

# Medication Errors and Strategies to Prevention of them from Nurses, Pharmacists and Nursing Student Viewpoint

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**Abstract:** Introduction and objective: Medication errors as a serious problem in the world and one of the most common medical errors that can endanger patient safety and even cause the death of them . The aim of this study was to examine the causes of medication errors and strategies to avoid them from the point of view of nurses and nursing students.

**Materials & Methods:** This cross-sectional descriptive study was carried out in 327 Pharmacy staff of KFMC and 62 nursing interns at School of Nursing ,KSA, enrolled to the availability sampling in 2015. The Data was collected from the valid and Questionnaire reliable. To analyze the data, descriptive statistics, t-test and ANOVA using SPSS16 software. were applied

**Results:** The results showed that the most common causes of medication errors in nursing care are fatigue due to heavy workload were (97.8%), and in students of nursing were Medicines calculation, (77.4%) The more important way for prevention, according to nurses and nursing students, was to relieve the work pressure by a proportional increase to reduce staff to the number and status of Patients and also Creating a unit as Medicine bill.

**Conclusion:** Based on the results, the nursing managers are recommended to solve the staffing problem, offer workshops and on-the-job training about preparation medication, secondary effects of drugs and knowledge pharmacological. Use Electronics Medications Cards es a measurement das Reduced drug errors.

**Keywords:** drugs mistakes, nurse, nursing students, prevention, strategies, point of view.

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## I. INTRODUCTION

Some health problems in today's world, such as obesity, cardiovascular disease, cancer, addiction and diabetes, are associated with lifestyle changes and in turn lead to drug use (Arbabisarjou, Robabi, 2015 ). Medication errors are the most common medical errors that can occur as inappropriate use of the drug at any stage of drug prescription to patients (Fontan

& Maneglier, 2003; Hansen & Greene, 2006; Wolf & Hicks, 2006). Medical errors include prescribing the wrong drug at every avoidable stage of the treatment process (Woods & Doan-Johnson, 2002). Medication administration is one of the most important, complex, yet vital processes of care and requires the right knowledge and action by caregivers. The implementation of medication prescriptions is an important part of the patient treatment and care process and is seen as an integral part of the caregiver's role, with patient safety being a particular concern (Soozani & Bagheri, 2007). . Studies have shown that of nearly 44,000 to 98,000 deaths from medical errors, 7,000 were due to medication errors. A 2005 study by Hughes and Ortiz showed that 30% of patients affected by medical malpractice die or remain disabled for more than six months (Hughes & Ortiz, 2005). In fact, nurses and nursing students in hospitals are the people directly involved in administering medication to patients and are known to be the people most likely to make medication errors (Clifton-Koeppel, 2008). Nurses spend an average of 40 percent of their time in the hospital administering medication to their patients (Demehin & Babalola, 2008). Therefore, nurses and nursing students need to have the necessary information about medications to avoid potential hazards (Koohestani & Baghcheghi, 2008).

Common medication errors when prescribing drugs include: error in drug concentration, ignoring the correct time to administer the drug, overdosing on the drug, and ignoring the correct way of administering the drug (Woods & Doan - Johnson, 2002). Research has shown that while the rate of medication errors among nurses and nursing students is high, their reporting of medication errors is low (Blegen & Vaughn, 2004; Benner & Sheets, 2002). ; Kawamura, 2001). The reported rate of medication errors among nursing students was 48.5%, and the most common type of medication error was forgetting to prescribe medication (McCarthy & Kelly, 2000). Things such as missing drug information, incorrect drug calculations, disregard for defined protocols, similarity in drug forms and choices, similarity in drug names, and physicians' poor handwriting can cause drugs (Carlton & Blegen, 2006). Medication errors are multidimensional problems and to solve them we need to find multilateral solutions. We can reduce medication errors through risk management, which is a daily and continuous diagnostic and intervention program. Therefore, this study aimed to examine the causes of medication errors and their prevention strategies from the perspective of nurses and nursing students.

## II. MATERIALS AND METHODS

This study was a descriptive study that was conducted cross-sectional to investigate the causes of medication errors and their prevention strategies from the perspective of Pharmacists and nursing students in 2015. Study population included all the nurses working in different wards of three specialty and subspecialty hospitals in Riyadh also the Pharmacists of inpatient and the nursing students at the nursing school of University of Medical Sciences. The sample volume consisted of 327 nurses working in different wards of hospitals, inpatient pharmacists and 62 nursing students. Sampling was convenience and available (simple non-random). Inclusion criteria in this study for nurses was having at least one year of work experience in the current ward and having at least a bachelor's degree in nursing and for students, senior nursing students were required to pass the course of pharmacology. Data collection tool was a questionnaire designed by the researcher, consisting of three parts. The questionnaire was used after confirming the validity and reliability. Face and content validity of the questionnaire was determined by ten educators, nurse educators and Statistics advisor. After collecting the opinions of these individuals' small changes were given to the questionnaire. To verify reliability of questionnaire test-retest method was used, that the correlation coefficients between the two turns answering the questions in nursing and undergraduate students were 89.0 and 91.0 respectively and validity of the questionnaire was approved. The first part of the questionnaire was related to demographic information such as age, sex, working ward, working shift, work experience, type of employment and having a training course in the field of giving drug. The second part contained 22 items about the causes of medication errors in nurses and student's viewpoint that they responded to them by YES and NO. The third part was about the ways of preventing medication errors in nurses and student's viewpoint. Exclusion criteria in this study were lack of cooperation in filling out the questionnaires by the surveyed sections or uncompleted questionnaires. To respect the ethical considerations in research, first and above all the aim of the study and how to complete the questionnaire was described for surveyed groups and they were assured that the information will remain confidential, and it's not required to write the name. Inclusion to the study was voluntary based and it was up to oral satisfaction of sections.

Then with the permission of hospital and university administrators the questionnaires were distributed 16 times in different shifts (morning, afternoon, evening) between the sections and then after completing by them the questionnaires were collected. At the end for describing the data, descriptive statistics (frequency, mean and standard deviation) and analytical

statistics (t-test and ANOVA) were used. All analysis was performed using SPSS for Windows (Version 16.0 SPSS inc., Evenston, Illinois). This study conducted after the adoption of the proposal in research Council and approving by the Ethics Committee of the Zahedan University of Medical Sciences. A significance level of 0.05 was adopted.

### III. FINDINGS

Based on the results, response rate was 88.66% for nurses and 100%. For students. All the nurses had bachelor's degrees. Other demographic data of nurses and students have been presented in Table 1.

**Table 1. Mean distribution, standard deviation and frequency of demographic information for surveyed nurses and students**

Variable		Nurses M±SD	Nursing students M±SD
Age		32±5/4	21/53±0/93
		Frequency	
Sex	man	129	24
	woman	198	38
Ward	internal	118	13
	surgery	54	6
	emergency	56	7
	gynecology	37	-
	ICU	32	-
	pediatrics	30	10
	ALI-EBNE-ABITALEB	154	40
Hospital	KHATAM-AL-ANBIA	137	22
	AL-ZAHRA	36	-
	Fixed	71	-
Shift	Rotatory	256	-
	Official	103	-
	Contractual	87	-
Employment	Agreement	52	-
	Projective	85	-
	Have	152	-
having a training course in the field of giving drug	Don't have	175	-
		M±SD	
Job experience		9/63±1/78	-

According to nurse's viewpoint, heavy workload, the large number of critically ill patients, doctor's damaged and unreadable orders, the low ratio of nurses to patients and environmental conditions lead to distraction had the highest impact on medication errors in nursing. Other factors affecting the occurrence of medication errors are given in Table 2.

**Table 2. Nurses views point on the influencing factors of medication errors in 2015**

Cause (view point)	YES (%) number	NO (%) number
Fatigue due to high workload	320(97.8)	7(2.1)
the large number of critically ill patients	294(89.9)	33(10)
doctor's damaged and unreadable orders	290(88.6)	37(11.31)
the low ratio of nurses to patients	242(74)	85(25.9)
environmental conditions lead to distraction (Noise, heavy traffic)	228(69.7)	99(30.2)

Cause (view point)	YES (%) number	NO (%) number
Large variety of drugs in Ward	215(65.7)	112(34.2)
Poor physical environment (light, temperature)	191(58.4)	136(41.5)
Accompanying of patient	183(55.9)	144(44)
Officials failure in emphasizing the importance of recording and reporting the medication errors	178(54.4)	149(45.5)
Poor communication between care team members	171(52.2)	156(47.7)
Blaming the staff by the administrator for reporting medication errors	166(50.7)	161(49.2)
Inappropriate relationship between manager and the staff	142(43.4)	185(56.5)
Improper location of medicinal shelves	129(39.4)	198 (60.5)
Blaming the staff by doctors for medication errors reported	120(36.6)	207(63.3)
Lack of the source of pharmacological information in the ward	111(33.9)	216(66)
Getting incompetence label due to medication errors reported	98(29.9)	229(70)
Blaming by colleagues for reporting medication errors	93(28.4)	234(71.5)
Inadequate drug label or packaging	87(26.6)	240(73.3)
The absence of recording and reporting system for errors	73(22.3)	254(77.6)
the lack of monitoring of the care process	54(16.5)	273(83.4)
Lack of awareness and Collective agreement of definition of medication errors	47(14.3)	280(85.6)
Working in an educational hospital	0	327(100)

According to independent t-test there wasn't any significant relationship between gender and medication errors ( $p=0.08$ ). Also, according to analysis of variance, there was a significant relationship between the working shift ( $p=0.012$ ), type of employment ( $p=0.003$ ) and type of ward ( $p=0.019$ ) with the mean of medication errors occurred in nurses. So that the highest rate of medication errors in nurses with rotatory shift was reported in projective nurses and internal ward nurses. From the students view point, wrong drug calculation, lack of pharmacological information and doctor's damaged and unreadable orders on medicine cards were reported as factors that have the greatest impact on medication errors. Other factors affecting the occurrence of medication errors from the student's viewpoint are given in Table 3.

**Table 3. Nursing students' viewpoints about influencing factors of medication errors in 2015**

Cause (view point)	YES (%) number	number
Wrong medication calculation	28(77/4)	14(22/6)
Lack of pharmacological information	47(75/8)	15(24/2)
doctor's damaged and unreadable orders on medicine cards	45(72/6)	17(27/4)
environmental conditions lead to distraction (Noise, heavy traffic)	41(66/1)	21(33/9)
Stress in emergency situations	39(62/9)	23(37/1)
Lack of attention to the dose of a drug on the medicine card	38(61/3)	24(38/7)
To do oral statements without checking the medicine card	35(56/5)	27(43/5)
Similarity in the name of drugs and reading the wrong name from the medicine Card	34(54/8)	28(45/8)
Similarity in the drugs shape and lack of attention to the label of drugs	33(53/2)	29(46/8)
Different routine of wards in the concentration of infusion drugs	32(51/6)	30(48/4)
Failure to follow the process of infusion after injection	31(50)	31(50)
The use of acronyms instead of full name of drugs	31(50)	31(50)
Entering wrong drug in the medicine card	30(48/4)	32(51/6)
Similarity in the category of drugs	26(41/9)	36(58/1)
high workload	25(40/3)	37(59/7)

Cause (view point)	YES (%) number	NO (%) number
Not paying attention to the PRN order	23(37/1)	39(62/9)
Poor physical environment (light, temperature)	22(35/5)	40(64/5)
Poor clinical skills	21(33/9)	41(66/1)
Lack of familiarity with the drug injection equipment's	20(32/3)	42(67/7)
Prescription of drugs without medical supervision	19(30/6)	43(69/4)
Not following-up the treatment methods	18(29)	44(71)
Working in an educational hospital	15(24/2)	47(75/8)

According to independent t-test there was a significant relationship between gender and medication errors among students ( $p=0.63$ ). Also the ANOVA test showed a significant relationship between the ward and occurrence of medication errors among students ( $p=0.03$ ). So that most errors were related to the internal ward. From nurse's view point the most important way for prevention and controlling medication errors is to reduce working pressure and increase the number of staff proportional to the number of patients and in view point of nursing students it was to create a section as medication calculation to practice and improve the skills needed for calculating right dosage of the drugs. Other ways to prevent medication errors in separate surveyed groups are reported in Table 4.

**Table 4. Methods of prevention of medication errors by nurses and nursing students in Zahedan University of Medical Sciences in 2015**

<b>Nurse's &amp; Pharmacist's viewpoint</b>	
reduce working pressure by increasing the number of staff proportional to the number and condition of patients	98/16%
Education and improve nurses' knowledge about drugs and proper medicine prescribing and medication with principles and techniques	91/13%
Availability of the necessary information about drugs, side effects and interactions in the wards	84/70%
Using infusion pumps in wards in order to avoid rapid infusion of dangerous drugs	78/59%
Improve the working environment such as lighting, temperature, humidity, noise, controlling the number of patients, the movement of the patient accompanying	70/94%
Inform and educate nurses about new drugs	64/52%
Choosing nurses for different wards according to their interests	61/46%
Paying attention to medication error reports as an opportunity to learn in order to prevent their recurrence	57/18%
<b>Nursing student's viewpoint</b>	
create a section as medication calculation to practice and improve the skills needed for calculating right dosage of the drugs	96/77%
Availability of pharmacological books and access to sites related to pharmacological information in the wards and holding periodical pharmacological congresses	93/54%
Awareness on the correct principles of giving drug, such as identifying the correct patient, correct drug, correct dosage, correct time and routine of the ward	80/64%
The use of electronic medical cards for the correct reading of medication orders by students	66/12%
Positive reaction of nurse educators toward reporting medication errors for better management of errors	56/45%

#### IV. DISCUSSION

The results of this study have shown that the foremost vital factors which will be effective on the medication errors in nurses are: fatigue because of high work, the massive variety of critically ill patients, doctor' broken and unclear orders and also the low nurse: patient ratio. In Hosseinzade' et al. (2012) showed the most important causes of medication errors in nurses were the employees' deficiency, fatigue due to high workload and high workload within the wards (Hosseinzadeh & Aghajari, 2012). in an exceedingly study conducted by Blendon et al., low number of staff was mentioned as the leading reason behind medical errors (Blendon & DesRoche, 2002). additionally, Tang' study showed that, the low variety of

employees reduced the standard of labor and raised the medication errors (Tang & Sheu, 2007). during this study fatigue because of high work was according because the prime mover of medication errors. however, in NikPeyma' study, physical or mental fatigue was reported as the third cause of medication errors (Nikpeyma & Gholamnejad, 2009). However, in keeping with studies, fatigue due to high workload is one in every of the most causes of medication errors. Study results had shown that some medication errors such as quick injection of medication that has got to be injected slowly and not listening to the drugs that require far more attention than others are more common among nurses (Yaghoobi et al., 2015). As within the study of Howe et al. (2005) a couple of variety of commonest medication errors showed that, fatigue because of high work is that the most significant reason behind medication errors (Haw & Dickens, 2005). Exhaustion emerges because the sense of pressure specifically chronic from high load operating (Arbabisarjou et al., 2015). Findings of a study according to fatigue as the third cause of medication errors. They believed that long operating hours and high work and increase in surroundingsal stimulations admire noise and inappropriate lightening in working environment will result in medication errors. They believe that multiple and complicated roles and functions that are at the same time expected from nurses can increase the incidence of medication errors in them (Pape & Guerra, 2005). In another study, the foremost vital reason behind medical errors was involving nurses' high workload and their unusualness with the patient' condition had less impact among the effective factors of medication errors (Al-Shara, 2011). in keeping with the study results it became clear that many factors are concerned in medication errors, and additionally human errors are inevitable (Wolf & Hicks, 2006). however correct designing and a observance and caring system will cut back the errors and stop the damaging results of errors in time of occurrence. Medication errors result in distrust of the patient and his family toward the aid system and also lead to increasing the prices that this downside relates to completely different causes admire lack of awareness and data and not listening to the drug prescription standards (American Society of Hospital Pharmacists 1993). Study results explicit that false medicative calculations, lean pharmacological knowledge and incomprehensibility of patients' records are the foremost common medication errors among students. (Gorgich et al., 2014) concerning the nurses' read purpose on a way to prevent medication errors the results showed that reducing the work pressure by increasing the quantity of employees proportional to the number and standing of patients, is that the most significant strategy to avoid this error. whereas in another study during this field increasing the number of staff proportional to the number of patients, staff coaching and data about new medication were the most important ways that to stop medication errors (Ghasemi & Valizadeh, 2009). The study showed that the most causes of medication errors in nursing students were: wrong medication calculations, lack of pharmacologic information, unclear orders in medicine cards, environmental conditions result in distraction and having stress within the emergency situation, that they were according as 5 causes that have most impact on medication error prevalence in nursing students. In Esmaeil nejad' study getting into wrong drug in the medicine card and not listening to the dose of the drug therein were reported as causes of medication errors. but the very best rate of medication errors occurred in the emergency ward (Nejad & Hojjati, 2010). within the study of Wolf and colleagues the foremost common causes of medication errors in students were poor clinical performance, not following-up the treatment strategies and lack of pharmacologic info in students (Wolf & Hicks, 2006). in an exceedingly study conducted by Kouhestani because the amount, sort and causes of medication errors in nursing students, lack of pharmacological information, not listening to the quantity of drug in the medicine card and wrong medication calculation were according as commonest causes of medication errors prevalence (Koohestani & Baghcheghi, 2008), that's fully compatible with the results of this study concerning the causes of medication errors in students. They terminated that a lot of familiarity with drug info at college and clinical post will be effective in reducing medication errors occurrence. Health care suppliers ought to determine the causes of errors to search out their solutions and cut back the quantity of them and find higher results for rising the situation. Effective pharmacologic management could be a nursing task that links the scientific ability, technical skills and practices supported compliance (Soozani & Bagheri, 2007).

## V. CONCLUSION

Concluding on the causes of medication errors and their importance, which are a measure of the quality of health care and must play an important role in the incidence of medication due to the increasing number of critically ill patients on wards, coping with the labor shortage proportional to the number of patients. In addition, familiarizing and educating caregivers on the impressive processes for reducing medication errors and creating electronic medication charts for patients can lead to a reduction in medication errors. In order to control and reduce the risk factors for medication errors, the following is recommended: a systematic approach to

identify the effective causes of medication errors and to try to solve them, a quantitative and qualitative increase in student nurses' knowledge of medication errors, leading to As a result, improved student function and reduced medication errors,

holding regular pharmacology refresher courses, providing medical knowledge according to student needs, easy access to the Internet for health students to update their pharmacology information, and continuous assessment of students on their pharmacology knowledge in the course of clinical practice.

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### Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

### REFERENCES

- [1] Al-Shara, M. (2011). Factors contributing to medication errors in Jordan: A nursing perspective. *IJNMR*, 16(2) 158-161.
- [2] American Society of Hospital Pharmacists. (1993). ASHP guidelines on preventing medication errors in hospitals. *Am J Hosp Pharm*, 50, 305-314.
- [3] Arbabisarjou, A., Robabi, H., & Zareban, I. (2015). An analysis of Life style of Married women admitted to Zahedan Health care centers. *Der Pharmacia Lettre*, 7(11), 308-312.
- [4] Arbabisarjou, A. (2012). *Practical Leadership and Management in Nursing*. Tehran: Nashre-Jameenegar. 9786001011283.
- [5] Arbabisarjou, A., Hashemi, S. M., Sharif, M. R. et al. (2016). The relationship between Sleep quality and Social intimacy, and Academic burn-out in students of Medical Sciences. *Global Journal of Health Science*, 8(5). <http://dx.doi.org/10.5539/gjhs.v8n5p231>
- [6] Balas, M. G., Scott, L. D., & Rogers, A. E. (2004). The prevalence and nature of errors and near errors reported by hospital staff nurses. *Appl Nurs Res*, 17(4), 224-230. <http://dx.doi.org/10.1016/j.apnr.2004.09.002>
- [7] Benner, P., Sheets, V., Uris, P., Mallah, K., Schwed, K., & Jamison, D. (2002). Individual, practice, and system causes of errors in nursing: A taxonomy. *J Nurs Adm*, 32(10), 509-523. <http://dx.doi.org/10.1097/00005110-200210000-00006>
- [8] Blegen, M. A., Vaughn, T., Pepper, G., Vojir, C., Stratton, K., & Boyd, M. (2004). Patient and staff safety: Voluntary reporting. *Am J Med Qual*, 19(2), 67-74. <http://dx.doi.org/10.1177/106286060401900204>
- [9] Blendon, R. J. et al. (2002). Views of practicing physicians and the public on medical errors. *N Engl J Med*, 347(24), 1933-1940. <http://dx.doi.org/10.1056/NEJMs022151>
- [10] Carlton, G., & Blegen, M. A. (2006). Medication-related errors: A literature review of incidence and antecedents. *Nursing Research*, 24, 19-38.
- [11] Clifton-koepfel, R. (2008). What Nurses Can Do Right Now to Reduce Medication Error in the Neonatal Intensive Care Unit. *Newborn and Infant Nursing Reviews*, 8(9), 72-82. <http://dx.doi.org/10.1053/j.nainr.2008.03.008>
- [12] Demehin, A. I., Babalola, O. O., & Erhunu, W. O. (2008). Pharmacists and Nurses Perception of Medication Error in Nigerian University Teaching Hospital. *International Journal of Health Research*, 1(2), 51-67.
- [13] Fontan, J. E., Maneglier, V., Nguyen, V. X., Lairat, C., & Brion, F. (2003). Medication errors in hospitals: computerized unit dose drug dispensing system versus warj stock distribution system. *Pharm warj sci*, 25(3), 112-117.
- [14] Ghasemi, F., Valizadeh, F., & Nasab, M. M. (2009). Analyzing the knowledge and attitude of nurses regarding medication error and its prophylactic ways in educational and therapeutic hospitals of Khorramabad. *Yafteh*, 10(2), 55-63.
- [15] Gorgich, C. E. et al. (2014). The types and causes of medication errors in nursing students. *Science Road Journal*, 8(2), 48-54.
- [16] Grissinger, M. C., & Kelly, K. (2005). Reducing the risk of medication errors in women. *J Women Health*, 14(1), 61-66.
- [17] Grissinger, M. C., & Kelly, K. (2005). Reducing the risk of medication errors in women. *J Women Health*, 14(1), 61-66.

67. <http://dx.doi.org/10.1089/jwh.2005.14.61>

- [18] Hansen, R. A., Greene, S. B., Williams, C. E., Blalock, S. J., Crook, K. D., & Akers, R. (2006). Types of medication errors in North Carolina nursing homes: A target for quality improvement. *Am J Geriaty*
- [19] *Pharmacother*, 4(1), 52-6. <http://dx.doi.org/10.1016/j.amjopharm.2006.03.007>
- [20] Haw, C. M., Dickens, G., & Stubbs, J. (2005). A review of medication administration errors reported in a large psychiatric hospital in the United Kingdom. *Psychiatr Serv*, 56(12), 1610-1613. <http://dx.doi.org/10.1176/appi.ps.56.12.1610>
- [21] Hosseinzadeh, M., Aghajari, E. P., & Mahdavi, N. (2012). Reasons of Nurses' Medication Errors and Persepectives of Nurses on Barriers of Error Reporting. *Hayat*, 18(2), 66-75.
- [22] Hughes, R. G., & Ortiz, E. (2005). Medication Error why they happen and how they can be prevented. *AM J Nurs*, 105(3), 14-24. <http://dx.doi.org/10.1097/00000446-200503001-00005>
- [23] Kawamura, H. (2001). The approaches to factors which cause medication error-from the analyses of many near-miss cases related to intravenous medication which nurses experienced. *Gan to Kagaku Ryoho*, 28(3), 304-309.
- [24] Koohestani, H. R., & Baghcheghi, N. (2008). Investigation medication errors of nursing students in Cardiac Care Unite. *Journal of Legal Medicine of Islamic Republic of Iran*, 13(4), 249-255.
- [25] McCarthy, A. M., Kelly, M. V., & Reed, D. J. (2000). Medication administration practices of school nurses. *J sch Health*, 70(9), 371-376. <http://dx.doi.org/10.1111/j.1746-1561.2000.tb07277.x>
- [26] Mohammad, N. I., Hojjati, H., Sharifniya, S., & Ehsani, S. (2010). Evaluation of medication error in nursing students in four educational hospitals in Tehran. *IJME*, 3, 60-69.
- [27] Mrayyan, M. T., Shishani, K., & Al-faouri, I. (2007). Rate, causes and reporting of medication errors in Jordan: Nurses perspectives. *J Nurs Manag*, 15(6), 659-670. <http://dx.doi.org/10.1111/j.1365-2834.2007.00724.x>
- [28] Nikpeyma, N., & Gholamnejad, H. (2009). Reasons for medication errors in nurses' views. *Faculty of Nursing and Midwifery Quarterly Shahid Beheshti University of Medical Sciences and Health Services*, 19(64), 18-24.
- [29] Pape, T. M. et al. (2005). Innovative approaches to reducing nurses' distractions during medication administration. *J Contin Educ Nurs*, 36(3), 108-116.
- [30] Rahimi, S., & Seyyed-rasouli, A. (2004). Nurses drug precautions awareness. *Iran J Nurs*, 16(36), 53-56.
- [31] Soozani, A., Bagheri, H., & Porheydari, M. (2007). Factors contributing to medication errors of View Nursing staff shahrod in Parts Imam Hossain anymore. *Danesh and Tandorosti Jurnal Shahrood University of Medical Sciences*, 2(3).
- [32] Stratton, K. M., Blegen, M. A., Pepper, G., & Vaughn, T. (2004). Reporting of medication Errors by Pediatric Nurses. *J Peditric Nurs*, 19(6), 385-392. <http://dx.doi.org/10.1016/j.pedn.2004.11.007>
- [33] Tang, F. I., Sheu, S. J., Yu, S., Wei, I. L., & Chen, C. H. (2007). Nurses relate the contributing factors involved in medication errors. *J Clin Nurs*, 16(3), 447-457. <http://dx.doi.org/10.1111/j.1365-2702.2005.01540.x>
- [34] Webster, C. S., & Anderson, D. J. (2002). A practical guide to the implementation of an effective incident reporting scheme to Reduce medication error on the hospital ward. *Int J Nurs pract*, (4), 176-183. <http://dx.doi.org/10.1046/j.1440-172X.2002.00368.x>
- [35] Wolf, Z. R., Hicks, R., & Serembus, J. F. (2006). Characteristics of medication error made by student during the administration phase. *J Prof Nurs*, 22(1), 39-57. <http://dx.doi.org/10.1016/j.profnurs.2005.12.008>
- [36] Woods, A., & Doan-Johnson, S. (2002). Executive summary: Toward taxonomy of nursing practice errors. *Nurs Manage*, 33(10), 45-48. <http://dx.doi.org/10.1097/00006247-200210000-00020>
- [37] Yaghoobi, M., Navidian, A., Charkhat-gorgich, E., & Salehiniya, H. (2015). Nurses' Perspectives of the Types and Causes of Medication Errors. *IJN*, 28(93&94), 1-10.