Nurses' Perception of Medication Administration Errors

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Abstract   **Background:** medication administration error (MAE) is one main component for safety healthcare services. The purpose of this study is to investigative factors associated with nurses' medication administration errors. Design: A descriptive, correlational, cross-sectional design was used. **Methods:** 309 nurses at two regional hospitals we included and 288 hospital records of medication error analyzed. Medication administration error checklist and hospital records of medication errors were employed to measure the key variables. **Results:** rate of medication error among nurses was 1.4 times per month (SD = 1.3). The most common factors associated with errors were "Unit staffs do not receive enough in services on new medications" (69.6%, n = 215) and "Poor communication between nurses and physicians" (65.4%, n = 202), while the lowest reported factors was "Physicians change orders frequently" (23.3%, n = 72) and "Physicians' medication orders are not clear" (24.9, n =77). Items analysis also showed that miscommunication with physicians (M=4.51), work overload (staffing) (M= 4.42) had the highest means among all factors. The most reported type of error is the wrong timing of medication administration (30.9%, n = 89). **Conclusion:** communication, unclear medication orders, workload and medication pancakes were the main factors associate with Medication administration errors.

Keywords: medication administration errors, nurses

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1. Introduction

Patient's safety is a major public health concern and a requirement for quality of health care services [1]. Medication administration is considered as one main function for nurses, and that nurses competency and following guidelines of medication administration is a warranty for patients' safety and a quality of nursing care [2]. The World Health Organization [3] reported that patient's safety requires that health care professionals focus on reducing the risk of unnecessary harm. According to Millenson [4], one of the main factors that contribute to low safety at health care settings is the failure to acknowledge the prevalence and seriousness of medication errors. This infers that medication administration, which is one core nursing action, if not performed in accordance to standards of care may increase the unnecessary risks among patients. The great concerns of the serious indication of medication error provoked attention professional institutions. For example the European Medicines Agency introduced a definition for medication error that refers to any unintentional error in the prescribing, dispensing, or administration of a medicinal product while in control of the healthcare professional, patient or consumer [5].

Data compiled by the Joint Commission on Accreditation of Healthcare Organizations [3] indicated that 334 out of 378 (88.35%) cases that resulted in deaths or permanent loss of function were attributed to medication use. Mahmood and colleagues [6] reported that poor training of health professionals, overwork, stress of health professionals, and high patients-nurse- ratio are among the most reported factors related to medication error. Mahmood and colleagues [6] have also connected various physical environment-related factors to medication error such lack of privacy in the nurses' work area, insufficient space for documentation for charting, lack of space in the medication room, and faulty medication dispensation equipment. Moreover, there are also work-related factors that have been associated with medication error like interruptions by patients/ relatives/ visitors and telephone calls during the process of medication preparation and administration [7] and poor communication among health staff and patients [8]. The literature, in general, provide evidence that medication administration errors (MAES) is a threat to patient's safety stemming from a combination of systems, procedures, and environmental factors.

Although the literature addressed reasons and factors associate with MAES, there is a legitimate need to explore these factors from nurses' perspectives. Medication administration is one core job assignment for nurses at daily base. Therefore, nurses' perception for these reasons will enhance understanding of these factors. In Saudi Arabia, there is great formal and professional efforts to improve the quality of nursing care provided to patients at all health care levels. However, baseline data are needed in order to formulate strategies for improvements that include information related to safety measures and quality

patient care. One area that needs to be assessed for safe and quality practice is the medication administration. There is a dearth in Saudi studies that explore factors related to MAES. This study will increase our knowledge about this issue and further will contribute to form a baseline data for quality improvement indicators. Therefore, the *purpose* of this study was to investigative factors associated with nurses' medication administration error in Saudi Arabia. The research questions were:

- What is the rate of medication administration error among nurses level of management and care.
- What are the factors that associate with nurses' perception for medication administration error in Saudi Arabia?
- Is there a difference in nurses medication administration error related to their demographic and personal characteristics?

2. Methods

Design: This is a cross-sectional survey utilizing descriptive –correlational design. Data collected from nurses in two regional hospitals in Riyadh, Saudi Arabia. Data collected using self reported format of data collection and hospital records at hospital settings related to medication administration error.

Sample and Setting: convenience sample of 309 nurses represented the sample of this study, in addition, reviewing hospital records of medication administration error. 380 nurses approach and 309 of them agreed to participate with an agreement rate of 81.3%. Date collection took place at two regional hospitals in Riyadh, Saudi Arabia. The hospitals are considered a referral, tertiary, education and multi-specialty hospitals. Inclusion criteria for nurses include: 1) above the age of 18 years, and 2) being hired for at least 3 months that allow the nurse to recognize rules and regulation and policies at the hospital.

Hospital records: hospital records for medication administration error reviewed based for the purpose of investigating the types of medication error. Information reviewed limited to types of medication error and risk of medication on patients' health. A total of 288 records have been reviewed.

Data Collection Procedure: Prior to data collection, ethical approval was obtained from the IRB committee at King Saud University and the targeted hospitals. A package including one self-reported questionnaire and an author-developed demographic survey was distributed to department nurses. In addition, a form to review the hospital records of medication administration error. A liaison served as facilitator to access nurses and hospital records. The questionnaires were distributed in closed packages. Co-investigators were available during distribution and receipt of the packages. Each package included a cover letter that provided information on the purpose and significance of the study, the expectations for the nurses, and instructions on where to return the packages. The cover letter assured the participants of confidentiality. Nurses were informed that the information gained from the questionnaires would be used only for the purpose of this study. In addition, the cover letter included contact information for the principal investigator and co-

investigators to allow participants to obtain further information and ask study-related questions. The participants were asked to sign the cover letter, which explicitly stated that participation was voluntary, without any direct or indirect influence. An identification number was assigned for each participant at the beginning of the study, and the information received was kept confidential by the investigators. Hospital records were reviewed by a co investigator. All identifiable information related to patient's information was removed

2.1. Instrument

Medication Administration Error Survey was used to measure medication administration error [7]. For the purpose of this study, the reasons why medication errors occur in the unit" subscale was used. The scale has been modified with permission from the author. The scale if formed of 29 items scale that describe situations and processes that are undertaken during medication administration by nurses. The nurse made their responses on a Likert-type scale that ranges from strongly disagree (1) to strongly agree (6). The items underwent rigorous review, revisions, tests and retests, and was subjected to psychometric tests. The survey consists of five subscales (physician-communication, medication packaging, transcription-related, pharmacy processes, and nurse staffing) with an inter-item correlation coefficient ranging from. 82 to. 91. Pilot testing was conducted using nurses (n = 15) who are bilingual requesting their appraisals for the appropriateness of the translation. In addition, the research package included an author-developed profile that was used to obtain demographic and personal information such as gender, age, length of nursing experience, unit assigned, position, and percentage of actual errors.

Types of medication error retrieved from the hospital records of medication error. A particular form was used to collected information on: 1) type of medication error, and 2) health risk on patients' health. Risk on patients health measured on an ordinal level of measurement in which a risk classified into: no risk, minimal risk, mild risk, moderate risk, server risk.

2.2. Data Analysis

The Statistical Package for the Social Sciences (SPSS 18, Inc., and Chicago, IL) was used for statistical analysis. Nurses' reports were described using central tendency measures and dispersion measures (standard deviation and range). Pearson coefficient was used to examine relationships and differences in relation to demographic characteristics (age and years of experience). The t test and ANOVA were used to examine differences in relation to demographic and personal characteristics.

3. Results

3.1. Demographic Characteristics

Of the 309 nurses, the majority (n=214; 69.2%) were females. Nurses' age ranged from 20 to 40 years with mean age of 28.4 (SD = 1.8). About 76% (n = 235) of nurse had bachelor degree, while 16% (n = 49) had

diploma and 8% (n = 25) had master degree or higher. More than half (n= 164; 53.1%) reported experience had 11 years of experience in nursing or more. Nurses who work in specialized care units represented 55% (n=173) of the sample. Regarding self report of committing actual medication administration error, the analysis showed that 59.6% (n=184) of the nurses reported MAE up to 20% of the time.

In regards to frequency of medication admiration error, the analysis showed that nurse had a mean of 1.4 (SD = 1.3) times per month.

3.2. Factors Associated with MAES

Regarding factors associated with MAE, the analysis showed that (Table 1), the most reported factors associated with medication administration error is:" Unit staffs do not receive enough in services on new medications" (agreement rate 69.6%, n = 215) followed by "Poor communication between nurses and physicians" (65.4%, n = 202), while the lowest reported factors is "Physicians change orders frequently" (23.3%, n = 72) and "Physicians' medication orders are not clear" (24.9, n =77). In general, the analysis showed that nurses had moderate agreement across all types of factors that associate with medication administration error.

Table 1. Factors associated with medication administration error (N = 309)

	Items	Agree response	
		%	n
CME1	The names of many medications are similar	42.1	130
CME2	Different medications look alike.	33.7	104
CME3	The packaging of many medications is similar.	45.3	140
CME4	Physicians' medication orders are not legible.	28.8	89
CME5	Physicians' medication orders are not clear.	24.9	77
CME6	Physicians change orders frequently.	23.3	72
CME7	Abbreviations are used instead of writing the orders out completely.	39.2	121
CME8	Verbal orders are used instead of written orders.	35.9	111
CME9	Pharmacy delivers incorrect doses to this unit.	46.9	145
CME10	Pharmacy does not prepare the medication correctly.	56.6	175
CME11	Pharmacy does not label the medication correctly.	46.9	145
CME12	Pharmacists are not available 24 hours a day.	43.7	135
CME13	Frequent substitution of drugs.	41.4	128
CME14	Poor communication between nurses and physicians	65.4	202
CME15	Nurses on this unit have limited knowledge about medications	46.0	142
CME16	Nurses get pulled between teams and from other units.	73.8	228
CME17	When scheduled medications are delayed, nurses do not communicate the time when the next dose is due	59.9	185
CME18	Nurses on this unit do not adhere to the approved medication administration procedure.	38.2	118
CME19	Nurses are interrupted while administering medications to perform other duties.	39.2	121
CME20	Unit staffing levels are inadequate.	55.7	172
CME21	All medications for one team of patients cannot be passed within an accepted time frame.	53.7	166
CME22	Medication orders are not transcribed to the Kardex correctly.	60.5	187
CME23	Errors are made in the Medication Kardex.	63.1	195
CME24	Equipment malfunctions or is not set correctly.	60.2	186
CME25	Unit staffs do not receive enough in services on new medications	69.6	215
CME26	On this unit, there is no easy way to look up information on medications	47.9	148
CME27	Nurse is unaware of a known allergy.	54.4	168
CME28	Patients are off the ward for other care.	64.4	199
CME29	Many patients are on the same or similar medications	57.3	177

Using mean item analysis, analysis (see Table 2) nurses had moderate perception that factors related to communication with physicians caused MAE (M=4.51) with charge nurse having the higher level of perception (M = 4.84, SD = 1.34). Regarding factors related to medication packaging had lower level of perception as nurses' mean items response showed slight agreement on these factors (M=4.03) with head nurses having the higher perception (M = 4.10, SD = 1.10). Regarding factor related to administration processes and pharmacy processes, nurses showed that these factors had very minimal effect as nurses' mean items response was very low showing perception of slight disagreement of administration ones (M=2.01) and pharmacy processes related ones (M=2.3). Among the sample, the mean responses were almost equal although charge nurses had the higher perception (M = 2.0, SD =. 82).while regarding the pharmacy related factors, charge nurses had the higher perception (M = 3.7, SD = 1.34). However, regarding nurse staffing-related factors, nurses had higher perception

that these factors play a significant role in medication administration errors. Nurses mean items response showed moderate agreement (M= 4.42).Charge nurse were also had the higher perception (M = 4.75, SD =1.25).

The results indicate that, in general, nurses had agreement that communication with physicians and workload are the main factors that associate with medication administration errors, while other factors had minimal effects. Moreover, charge nurses seem to have the higher level of perception among all nurses with higher mean item response in most domains.

Table 2. Nurses perception for factors related to medication administration errors (N = 309)

Perceived MAE factor	Position	n	M	SD	*Mean Range Interpretation
Medication packaging related	Staff Nurse	280	3.88	1.30	Slightly agree
	Charge Nurse	19	3.84	1.61	Slightly agree
	Head Nurse	10	4.10	1.10	Slightly agree
	Collectively	309	3.89	1.32	Slightly agree
Physician communication related	Staff Nurse	280	4.33	1.19	Moderately agree
	Charge Nurse	19	4.84	1.34	Moderately agree
	Head Nurse	10	4.70	1.16	Moderately agree
	Collectively	309	4.38	1.20	Moderately agree
Pharmacy processes related	Staff Nurse	280	3.05	1.30	Slightly disagree
	Charge Nurse	19	3.37	1.34	Slightly disagree
	Head Nurse	10	3.70	1.34	Slightly agree
	Collectively	309	3.09	1.31	Slightly disagree
Nurse staffing related	Staff Nurse	280	3.75	1.16	Slightly disagree
	Charge Nurse	19	4.75	1.25	Slightly disagree
	Head Nurse	10	3.65	1.25	Slightly disagree
	Collectively	309	4.42	1.15	Slightly disagree
Med administration related	Staff Nurse	280	1.90	.95	Mod disagree
	Charge Nurse	19	2.00	.82	Mod disagree
	Head Nurse	10	1.70	1.06	Strongly disagree
	Collectively	309	1.90	.95	Mod disagree

*Mean interpretation model: 1.00 to 1.80 = Strongly disagree; 1.81 to 2.64 = Moderately disagree; 2.65 to 3.48 = Slightly disagree; 3.49 to 4.32 = Slightly agree; 4.33 to 5.16 = Moderately agree; and 5.17 to 6.00 = Strongly agree.

3.3. Types and Severity of Medication Error

Using hospital records, the analysis (see Table 3) showed that the most reported type of error is the wrong timing of medication administration (30.9%, n = 89) followed by "Not testing allergy before administration "(25.0%, n = 72), while the lowest was wrong route of medication (7.3%, n = 21). Regarding the severity of medication error, the analysis showed that 13% of the medication error reported as not having any risk, 41 with minimal risk (no clinical sign and symptoms, 27% with mild (reported side effects of drugs), 17% moderate (skin rashes and apparent side effects of drugs), while less than 2% classified as severe and that required immediate intervention related to allergy or adverse effect of the drug. Data was not sufficient to explore personal characteristics nurses who committed the incidence report neither a full description of the complications due to medication error.

Table 3. Types of medication administration error (N = 288)

Type of Medication Errors	%	n
Wrong patient	14.6	42
Improper dose	13.2	38
Medication without physician order	9.0	26
Wrong route of administration	7.3	21
Wrong time of medication	30.9	89
Not testing allergy before administration	25.0	72

3.4. Differences in Perception of MAE Related to Nurses Demographics

In relation to differences in perception of MAE related to nurses demographics, the analysis showed that there was a significant difference between male and female nurses in their frequency of medication administration error with mean of frequency of medication error among males was 1.2 per month (SD =. 70), while for female nurses mean was 1.5 (SD = 1.1). Moreover, analysis showed that there is a positive and significant correlation between frequency of MAE and years of experience (r =. 41, p <.001) and age (r =. 26, p =. 035). Regarding differences related to education level and type of unit (acute, subacute and general words), the analysis showed that there is no significant difference in frequency of MAE and these variables.

4. Discussion

This study came to address one significant issue related to quality of health care services, and in particular, examines one core component in patients safety in health care setting; medication error. The study emphasizes the nurses' perception for factors contribute to medication administration errors. The study found that nurses perceived that factor related to communication with physicians and staffing issues are the main proposed reasons for medication administration errors at the Saudi hospital setting. Findings of this study agree with previous international ones [9,10] who found that nurses communication and communication in health care settings among staff is significant factors that contribute to medication errors. For example, Kim and colleagues [7] reported that verbal orders of physicians have been reported as one significant reason for medication administration among nurses. However, Taxis and Barber [11] found that most common cause for medication errors among nurse is the deliberate violation for guidelines rather than written documents, and that nurses' lack of perceived risk and poor role model were other factors. Franklin [5] has emphasized documentation process and appropriate communication among nurses as prequisite competency standard for administering medications.

Although medication packaging factors has been slightly perceived as reason for MAE, however; the results

do not agree with report from international studies who found that medication packaging is one significant factor [9]. This issue has also been addressed by Taxis and Barber [12] who found that causes of medication error mostly occurred when medication preparation or administration involve uncommon procedures and lack of knowledge among nurses. This infers that nurses' information and knowledge about the medication, and the ability to comprehend and follow the guidelines for medication administration considered a cornerstone for medication administration safety. This requires that manufacturers implement measures to safeguard the consumption of misread medications due to similarity in names, packaging, and appearance. On the other hand, as related to nurses staffing, the findings from this study correspond with previous ones that high ratio of patients /nurse was perceived by nurses as the reason for medication errors [6]. In regards to pharmacy processes that have not been perceived by nurses in this study as one significant reason for medication error, the results support previous ones [2] that pharmacy factors are not considered among those factors that may contribute to medication error at health care settings. One limitation for this study is that the study targeted nurses only, while targeting all health professionals at the hospital setting might be more informative and add to our understanding.

5. Conclusion

In conclusion, this study found that communication, unclear medication orders, workload and medication pancakes were the main factors associate with MAE. Nurses' experiences and age also found to be inversely related to prevalence of MEA. Nurses also reported that they do not receive enough in-service education related to medication administration and new medication in the field. The study also emphasized the role of workload and following medication guideline to prevent errors and improve patients' safety healthcare services. It is undisputable that medication administration errors occur. Solutions and strategies cannot be drawn out without recognizing and considering the underlying reasons behind the problem of MAES. This issue will continue to persist and the safety of patients will continue to be jeopardized unless effective interventions carried out. The findings in this study provide evidence that communication with physicians, staffing and not receiving appropriate education about new medication are significant factors that contribute to medication administration errors at Saudi health care settings. While, factors related to administration and medication package had minor roles in medication errors. This infers that nurses' information and knowledge about the medication, and the ability to comprehend and follow the guidelines for medication administration considered a cornerstone for

medication administration safety. Quality of care and policy maker officers needs to adopt effective interventions and develop programs to enhance medication administration accuracy and overcome factors that contribute to medication errors. Such efforts should target communication pattern among the hospital staff (nurses, physicians and pharmacy personnel), and enhancing nurses' knowledge and competency in medication administration. A follow-up studies that include in-depth interviews across the organization should be conducted to find out other underlying reasons why MAES continue to occur.

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