Assessment of Medication Errors among Nurses in the Intensive Care Unit

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Abstract: **this study aimed to assess Medication Errors among Nurses in the Intensive Care Unit. Setting this study was conducted at Kafrelsheikh University Hospital, 3critical care units Medical ICU, surgical ICU & Cardiac care unit CCU. Sampling; a convenient sample of 59 nurses working in the mentioned setting. Tools two tools were used for data collection. First tool; a self-administered questionnaire sheet consisted of two parts. Part I concerned with nurses' demographic data. Part II concerned with nurses' knowledge assessment. Second tool; was nurses' practice observational checklist. Results most of the studied nurses had errors in their knowledge and practice of medication safety, regarding all components medication Conclusion; most of the studied nurses had unsatisfactory of both levels knowledge and practice regarding all components medication. Recommendations: the study recommended that; Arranging continuous education programs for nurses, about medication safety and prevention of medication errors**

Keywords: **medication safety, medication errors, nurses & intensive care unit.**

1. INTRODUCTION

Medication errors are a significant worldwide concern and cause serious medical consequences for patients *(World Health Organization [WHO], 2017).* Despite the increased awareness about patient safety and quality of care, medication errors and adverse patient outcomes occur frequently in clinical practice. Researchers are estimating the medication errors' rate in dose by 19.6% in the United States, a country with the most sophisticated healthcare delivery system in the world *(Zayed, Conroy & Imti Choonara, 2013 & Public Health Walden University, 2017).*

Medication errors cause at least one death every day and injury to approximately 1.3 million people annually in the United States of America alone. While low- and middle-income countries are estimated to have similar rates of medication-related adverse events to high-income countries, the impact is about twice as much in terms of the number of years of healthy life lost. Many countries lack good data, which should be gathered as part of the initiative. Globally, the cost associated with medication errors has been estimated at US$ 42 billion annually or almost 1% of total global health expenditure. Errors may also be classified according to their level of severity *(WHO, 2017).*

Unsafe medication practice and medication errors are a leading cause of injury and avoidable harm in health care systems across the world. Globally, the cost associated with medication errors has been estimated at $42 billion USD annually. Errors can occur at different stages of the medication use process.

Medication errors occur when weak medication systems and/or human factors such as fatigue, poor environmental conditions or staff shortages affect prescribing, transcribing, dispensing, administration and monitoring practices, which can then result in severe harm, disability and even death. Multiple interventions to address the frequency and impact of medication errors have already been developed, yet their implementation is varied. A wide mobilization of stakeholders

supporting sustained actions is required. In response to this, WHO has identified Medication without Harm as the theme for the third Global Patient Safety Challenge *(Garfield, Chan, Vujanovic, Aftab, Coleman, Puaar, Sen Green, Franklin, 2020).*

Critical care nurses work with a multitude of potent and lifesaving medications that paradoxically can pose a considerable risk for injury and harm when some errors that are common in critical care units occur. Besides the pharmacokinetics being responsible for injury and harm, other sources of harm resulting from medication errors include the level of nurse experience, shift worked or time of day, lack of computerized orders, and distractions and interruptions *(Adam & Howard, 2017).*

Significance of the study

Some medications may have narrow margin of safety between therapeutic and harmful doses, which may produce serious side effects, and require close monitoring to determine their effectiveness in individual patients *(Juan, Jean-Yves & Phillipe, 2015).*

Regarding Egyptian statistics; it was found that, prescribing errors were the most common type of Medication Errors (MEs) (54%) followed by monitoring (25%) and administration errors (16%). The most frequent error was incorrect dose (20%) followed by drug interactions, incorrect drug, and incorrect frequency. Most reports were potential (25%), prevented (11%), or harmless (51%) errors; only 13% of reported errors lead to patient harm *(El-Shazly, Al-Azzouny, Soliman, Abed & Attia, 2017).*

AIM OF THE STUDY

This study aimed to medication errors among nurses in the Intensive care unit.

Through the following:

1. Assessing the nurses' level of knowledge regarding medication safety and errors

2. Assessing the nurses' level of practice regarding medication safety

3. Assessing types and frequency of medication errors in the ICU

Research hypothesis:

What is the level of knowledge and practices regarding medication errors among nurses in Intensive Care Unit.?

2.   SUBJECTS & METHODS

2. Methodology

2.1. Research Design: A descriptive design was used.

2.2. Setting: This study was conducted at the intensive care units at Kafr elsheikh University Hospital in Kafr elsheikh Governorate. This hospital serves all sectors of people in Kafr elsheikh governorate. The hospital contains three main ICU s (medical ICU, surgical ICU & CCU).

2.3. Subjects: A convenient sample included all available nurses at the time of the study (n=59), who are working in the previously mentioned setting

2.4. Tool of Data Collection

1- Self-administered questionnaire; consisted of two parts (A&B)

A. Demographic data; It is concerned with, (years of experience, Gender, qualifications, job title, and unit of specialty)

B. Nurses' knowledge assessment: It is developed by the researcher after reviewing the recent literature review, *American Hospital Association & Institute for safe Medication Practice, (2002), & Zayed M. (2012).* Used to assess the nurses' level of knowledge regarding medication safety guidelines'

Part a: Concerning medication safety overview, which included 5 questions about patient safety, medication safety, medication errors, medication errors' types and medication errors' reasons.

Scoring System; the responses to each statement were either (correct or incorrect). Weighted scores were assigned to the response choices, as the following correct answer took score (one). The total number of the statements was 84 and the cutoff point of the tool was 90% of the total score distributed as the following. 90% ----→ meant unsatisfactory level of knowledge (75.6 from the total score 84). **&** ≥ 90% ---→ meant satisfactory level of knowledge (≥ 75.6 from the total score 84).

2- Nurses practice observational checklist: This tool was developed by the researcher after reviewing the related literature. It is used to assess the nurses' practice; regarding medication safety guidelines' components and their related (10) items and consequently the medication errors were estimated which included (13) types,

Scoring system; each component item was scored as follow; done correctly or safely; took score (1) which meant that the medication safety guideline components were applied. And done incorrectly or unsafely or not done was took score (zero) which meant that the medication safety guideline components were not applied and consequently medication errors types were estimated considered a type of the 13 estimated medication errors and scored as following: prescribing error was representing 24 items in the nursing practice checklist, monitoring error was representing 20 items, drug preparation error was representing 22 items, deteriorated error was representing 13 items, fragmented error was representing 10 items, technique error was representing 11 items , dose error was representing 9 items, adherence error was representing 7 items, unauthorized error was representing 3 items, compliance error was representing 5 items, omission error was representing 3 items, wrong time error was representing 1 item, and dose form error was representing 2 items. The cutoff point of the used tool was 90% of the total score. < 90% ----→ meant unsatisfactory level of practice or unsafe **&** ≥ 90% ---→ meant satisfactory level of practice or safe

Validity and Reliability

Testing validity of the proposed tools by inspecting the items to determine whether the tools measure what supposed to measure *(Sharma, 2014)*. This stage developed by a jury of 7 experts from different academic categories (professors and assistant professors) of the medical –surgical nursing at the faculty of nursing, Ain Shams University. The expertise reviewed the tools for clarity, relevance, comprehensiveness, simplicity and minor modification was done.

Testing reliability of the proposed tools was done statistically by Cronbach alpha test. Reliability is defined as the overall consistency of a measure. A measure is said to have a high reliability if it produces similar results under consistent conditions *(Sharma, 2014).* Cronbach alpha for knowledge assessment sheet was 0.840. Cronbach alpha for observational checklist or safe medication practices was 0.850.

Pilot Study: A pilot study was carried out for 6 ICU nurses (10%) at Kafr Elsheikh University hospital to assess the clarity of the tools' language, applicability of tools, and the time needed for filling in the questionnaire sheet. The questionnaire was distributed to the selected nurses after explaining the purpose of the study. The participants were asked to give comments on the questionnaire items in term of clarity and completeness. Each nurse took about 20 to 30 minutes to complete the sheet. Some modifications were done based on pilot study. The subjects who included in the pilot study were excluded from the main study group.

Ethical Considerations: The research approval was obtained from the Faculty of Nursing Ain Shams University Ethical Committee before starting the study. The researcher clarified the objectives and aim of the study to nurses included in the study before starting. The researcher assured maintaining anonymity and confidentiality of subjects' data included in the study. Nurses were informed that they were allowed to choose to participate or not in the study and they had the right to withdraw from the study at any time.

Field Work:

The study started from June 2019 to October 2019, the actual duration was 4 months. The assessment phase was done for 40 of the ICU nurses and took about four weeks to be fulfilled; nearly 6 nurses were assessed per visit. The implementation phase was done for all the entire studied sample 59 nurses and took about 2 months. The previously mentioned setting was visited by the researchers two days/week, in morning shift from 9.00 am to 1.00 pm.

The study was started and finished through the following phases.

1. Program Development:

The program was designed by the researcher and based on the result obtained from the study tools; also, review of recent, current, national and international related literature. The program content was revised and validated by the experts in Faculty of Nursing, Medical Surgical Nursing Department, Ain Shams University.

2. Assessment and planning phase:

- The researcher met the ICU nurses at Kafr Elsheikh University hospital.

- The researcher obtained their consent for participating in this study after explaining its aim.

- Filling in the self-administered questionnaire, including the demographic date and knowledge assessment sheet, was done by the nurses pre the medication safety guidelines' components application.

- ICU Nurses were observed by the researcher for assessing to which extent the medication safety guidelines' components were applied during the whole process of medication management.

- These tools were completed within an average time 70 minutes.

- All information collected through study tools were interpreted accurately for identifying individualized teaching needs to be a base for giving the training program contents accordingly.

- The researcher set up teaching plan covering all objectives (equipping, acquiring, and demonstrating knowledge, practice, the resources and facilities for applying medication safety guidelines were allocated (printed material, power point presentation, videos and location of session that best serve the learners, and posters).

- The appointment for starting teaching sessions was determined and scheduled with the staff and managerial staff as two days weekly.

3. Implementation phase:

- The teaching sessions were conducted in a classroom in each unit. The Classroom was quite, had adequate lighting, well ventilated, and had adequate spacing for the place for implementing the target guidelines.

- Each session of medication safety guidelines' components had taken two hours/ day for 2 days (Monday & Wednesday) per week. These sessions were conducted for small groups; each group number didn't exceed 6 nurses.

- At the beginning of each session, an orientation of the importance of medication safety guidelines explained to nurses to motivate them to follow these guidelines' components.

- Each session started by greeting the staff nurses, assessing their motivation for learning, present the objectives, showing, and explaining the topic by using simple language to suit the understanding level of all subjects.

- Getting feedback about what was explained and given through the session and facilitate for asking any questions about the topic.

- The researcher emphasized the importance of adherence to each step in medication safety guidelines for reducing patient stay, improving practice level, and improving the reputation of the hospital through reducing the frequency of all types of medication errors.

- The researcher encouraged nurses to express his/her readiness for changing behavior.

- Implementation of medication safety guidelines' training program for the nurses in the three units lasted over a period of 2 months divided into 8 sessions for theory and 8 sessions for application for all the ICU nurses, the most sessions were at the morning shift, because the medication dispensing, checking stock, storage, distribution of medications, changing the doctor orders and the medication administration records occur in the morning shift coinciding with the medical staff

round, but about 6 sessions were at the afternoon shift for observing and training the rest of nurses at the time of medication administration

- The collection of data and application of guidelines lasted over a period of 3 months after the assessment phase.

The overall goal of the program: The training program aims to prevent drug error rates by increasing the level of knowledge and practice by the nursing personnel within intensive care units.

- **Teaching methods** and media used are; lectures, group discussion, demonstration and re-demonstration. Suitable teaching aids prepared especially for the program were used such as guiding booklet specifically designed based on assessment needs and videos.

4. Evaluation phase:

- The evaluation phase emphasized on determining the effect of medication safety guidelines' components on nurses' level of knowledge and practice and medication errors, through filling in the study used tools.

Statistical Design:

All data were collected, tabulated and subjected to statistical analysis. Statistical analysis is performed by SPSS in general (version 17), also Microsoft Office Excel is used for data handling and graphical presentation. Quantitative variables are described by the Mean, Standard Deviation (SD), while qualitative categorical variables are described by proportions and percentages. Chi-squared test of independence is used for categorical variables. A statistically significant difference was considered at p-value p≤0.05, and a highly statistically significant difference was considered at p-value p ≤ 0.001.

RESULTS

Table (1): Frequency and percentage distribution of the studied subjects according to their demographic characteristics (n = 59)

Items		No	%
Age	20 < 25 years	13	22.03%
	25 < 30 years	31	52.54%
	30 – 35 years	15	25.42%
Gender	Male	12	20.34%
	Female	47	79.66%
Level of education	Diploma	0	0.00%
	Bachelor degree	59	100%
Unit	CCU	21	35.59%
	Surgical ICU	14	23.73%
	Medical ICU	24	40.68%
Job description	Nurse	47	79.66%
	Charge nurse	9	15.25%
	Head nurse	3	5.08%
Years of experience	1 < 5	32	54.24%
	5 < 10	12	20.34%
	10 – 15	15	25.42%
Nurse/patient ratio	1:1	0	0.00%
	1:2	56	100%
	1:>2	0	0.00%
	1:2	56	100%
	1:>2	0	0.00%

Table (2): Frequency and percentage distribution of the rate of medication errors

Types of Medication Errors	No	%	P Value
Prescribing error	730	13.39%	
Monitoring error	243	4.46%	
Drug preparation error	215	3.94%	
Deteriorated error	378	6.93%	
Fragmented error	4	0.07%	
Technique error	376	6.90%	
Dose error	276	5.06%	0.000**
Adherence error	417	7.65%	
Unauthorized prescribing error	108	1.98%	
Compliance error	169	3.10%	
Omission error	77	1.41%	
Time error	82	1.50%	
Dose form error	84	1.54%	
Total	**3159**	**4.46%**	

**P≤ 0.001 highly significant

Table (3): Frequency and percentage distribution of safe knowledge among nurses about safety medication (n=59).

Items	No	%	P value
Medication safety overview	17	28.81%	
Medication safety guidelines' components			
Drug labeling, packaging and nomenclature	11	18.64%	
Drug storage, stock and standardization	18	30.51%	
Environmental Factors	19	32.20%	
Patient information	8	13.56%	
Drug information	0	0.00%	
Communication of Drug Information	29	49.15%	0.000**
Competency and staff education	28	47.46%	
Patient education	25	42.37%	
Quality Process and Risk Management	11	18.64%	
Drug device acquisition, use and monitoring	31	52.54%	
Total knowledge score	**4**	**6.78%**	

Satisfactory level ≥ 90 means safe knowledge.

Table (4): Frequency and percentage distribution of safe practice among nurses medication safety guidelines' components application (n=47).

Items	No	%
Drug labeling, packaging and nomenclature	7	14.89%
Drug storage, stock and standardization	0	0.00%
Environmental factors	0	0.00%
Patient information	0	0.00%
Drug information	2	4.26%
Communication of drug information	0	0.00%
Competency and staff education	0	0.00%
Patient education	0	0.00%
Drug device acquisition, use and monitoring	2	4.26%
Total practice score	**0**	**0.00%**

P Value = 0.000**

Satisfactory level ≥ 90 means safe practice.

Table 1: Shows that, 52.54% of the nurses were in the age category (25 < 30 years), regarding gender 79.66% of them were females & 100% of them had a bachelor degree. In relation to the ICU type 40.68% were in medical ICU, (79.66%, 15.25%, and 5.08%) were staff nurses, charge nurses and head nurses respectively. Regarding nurse patient ratio; it was found that 100% of them were assigned to only 2 patients).

Table 2: Shows that the rate of medication errors were 4.46% among the ICU nurses of medication safety at (P≤ 0.001).

Table 3: This table shows that ICU nurses had reach a safe knowledge level regarding medication safety overview, **the Total knowledge score** was 6.7 % at (P≤ 0.001).

Table 4: This table shows that ICU nurses had not reach to safe practice level regarding; drug storage, stock and standardization, patient information, drug information, communication of drug information, was unsatisfied at (P≤ 0.001).

4. DISCUSSION

Medications may be very dangerous if improperly used, moreover medication safety is one of the highest priorities of nursing practice, a matter of considerable concern for all health team members. Medication errors produce a variety of problems for patients ranging from minor discomfort to substantial morbidity that may prolong hospitalization or lead to death and risk of litigation *(WHO global patient safety challenge, 2017)*.

Unsafe medication practices and medication errors are a leading cause of injury and avoidable harm in health care systems across the world. Errors can occur at different stages of the medication use process. Harm, disability and even death can occur when weak medication systems and/or human factors such as fatigue, poor environmental conditions or staff shortages affect prescribing, transcribing, dispensing, administration and monitoring practices *(Clinical Excellence Commission, 2017)*.

The study results revealed that the age of more than half of the ICU nurses was ranged between twenty five to less than thirty years. Concerning gender; more than two thirds of them were females. As regards the educational qualifications; the entire study sample had a bachelor degree in nursing, and more than half of the study subjects had years of experience ranged from one to less than five years.

There were no statistically significant relationship between nurses' age, years of experiences and educational qualifications in relation to studied nurses' performance (knowledge & practice). Because the research investigate an area of care that was relatively known for all staff nurses and it was observed that more than half of staff nurses who shared in the study had less years of experience however all of them had been highly educated **(Table 1)**.

This result is agreed with *Blegen, Vaughn, and Goode, (2001)* mentioned that many research studies are generally considering that more experienced and highly educated nurses are more oriented and provide higher quality of care. As well, *Wright and Taylor, (1994)* identified that a wide range of factors have been put forward as influencing the performance and perception of nurses as level of education. In contrast, studies done by *Mayo and Duncan (2004) and the Osborne, Blias and Hayes, (1999)* showed that, no relationships were found between medication practices or perceived sources of error by years of experience **(Table 1)**.

Regarding nurse patient ratio; the study revealed that all of the ICU nurses were responsible to give care only for two patients, and this result was congruent with the ideal ratio, as in the acutely ill areas, and in case of high severity cases, an assignment change occurs to become one to one, as stated by the nurses themselves and observed by the researcher **(Table 1)**.

In relation to the satisfactory level of knowledge regarding all components of medication safety guidelines, the current study results revealed that; the majority of the studied nurses had unsatisfactory medication administration process **(Table 3)**. This study results is congruent with *Jennifer, Helene & Ginger, (2020)* in the qualitative systematic review entitled **"Nurses' Perceived Causes of Medication Administration Errors"** in which concluded that; Causes of medication administration errors are perceived by nurses to be multifactorial and interconnected, and often stem from systems issues. Multifactorial interventions as nurses' training programs aimed at mitigating medication errors are required with an emphasis on systems changes. Findings in this review can be used to guide efforts aimed at identifying and modifying factors contributing to medication administration errors.

In relation to the satisfactory level of practice regarding all components of medication safety guidelines, the current study results revealed that; the majority of the studied nurses had unsatisfactory practice during medication administration process **(Table 4).** This study results is congruent with *Mekonnen & Alemayehu, (2018),* in the systematic review entitled **"Medication Reconciliation as a Medication Safety Initiative"** which have shown that medication reconciliation interventions carried out at hospital transitions were found to be an effective strategy for improving clinical experience resulting in improving outcomes (e.g. adverse drug event, all-cause readmissions, and emergency department visits), as well as process outcomes, such as the occurrence of medication errors.

Regarding medication errors' types and frequency, the current study results showed that; all types of medication errors' rate were increased among the ICU nurses about medication safety **(Table 2).** This study result is supported by *Roughead & Susan, (2009)* in the study entitled **"Medication safety in acute care in Australia: where are we now? Part 1: a review of the extent and causes of medication problems 2002–2008",** in which concluded that; two new studies, published since 2002 concluded that adverse drug reactions had reduced in 1.3% of admissions, and were associated with an adverse drug reaction at the time of the admission and required treatment. Another 0.3% level of improvement of admissions' adverse drug reaction identified at the time of admission, but not treated.

In the same line *Andrea et al. (2000)* pointed out that; eight types of medication errors had changes were implemented, with a success rate of 70%. These changes included non-punitive reporting, ensuring documentation of allergy information, standardizing medication administration times, and implementing preprinted policies. In the study entitled; **"Adverse Drug Events: Lessons from a Break through Series Collaborative".**

5. CONCLUSION

Based on findings of the present study, it can be concluded that:

There was a significant increase in the frequency of all types of errors of the medication safety at (P≤ 0.001), the unsatisfactory levels of both knowledge and practices regarding medication safety and errors

Based on the results of the current research, the following suggestions for future research and practice are proposed:

1. Arranging continuous education programs for nurses.

2. Using the study findings as a basis for construction of training endeavors based on identified knowledge and practice gaps to respond to their unmet needs.

3. Building a safety culture in the health care setting which provides a comforting environment for the ICU staff nurses regarding the improvement of reporting medication errors.

4. Performing further researches on the impact of medication errors on patient progress and length of stay.

5. Empowering the staff nurses with the health teaching knowledge to be able to transfer it to the patients and their families.

6. Continuous monitoring for staff nurses during the work on all steps of medication management.

7. Collaboration between pharmacists and nurses is paramount to improve the quality of the drug supply chain and decrease the risk of medication errors.

REFERENCES

[1] *A PINCH. Haymarket: Clinical Excellence Commission, (2017):* Retrieved from: http://www. cec.health.nsw.gov. au/patient-safety-programs/medication-safety/high-risk-medicines/A-PINCH

[2] *Adam Gaffney & Howard Waitzkin, (2017):* Introduction and General Concepts, Policy, Politics, and the Intensive Care Unit, chapter 1. P 1-11 Retrieved from: https://examdev.theaba.org/E-Library/texts/2/3.pdf

[3] *Ahmed N. El-Shazly 1 , Mahmoud A. Al-Azzouny 2 , Doaa R. Soliman 1 , Neveen T. Abed 1 and Sameh S. Attia, (2017):* Medical errors in neonatal intensive care unit at Benha University Hospital, Egypt. Eastern Mediterranean Health Journal. 23. 1. 32-35 Retrieved from: https://scholar.google.com/scholar?cites=3721542189443302146 &as_sdt=2005&sciodt=0,5&hl=en

[4] *Blegen, Mary A. Goode, Colleen J. Park, Shin Hye , Vaughn, Thomas; Spetz, Joanne (2013):* Baccalaureate Education in Nursing and Patient Outcomes, The Journal of Nursing Administration: 43 - 2 - 89-94, Retrieved from: https://journals.lww.com/jonajournal/fulltext/2013/02000/Baccalaureate_Education_in_Nursing_and_Patient.8.aspx ?

[5] *Charles J. Fisher; Jean-Francois A. Dhainaut & Steven M. Opal; et al. (1994):* Recombinant Human Interleukin 1 Receptor Antagonist in the Treatment of Patients With Sepsis Syndrom, Randomized, Double-blind, Placebo-Controlled Trial, JAMA. 271, (23):1836-1843. doi:10.1001/jama.1994.03510470040032

[6] *Garfield STeo, V., Chan, L., Vujanovic, B., Aftab A., Coleman, B., Puaar, S., Sen Green, N., Franklin, B.D. (2020):* To What Extent Is the World Health Organization's Medication Safety Challenge Being Addressed in English Hospital Organizations? A descriptive study. Journal of Patient Safety, Retrieved from: 10.1097/pts. 0000000000000757

[7] *Jennifer Gunberg Ross, , Helene Moriarty, & Ginger Schroers, (2020):* Nurses' Perceived Causes of Medication Administration Errors: A Qualitative Systematic Review, joint commission journal. Retrieved from https://doi.org/ 10.1016/j.jcjq.2020.09.010

[8] *Juan Tamargo, Jean-Yves Le Heuzey & Phillipe Mabo (2015):* Narrow therapeutic index drugs: a clinical pharmacological consideration to flecainid, European Journal of Clinical Pharmacology, 71, 549–567. Retrieved from: https://link.springer. com/journal/228.

[9] *Kyle Anthony, RN, BA; Clareen Wiencek, PhD, CNP, ACHPN; Catherine Bauer, BSN, CCRN, ACN; Barbara Daly, RN, PhD; Mary K. Anthony, RN, PhD, CS (2010) :* Impact of a No Interruption Zone on Medication Safety in Intensive Care Units. Crit Care Nurse 30 (3): 21–29. Retrieved from https://doi.org/ 10.4037/ccn2010473

[10] *Leotsakos, Zheng, Croteau, Jerod,Loeb, Sherman, Hoffman, Morganstein, O'Leary, Bruneau, Lee, Duguid,Thomeczek, De Loos & Munier (2014):* Standardization in patient safety: the WHO High 5s project. International Journal for Quality in Health Care, 26, 2, 109–116, Retrieved from: https://doi.org/ 10.1093/intqhc/ mzu010

[11] *Mayo, A.M. & Duncan. (2004):* Nurse perception of medication errors. What we need to know for patient safety. Journal of Nursing Care Quality; 19(3): 209-17. Retrieved from: https://journals.lww.com/jncqjournal/toc/2004/ 07000

[12] *Mekonnen and Alemayehu, B. (2018):* Medication Reconciliation as a Medication Safety Initiative. Sydney Digital Thesis, Retrieved from http://hdl.handle.net/2123/18050

[13] *Mohamed M. M., Abdel-Latif. (2016):* Knowledge of healthcare professionals about medication errors in hospitals. Journal of Basic Clin Pharm. June 2016, retrieved at February 2020.

[14] *Patient safety. WHO global patient safety challenges (2017):* Medication without harm. Geneva: World Health Organization; Retrieved from: http://www.who.int/patientsafety/medication-safety/en/

[15] *World Health Organization (2017):* Patient safety: making health care safer. World Health Organization Retrieved from. https://apps.who.int/iris/handle/10665/255507

[16] *Zayed Alsulami, Sharon Conroy & Imti Choonara (2013):* Medication errors in the Middle East countries: A systematic review of the literature, European Journal of Clinical Pharmacology, 69, 995–1008 Retrieved from: https://link.springer. com/journal/228