

Medical Errors Among Nurses in The University Hospital of Benha, Egypt: Forms, Underlying Factors and Reporting



EM Araby¹, RSH Eldesouky*² and HA Abed³

¹Lecturer of Public Health, Community Medicine Department, Faculty of Medicinem, Benha University, Egypt

²Assistant Professor of Public Health, Community Medicine Department, Faculty of Medicinem, Benha University, Egypt

³Lecturer of Public Health, Community Medicine Department, Faculty of Medicinem, Benha University, Egypt

Received:  July 28, 2018; **Published:**  August 06, 2018

***Corresponding author:** RSH Eldesouky, Assistant Professor of Public Health, Community Medicine Department, Faculty of Medicinem, Benha University, Benha, Egypt

Abstract

Background: Medical Errors (ME) are inevitable part of any health care system and pose a threat to patient safety.

Objectives: To determine the prevalence, forms, consequences and the underlying factors of ME among nurses in the University Hospital of Benha and to detect the prevalence of reporting ME and causes of un-reporting.

Material and Methods: This cross-sectional study was conducted up on 257 nurses. Data were collected during December 2017, using an English self-administered, anonymous questionnaire sheet.

Results: 36.2% of the studied nurses committed ME, 48.4% of them committed errors more than once. The most frequent form was giving wrong dose of medications (35.5%). Tiredness due to excessive overtime work and inadequate training of the nurses were the mostly reported underlying factors (62.6% and 39.3% respectively). The prevalence of ME was significantly higher among junior nurses ($P=0.029$), those graduated from nursing school and technical institute of nursing than faculty of nursing (41.6%, 29.6% and 16.7% respectively) ($P=0.017$), among single, widowed and divorced nurses than married ones (81.2%, 60%, 50% and 32.5% respectively) ($P<0.001$). Also, it was higher among Nurses of work experience <10 years (51.9%) compared with those of 20-30 or more years (33.3% and 30.2% respectively) ($P=0.024$). One third (33.3%) of nurses who committed ME did not report it. Fear of legal issues was the most common cause of un-reporting (80%).

Conclusion: ME is a serious problem that threatens patient safety. Staff training, non-punitive work environment and properly working reporting system are the best solutions to prevent ME.

Keywords: Medical errors; Nurses; Forms; Reporting; Administering Treatment; Un-Reporting; Fisher's Exact Test

Introduction

Medical Errors (ME) represent a serious public health problem and pose a threat to patient safety [1]. It is extremely important to adopt a standard definition for ME throughout the world, because lack of agreement on standard definition makes it difficult for researchers to obtain valid and reliable data, and to assess the impact of specific organizational interventions [2]. The most common definition for ME is that it is an unintended act (either of omission or commission) or one that does not achieve its intended outcome, [3] the failure of a planned action to be completed as intended (an error of execution), the use of a wrong plan to achieve an aim (an error of planning), [4] or a deviation from the process of care that may or may not cause harm to the patient [5]. According

to Institute of Medicine (IOM) approach, ME comprise a wide range of events. It may be diagnostic; "error or delay in diagnosis", failure to employ indicated tests, use of outmoded tests or therapy, failure to act on results of monitoring or testing, treatment error; "wrong performance of an operation, procedure, or test", error in administering treatment; "error in the dose or method of using a drug, avoidable delay in treatment or in responding to an abnormal test and inappropriate care", preventive error; "failure to provide prophylactic treatment or inadequate monitoring or follow-up of treatment" and finally, failure of communication, equipment and other system failure [1]. Although medical errors can be caused by all members of health care team, nursing medical errors are the most common [6].

In developed countries, with sufficient funds and modern technology, one out of ten patients are injured. Ten to eighteen percent of hospitalized patients are injured due to ME [7]. The problem is greater in developing countries where there is an inappropriate infrastructure, poor technology and insufficient or even unskillful human resources. These factors have caused higher possible risk of harm to the patient in hospitals and in primary care compared with developed countries [8]. Lack of a well-developed system of ME reporting in developing countries has increased the ambiguity [7-15]. The objectives of this study were to determine the prevalence, forms and consequences of MEs among nurses in the University Hospital of Benha, to outline the underlying factors of ME from the nurses' point of view and to detect the prevalence of reporting ME and causes of un-reporting.

Methodology

This cross-sectional study was conducted up on 257 nurses of the university hospital of Benha, Egypt. All departments [16] were represented with average response rate of 87.1% ranging from 80% (Department of ENT) to 95% (Department of Neuropsychiatry).

Ethical Consideration

An approval from the Research Ethics Committee in Benha Faculty of Medicine was obtained to conduct this work. An administrative approval from each department Head was also obtained to interview the nurses. A written informed consent was obtained from each nurse before participation. It included data about title, objectives, methods, expected benefits and risks of the work and confidentiality of data.

Collection of Data

Data were collected during December 2017. An English self-administered, anonymous questionnaire sheet was used to collect data from nurses. This questionnaire was developed and modified from Shahrokhi et al. [9], Aboshaiqah et al. [10] and Mohammad et al. [11]. Two hundred ninety-five questionnaires were distributed, 278 questionnaires were returned (94.2%), 257 were completely filled in a right way (87.1%). The questionnaire comprised of four sections: The first one included socio demographic and work information of the nurses. The second section included questions about the prevalence of committing ME during the year 2017 (named current year), its frequency, past history of ME in the previous years, forms of ME and if the committed error resulted in a harm to the patients. The third section asked about the underlying factors of ME from the nurse point of view.

These factors were classified into nurse related factors, work environment related factors and managerial factors. The fourth part included data about reporting of ME, reasons for not reporting and the specifications should be available in the ME reporting system. The questionnaire was revised by 3 academic professors to assess its construct validity. Content and face validity were assessed by a pilot study conducted during November 2017 up on 20 nurses. The required modifications in the tool were done, arising difficulties in data collection were planned to be overcome. The results of pilot study were not included in the study.

Statistical Analysis

The collected data were tabulated and analyzed using SPSS version 16 software (SpssInc, Chicago, ILL Company). Categorical data were presented as number and percentages, using Pearson's chi square test (χ^2) or Fisher's Exact test (FET) for their analysis. Continuous data were expressed as mean \pm standard deviation and range. Two-sided P value < 0.05 was considered significant.

Results

Socio-Demographic Characteristics of The Studied Elderly

This study included 257 nurses; their age ranged from 20 to 55 years old with mean value 36.2 ± 8.7 , 26.5% of them aged 20 to < 30 , 65.4% were 30 - < 50 years old while 8.2% were 50 or more years old. Only 5.8% were males. Seventy-one-point two percent were from rural areas, 67.3% were graduated from nursing school, 91.1% were married, and 51.4% works more than 50 hours per week. Their years of work experience ranged from 1-32 years and average of 16.1 ± 8.2 . Nine males (3.5% of total) were tobacco smokers (Table1).

Table 1: Socio-demographic characters of the studied sample.

Variable	Frequency (N=257)	Percent (100.0)
Age (in years)	68	26.5
20-	90	35
30-	78	30.4
40-	21	8.2
≥ 50	36.2 \pm 8.7 (20-55)	
Mean\pmSD (range)		
Sex	15	5.8
Male	242	94.2
Female		
Residence	183	71.2
Rural	74	28.8
Urban		
Graduation	30	11.7
Faculty of nursing	173	67.3
Nursing school	54	21
Technical institute of nursing		
Marital status	234	91.1
Married	2	0.8
Divorced	5	1.9
Widowed	16	6.2
Single		
Years of work experience	54	21
< 10		
20-Oct	117	45.5
> 20	86	33.5
Mean\pmSD (range)	16.1 \pm 8.2 (1-32)	

Working hours per week		
≤ 50	125	48.6
> 50	132	51.4
Tobacco		
No	248	96.5
Yes	9	3.5

Prevalence, Forms, Consequences and Underlying Factors of Medical Errors

The study revealed that 36.2% of the studied nurses committed medical error during the current year. 51.6% of them (47/93) committed errors once, 28% committed errors twice and 20.4% committed errors 3 times with total 157 errors. Eighty-two nurses (31.9%) reported positive past history of medical error, 65 of them (25.3% of total 257 nurses) are among those who did not commit error during the current year. The most frequently committed error among nurses was giving wrong dose (33/93, 35.5%), followed by giving drug instead of another (19.4%), wrong route and failure to prepare the patient prior to surgery (17.2% each), delayed or missed dose (16.1%), giving nonscheduled doses (15.1%), wrong infusion rate (12.9%), giving patient drug to another one (11.8%), wrong or incomplete medical record (7.5%), giving drug with wrong concentration (6.5%), failure to identify the patient (5.4%) and lastly giving expired medications and failure to prevent patient fall (2.2% each). Nine nurses declared that the error they committed caused harm to the patient. This harm was death (one case), ICU admission (3 cases) and anaphylaxis (5 cases) (Table 2). The results also showed no significant (P>0.05) difference between the departments regarding prevalence of medical errors. The underlying factors of medical errors were classified into nurse related, work environmental and managerial factors.

Table 2: Prevalence, forms and consequences of MEs during the current year among the studied nurses.

Variable	Frequency (N=257)	Percent (100.0)
Committing ME during the current year		
No	93	36.2
Yes	164	63.8
Frequency of the error (n=93)		
Once	48	51.6
Twice	26	28
Thrice	19	20.4
Past history of ME		
No	82	31.9
Yes	175	68.1
Forms of the committed MEs (n=93)		
Delayed / missed dose	15	16.1
Wrong dose	33	35.5
Wrong route	16	17.2

Nonscheduled doses	14	15.1
Giving patient's drug to another one	11	11.8
Wrong infusion rate	12	12.9
Drug instead of another	18	19.4
Wrong concentration	6	6.5
Giving expired medication	2	2.2
Failure to prepare the patient prior to surgical operation	16	17.2
Failure to identify the patient	5	5.4
Failure to prevent patient fall	2	2.2
Wrong/ incomplete medical record	7	7.5
Did the error cause harm to the patient? (n=93)		
No	9	9.7
Yes	84	90.3
What is the harm? (n=9)		
Death	1	11.1
ICU admission due to arrhythmia	3	33.3
Anaphylaxis	5	55.6

Table 3: Underlying factors of MEs from the nurses' point of view.

Variable	Frequency (N=257)	Percent (100.0)
Nurse related factors		
Tiredness due to excessive over-time work	161	62.6
Inadequate training of the nurses	101	39.3
Nurses' affective and mood problems	49	19.1
Personal or familial problems	27	10.5
Financial / economic problems	29	11.3
Lack of job interest	40	15.6
Work environmental factors		
Noisy ward environment	110	42.8
Messy arrangement of devices, and equipment's in the ward	70	27.2
Large variety of drugs in medication cabinet	78	30.4
Bad drug storage conditions in the ward	43	16.7
Equipment malfunction or equipment was not adjusted properly	60	23.3
Inadequate lighting of the ward	33	12.8
Managerial factors		
Insufficient knowledge	62	24.1
Improper dose calculation	52	20.2
No rigorous regulations for high-alert medications	48	18.7
Inadequate staffs in each working shift	134	52.1
Physician's medication orders were incomplete	69	26.8
Physician repeatedly changed medication orders	66	25.7
Working in night shift	80	31.1
Variety of drugs used by each patient	45	17.5
	75	29.2

Shortage of time		
Using abbreviations of names	75	29.2
Taken oral orders instead of writing orders	74	28.8

Tiredness due to excessive overtime work and inadequate training of the nurses were the mostly reported factors (62.6% and 39.3% respectively) by the studied nurses. Noisy ward environment and large variety of drugs in medication cabinet were the most common (42.8% and 30.4%) among the environmental factors. Regarding managerial factors, inadequate staffs in each working shift and working in night shift were the mostly reported (52.1% and 31.1% respectively) (Table 3). The study also investigated the association between committing errors and socio-demographic

characters of the studied nurses where (Table 4) illustrates that the prevalence of medical errors significantly ($P < 0.05$) decreased by age (45.6% of nurses of 20- year age group, 40% of those of 30- years, 29% of 40- years and only 14.3% of those of ≥ 50 years age group. Prevalence was significantly ($P < 0.05$) higher among the nurses graduated from nursing school and technical institute of nursing than faculty of nursing (41.6%, 29.6% and 16.7% respectively). Also, medical errors were higher among single, widowed and divorced nurses than married ones (81.2%, 60%, 50% and 32.5% respectively), $P < 0.001$. The prevalence was significantly higher among nurses of work experience less than 10 years (51.9%) compared with those of 20-30 or more years of work experience (33.3% and 30.2% respectively), $P < 0.05$.

Table 4: Association between committing MEs and socio-demographic characters of the studied nurses.

Variable	Not committed errors (n=164)		Committed errors (n=93)		X ² (P)
	No.	%	No.	%	
Age (in years)					
20-	37	54.4	31	45.6	9.05 (0.029)
30-	54	60.0	36	40.0	
40-	55	70.5	23	29.5	
≥ 50	18	85.7	3	14.3	
Sex					
Male	9	60.0	6	40.0	0.1 (0.75)
Female	155	64.0	87	36.0	
Residence					
Rural	117	63.9	66	36.1	0.004 (0.95)
Urban	47	63.5	27	36.5	
Graduation					
Faculty of nursing	25	83.3	5	16.7	8.16 (0.017)
Nursing school	101	58.4	72	41.6	
Technical institute of nursing	38	70.4	16	29.6	
Marital status					
Married	158	67.5	76	32.5	FET= 16.4 (< 0.001)
Divorced	1	50.0	1	50.0	
Widowed	2	40.0	3	60.0	
Single	3	18.8	13	81.2	
Years of work experience					
< 10	26	48.1	28	51.9	7.47 (0.024)
10-20	78	66.7	39	33.3	
>20	60	69.8	26	30.2	
Work hours per week					
≤ 50	82	65.6	43	34.4	0.34 (0.56)
> 50	82	62.1	50	37.9	
Tobacco (n=15 males)					
No	7	77.8	2	22.2	FET (0.13)
Yes	2	33.3	4	66.7	

Reporting of Medical Mrror, its Determinants and Attitude of the Studied Nurses

The results showed that one third (33.3%) of nurses who committed medical error did not report it. Among those who reported the error (62/93, 66.7%), 47 nurses (75.8%) informed the physician in duty, 24.2% told the head nurse. Fear of legal issues after reporting was the most common cause of lack of reporting, followed by unknown error reporting mechanism (38.7%), lack of clear definition of the term medical error (29%), reporting medical error will make others underestimate one's capability (22.6%), fault management /lack of support (19.4%) and lastly sophisticated reporting mechanisms and forgetting to report (6.5% each). However, 20.7% of nurses who did not commit errors declared that if they did an error, they would not report it. Also, 18.3% of those who committed errors decided that they would not report if they committed errors again. The studied nurses agreed on confidentiality (98.1%), being non-punitive (85.5%), being well known and agreed upon by all working in healthcare system (73.5%) and being transparent and the action taken against the offender is revealed (59.1%) as specifications of the medical error reporting system (Table 5). The results illustrated that reporting was significantly (P=0.024) lower among nurses of <10 years work experience (46.4%) than those 10-20 or more (74.4 and 76.9 respectively).

Table 5: Prevalence and determinants of reporting MEs and the attitude of the studied nurses.

Variable	Frequency (n=93)	Percent (100.0)
Did you report the error?		
No	31	33.3
Yes	62	66.7
To whom? (n=62)		
Physician	47	75.8
Head Nurse	15	24.2
Causes of un reporting (n=31)		
Lack of clear definition of the term ME	9	29.0
Fear of legal issues after reporting	25	80.0
Sophisticated reporting mechanisms	2	6.5
Unknown error reporting mechanism	12	38.7
Reporting ME will make others underestimate one's capability	7	22.6
Fault management /lack of support	6	19.4
Forgotten to report	2	6.5
If you committed an error, would you report it? (n=164)		
No	34	20.7
Yes	130	79.3
If you repeated the error, would you report it? (n=93)		
No	17	18.3
Yes	76	81.7

What specifications should be available in the ME reporting system? (n=257)		
Confidentiality	252	98.1
Non-punitive	219	85.5
Well known and agreed upon by all working in healthcare system	189	73.5
Transparent and the action taken against the offender is revealed	152	59.1

Discussion

Our results were that (36.2%) of study participants committed at least one ME in the current year of the study and the most frequently committed ME among nurses were medication errors especially giving wrong dose (35.5%) followed by giving drug instead of another (19.4%), then wrong route & failure to prepare the patient prior to surgery(17.2% each), delayed or missed dose(16.1%), giving non-scheduled doses (15.1%) and finally, wrong infusion rate (12.9%). These finding came in agreement with most of studies that considered medication errors are the most common MEs but there were differences in percentage of each cause of medication errors that we estimated and that of other studies. For example, our findings were not supported by Ehsani et al. who found that the most common errors were wrong infusion rates and giving two doses of medicine instead of one [12].

Al-Shara in Jordan found that wrong patient and wrong dose were the most common errors [13]. Other studies concluded that wrong dosage, medication omission and medication administration at inappropriate times were more common sources of medical errors [14-16]. Higher percentage of medication errors were reported by other studies such as Cheragi et al. who reported that (64.6%) of the Iranian nurses committing errors and mean number of medication errors committed by each nurse during the 3-month period of the study was (7.4) [17]. in Jordan, Mrayyon et al. reported that at least (42.1%) of nurses had committed one medication error and within 3 months [18]. Lisby et al. performed a study in the hospitals of Denmark and found the rate of nursing medication errors to be higher than what we found (43%) [19].

This considerable difference between our findings and rates of medication errors reported in other countries can be due to negative reactions of colleagues and administrators after reporting an error, fear of legal responsibilities, lack of drug monitoring, and absence of a definite medication error reporting and archiving system. On attempt to explore the most common causes of MEs we found that tiredness due to excessive overtime work and inadequate training of the nurses (62.6% and 39.3% respectively) were the most reported nurse related factors of ME, and on asking about work environment as a cause of ME we found that noisy ward environment and large variety of drugs in medication cabinet were the most common (42.8% and 30.4%). Regarding managerial factors, inadequate staffs in each working shift and working in night shift were the most reported (52.1% and 31.1% respectively).

Our results were consistent with Ehsani et al. [12] who found that shortage of nursing staff, inadequate pharmacological knowledge and fatigue resulting from high workload were among human and managerial factors as well as usage of abbreviated names and similarities in drug names were among the medical factors associated with medication errors. The same findings were reported by other studies such as Al-Shara [13], Hosseinzadeh et al. [20] and the systematic review by Alsulami et al. which mentioned that poor knowledge of prescribed or administered medications was the most common reported contributory factor for MEs in Middle Eastern countries [21] Also, hesitated that shortage of workforce [20-25], heavy workload [23-27], poor physical or mental health [24-28], are also common factors contributing to MEs in different studies and literature reviews.

Pape et al. [29] reported that, inadequacy of job training and insufficient knowledge of the graduates are causes of medication errors. Cheragi et al. [17] reported that low nurse to patient ratio among the managerial factors causing medication errors. Dibbi et al. [30] agree with our results as he showed that human factors were the most common cause (46.5%) of medication errors among patients in Saudi Arabia's hospital. Various studies have reported that crowded and noisy environment, tiredness, lack of adequate support, carelessness, increased workload as the most important factors causing medication errors, mostly in intensive care units [31]. On assessment of the association between committing MR and some sociodemographic factors of participating nurses, we found that the prevalence of ME was significantly higher among young age nurses (45.6% of nurses of 20- year and only 14.3% of those of ≥ 50 years age group). The prevalence was significantly higher among nurses of work experience less than 10 years (51.9%) compared with those of 20-30 or more years of work experience (33.3% and 30.2% respectively).

These results were not supported by Sozani et al. and Ghasemi et al. as they found that there was no significant association between the effective factors in causing the medicine-related errors and variables of age and work experience [32,33]. This may be due to difference in demographic characteristics among Egyptian and Iranian populations. Prevalence was significantly higher among the nurses graduated from nursing school and technical institute of nursing than faculty of nursing (41.6%, 29.6% and 16.7% respectively), and the possible explanation for this finding is that faculty graduated nurses are knowledgeable and more qualified. We also noticed that ME were higher among single, widowed and divorced nurses than married ones (81.2%, 60%, 50% and 32.5% respectively), and this could be attributed to the psychological problems facing single, divorced & widowed nurses.

We tried to estimate ME reporting rate and investigate the causes of un-reporting and we found that one third (33.3%) of nurses who committed ME did not report it. This percentage was so much lower than declared by Weingart et al. [34] that found that (72.7%) of the nurses never reported medication errors [34]. More than fifty percent of Junior nurses (less than 10y experience) did not report medication errors in comparable to senior nurses (10-20y & >20y experience) (25.6% & 23.1% respectively) This finding

was confirmed by other studies [35-38] as they found that young nurses were reluctant to report, perceived more reporting barriers and had more negative attitude to error reporting than senior nurses. This could be explained that young nurses are the front-line personnel involved in administering drugs and the prevalence of committing MEs are higher among them than senior nurses. When they commit errors which are common, any negative consequences are likely to impact them directly and make them unwilling to report them.

Another important finding of our study was that the number of medication errors reported by the nurses was less than occurred in real practice. This can be explained by fear of legal issues. Among those who reported the error (62 out of 93, 66.7% of nurses committing ME), (75.8%) of reporting nurses informed the physician in duty, (24.2%) told the head nurse to take the suitable actions. This was the opposite to the situation of Yung et al. who demonstrates that (88.9%) of nurses had reported the error orally and that most had done to the head nurse (67.6%) and physicians (44.4%) [37]. The principle causes of un-reporting were fear of legal issues, followed by unknown error reporting mechanism and finally lack of clear definition of ME. Another study done by Yung et al. [37] declared that fear (fear of blaming, labeled as incompetent nurses, a fear of judicial issues, a fear of being dis-trusted by doctors; patients and families, and a fear of being exposed to the public by the media).

Also, our finding come in agreement with other several studies which found that personal fears were the major perceived barriers of ME reporting [38-41]. However, most of nurses declared that if they committed an error, they would report it on condition that the reporting system characterized by confidentiality, being non-punitive, well known and transparent. Similar finding was demonstrated by Yung et al. who reported that (73.5%) of nurses considered that all medication errors should be reported, whether the patient is harmed or not [37]. There are many studies which emphasize on non-punitive [26,39], blame free [22,27,42] and supportive [22] work environment for ME reporting; being familiar with clinical terminology, training and experience, regular feedback, mandatory and optional reporting are important requirements for good error reporting system [43].

Limitation of the study

The participants were the nursing staff only of a university hospital; future studies should include physicians and other para medical staff from university, private and teaching hospitals. Moreover, self-reported data were collected, and this may be subjected to recall bias. However, bias is a part of any study.

Conclusion

The rapid progress in medical science and technology is creating an ever more complicated environment for nursing practice and thus increase the opportunity of occurrence of MEs. Our results revealed that more than one third of nurses committed MEs during current year due to multiple combined factors concerning the nurses as tiredness, Inadequate training, noisy ward environment,

working in night shift and inadequate staffs in each working shift. The prevalence of errors was higher among junior nurses than senior ones. The most frequently committed errors were giving wrong dose followed by giving drug instead of another. About one third of committed error were not reported due to fear of legal issues after reporting and unknown reporting mechanism.

Recommendation

Health care is a complex system that includes a lot of processes and procedures. ME represent a major threat to patient safety. They are inevitable but could be prevented. It is essential to identify causes and attempt to minimize them. Managers should have a positive attitude toward the reporting of MEs. They should consider error reporting as an opportunity to understand the causes of errors and to analyze cause and effect relations to establish better policies to prevent errors and remove the barriers of reporting. Educating and training all those involved in patient care is an important step to ensure better patient safety.

Acknowledgment

The authors are thankful for nurses for their collaboration in this study.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2018.07.001533

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