the study was conducted to investigate medication administration errors, prescribing different dosage of medication, incorrect dosage and no prescribing standard dosage were three factor that due to occurrence these errors (Gonzales 2010). In study of Patricia et al the most frequently occurring types of errors were use of wrong administration techniques (especially incorrect crushing of medication and not supervising the intake of medication) and wrong time errors (Van et al. 2009). Robinson et al studied Medication errors in a descriptive study using NCC MERP index based on reports received by the MEDMARX system. In their study about 3% of 1,305 student-made medication errors occurring in the administration process resulted in patient harm. Most were omission errors, followed by errors of giving the wrong dose (amount) of a drug (Wolf et al. 2006).

Intensive care of patients in the units that are equipped high-tech be considered an essential component of modern health care. Hence units like intensive care unit (ICU) are located priority of intensive care service in hospitals due to care of critical condition patient so any error can lead to irreparable consequences. On the other side the leading organizations in health care involved establishment of standards for patient safety and issues related of clinical sovereignty that importance of this issue becomes clearer. The exact statistics of medical and nurse errors rate prevalence are not available in Iran. Main reason its lack of registration and monitoring system, so adopt strategies to reduce errors by managers are difficult. This study aimed to determine the type and frequency of medication errors and correlation of age, gender, experience, training, and the shift work with medication errors in General intensive care unit been designed and implemented. In the hope that its results can be helpful to reduce medical errors and Next studies.

METHODS AND SUBJECTS

This study was a descriptive study that was performed to determination of type and frequency of medication error with using of self-report by nurses in last six month and determining relationship between demographic and organizational information with medication error. The study population consisted of all nurse staff (40 people) who worked in the intensive care unit of Imam Khomeini Hospital, Tehran University of Medical Sciences (TUMS), in 2014. Inclusion criteria for this study were: Bachelor's degree or higher, employed in the intensive care unit of a hospital for at least six months.

After of starting study, confirmation was received from research deputy of TUMS and Imam Khomeini Hospital, and unit's verification and taking satisfaction of all the participants. Data were collected using a two part self-constructed questionnaire that was designed by surveyed of Iranian and foreign studies that were conducted in the field of medication errors.

First part included demographic data (age, gender, education, work experience, experience in ICU, shift pattern, taking part in training class associated with medication errors), the second part consisted of 33 items related to medication errors. Its validity was confirmed by the 8 expert, Reliability was assessed by internal consistency with Cronbach's alpha ($\alpha = 0.807$). Despite several approaches to collect data on medication errors, voluntarily report provided the more precise information (Wakefield et al. 2005). Hence despite of limitation of self-reporting, this method was chosen for study of medical errors. For ethical considerations, after providing the necessary explanations about the purpose of the study and assurance of confidentiality and is no need to write the name. The questionnaires were placed in sealed envelopes and were distributed among the participants. After data

collection, errors were classified in 15 categories error mode. Errors categorization performed according to National Coordinating Council for Medical Error Reporting and Prevention (NCC MERP) (The National Coordinating Council for Medication Error Reporting and Prevention). Data was analyzed using descriptive statistics, independent T-test and Kruskal-Wallis test at significant level 0.05 by SPSS version 16.

Table 1. absolute and relative frequency distribution errors mode

Error Code	Error mode	Description	F	%
EM1*	Dose Omission	Not giving medications prescribed to the patient Omission of physician order during transfer to drug chart	37	2.59
EM2	Improper Dose	Giving wrong dose (overdose or under dose than the amount prescribed)	25	1.75
EM3	Wrong Strength/Concentration	Wrong diluents Giving wrong medication	11	0.77
EM4	Wrong Drug	Prescribing medication with wrong order Error in labelling of a prepared drug Error in prescribing or preparation of different drugs	68	4.76
EM5	Wrong Dosage Form	Prescribing a wrong form of medication (e.g. giving ampoule instead of tablets, etc.) Giving Sublingual or chewable medication in form of swallowing	23	1.61
EM6	Wrong Technique	Giving drug which not mixed properly Crushing tablets or opening capsules without authorization Mixing drug with food without physician authorization	161	11.29
EM7	Wrong Route of Administration	Intravenous drug injection in form of subcutaneously Intravenous drug injection in form of intramuscular intramuscular drug injection in form of Intravenous Subcutaneous drug injection in form of Intravenous	49	3.43
EM8	Wrong Rate	Giving medication without considering the specified route of administration Wrong injection site or disregarding this point	42	2.94
EM9	Wrong Duration	Wrong injection rate Replications prescribing a medication (giving medication more or less frequently)	16	1.12
EM10	Wrong Time	Giving medication at the wrong time (later or earlier than the prescribed time) Disregarding to correct time of medication (before or after a meal)	266	18.65
EM11	Wrong Patient	Giving medication to the wrong patient Don't get the information about patient's history of medications allergies	37	2.59
EM12	Monitoring Error	Drug Interactions Disregarding to required actions of medications that entail special attention. Lack of adequate supervision after the prescribing (e.g. no investigation after injection of a drug and ...)	280	19.63
EM13	Deteriorated Drug Error	Disregarding patient posture during medication Use of expired medications	3	0.21
EM14	Order misunderstanding	Error in the reading doctor prescription Error in the entering physician order to drug chart	72	5.04
EM15	Unauthorized drug	Giving medication without a prescription	336	23.56
Total			1426	100

RESULTS

The results of a descriptive study of demographic data showed that 83/3% of the participants were female. The mean and standard deviation age of people were in the age group of 20-30. 50% of nurses were contracted employ that most of them (47/7 %) had less than 5 years nursing experience and among them, there were 70% had less than 5 years working experience in the ICU, and 76/66% of them had passed medication errors classes. 43/3% of nurses had worked in the irregular shift system. According to results obtained in this study, the total number of errors has occurred in 1462 item and mean of errors was 47/53 item per person. The percentage of medication errors by nurses within six months were 3/03%. Table 1 shows the absolute and relative frequency

*Error Mode

distribution errors occurred by nurses. Based on these findings the highest rate of medication errors related to unauthorized drug (23.56 %), monitoring error (19.65 %) and wrong time administration medication(18.63%) and the lowest rate of medication errors were wrong strength/concentration(0.77%), deteriorated drug error(0.21%) and Wrong duration(1.12%) (Figure1). According to findings obtained from the analysis of analytical data (table 2) the mean error of the women (28/95±25/83) than the men (6/42±4/49) was higher and comparing means in independed T_Test showed the significant relationship between gender and medication errors (p=0.001) but compared to “taking classes of medication errors” in this test didn’t show any relationship (p=0.842).

The Kruskal-Wallis test results (table3) between age, work experience, work experience in the ICU and employment didn’t show a relationship with medication errors. But the average error in nurses who worked on irregular rotating shifts (33/5±26) were more than other systems shift and the result of kruskal-wallis test showed this relationship (p=0.03).

Table 2. Comparison mean of medication errors by nurses (independed T-Test)

Variable	Mean (±SD)	T-Test
1. Gender		
Female	28.95±25.83	P=0.001 df=23.5
Men	6.2±4.49	
2. Training classes		
Yes	25±25.43	P=0.842 df=23
No	25.66±27.07	

Table 3. Comparison mean of medication errors by nurses (Kruskal-Wallis test)

Variable	Mean (±SD)	Kruskal-Wallis
1. Age		
20-30	27.47± 2.31	P= 0.923 df=2 X2= 0.15
31-40	34.2± 2.16	
>40	42.5± 2.12	
2. Experience		
<5	28.25± 28.5	P=0.574 df=2 X2= 1.1
6-10	23.8±23.25	
>10	15.5±20.1	
3. working experience in ICU		
<1	26.2±31.81	P= 0.621 df=2 X2= 0.95
1-3	25.71±24.45	
>3	17.2±20.14	
4. Shift pattern		
Fixed	28±30.48	P= 0.03 df=2 X2= 6.78
Regular rotation	13.6±17.36	
Irregular rotation	33.5±26	
5.Type of Employment		
Formal	25.66±24.22	P= 0.283 df=2 X2= 2.52
Contractual	19.88±24.34	
Treaty	27.81±27.41	

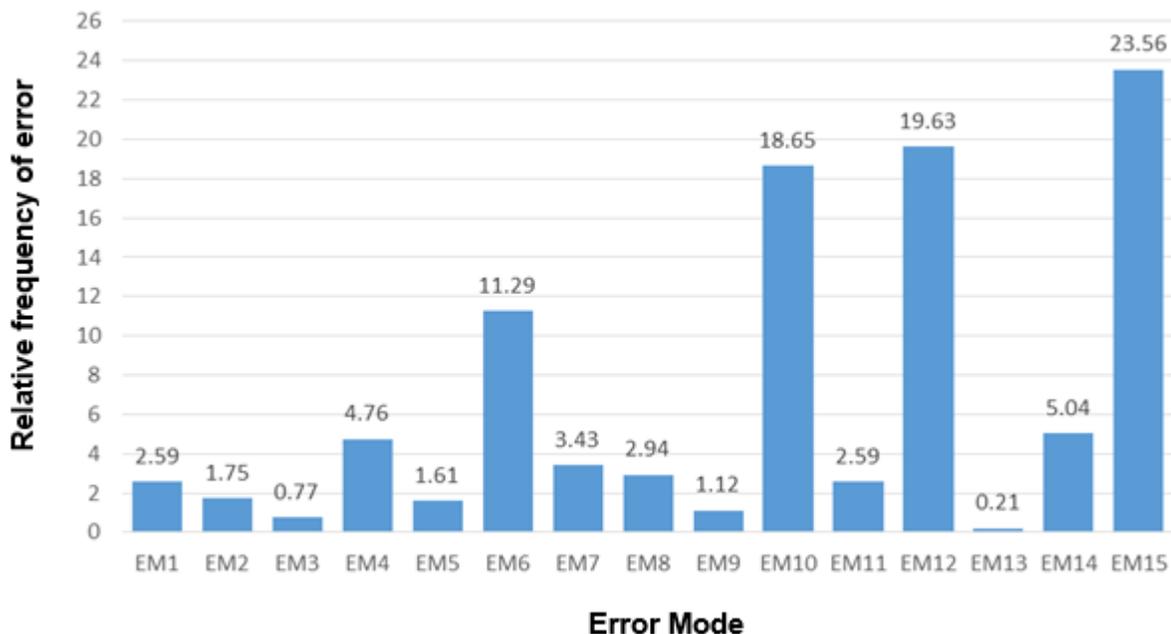


Figure 1. relative frequency distribution of medication error

DISCUSSION

Error is inherent of human nature and the nurses aren't exempt from these challenges. Rothschild et al in a study on medical errors in the intensive care unit stated that the most important and the most common medical errors, errors related to the management of drug therapy (61%), especially medication error (Rothschild et al. 2005). Although most medication errors are minor and may not harm to patient, however those indicate the quality work of personnel (Pazokian et al. 2013).

According to results of this research the mean of occurrence medication errors is 47.53 per nurse in the same way in 2007 Mrayyan et al in their study reported a mean medicine error 2.2 for each nurse (Mrayyan et al. 2007) and in Iranian studies this mean in 2011 was 19.5 in Hajibabaei et al study (Hajibabaei et al. 2011) and in 2013 Rezai et al in their study reported 11 for each nurse in during three month (Musarezaie et al. 2013). This difference could be due to the time of study that in the present study these was six month, so opportunity for occurred errors by nurses is twice than similar studies, there is also imbalance of nurse staffing with patient should not be ignored. Based on this findings, the highest rate of medication errors related to medication administration without order (23.56%), lack of proper monitoring (monitoring error) 19.63%, and non-compliance medication administration in the right time (wrong time) was 18.65%. In 2009 Van et al also expressed wrong time errors and a lack of monitoring is the most type of medication errors (Van et al. 2009) in study by Taxis et al, preparation and administration simultaneous infusion drugs that have the interact potential were the major errors (Taxis and Barber 2004) also Kopp stated one of the most common medication errors are drug interactions (Kopp et al. 2006). In another study in the Canadian, Medical errors included delay of medication administration and wrong monitoring of patient that were 51.7% of errors (Orser and Byrick 2004).

In the study of Dean and et al the most common medication errors of American nurses were wrong dosage and giving medication without prescription (Dean et al. 1995). In studies of Iran, similar to above studies, results were reported like our study which the most medication errors are related to oral medication that have drug interactions (57.7%) and giving ant pain medication without a prescription (44.39%) (Shams et al. 2012). Also Hajibabaei et al in their study stated the most common medication errors are oral drug administration together and wrong time (Hajibabaei et al. 2011). High levels of drug administration without a prescription reported in most studies can be worrying but shouldn't ignored some cases such as "Standing Orders" because nurses in during the treatment process can gave certain drugs without a doctor's prescription to their patients.

Results of statistical analysis showed significant difference between medication errors with gender and shift pattern so that more females than men committed errors this relationship was confirmed by Mrayyan et al (Mrayyan et al. 2007) Van et al expressed one of the risk factors for the occurrence of medication errors is gender

and female gender have more potential for medication errors (Van et al. 2009). Several studies suggest the related between the medication errors and gender. Penjoueni reported significant relationship between intravenous drug administration and gender in her research findings (penjoueni 2006) in 2011 Hajibabaei et al also expressed significant relationship between gender and medication errors with this difference that medication errors by men were more than female (Hajibabaei et al. 2011). Perhaps the reason this is difference the ratio of the participants number because female nurses more than men desire to report medication errors (Mrayyan et al. 2007). Also there are Varies information about shift work, studies have shown that night work can cause problems in focusing, fatigue, physical activity and changes in heart rate compared with morning and afternoon shifts will reduce the efficiency of nurses (Takahashi et al. 1999). Working at the night shift because create of problems in person's consciousness level, will lead to an increase in their medication errors, also two or three shift systems can affect the quality of sleep and lead to sleep disorders and persons feel sleepiness during the day (O'Shea 1999; Ohida et al. 2001).

When people are working in the consecutive 24-hours shifts has more serious medical errors than working in the shorter shifts. Remove large shifts and reducing the number of hours per week can be reduce serious errors in the medical intensive care unit (Landrigan et al. 2004) Ghasemi et al reported the major causes of medication errors are lot of night work, long shifts and consecutive (83.7%) (Ghasemi et al. 2009).

Among other variables studied, including: taking classes, age, experience, work experience in the ICU and employment, there was no statistically significant relationship with the occurrence of medication errors It seems are not significant relationship between experience ,age and medication errors (Zahmatkeshan et al. 2010; Soozani et al. 2007). This study and studies like these can be provide interesting results but these cannot have a comprehensive assessment of errors It is just a warning for existence errors. Because medication errors analysis are requirement to a structured approach including: detection, reporting and analysis, to provide more efficient and practical information for the ICU team. In addition, a special focus on implement of strategies for the prevention of medical errors such as evidence-based protocols, team Training and technology are essential. Effort to reduce medication errors in the ICU are requires a multidisciplinary collaborative approach to effective and sustained. Further recent research efforts in this field, are challenging aspects of patient care to provide strategies for medication error detection, analysis, and prevention (Patel and Kane-Gill 2010) that need to propose a method which include all personal ,organizational and environmental aspects and factors that effect on medical error so, You cannot accuse an individual or a particular group of nurses for this error.

CONCLUSION

The result of this study showed significant percent of medication error and studied unit in a hospital is an important unit. In the other hand, referring patients to this unit have the acute medical conditions hence that needed more attention from the authority. Custodians of health should be reduce medication errors with adoption and implementation of correct strategies. Providing of continuous educational programs and monitoring of nurse's performance and medical team could enhance perception of nurses, supervisors and other individuals that related to medication treatment process and also promote safety culture in this unit of hospital. In addition, providing regular and periodical registration system for medication errors could be affective in that issue by giving clearly perception of mechanisms and causes of medication errors. Providing interventional programs is necessary and their results obtained could be very effective and useful for reducing medication errors. Conducted interventional studies have demonstrated the authenticity of this issue (Landrigan et al. 2004). Researchers of this study offer performing interventional studies related to error reduction strategies by balancing between patients and nurses and changing in their shiftwork pattern.

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