Nurses' Experiences toward Perception of Medication Administration Errors Reporting

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Abstract: Background: *Patient safety is a significant challenge facing healthcare systems today. An important part of patient safety is the issue of medication administration within the acute-care setting that has long been the focus of scrutiny and research because it contributes directly to patient morbidity and mortality.* ***Aim:*** *The current study aimed to assess the input from nurses based on their clinical experiences towards perception of occurrence and reporting of medication administration errors, as well as the extent to which errors are reported on their units.* ***Design:*** *The study used a descriptive cross-sectional survey using self-report questionnaire.* ***Setting:*** *The present study was carried out in all departments of King Khalid Public Governorate Hospital in Hafer El-Batin at Kingdom Saudi Arabia.* ***Subjects:*** *A convenience sample of 253 nursing staff worked in the previous mentioned setting.* ***Tools:*** *The data gathering tool was Medication Administration Errors (MAEs) Reporting Questionnaire which was developed by Wakefield et al. (1996) and was modified by the researchers. It contained 65 questions; 29 items regarding reasons why medication errors occur, 16 items regarding reasons why medication errors not reporting and 20 items regarding what percentage of each type of medication error actually reported on units which divided into 9 items for non intravenous and 11 items for intravenous medication administration errors.* ***Results:*** *This study suggested five categories for reasons of why MAEs occur and three categories for reasons of why MAEs not reporting. Nurses perceive low percentages of MAEs reporting. Emergency room was more likely to report medication administration errors than other units.* ***Conclusion:*** *Medication errors are common in clinical practice. Actually, reducing these errors requires the commitment of everyone with a stake in keeping patients safe; physician who wrote the prescription, pharmacist who dispensed it and the nurse who received the medicine and administered to the patient, all play an important role in preventing medication errors reaching to patient.* ***Recommendation:*** *This study recommended for provision of ongoing education & training on safe medication administration and utilization of medication information guide though developing self-report logbook.*
Keywords: *Medication administration errors, Reporting of medication errors, Patient safety, Perception.*

I. INTRODUCTION

Patient safety is a concern worldwide and is a significant challenge facing healthcare systems today[1]. An important part of patient safety is the issue of medication administration (MA) within the acute-care setting that has long been the focus of scrutiny and research because it contributes directly to patient morbidity and mortality[1,2]. Medication errors are a serious public health threat, causing patient injury, death and sharply increasing health care costs[3]. The medication administration process is an everyday part of nursing practice[2], and is so much more than a simple psychomotor task[4]. Safe administration of medication is significant to nurses, doctors, administrators, educators, patients, the public at large, and the entire healthcare system. In essence, each stakeholder is potentially impacted when errors occur[5].

MA is often viewed as a routine and basic nursing task[6,7]. In reality, it reflects a complex interaction of a large number of specific decision and actions[8]. While medication administration errors (MAEs) are frequently associated with nursing actions, it is important to recognize that actual administration of a drug is the last step in a long and complicated process involving a number of different physicians, pharmacists, nurses, clerical and technical staff[3,9]. Preventing MAE represents a central focus of hospital's quality improvement and risk management initiatives. Because the identification and reporting of MAEs is a non-automated and voluntary process, it is essential to understand the extent to which errors may not be reported[6].

Multiple definitions of what constitutes a MAE exist in published research and literature. One definition frequently employed by medical doctors of MAE is any deviation from the physician's medication order as written on the patient's chart[10]. However, the definition typically cited in literature that is authored by nurses defines MAE as 'mistakes associated with drugs and intravenous solutions that are made during the prescription, transcription, dispensing, and administration phases of drug preparation and distribution[11,12]. These errors can be classified as either acts of commission or omission, and may include wrong drug; wrong

route; wrong dose; wrong patient; wrong timing of drug administration; a contra-indicated drug for that patient; wrong site; wrong drug form; wrong infusion rate; expired medication date; or prescription error. Such errors can occur in either an intentional or unintentional manner[13-15].

MAEs are often used as indicators of patient safety in hospitals because of their common occurrence and potential risk to patients[13]. Interception of medication errors occurs more commonly in the early stages of medication processing (prescription and preparation); whereas errors originating in later stages of the process (administration) have fewer system checks and are at a greater risk for remaining undetected. Because nurses administer most medications to patients in hospitals, medication errors can be directly affected by nursing care[14,16].

In the acute care setting of a hospital, the medication process is complex and time-consuming, occupying up to one-third of the nurses time[17]. Medication administration is often carried out under chaotic and stressful circumstances and is probably the highest risk activity a nurse performs. An error in the medication process can be minor or lead to devastating effects for the patient and also for the nurses'/midwives' career[10,18].

In clinical settings, nurses function in fast paced, complex, unpredictable settings with high-stake patient care situations[19,20]. Adding to the complexity are variables such as standardized medication administration schedules and distractions[7,21]. Therefore, nurses should aware of their legal and professional accountability with regard to medication management[19].

Assuring MAE reporting is of great significance for the patient, the hospital, and the nurse[22]. For the hospital, the end result of the underreporting of medication errors is weakened internal quality improvement and risk management opportunities due to inadequate data. Resulting for non-comparability of MAE data used for intra- and inter-institutional comparisons or benchmarking[23,24]. The end result for patients of underreporting of MAEs includes an increased potential of adverse outcomes, due to the failure of the hospital to identify and correct systems related problems amenable to correction[25]. Underreporting of MAEs allows the nurse, however, to avoid being blamed, counseled, or labeled by others as incompetent. The nurse may also not report errors by other nurses, either because of empathy for the nurse committing the error or the desire to avoid being ostracized by other staff[24,26].

The roles of clinical nurses in medication management are complex and multifaceted. These roles include administering medication safely and efficiently, assessing and monitoring for desirable and unwanted effects, discharge planning, and providing patient education[27]. For nurses to carry out these roles effectively, they must possess comprehensive pharmacology knowledge, which involves an understanding of the scientific principles underpinning medications as well as the ability to contextualize medication management to the complex and changing needs of patients[28]. Medication administration requires extensive knowledge and skill to perform correctly[7,29].

In spite of the critical role of the nurse in identifying and reporting MAEs when they occur, there has been little research attempting to assess their perception. In fact, every step in patient care for a nursing professional involves a potential for error and some degree of risk to patient safety. This is especially true in regards to medication errors. Really, proper understanding of the contributing reasons for why MAEs occur, why MAEs not reporting and the extent to which errors are actually reported is the first step toward preventing errors. Furthermore, an understanding of their perceptions about MA is important because it helps organizations to find the factors that threaten patient safety[29]. Therefore, this paper represents responses of nurses in a survey designed to measure their perceptions as well as solicit information about their personal experiences with medication errors.

AIM OF THE STUDY

The purpose of this survey aimed to assess the input from nurses based on their clinical experiences towards perception of occurrence and reporting of medication administration errors, as well as the extent to which errors are reported on their units.

RESEARCH QUESTIONS

Three research's questions were asked about:
1. Why medication errors occur?
2. Why medication errors are not reported?
3. What is the extent (percentage) of medication errors on the unit?

II.　　MATERIAL And Methods

RESEARCH DESIGN: This study used a descriptive cross-sectional survey through self-report questionnaire.
SETTING: The present study was carried out in all departments of King Khalid Public Governorate Hospital in Hafer El-Batin at Kingdom of Saudi Arabia during the period from December 2012 to the end of February 2013.

SUBJECTS: A convenience sample of nursing staff was contacted and asked to participate in the survey. The subjects of the study consisted of 253 nurses working at King Khalid Hospital. The sampling criteria for selection of nurses were working in hospital settings for a minimum period of one year of experience and involved in administering medications.

TOOLS OF DATA COLLECTION: The current study was used one tool called Medication Administration Errors (MAEs) Reporting Questionnaire which was developed by **Wakefield et al.** (1996)[30]. It was consisted of two parts.

The first part: Sociodemographic Data

This part was modified by the researchers to include sex, age, education level, years of experience, nationality, working unit, and current position. Moreover, three additional questions were added to ask about; does your nursing unit using dose system? How many units do you float between in a month? And Are you employed full-time or part-time in your current position in this institution?

The second part: Medication Administration Errors (MAEs) Reporting Questionnaire

This part contained 65 questions. It consisted of three sections; the first section included 29 items regarding reasons why medication errors occur and second section included 16 items regarding reasons why medication errors not reporting. Respondents were asked to indicate their level of agreement using a five points Likert type scale with fix values ranging from 5=strongly agree to 1=strongly disagree.

For the first and second section of second part of the questionnaire, principle components factor analysis with orthogonal rotation was used to determine whether nurses' questions could be combined into subscales. Items found to load together on the same factor were formed into subscales in which each item was equally weighted. Subscale values were calculated by adding the value of each questionnaire item in the scale and dividing by the number of items in the subscale.

The third section included 20 items regarding what percentage of each type of medication error actually reported on units; 9 items for non intravenous (Non-IV) medication errors and 11 items for intravenous (IV) medication errors. More specifically, participants were asked to use a 10-point ordinal scale to indicate the range of MAEs which they perceived to be reported on their patient care units in this survey, the scale range allowed them to indicate their perceptions of MAEs being reported along the full range of 0% to 100%.

METHODS

The questionnaire was tested for its content validity and relevance by a jury consisted of five experts in different fields of nursing at Tanta and Zagazig Faculty of Nursing. The experts' responses were represented in four points rating score ranging from (4-1); 4= strongly relevant, 3= relevant, 2= little relevant, and 1= not relevant. These questionnaires were translated into Arabic language and accordingly, minor changes were made for a few unclear words. The subscales' reliability values of these factors measured by Cronbach's coefficient Alpha, in which the internal consistency reliability ranged from 0.785 to 0.905 and the Scale Content Validity Index S-CVI (S-CVI) was 0.99. A pilot study was conducted on 20 nurses (excluded from the sample) for two times separated by two weeks to ensure the reliability of the tool and assess the nurses' acceptance to be involved in the study.

ETHICAL CONSIDERATION

The agreement for participation of the subjects was taken after the researcher explained the aim of the study. They were given an opportunity to refuse the participation or withdrawal at any stage of the research. They were assured that the information would be confidential and used for the research purpose only.

STATISTICAL ANALYSIS

All Data were collected, coded, tabulated and subjected to statistical analysis. Statistical analysis is performed by statistical Package SPSS in general (version 17), also Microsoft office Excel was used for data handling and graphical presentation. Quantitative variables were described by the Mean, Standard Deviation (SD), while qualitative categorical variables are described by proportions and Percentages.

Descriptive statistics were used to analyze the response to individual items and the respondents' characteristics. Principle Components factor analysis using orthogonal rotation was used to determine if the individual questions could be combined into the subscales. Subscale reliability was assessed using Cronbach's Coefficient Alpha. Item content validity ratio CVR and Scale Content Validity Index S-CVI was used to assess validity. Spearman's rho correlation coefficient was used to measure the correlation between quantitative variables, while student t-test was used for comparing the means of two groups. ANOVA F-test was used for

comparing the means of more than two groups of quantitative variables. Significance level was considered at $P < 0.05$.

III. RESULTS

Not all respondents agree to participate in data collection; the overall response rate from 253 participants was 72.3%. Table (1) illustrated the demographic characteristics of nursing staff at King Khalid Hospital. The table reveals that 77.1% of nursing staff were female, and more than half of them aged between 26-30 years old with mean score 29.17±5.485, as well as 30% of them worked in ICUs (Intensive Care Units & Coronary Care Unit), 25.7% worked in OBS (delivery room, antenatal & postnatal care), and 18.2% worked in medical ward (male & female). It was observed that majority of nursing staff (71.9%) was nurses, 50.2% of them had diploma degree, 38.3% of them were Saudi, and 59.3% of them had less than 5 years of experiences with mean score 4.65±3.466. Moreover, it can be noticed that 69.2% of nursing staff always use unit dose system and 34.8% of them sometimes float between units.

Table (1) Demographic characteristics of nursing staff at King Khalid Hospital

Personal Characteristics	Frequency	Percent (%)
▪ **Sex**		
Male	58	22.9
Female	195	**77.1**
Total	253	100.0
▪ **Age**		
≥25 years	48	19.0
26 –	147	**58.1**
31-	34	13.4
≤35 years	24	9.5
Total	253	100.0
Range	**20 - 58 years**	
Mean ±SD	**29.17±5.485**	
▪ **Unit**		
ICU*	76	**30.0**
AKU*	12	4.7
Pediatric Unit	13	5.1
Surgical Ward	23	9.1
Medical Ward	46	**18.2**
ER*	18	7.1
OBS Ward*	65	**25.7**
Total	253	100.0
▪ **Current Position**		
Nurse	182	**71.9**
Midwife	71	28.1
Total	253	100.0
▪ **Educational Level**		
BNS	126	49.8
Diploma	127	**50.2**
Total	253	100.0
▪ **Nationality**		
Saudi	97	**38.3**
Filipino	65	25.7
Pakistani	17	6.7
Indian	74	29.2
Total	253	100.0
▪ **Years of Experience**		
Less than 5 years	150	**59.3**
5 to less than 10	83	32.8
10 or more years	20	7.9
Total	253	100.0
Range	0-21 years	
Mean ±SD	**4.65±3.466**	
▪ **Using Unit Dose System**		
Rarely	23	9.1
Sometimes	55	21.7
Always	175	**69.2**
Total	253	100.0
▪ **Floating Between Units**		
Never	71	28.1
Rarely	23	9.1
Sometimes	88	**34.8**
Always	71	28.1
Total	253	100.0

ICU*= Intensive Care Units, OBS*=Obstetric ward Unit, AKU* = Artificial Kidney Unit, ER* =Emergency Room

Table (2) Factor Analysis for Reasons of Why Medication Administration Errors Occur

Item No.	Items of Reasons Why MAEs Occur	Factors' Analysis				
		Nurse-Physician Reasons	Pharmacy Reasons	Documentation-Transcription Reasons	System Reasons	Medication Packaging Reasons
CME1	The names of many medications are similar	.379	.146	.106	.024	.760
CME2	Different medications look alike.	-.143	-.059	-.011	.310	.832
CME3	The packaging of many medications is similar.	-.225	-.057	.000	.123	.836
CME4	Physicians' medication orders are not legible.	.689	.443	.007	-.172	-.006
CME5	Physicians' medication orders are not clear.	.716	.455	-.063	-.086	.078
CME6	Physicians change orders frequently.	.636	.459	-.093	.189	.004
CME7	Abbreviations are used instead of writing the orders out completely.	.168	.213	.005	.661	.288
CME8	Verbal orders are used instead of written orders.	.294	.541	.318	.214	.058
CME9	Pharmacy delivers incorrect doses to this unit.	.388	.733	.149	.075	.017
CME10	Pharmacy does not prepare the medication correctly.	.175	.799	.104	.251	.088
CME11	Pharmacy does not label the medication correctly.	.264	.795	.223	.033	-.116
CME12	Pharmacists are not available 24 hours a day.	.351	.701	.300	.046	-.008
CME13	Frequent substitution of drugs.	.182	.252	.433	.377	.182
CME14	Poor communication between nurses and physicians	.558	.383	.427	-.015	.152
CME15	Nurses on this unit have limited knowledge about medications	.631	.252	.281	.077	-.134
CME16	Nurses get pulled between teams and from other units.	.138	.152	-.027	.796	.078
CME17	When scheduled medications are delayed, nurses do not communicate the time when the next dose is due	.249	.250	.719	.038	.090
CME18	Nurses on this unit do not adhere to the approved medication administration procedure.	.358	.305	.648	-.261	-.079
CME19	Nurses are interrupted while administering medications to perform other duties.	.463	.197	.625	.177	-.084
CME20	Unit staffing levels are inadequate.	.700	.195	.105	.363	-.031
CME21	All medications for one team of patients cannot be passed within an accepted time frame.	.777	.168	.238	.066	.043
CME22	Medication orders are not transcribed to the Kardex correctly.	.139	-.228	.506	.344	.319
CME23	Errors are made in the Medication Kardex.	-.027	-.493	.436	.386	.177
CME24	Equipment malfunctions or is not set correctly.	.741	.152	.231	.101	-.014
CME25	Unit staffs do not receive enough in services on new medications	.613	.044	.286	.363	-.129
CME26	On this unit, there is no easy way to look up information on medications	.563	-.014	.483	.151	-.007
CME27	Nurse is unaware of a known allergy.	.768	.227	.262	-.010	.005
CME28	Patients are off the ward for other care.	.620	.162	.287	.185	-.051
CME29	Many patients are on the same or similar medications.	.616	.203	.242	.216	.106

Table (2) illustrates the factor analysis for reasons of why medication administration errors occur. The exploratory factor analyses in this table revealed the consistent presence of five valid and reliable factors for reasons why MAEs occur. When combing responses across nurses, nurses - physician reasons included 12 items such as 'physicians medication orders are not legible; poor communication between nurses and physicians'. Pharmacy reasons included 5 items such as 'pharmacy delivers incorrect doses to this unit; pharmacists are not available 24 hours a day'. Documentation -transcription reasons included 6 items such as 'nurses on this unit do not adhere to the approved medication administration procedure; errors are made in the Medication Kardex'. System reasons included 3 items such as 'frequent substitution of drugs; nurses gets pulled between teams and

from other units'. Medications packaging reasons included 3 items such as 'the names of many medications are similar; different medications look alike'.

Figure (1) Perception of Participants for Why Medication Administration Errors Occur
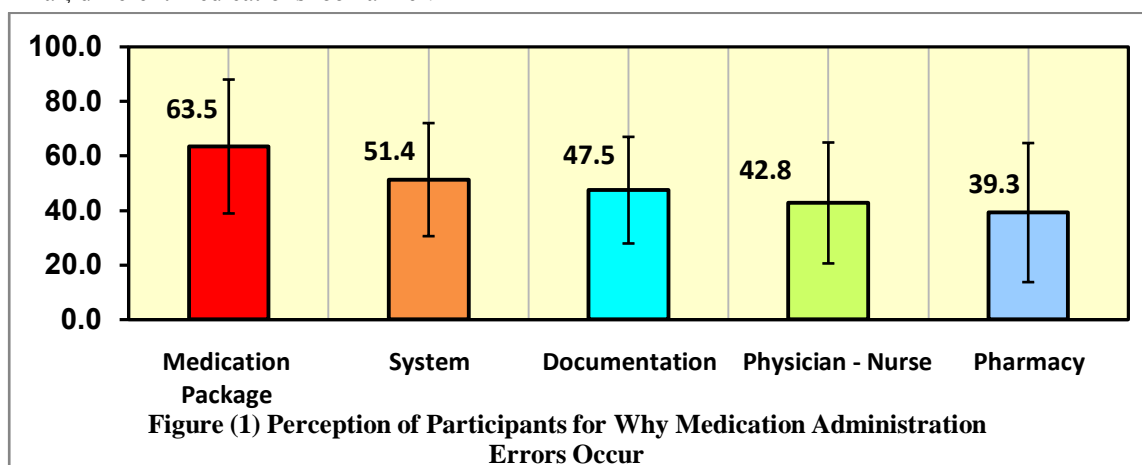
Figure (1) represents perception of participants for why medication administration errors occur. Accordingly the ranking of the five mean values of causes stated that the medication package reason (63.5) was perceived as the most important factor for reasons of MAEs occur, followed by system reason (51.4), then documentation-transcription reason (47.5) and after that nurse - physician reason (42.8). Finally, pharmacy reason (39.3) was perceived as the least reason of MAEs occurs.

Table (3) Factor Analysis for Reasons of Why Medication Administration Errors Not Reporting

Item No.	Items of Reasons Why MAEs not reported	Factors' Analysis		
		Disagreement Over Time and Error Definition Reason	Administrative Reason	Fear Reason
CNR1	Nurses do not agree with hospital's definition of a medication error.	.682	.390	.229
CNR2	Nurses do not recognize an error occurred.	.759	.230	.172
CNR3	Filling out an incident report for a medication error takes too much time.	.825	.079	.240
CNR4	Contacting the physician about a medication error takes too much time	.594	.297	.396
CNR5	Medication error is not clearly defined.	.636	.274	.400
CNR6	Nurses may not think the error is important enough to be reported.	.770	.315	.017
CNR7	Nurses believe that other nurses will think they are incompetent if they make medication errors.	.792	.291	.022
CNR8	The patient or family might develop a negative attitude toward the nurse, or may sue the nurse if a medication error is reported.	.189	.039	.772
CNR9	The expectation that medications be given exactly as ordered is unrealistic	.698	.430	-.058
CNR10	Nurses are afraid the physician will reprimand them for the medication error.	-.035	.441	.711
CNR11	Nurses fear adverse consequences from reporting medication errors.	.389	-.218	.671
CNR12	The response by nursing administration does not match the severity of the error.	.577	.619	-.080
CNR13	Nurses could be blamed if something happens to the patient as a result of the medication error.	.293	.825	.098
CNR14	No positive feedback is given for passing medications correctly.	.256	.873	.133
CNR15	Too much emphasis is placed on medication errors as a measure of the quality of nursing care provided.	-.206	.140	.791
CNR16	When medication errors occur, nursing administration focuses on the individual rather than looking at the systems as a potential cause of the error.	.437	.724	-.070

Table (3) shows factor analysis for reasons of why medication administration errors not reporting. The exploratory factor analyses in this table revealed the consistent presence of three valid and reliable factors for reasons why MAEs not reported. When combing responses across nurses, disagreement over time-error definition reasons included 8 items such as 'nurses do not agree with hospital's definition of a medication error; contacting the physician about a medication error takes too much time'. Administrative reasons included 4 items such as 'the response by nursing administration does not match the severity of the error; when medication errors occur, nursing administration focuses on the individual rather than looking at the systems as a potential cause of the error'. Fear reasons included 4 items such as 'the patient or family might develop a negative attitude toward the nurse; nurses fear adverse consequences from reporting medication errors'.

Figure (2) Perception of Participants for Reasons of Why Medication Administration Errors Not Reporting
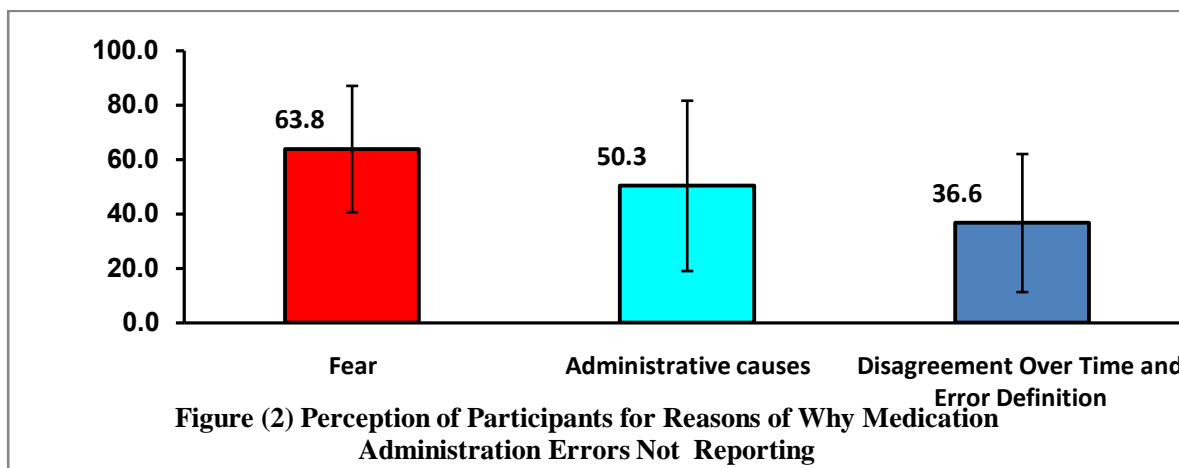
Figure (2) represents perception of participants for why medication administration errors not reporting. Accordingly, the ranking of the three mean values of causes stated that the fear reason (63.8) was perceived as the most important factor for reasons of MAEs not reporting, followed by administrative reasons (50.3), and then disagreement over time-error definition reasons (36.6).

Table (4) describes the relation of socio-demographic data with reasons of why medication administration errors occur and not reporting. This study revealed no statistically significant correlation between participants' age and experience with reasons of why MAEs occur or not reporting. Concerning sex, there were significant correlations with all reasons of not reporting MAEs at $P<0.05$ & $P<0.001$, while only with physician-nurse reasons of MAEs occur. Regarding working position, there was an inverse statistically significant correlation between participants and physician - nurse reason, as well as a positive statistically significant correlation for medication package reason of why MAEs occur. Moreover, there were an inverse statistically significant correlation for administrative reason and a positive statistically significant correlation for fear reason of why MAEs not reporting.

In relation to level of education, there were inverse statistically significant correlations between BNS and diploma for physician - nurse and documentation reasons of why MAEs occur as well as for disagreement over time-error definition reason of why MAEs not reporting. Additionally, there were positive statistically significant correlations between participants' nationality for documentation-transcription and system reasons of why MAEs occur at $P<0.05$. Furthermore, this study showed highly statistically significant correlation between participants' working area with all reasons of why MAEs occur and not reporting at $P<0.001$. There were positive statistically significant correlations between units' using dose system and all reasons of why MAEs occur except for medication package reason, as well as for all reasons of why MAEs not reporting except for fear reason. According to floating between units, there was positive significant correlation with physician –nurse reason of why MAEs occur, as well as for disagreement over time-error definition and administrative reasons of why MAEs not reporting.

Table (5) shows perceived reasons of non IV and IV MAEs reporting. The table revealed no statistically significant correlation between all items of non IV and IV MAEs reporting. It was observed that both total percentages of Non-IV and IV MAEs reporting were around 22%. The perceived rates of MAEs reporting for non-IV medications ranged from a low of 16.8% for medication given but not ordered by physician to 28.6% for wrong time. For IV-related MAEs, the perceived percent of MAEs being reported ranged from 17.6% for medication given but not ordered by physician to 34% for wrong rate.

Table (4) Relation of Socio-demographic Data with Reasons of Why Medication Administration Errors Occur and Not Reporting

Demographic Variables			Reasons of Why MAEs Occur					Reasons of Why MAEs Not Reporting		
			Physician - Nurse	Pharmacy	Document	System	Medication Package	Disagreement Over Time and Error Definition	Administ.	Fear
Age		r*	0.006	0.063	-0.043	-0.027	-0.019	-0.028	0.041	-0.023
		p-value	0.928	0.320	0.492	0.670	0.761	0.662	0.518	0.717
Sex	Male	t*	-3.9	-1.9	-1.4	0.4	1.9	-2.6	-7.2	3.6
	Female	p-value	0.00014***	0.054	0.156	0.672	0.062	0.0107*	0.0000***	0.0000***
Experience		f*	0.052	0.123	0.013	.001	-0.088	-0.024	0.096	-0.060
		p-value	0.410	0.050	0.834	0.989	0.165	0.705	0.129	0.339
Position	Nurses	t*	-2.4	-0.2	-2.0	-0.1	2.1	0.4	-2.3	2.2
	Midwives	p-value	0.0183*	0.846	0.052	0.913	0.0350*	0.663	0.0218*	0.0309*
Level of Education	BNS	t	-2.7	0.5	-3.4	-1.5	-0.8	-3.6	-2.0	-1.7
	Diploma	p-value	0.0070**	0.607	0.00081***	0.126	0.451	0.00041***	0.051	0.085
Nationality	Saudi Filipino Pakistani Indian	f	0.7	0.3	3.7	3.2	0.8	1.6	0.2	2.4
		p-value	0.533	0.816	0.0125*	0.0256*	0.498	0.191	0.893	0.065
Working Area	ICU AKU Pediatric Surgical Medical OBS ER	f	13.5	6.0	5.7	5.0	7.1	6.3	18.5	7.1
		p-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Using Unit Dose System	Rarely Sometimes Always	f	19.2	7.1	5.8	5.1	1.0	15.8	18.5	2.3
		p-value	0.0000***	0.0009***	0.0033**	0.0064**	0.376	0.0000***	0.0000***	0.098
Floating between Units	Never Rarely Sometimes Always	f	3.5	2.0	2.1	0.5	1.3	3.0	5.4	1.1
		p-value	0.0156*	0.122	0.104	0.690	0.264	0.0331*	0.0013**	0.369

Significant P < 0.05*, P < 0.01**, P < 0.001***   t*= Statistical t-test BNS*= Bachelor Nursing Science
r*= Correlation Coefficient f*= Analysis of Variables ANOVA f-test

Table (5) Perceived Reasons of Non-IV and IV MAEs Reporting

MAEs items	Percentage of Each Type of Medication Error Actually Reported			
	Non-IV MAEs	IV MAEs	z	P-value
1)Wrong route	19.9	18.6	0.34	0.74
2)Wrong time	**28.6**	25.6	0.80	0.42
3)Wrong patient	19.7	17.1	0.69	0.49
4)Wrong dose	25.3	24.7	0.10	0.92
5)Wrong drug	21.2	20.9	0.11	0.91
6)Medication is omitted.	24.0	22.4	0.42	0.67
7)Medication is given, but not ordered by physician.	**16.8**	**17.6**	0.23	0.81
8)Medication administered after the order discontinued.	20.1	19.8	0.00	1.00
9)Given to patient with a known allergy.	22.0	23.5	0.42	0.67
10) Wrong fluid	…	20.9	……	……
11) Wrong rate	……	**34.0**	……	……
TPP* of Reporting	**22.0**	**22.4**	0.00	0.99

TPP* = Total Perceived Percentage

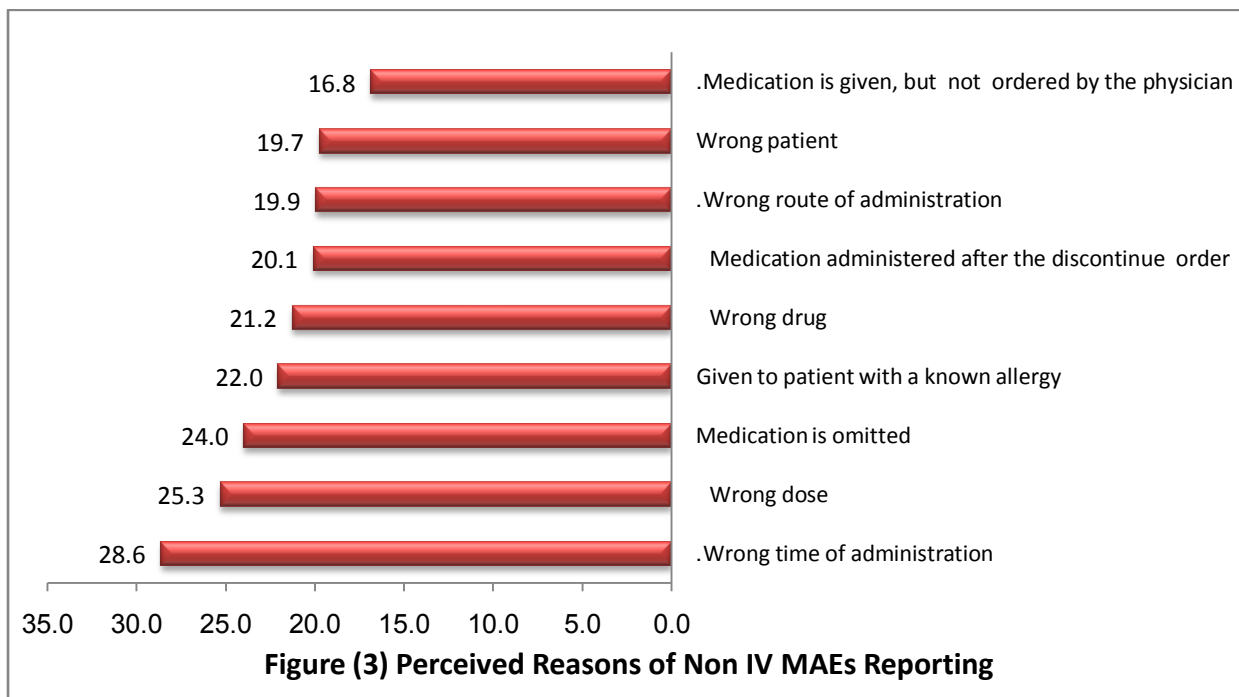**Figure (3) Perceived Reasons of Non IV MAEs Reporting**

Figure (3) displays perceived reasons of Non-IV MAEs reporting. The figure shows that the most common Non-IV MAEs was for wrong time (28.6%), followed by wrong dose (25.3%) and medication omitted (24%), then given to patient with a known allergy (22%), after that wrong route (21.2%).
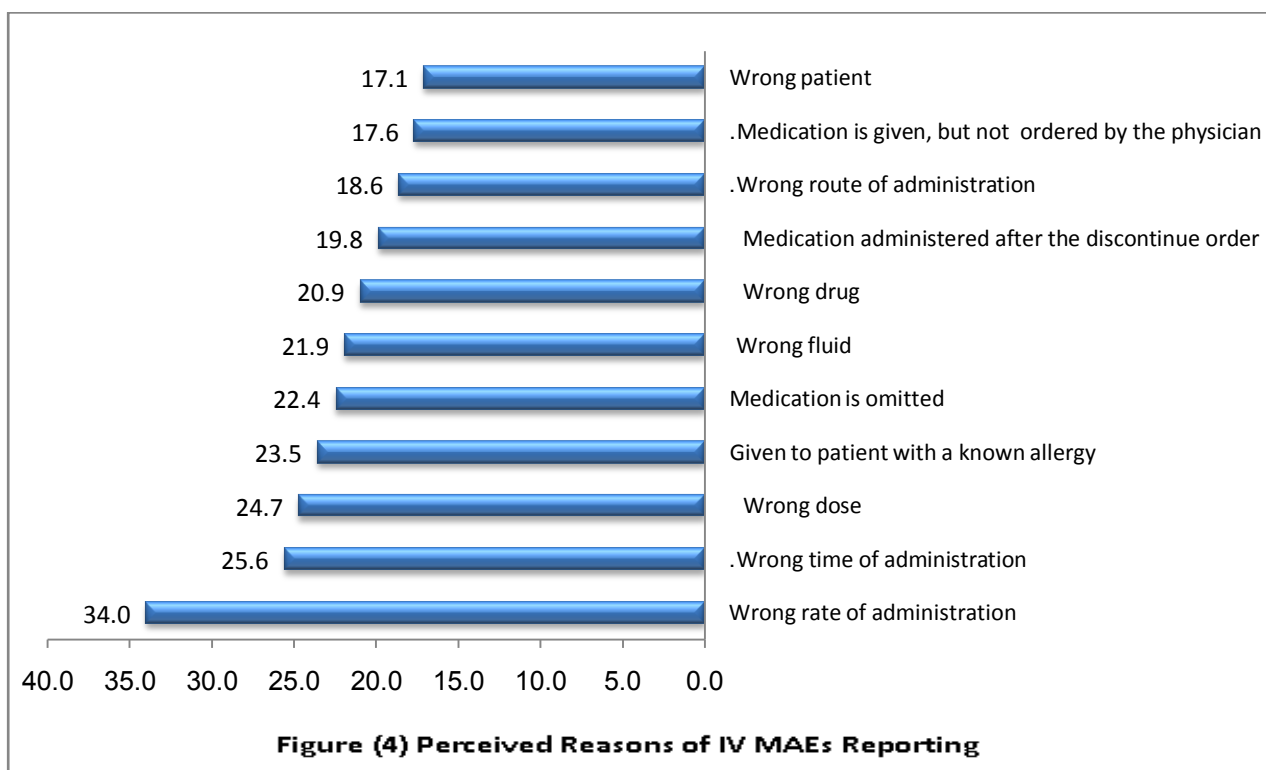

Figure (4) Perceived Reasons of IV MAEs Reporting

Figure (4) illustrates perceived reasons of IV MAEs reporting. The figure revealed that the most common IV MAEs was for wrong rate (34%), followed by wrong time (25.6%), wrong dose (24.7%), and then given to patient with a known allergy (23.5%), after that medication omitted (22.4%).

Figure (5) Comparison of Percieved Reasons of Non IV and IV MAEs Reporting among Different Units
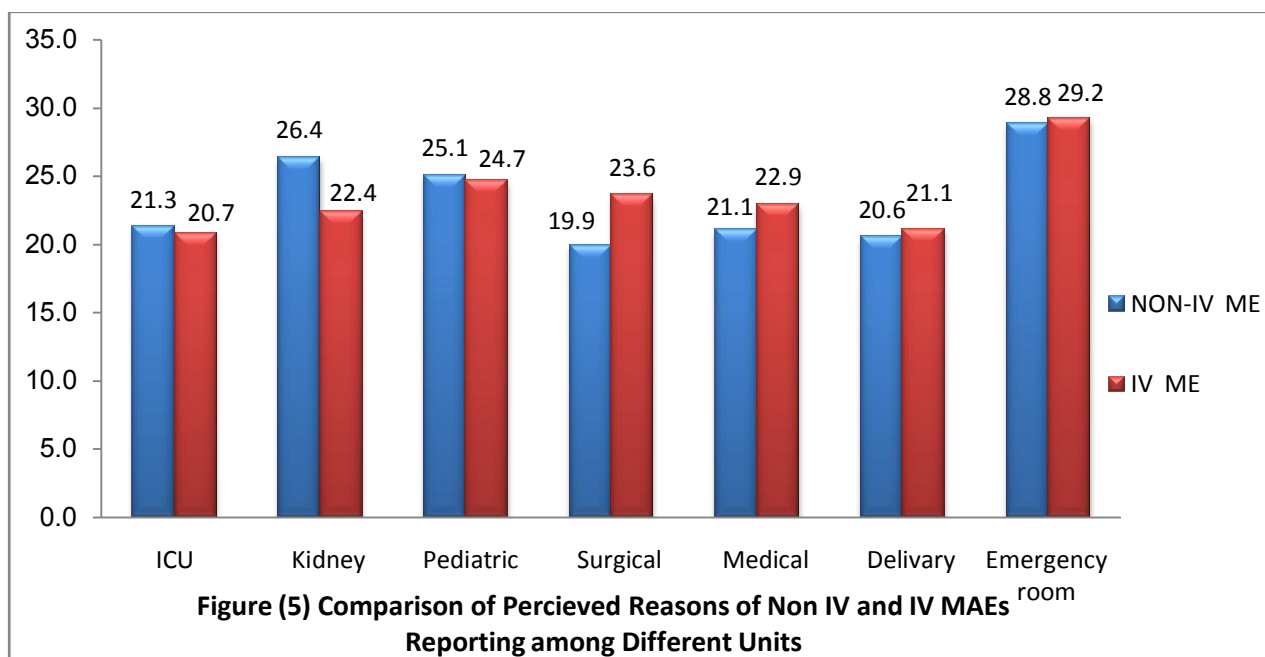
Figure (5) represents the comparison of perceived reasons of Non-IV and IV MAEs reporting among different units. The figure clarified that the emergency room was the unit with the highest rate of MAEs reporting for both Non-IV (28.8%) and IV (29.8%). The same figure also showed small variations between IV and Non-IV related MAEs reporting among different units of King Khalid Hospital at KSA.

IV. DISCUSSION

Nurses play a major role in reducing medication errors and frequently administer medications in patients' healthcare settings[31]. Thus, they are the last line of defense to safeguard against medication errors as administration is the last part of the medication process[32]. Therefore, the aim of the present study was to assess the input from participants based on their clinical experiences towards perception of occurrence and reporting of medication administration errors, as well as the extent to which errors are reported on their units.

In this study, results of the factor analysis revealed five categories of reasons for why MAEs occur that were identified in this survey. In descending order of magnitude, these categories included medication package reasons, followed by system reasons, then documentation-transcription reasons, physician-nurses reasons and finally pharmacy reasons.

However, in another survey conducted by Cohen et al. (2003)[33] mentioned five major reasons for what caused or increased the risk of medication errors; distractions and interruptions during MA, inadequate staffing and high nurse/patient ratios, illegible medication orders, incorrect dosage calculations and similar drug names and packaging.

In current study, the first category of reasons why MAEs may occur is medication package. This includes similarity of many medications' names, different medications look alike, and similarity of many medications' packaging. In fact, once a medication has been removed from its packaging, it's hard to identify and can be easily confused with another one. Thus well-designed medications' names, labels and packages can support safe and appropriate use by healthcare professionals, patients and consumers. The nurses must take the medication to the patient's bedside in its original packaging and open the packaging immediately before giving the dose.

Really, look-alike/sound-alike medication names can result in medication errors. Misreading medication names that look similar is a common mistake. These look-alike medication names can lead to errors associated with verbal prescriptions. For these reasons, the Joint Commission published a list of look-alike/sound-alike drugs that are considered the most problematic medication names across settings[34].

Mrayyan et al.(2007)[35] supported this finding and suggested that the medications' labels and packages may be confusingly the health care personnel due to do not place important information prominently and small font size of displaying text, which may lead to poor readability. Roy et al (2005)[36] pointed out that miscommunication of drugs orders, which can involve poor handwriting, confusing between drugs with similar names, misuse of zeroes and decimal points. Moreover, environmental factors such as lighting, heat, noise and interruptions that can distract health professional from their nursing tasks.

The second category of reasons why MAEs may occur is system issues; such as using abbreviations instead of writing the orders out completely, frequent substitution of the drug and pulling of nurses between teams and from other units. This result concurring with the study findings of Wakefield (2005)[37], which showed the systems issue is workload and type of care delivery system, and includes factors such as number of consecutive hours worked, rotating shifts, staffing mix and numbers, nurse-to-patient ratios, distractions and interruptions, assignment of floating nurses to unfamiliar units, and hospital – pharmacy design features.

Based on the participants' perception, the results of the current study showed that documentation – transcription issue is the third category of MAEs. These reasons included delaying scheduled medications, nurses do not communicate the time when the next dose is due, nurses on this unit do not adhere to the approved medication administration procedure, nurses interrupted while administering medications, not transcribed medication orders to the Kardex correctly, errors made in the medication Kardex and no easy way to look up information on medications in this unit. These findings might be because the nurses misread what is written on the source document or perhaps mishears what the physician tells them over the telephone, as well as majority of the sample was foreigners, nurses sometimes can't recognize words correctly—especially if the speaker and the listener come from different regions. This finding is in the line with Moyen (2008)[38] who suggested that transcription errors are usually attributed to misinterpretation of handwriting, abbreviation use and mistakes in reading.

Finding of the current study illustrated that participants perceived physician-nurse relationship reason as the fourth category of MAEs. These included illegible physicians' medication orders, unclear physicians' medication, frequently change physicians' orders, poor communication between nurses and physicians, limited knowledge of nurses about medications, inadequate unit staffing, impossibility to pass all medications for one team of patients within an accepted time frame, equipment malfunctions and no in-services training on new medications.

This finding was relevant and consistent with Dumo (2012)[39] who reported that poor nurse/physician relationships may cause MAEs due to physicians don't spend enough time discussing care options with nurses. Many nurses still feel that physicians don't understand, respect, or care to listen to nursing perspectives on patient care that lead to misunderstanding and conflict between nurses and physicians.

Results of this study indicated that the pharmacy issue classified as the last category of MAEs such as; using of verbal orders instead of written orders, pharmacy delivers incorrect doses, pharmacy does not prepare and label the medication correctly, as well as pharmacists unavailable 24 hours a day. Ideally, the pharmacist should collaborate with the prescriber in developing, implementing, and monitoring a therapeutic plan to produce defined therapeutic outcomes for the patient[39].

The present study factor analysis for not reporting MAEs showed three categories ranked as; fear reasons, followed by administrative reasons, then disagreement over time - error definition reasons. In this respect, several studies like Wakefield (2000)[24], Wakefield (2005)[37], Dorgham & Khamis (2012)[41] and Abou Hashish & El-Bialy (2013)[42] used a similar instrument to investigate nurses' perceptions of not reporting medication errors and supported this findings but with different ranking.

Otherwise, several survey studies[43,44] have shown that the underlying reasons for not reporting MAEs included organizational and individual factors. These organizational or system factors were articulated as administrators' attitudes and responses to medication errors such as unsupportive responses from administrators and coworkers, challenges to professional credibility, focus on system approaches rather than human approaches, a culture of blaming, reporting burden, post-reporting feedback, and policy related to patient safety, as well as the disciplinary actions after reporting.

Fear reasons included fear from the patient, family or physician to develop a negative attitude or may sue the nurse if a ME is reported, and fear from reporting adverse consequences of ME, as well as more emphasizing placed on medication errors as a measure of the quality of nursing care provided. The truth stated that the nursing staff fear for their personal reputation, threat of malpractice suits, high expectations of the patient's family or society, possible disciplinary actions by licensing boards, threat to job security and expectations of other team members.

Administrative reasons included inappropriate response by nursing administration with the severity of the error, blaming of nurses if something happens to the patient as a result of the ME, no positive feedback is given for passing medications correctly and focusing on the individual rather than looking at the systems as a potential cause of the error when medication errors occur. Indeed a punitive environment to error reporting was an important feature due to culture of blame within healthcare without organizational leadership and support. However, a non-supportive environment, a culture of blame and shame is unlikely to foster incident reporting.

Disagreements over time - error definition reasons included disagreement of nurses with hospital's definition of a ME, unrecognized an error occurred; too much time for filling out an incident report and for contacting the physician about a ME, as well as thinking of nurses that error not important enough to be reported, believing of nurses that other nurses will think they are incompetent and unrealistic expectation that

medications be given exactly as ordered. In fact, lack of understanding among nursing staff for what constitute the errors due to much responsibility, job stress, anxiety and lack of appropriate teamwork. Moreover, most of nursing staff have poor time management skills because they waste a lot of time doing unproductive things.

In this aspect, Cohen et al. (2003)[33] mentioned that the error reports are a poor indicator of a nurse's competence. Nurses who report their own errors or errors they discover are probably conscientious and know that reporting errors helps identify and correct recurring problems. Nurses who are frequently reported by others for errors may not be "liked" by others in the unit for reasons that have little to do with competence.

Regarding demographic characteristics, there was no relation between participants' age and experience with reasons of why MAEs occur or not reporting. This means that all nurses are equally vulnerable to experience errors regardless of their age or years of experience, as well as they didn't protect from incurring medication errors. The same findings were reported by Armutlu et al. (2008)[45]. In contrast, the study of Flor et al. (2012)[46] and Zein Eldin and Abd Elaal (2013)[47] found that working experience of nurses is an important factor that affects general medication errors, in which nurses who have worked more years are less prone to having wrong time errors as compared to nurses who have less working experience.

Concerning sex, there were significant relations with all reasons of why MAEs not reporting and only with physician-nurse reasons of why MAEs occur. Accordingly, Dumo (2012)[39] suggested that nurses and physicians don't come to work to harm patients; unfortunately, the hard reality is that errors and subsequent harm to patients do happen. They administer hundreds of medications daily to multiple patients with multiple disease processes and via multiple routes.

Another factor that affects general medication errors was the working position. Moreover, there were inverse statistically significant correlations between level of education with physician - nurse and documentation-transcription reasons of why MAEs occur as well as for disagreement over time-error definition reason of why MAEs not reporting. These findings consistent with Anderson (2010)[48] who pointed out that continuing education of the nursing staff can help reduce medication errors. In contradictory, Bailey (2008)[49] found that there was a relationship between the number of medication errors and nurses with varying education levels. His study indicated that a BSN RN generally makes the most errors, which could be useful information in structuring future BSN programs to increase clinical focus in the preparation of their students.

Results of the present study revealed positive statistically significant relations between participants' nationality for documentation-transcription and system reasons of why MAEs occur. These results can be explained as majority of sample were foreigners from different culture, their basic language not English which play a significant role in all aspects of errors. In the current study, it can be noticed that respondents' working area had highly statistically significant correlation with all reasons of why MAEs occur and not reporting. This means that all participants regardless of their working area, errors occur in a variety of settings. They can occur in ICUs, pediatric, medical, surgical, obstetric, or emergency room.

On the other hand, there were positive statistically significant correlations between units using dose system and all reasons of why MAEs occur except for medication package reason, as well as for all reasons of why MAEs not reporting except for fear reason. This means that all units use dose system protect their staff from all reasons of MAEs except for medication package reason and from all reasons of MAEs not reporting except for fear reason because both of them out of their control.

Concerning floating between units, positive significant correlation was found with physician –nurse reason of MAEs, as well as disagreement over time-error definition and administrative reasons of why MAEs not reporting. This means that float pool nurses from their unit to other units increase the chance for occurrence of MAEs but improve nurse-physician communication, as well as increase the chance for reporting of MAEs due to workload demands, interruptions in continuity of care, and inconsistencies in nursing assignments. Correspondingly, Larson et al. (2012)[50] in her study demonstrated that float pool nurses are overwhelmed and unsatisfied with the work environment due to working in inconsistent environments and often receiving the most difficult patient assignment which increase their liability of errors.

One of the key findings of this study was that nurses perceive only low percent for Non-IV and IV MAEs which actually being reported with no statistically significant correlation between them. In general, available medication error rates are misrepresentative because a small proportion of administration errors are reported by the staff due to their attitudes toward reporting systems. This finding was parallel with the study of Alshaikh et al. (2008)[51] which stated that medication errors in Saudi Arabia are, to a large extent, under reported.

In Saudi Arabia, 40,000 medical errors complaints are filed yearly, a third of medical practitioners are banned from travel due to those complaints, and 80% of those complaints end without convection. Furthermore, most of the procedures carried out at the hospitals prior to any medical intervention are not known to the patients[52].

The present study suggested that the most common Non-IV MAEs was wrong time, followed by wrong dose and medication omitted, then given to patient with a known allergy, and after that wrong route. While, the

most common IV MAEs was wrong rate, followed by wrong time, wrong dose, and then given to patient with a known allergy, after that medication omitted. Indeed, staff nurses are at risk of committing medication errors because they do not have enough time to follow the ten rights of MA. Accordingly, Wirtz et al. (2003)[53] stated that the most common type of administration error on all wards was the wrong rate error.

Leape and colleagues (2002)[54] reported more than 15 types of medication errors; wrong dose, wrong choice, wrong drug, known allergy, missed dose, wrong time, wrong frequency, wrong technique, drug-drug interaction, wrong route, extra-dose, failure to act on test, equipment failure, inadequate monitoring, preparation error, and other. Of the 130 errors for physicians, the majority were wrong dose, wrong choice of drug, and known allergy. Among the 126 nursing administration errors, the majority were associated with wrong dose, wrong technique, and wrong drug.

Results of this study reflected that nurses who work on emergency room are more likely to report MAEs than nurses who work on other units. This finding not surprising because the emergency room are overcrowded from the increased responsibility of providing emergency and non-urgent medical care. Additionally, nursing staff in emergency departments is inadequate to handle the overload of patients' visits. As a result, care is fragmented and methods designed to support patient safety are compromised. Hillin and EHicks (2010)[55] mentioned that the most frequently reported error in emergency department care was medication error.

Clearly, nurses must understand that the mistakes are signs of safety problem exist, not that a nurse is doing a bad job. The mistake should be viewed as an opportunity to learn why the error occurred and how to prevent similar errors that others may make in the future.

V.   CONCLUSION

In conclusion, the data of this study suggested the ranking of five reasons of why MAEs occur; medication package reasons, system reasons, documentation-transcription reasons, nurse - physician reasons and finally pharmacy reasons. Additionally, the ranking of reasons of why MAEs not reporting were fear reasons followed by administrative reasons, then disagreement over time-error definition reasons. The findings from this survey supported the notion that nurses perceive low percentages of MAEs reporting. The most common Non-IV MAEs was wrong time, while the most common IV MAEs was wrong rate. Finally, results of this study suggested that nurses who work on emergency room are more likely to report MAEs than nurses who work on other units.

Medication errors are common in clinical practice. Actually, reducing these errors requires the commitment of everyone with a stake in keeping patients safe. The physician who wrote the prescription, pharmacist who dispensed it and the nurse who received the medicine and administered to the patient, all play an important role in preventing MEs reaching to patient. These medication rights are designed to ensure patient safety and prevent harm.

VI.   RECOMMENDATIONS

1.   The current study suggested the need to improve the accuracy of MEs reporting by nurses through:
1.1. Designing safe work environment conducive for patient care delivery and reduce the occurrence of MAEs.
1.2. Top management should encourage their staff to perform incident report away from any sort of blame or punishment culture and perceived by nurses as designed to improve patient safety as opposed to discover mistakes.
1.3. Developing and disseminating the patient safety guidelines in all hospital setting.
2.   The researchers recommended for provision of ongoing education & training on practice of double checking medication to safe medication administration for all nurses, as well as utilization of medication information guide though developing self-report logbook..
3.   The findings from this study pointed to the need to further investigation on how the hospital administration is addressing the problem of MEs underreporting and the role of the unit nurse in quality management process.

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