

Application of World Health Organization's Five Moments for Medication Safety Tool: An Intervention Towards Medication Without Harm among Patients in Long-Term Care Units

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Abstract

Background

The Five Moments for Medication Safety tool are critical times when a patient's or caregiver's actions can significantly lower the risk of damage linked with their medication(s).

Aim

The aim of this study was two-fold: (a) to investigate the effectiveness of nurses' application of the World healthcare organization' Five moments for medication safety tool on patients in long-term care units, and (b) to determine the relationship between nurses and patients' outcomes before and after the application of World healthcare organization' Five moments for medication safety tool.

Method

an intervention research design was conducted/ A quasi-experimental research study with two groups (nurses and patients), pre-test post-test design was conducted, A sample included all nurses who were working in Long-Term Care Units at Alexandria' New Medical Center, Egypt (N = 55) and a proportional sample of 35 patients at Long-Term Care Units. The World Health Organization's Five Moments for Medication Safety tools were used to measure study variables.

Results

there were significant differences between patients' and nurses' outcomes regarding their application of the World Health Organization's five moments for medication safety tool at the two evaluative times of intervention (pre and post) where ($P = < 0.001^*$). there was a positive significant correlation between nurses' and patients' outcomes in the overall responses especially the Second Stage (Taking medication), and Fourth Stage (Reviewing medication) where ($p = < 0.001^*$). the intervention had a large effect on the overall patients' outcome, with an effect size (of 0.873).

Conclusion

Patients can play a vital role in preventing medication errors when they have been educated about their medications and encouraged to ask questions and seek satisfactory answers. Also, nurses have an important role in medication management by informing, supporting, representing, and involving all relevant parties. Therefore, they should be reinforced by continuous education and training to take up this role.

Introduction

The most crucial part of treatment is medication, but it also has the highest percentage of medical errors (Pham et al., 2012; Williams, 2007; World Health Organization [WHO], 2016). According to the World Health Organization, drug errors account for 6%–7% of all hospital admissions (WHO, 2016). Each year, 1.5 million preventable pharmaceutical errors occur, according to the Institute of Medicine (IOM) (Aspden et al., 2007).

Nurses have an important role in the continuity of care and proximity to the patient, making them an important link between the physician and the patient or informal caregiver. Nurses can also contribute to a holistic assessment and strategy, which is critical in encouraging patients to participate in medication management. By informing, supporting, representing, and involving the patient and his family, nurses can and should have a role in medication management (Huisman et al., 2020b).

According to the findings of (Salar et al., 2020), nurses can make medication errors, but if they act professionally and have a professional attitude toward control systems, they can reduce the number of medication errors by establishing technological techniques. In addition, in-service training should be conducted regularly, and nurses should be closely watched to ensure that they perform properly. Patients and families who are well-informed, knowledgeable, and empowered can make a significant contribution to their positive health outcomes and safety, including preventing, recognizing, and taking early action to minimize medication-related damage. Patients who are informed well can make the best decisions about self-medication and health care (WHO, 2019).

Improved patient participation is needed in specialized practice settings to manage drugs since it reduces the harm to patients caused by medication administration errors and the expense of such errors to patients and hospitals (Mohsin-Shaikh et al., 2014). Increasing patient participation in medication management is thought to be a significant method for increasing medication management's safety and quality. A major transformation in the way doctors now offer care is required to achieve this strategy, specifically the inclusion of patients in routine medication administration (Mctier et al., 2015a)

Medication errors are a widespread occurrence that puts a significant strain on healthcare systems, and they may often be avoided by employing efficient preventive techniques. The Five Moments for medication Safety tool are key moments in the patient's or caregiver's medication use that can considerably lower the chance of damage. 5 key questions are asked at each moment. Some are self-reflective for the patient, while others necessitate the assistance of a health professional to be accurately answered and reflected on. As part of the WHO's Third Global Patient Safety Challenge, Medication Without Harm, this patient engagement tool was created (Figure (1)). Its goal is to get patients more involved in their treatment, to pique their interest in the medications they're taking, and to give them the confidence to speak openly with their doctors. Patients, their families, and caregivers are encouraged to use this tool., at all levels of care and in all contexts, with the assistance of health professionals (WHO, 2019).

Significance of the study

In Egypt, there are little data on drug mishaps. The paucity of data in Egypt is attributable to a dearth of research in this area and the lack of voluntary reporting systems, except for a few hospitals. Although such issues do not exist in every health organization, some have previously addressed them, while others are still working to do so (Shehata et al., 2016). To prevent medication errors and increase patient safety, nurses (who administer pharmaceuticals) must participate in educational and training programs on drug therapy. A methodical approach is required immediately (Elden & Ismail, 2015).

According to (Mohaini et al., 2021), every medical institution should strive to establish procedures that prevent patients from being put in danger owing to medication errors. Healthcare organizations should investigate errors that have already occurred as well as those that may occur in the future. To monitor and measure pharmaceutical safety, a uniform organizational architecture is required. To build a culture of safety, it is critical to encourage reporting, monitoring, and open discussion of drug mishaps.

Aim of the study: The aim of this study was two-fold: (a) to investigate the effectiveness of nurses' application of the World Healthcare Organization's five moments for medication safety tool on patients in long-term care units, and (b) to determine the relationship between nurses and patients outcomes before and after application of World Healthcare Organization' five moments for medication safety tool.

Research objectives

1. Assess nurses' and patients' application of five moments for medication safety tools before the training sessions (pre-test).
2. Develop and implement five moments for medication safety tool training sessions for nurses and patients.
3. Evaluate the effectiveness of the application of five moments for medication safety tools on nurses' and patients' medication management after the training sessions (post-test).

1.2. Research Hypothesis: The hypotheses of the study were postulated as follows:

Hypothesis 1: The application of the World Healthcare Organization's five moments for medication safety tool for patients and nurses will be significantly effective by their participation in educational sessions .

Hypothesis 2: There is a significant correlation between nurses' and patients' outcomes before and after the application of the World Healthcare Organization's five moments for medication safety tool.

Methodology

Research design and setting

An intervention research design was conducted/ A quasi-experimental research study with two groups (nurses and patients), pre-test post-test design was conducted.

This is an intervention study was conducted at Alexandria's new medical center; is an Egypt-based public shareholding organization engaged in the provision of medical diagnostic and treatment services in various medical fields has the capacity of 300 beds and provides a range of medical services, including dialysis, oncology, blood diseases, gynecology, general surgery, pediatrics, internal disease, laboratory and radiology, ophthalmology, ear, and throat disease, outpatient clinics of various specialties, natural treatment unit, radiotherapy unit, intensive-care unit, and dental and oral surgery, among others.

Study participants and sampling

The subject of the study comprised all nurses (N = 60) working at dialysis, oncology, and blood diseases units, who are dealing with medications daily and willing to participate in the study. The sample size was calculated using the "Epi info program version 7" and indicated the minimal sample size to be (52) nurses. The sample size was based on a variance of 5%, a confidence level of 95%, and a power of 0.80. Fifty-five nurses participated in the study (response rate = 91.7 %). This response rate was expected as the medication safety educational sessions were developed based on their identified needs and the hospital administrator's invitation to conduct the training. By using the proportional allocation method, 25% of the total number of patients hospitalized during the time of data collection and who have long-term medications with regular admission to long terms care units were selected randomly 35 patients had been invited to interview; who were willing to participate in the study.

Study instruments and technique

Nurses' five moments for medication safety tool: A structured questionnaire; was developed by the researchers based on the World Health Organization's five moments for medication safety tool (WHO, 2019). It is a self-administered questionnaire that consists of two main sections:

Section 1: includes questions about nurses' demographic and work variables.

Section 2: includes 25 questions categorized under five main stages; each stage includes five questions, which assess nurses' promotion of patient engagement by introducing five moments for medication safety to their patients, and their families. Responses were measured on a five-point Likert scale ranging from 1–5 (1 never, 5 always). Higher scores indicated a higher level of nurses' application of the World Healthcare Organization's five moments for a medication safety tool

Patient' five moments for medication safety tool: Face- to -face structured interview with patients was developed by the researchers based on the World Health Organization's five moments for medication safety tool (WHO, 2019), to assess patient engagement has been developed as a part of the third WHO Global Patient Safety Challenge: Medication without Harm. It is intended to engage patients in their care in a more active way, to encourage their curiosity about the medications they are taking, and to empower them to communicate openly with their health professionals. **This tool includes two sections.**

Section one: includes questions about patients' demographic data.

Section two: includes 25 questions categorized under five main stages (Starting a medication, taking medication, adding medication, reviewing medication, and stopping the medication). Where each stage includes five questions. Responses on tool two were measured using a three-point Likert scale yes (3), sometimes (2), no (1). Higher scores indicated a higher level of patients' application of the World healthcare organization's Five moments for medication safety tool.

Validity and reliability of the study tools

The two tools were created in English and then translated into Arabic to fit the Egyptian culture and nurses' and patients' various educational levels. The questionnaire was handed to a panel of five academic expert members to determine the face validity and fluency of the translation. Some items were changed to make them clearer, based on their suggestions. A language expert re-translated the tools into English. To ensure accuracy and reduce any threats to the study's validity, the authors and specialists checked the re-translation. Pilot research was done on 5% of nurses (n = 5) also carried out with nurses from different units to check and ensure clarity and applicability of the tools; identify obstacles and problems that may be encountered during data collection with no change occurring. The interview guide was sent to research peers to check and establish its face validity with a result of all agreeing on the interview guide. A pilot interview was conducted utilizing the developed guide to pretest the questions before data collection, support refinement of the questions as needed, and assess the researcher's competency with the interview technique which was followed by data collection. As a result, the final tool was received a few weeks. The tools were also assessed for internal reliability, and the results indicated that the tool was trustworthy, with a Cronbach's coefficient alpha of 0.979 for the questionnaire and 0.957 for the interview sheet.

Procedures

After obtaining the approval of the ethics committee of Alexandria's new medical center, the researchers explained the aim of the research to all participants. The study was implemented in five stages: World healthcare organization's Five moments for medication safety content development, pre-test, intervention application, post-test, and data analysis .

In the first stage, the content of the World Health Organization's Five Moments for Medication Safety Tool was developed based on patients' and nurses' needs assessment and the Global Patient Safety Challenge on Medication Safety. Educational sessions of the World Health Organization's Five Moments for Medication Safety Tool that aimed to raise nurses' and patients' awareness on medication safety and towards medication without harm. The educational sessions covered the following topics: self-assessment (strengths and weaknesses), connecting self-understanding with the third challenge of the World Health Organization's Five Moments for Medication Safety Tool, factors increased occurrence of medication errors and how to prevent it, five main stages of medication safety (Starting a medication, taking medication, adding medication, reviewing medication, and stopping the medication), application of five moments for medication safety.

In the second stage, the pre-test was performed before the beginning of the sessions using the study tools. The researchers described the purpose of the study to all participants after receiving approval from the hospital. The first tool was the Arabic form, which was hand-delivered by the authors to the nurses who participated in the study and were given specific instructions on how to complete the questionnaire. In this stage, the questionnaire was provided to the participants for one day to complete. After that, the researchers went to the units to collect the completed questionnaires, which were often left with the unit nurse's manager.

In the nursing unit office or patients' rooms, face-to-face structured interviews were conducted with patients in the Arabic language before intervention. At the start of each interview, the researcher explained the nature of the study, the associated ethical considerations, the estimated duration of the interview, data confidentiality, and voluntary participation, and obtained the patient's consent to participate in the study and to be quoted along with information. Because of the delicate nature of the subject, participants were given anonymity and the freedom to withdraw from the study at any time.

Based on the results of the assessment, the third stage, educational sessions of the World Health Organization's Five Moments for Medication Safety Tool were provided to nurses and patients. The nurses were divided into 5 groups, each group included 10-11 nurses while patients were divided into 3 groups according to their hospitalized units, each group included 11-12 patients. Each group was provided with three awareness sessions to cover the content. Each session took approximately two hours. A total of 15 sessions for nurses and 9 sessions for patients were conducted to cover all participants groups. The educational sessions were designed to satisfy the nurses' and the patients' needs. The training classes were implemented for nurses and patients at the studied hospital by the researchers. Following those, classes were implemented for patients by the trained nurses under the supervision of researchers. The following teaching methods were utilized: interactive lecture, discussion, brainstorming, and role play. The Media of teaching involved PowerPoint slides, flip charts, handouts, the booklet, pamphlet, flyer, poster, and mobile application (loaded onto a researcher's smartphone).

In the fourth stage, a post-test was done by using the study tools (Nurses five moments for medication safety, and Patient' five moments for medication safety tools) that were used in the second stage, to reveal the change in nurses, and patients' outcomes concerning medication safety after giving the five moments for medication safety intervention and to determine how the educational sessions were aligned with the specific concepts and measures employed in the study. In addition, the developed evaluation form was used to evaluate the educational sessions of the World Health Organization's Five Moments for Medication Safety Tool at the end of sessions from nurses' and patients' perspectives. Finally, the fifth stage; data analysis was conducted.

Data collection

Written approval was obtained from the administrators of the identified setting to collect the necessary data. Data were collected by the researcher using the study questionnaires, which were distributed individually to participants before and after educational sessions. Each nurse took approximately 20

minutes to complete all questionnaires and the length of the interview with patients ranged from 30–45 minutes. Educational sessions and data collection were coordinated with the nursing education department and health education department in the hospital to organize educational sessions according to workplace policy. Data were collected in 3 months, from September to November 2021.

Data analysis and management

Data were collected, tabulated, and analyzed statistically using an IBM personal computer with Statistical Package of Social Science (SPSS) version 25. Qualitative data were described using numbers and percentages. Kolmogorov-Smirnov test was used to verify the normality of distribution. Quantitative data were described using mean, standard deviation. The following statistics were applied. 1. Descriptive statistics: in the form of mean percent score with standard deviation; qualitative data were presented in frequencies and percentages. 2. Analytical statistics: Wilcoxon signed ranks test used for abnormally distributed quantitative variables, to compare between two periods, Paired t-test for normally distributed quantitative variables, to compare between two periods and Correlation coefficients are used to measure the strength of the relationship between two variables. Multiple linear regression was done using the "Enter" method, to predict the dependent outcome from independent predictors by Pearson correlation. The unstandardized regression coefficient (beta) for each independent predictor was compared to the beta of the standardized coefficient, to determine the strength of each as an independent predictor, even after adjusting the effect of other predictors in the model. All statistical analysis was done using two-tailed tests and an alpha error of 0.05. Regarding P-value, it was considered that: non-significant (NS) if $P > 0.05$, Significant (S) if $P < 0.05$, Highly Significant (HS) if $P < 0.01$.

Results

Table (1) clarified that the mean age of nurses was 31.33 ± 7.72 and 51.9 % of nurses were female. while the highest percentage of nurses (34.5 %) were working in hematology and oncology units; and the lowest percentage of them (30.9 %) were working in hemodialysis units. More than half of nurses were holding Bachelor's degrees in Nursing Science (50.9%) while 49.1 % had Technical Nursing Diploma. The mean years of experience of nurses in the hospital were 314.99 ± 3.42 while in the department were 3.66 ± 2.67 , respectively. 45.5 % of nurses received educational training programs related to medication safety inside the hospital and all nurses did not take any health educational sessions related to the World Healthcare Organization's five Moments of Medication Safety tool.

Table (2) clarified that the mean age of patients was 49.54 ± 11.54 . 54.3% of patients were female and all patients were Egyptian. The highest percentage of patients were married (65.7%), 45.7% of patients had a high level of education and 17.1 % were read and write. The average income for 51.4% of patients was 3000 -4000 Egyptian pounds. More than half of patients did not receive healthcare alone (62.9%) where husband or wife may be attended with patients. 37.1% of patients visit the hospital more than 3 times per month. The highest percentage of patients (37.1 %) were received hemodialysis care, and the lowest percentage of them (14.3%) were received radiotherapy. More than half of patients did not receive any

health educational sessions related to medication safety by healthcare providers (54.3%), and all patients did not take any health educational sessions related to five moments of medication safety.

Table (3) indicated that there were significant differences between nurses' and patients' outcomes regarding the World Health Organization's five moments for medication safety tool at the two evaluative times of intervention (pre and post) where ($P = <0.001^*$). about nurses, the table illustrates that nurses' total mean score was 42.36 ± 17.10 pre-intervention to be 72.73 ± 16.27 post-intervention where the highest stage was the Fifth Stage (Stopping medication) at pre, and post (42.36 ± 17.10 , 72.73 ± 16.27), respectively; followed by the Second Stage (Taking medication) (36.91 ± 17.41 , 64.09 ± 19.98), consecutively. regarding the patients' outcomes, it was evident that there is improvement in the total outcomes as the total mean score was 43.10 ± 13.57 pre-intervention to be 77.74 ± 7.39 post-intervention. moreover, the highest response was for the first stage (Starting medication) was (52.0 ± 14.91) pre-intervention to be (85.43 ± 8.52) post-intervention; followed by the second stage (Taking medication) the mean was (44.29 ± 22.92) pre-intervention and modified post-intervention to (80.86 ± 12.69).

Table (4) illustrates that there was a positive significant correlation between nurses' and patients' outcomes regarding the World Health Organization's five moments for medication safety tool in the overall responses and the Second Stage (Taking medication), and in Fourth Stage (Reviewing medication) where ($p = <0.001^*$).

Table (5) clarified that the intervention of the World Health Organization's five moments for medication safety tool had a large effect size on the overall patients' outcome where effect size (0.873). Meanwhile, this intervention had a medium effect size on nurses' outcomes where overall effect size (0.734).

Table (6) shows the outcomes of a multiple linear regression analysis designed to predict patients' response to the World Health Organization's five moments for medication safety tool (as the dependent outcome) from the (independent predictor) nurses' implementation of the World Health Organization's five moments for medication safety tool. The model shows that the overall significance of the model was high where $t = 31.184$, $P = <0.001^*$. as well, the second stage (Taking medication) intervention is the strongest independent predictor of nurses where $\beta = 0.167$ and $p\text{-value} = 0.001^*$.

Table (1): Demographic and work-related characteristics of studied subjects (nurses) at Alexandria New Medical Center (n = 55).

Demographic data	No.	%
Age (years)		
20 <30	25	45.5
30 < 40	22	40.0
40 <50	6	10.9
50+	2	3.6
Min. – Max.	20.0 – 52.0	
Mean ± SD.	31.33 ± 7.72	
Gender		
Male	27	49.1
Female	28	50.9
Working Units		
Oncology Unit	19	34.5
Hemodialysis Unit	17	30.9
Hematology Unit	19	34.5
Educational Level		
Technical Nursing Diploma	27	49.1
Bachelor of Nursing Science	28	50.9
Job Title		
Registered Nurse	27	49.1
Technical Nurse	27	49.1
Head Nurse	1	1.8
Years of Experience in hospital		
Min. – Max.	0.33 – 15.0	
Mean ± SD.	4.99 ± 3.42	
Years of Experience in department		
Min. – Max.	0.17 – 12.0	

Mean ± SD.	3.66 ± 2.67
Number of educational training programs taken related to medication safety	
0	26 47.3
1	25 45.5
2	2 3.6
≥3	2 3.6
Place of Training (n = 29)	
Inside the hospital	26 89.7
Outside the hospital	3 10.3
Do you take any educational training programs related to the World Healthcare Organization's third Challenge 5 Moments of Medication Safety?	0 0.0

SD: Standard deviation

Table (2): Demographic characteristics of studied subjects (patients) at Alexandria New Medical Center (n = 35)

Demographic data	No.	%
Age (years)		
20 <30	2	5.7
30 < 40	6	17.1
40< 50	8	22.9
50+	19	54.3
Min. – Max.	22.0 –	68.0
Mean ± SD.	49.54 ±	11.54
Gender		
Male	16	45.7
Female	19	54.3
Level of Education		
Read and write	6	17.1
Moderate level of Education	13	37.1
High Level of Education	16	45.7
Marital Status		
Single	5	14.3
Married	23	65.7
Divorced	1	2.9
Widow	6	17.1
Do you receive healthcare alone?		
Yes	13	37.1
No	22	62.9
My wife	7	31.8
My husband	5	22.7
My sister	3	13.6
My brother	5	22.7
My daughter	1	4.5

My mother	1	4.5
Number of visits of hospital per month		
1	10	28.6
2	10	28.6
3	2	5.7
>3	13	37.1
Min. – Max.	1.0 – 12.0	
Mean ± SD.	5.0 ± 4.61	
Type of service provided by the hospital		
Hemodialysis	13	37.1
Chemotherapy	10	28.6
Radiotherapy	5	14.3
Blood Transfusion	7	20.0
Do you take any health educational sessions related to medication safety by healthcare providers?		
Yes	16	45.7
No	19	54.3
Do you take any health educational sessions related to five moments of medication safety by healthcare providers?		
	0	0.0

SD: Standard deviation

Table (3): patients and nurses' mean percent scores at pre and post-intervention of the World Health Organization's Global Patient Safety Challenge "five moments for medication safety" at Alexandria New Medical Center

Patients/ Nurses	Patients (N= 35)			Nurses (N= 55)		
	Pre-intervention	Post-intervention	Z _p	Pre-intervention	Post-intervention	Z _p
Five Moments of Medication Safety	% score ± SD	% score ± SD		% score ± SD	% score ± SD	
First Stage Starting medication	52.0 ± 14.91	85.43 ± 8.52	t _p <0.001*	% score ± SD	% score ± SD	t _p <0.001*
Second Stage Taking medication	44.29 ± 22.92	80.86 ± 12.69	t _p <0.001*	38.64 ± 15.23	61.91 ± 16.96	t _p <0.001*
Third Stage Adding a medication	47.14 ± 24.46	79.29 ± 14.20	t _p <0.001*	36.91 ± 17.41	64.09 ± 19.98	t _p <0.001*
Fourth Stage Reviewing medication	38.29 ± 21.89	75.71 ± 9.48	t _p <0.001*	29.77 ± 17.39	63.30 ± 21.38	t _p <0.001*
Fifth Stage Stopping medication	34.57 ± 19.15	67.71 ± 17.16	t _p <0.001*	34.18 ± 15.72	63.91 ± 18.92	t _p <0.001*
% Score overall	43.10 ± 13.57	77.74 ± 7.39	t _p <0.001*	42.36 ± 17.10	72.73 ± 16.27	t _p <0.001*

Z: Wilcoxon signed ranks test

t: Paired t-test *: Statistically significant at $p \leq 0.0$

Table (4): Correlation Matrix between nurses and patients' responses to the World Health Organization's Global Patient Safety Challenge "five moments for medication safety", at Alexandria New Medical Center

Nurses	Patients			
	Pre-intervention		Post-intervention	
	R	p	r	p
First Stage Starting medication	0.215	0.115	0.072	0.601
Second Stage Taking medication	0.249	0.067	0.549*	<0.001*
Third Stage Adding a medication	0.030	0.826	0.136	0.323
Fourth Stage Reviewing medication	0.287*	0.034*	0.421*	0.001*
Fifth Stage Stopping medication	0.070	0.610	0.257	0.058
Overall	0.159	0.245	0.452*	0.001*

r: Pearson coefficient

*: Statistically significant at $p \leq 0.05$

Table (5): Impact / Effect of the World Health Organization's Global Patient Safety Challenge "five moments for medication safety" on patients and nurses

	Pre-intervention	Post-intervention	Mean Change	Effect size	Level
	Mean ± SD.	Mean ± SD.			
Patients					
First Stage (Starting medication)	52.0 ± 14.91	85.43 ± 8.52	33.43	0.823	Large
Second Stage (Taking medication)	44.29 ± 22.92	80.86 ± 12.69	36.57	0.778	Medium
Third Stage (Adding a medication)	47.14 ± 24.46	79.29 ± 14.20	32.14	0.579	Medium
Fourth Stage (Reviewing medication)	38.29 ± 21.89	75.71 ± 9.48	37.43	0.775	Medium
Fifth Stage (Stopping medication)	34.57 ± 19.15	67.71 ± 17.16	33.14	0.656	Medium
Overall	43.10 ± 13.57	77.74 ± 7.39	34.64	0.873	Large
Nurses					
First Stage (Starting medication)	38.64 ± 15.23	61.91 ± 16.96	23.27	0.531	Medium
Second Stage (Taking medication)	36.91 ± 17.41	64.09 ± 19.98	27.18	0.572	Medium
Third Stage (Adding a medication)	29.77 ± 17.39	63.30 ± 21.38	33.52	0.706	Medium
Fourth Stage (Reviewing medication)	34.18 ± 15.72	63.91 ± 18.92	29.73	0.646	Medium
Fifth Stage (Stopping medication)	42.36 ± 17.10	72.73 ± 16.27	30.36	0.656	Medium
Overall	36.65 ± 11.78	65.27 ± 15.97	28.62	0.734	Medium

Effect size 0.0 – 0.2 Small effect 0.3–0.7 Medium effect ≥0.8 Large effect

Table (6): Best fitting multiple linear regression model for nurses toward the World Health Organization's Global Patient Safety Challenge "five moments for medication safety" (Post-intervention)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
Independent Variable: Nurses							
(Constant)	72.873	2.337		31.184*	<0.001*	68.177	77.569
First Stage (Starting medication)	-0.034	0.031	-0.151	1.105	0.275	-0.095	0.028
Second Stage (Taking medication)	0.167	0.048	0.884	3.493*	0.001*	0.071	0.263
Third Stage (Adding a medication)	-0.009	0.048	-0.052	0.190	0.850	-0.107	0.088
Fourth Stage (Reviewing medication)	-0.007	0.045	-0.034	0.150	0.881	-0.098	0.084
Fifth Stage (Stopping medication)	-0.052	0.043	-0.226	1.225	0.226	-0.138	0.034
Dependent Variable: Patient							

$R^2 = 0.365$, $F = 5.638^*$, $p < 0.001^*$

F,p: f and p values for the model

R^2 : Coefficient of determination

B: Unstandardized Coefficients

SE: Estimates Standard error

Beta: Standardized Coefficients

t: t-test of significance

*: Statistically significant at $p \leq 0.05$

Discussion

(Thomas et al., 2019) conducted a systematic review and found 50 papers, the majority of which were from Iran, Saudi Arabia, Egypt, and Jordan. Thirty-two studies quantified pharmaceutical errors, which

included lack of understanding, insufficient staffing numbers, and a common severe workload. according to (Manias et al., 2020), medication errors can occur at any stage of the medication management process and are a leading cause of mortality and damage worldwide. It contributes to negative events that endanger patient safety and place a major financial strain on the healthcare system. The drug management phase, which includes monitoring the effectiveness and side effects, is handled by nursing. Effective management and boosting nurses' knowledge of drug management are two of the many measures offered to prevent medication errors (Abdulmutalib& Safwat, 2020). By informing, supporting, representing, and including all relevant stakeholders, nurses may and should play a significant role in medication management. Nurses' input should be valued when it comes to improving patient medication management. Nurses can encourage patients to take an active role in their drug management. So, they should be reinforced by education and training to take up this role (Huisman et al., 2020a). The present study aimed at evaluating the effectiveness of nurses' application of the World healthcare organization's five moments for medication safety tool on patients in long-term care units within a sample composed of fifty nurses their mean age was 31.33 ± 7.72 more than half of them were female. who are working in hematology, oncology; and hemodialysis units at Alexandria New Medical Center. More than half of nurses are holding a Bachelor's degree in Nursing Science, while 49.1% had Technical Nursing Diploma. Less than half of nurses received educational training programs related to medication safety inside the hospital and any nurses did not take any health educational sessions related to the World Healthcare Organization's five Moments of Medication Safety tool. As well the sample included the patients who are hesitating on the previously mentioned units and have long-term medications courses with a total number of 35 patients. nearly half of them were female and had a high level of education, all patients are Egyptian. The highest percentage of patients are married, more than half of them can't receive healthcare alone where husband or wife attended with them. 37.1% of patients visit the hospital more than 3 times per month. More than half of patients did not receive any health educational sessions related to medication safety by healthcare providers, and all patients did not take any health educational sessions related to five moments of medication safety.

Despite global breakthroughs in healthcare, one out of every ten patients is still harmed while undergoing treatment (Jha et al., 2013). 'Medication Without Harm, WHO Global Patient Safety Challenge' (World Health Organization, 2017) was issued by the World Health Organization (WHO) in March 2017 (Donaldson et al., 2017). It demanded that steps be taken to decrease patient damage caused by dangerous drug practices and medication errors. WHO urges countries to commit to taking effective steps to improve pharmaceutical safety as a top priority. To achieve the objectives, improvement initiatives are required. Implementing formal structured processes with enhanced workforce capacity and capability to deliver medication, partnering with patients and families, improving information quality and availability, and prioritizing this area for early and sustained action over the next five years are all key elements of programs that contribute to achieving the goal of the third WHO Global Patient Safety Challenge: Medication Without Harm, which is to reduce severe, avoidable medication-related harm. The WHO developed the 'Five moments for medication safety' patient engagement tool as part of this challenge, which focuses on five key moments where action by the patient and health care providers can reduce the

risk of medication-related harm: 'Starting a medication,' 'Taking a medication,' 'Adding a medication,' 'Reviewing a medication,' and 'Stopping the medication' (World Health Organization (WHO), 2019). Findings of the present study support the WHO challenge as it indicated a significant difference between patients' and nurses' outcomes regarding medication safety after application of the World Health Organization's five moments for medication Safety tool at the two evaluative times of intervention (pre and post) where ($P = < 0.001^*$). regarding the patients' outcomes, it was evident that there is improvement in the total patients' responses, the highest response was for the first stage (Starting medication); followed by the second stage (Taking medication). about nurses, findings illustrated that nurses' total mean score was improved post-intervention where the highest stage was the Fifth Stage (Stopping medication); followed by the Second Stage (Taking medication). The Five Moments for Medication Safety tool was valued by patients and should be used in practice, according to an exploratory descriptive study by (Subakumar et al. 2020) 83 percent of patients said the tool was very useful, and healthcare professionals need to play a role in engaging patients and helping them integrate the questions into consultations. (Mutair et al., 2021) asserted that for the medication usage process to progress into a safer practice, health care organizations must adopt a successful atmosphere. Inconsistent with these findings (Dijkstra et al., 2021) Develop a competency framework for nurses in pharmaceutical care and indicate that future research should focus on incorporating these capabilities in nurse education. According to (Park & Seomun, 2021), a systematic strategy and organizational effort are required to increase pharmaceutical safety in clinical practice. Nurses are the most crucial health care providers when it comes to drug safety and patient care. According to (Bengtsson et al., 2021), Organizational dangers were linked to educational standards and safety knowledge among healthcare providers; a lack of staff and the lack of time to act safely in the care are also perceived as safety hazards. (Magalhes et al., 2019) conducted an exploratory and ecological restorative approach study in three inpatient units of a teaching hospital in the south of Brazil to analyze the characteristics of the work organization performed by the nursing staff regarding medication administration procedures and their implications on the workload of these professionals and patients safety. Recommended It should be highlighted that the outcomes of this study are useful for evaluating drug administration procedure safety and nursing staff workload in the Brazilian healthcare setting. In the same vein, (Heczková & Bulava, 2018) reported that in terms of ensuring safe care, the extent of nursing education in medical management, the manner of nursing training, as well as the proportion of nursing specialists in the nursing team at specialized workplaces, all deserve much more attention. Medication-related activities have a critical role in attaining a good therapeutic result for patients in nursing practices. In this regard, one of the most common actions during nursing staff work shifts has been identified as the medication procedure, which influences the workload of these professionals (Magalhaes 2015, 2013). Medications are one part of a client's treatment regimen. Before administering drugs, nurses must ensure that they have the necessary skills and expertise to do it safely. When providing drugs, evidence-based best practices should be followed. Nurses must be aware of their limitations and seek assistance when required (Health Care Association of New Jersey, 2012).

The research of (Mulac et al., 2020) comprised 3372 reports from the Norwegian Incident Reporting System, which revealed that the majority of drug mistakes happened during administration (68 percent) and prescribing (38 percent) (24 percent). Dosing mistakes (38 percent), omissions (23 percent), and incorrect medications were the most common forms of errors (15 percent). They concluded that pharmaceutical mistakes were more prevalent during drug delivery. The most prevalent sort of mistake was dosing problems. Medication management necessitates assessment, planning, preparation, implementation, administration, evaluation, and documentation (College of Licensed Practical Nurses of Alberta, 2021). In one long-term rehabilitation center, (Studer et al., 2021) designed a program focused on enhancing patients' independence and self-care. Patients learned to manage their medications two to three months before discharge. Patients were first watched by a nurse as they prepared their medications, frequently using a pillbox, to assess their capacity to handle their medications on their own. According to the findings, measures such as patient counseling and dialogue with healthcare practitioners are highly suggested. Medication management, according to the Canadian Patient Safety Institute (CPSI), is "patient-centered care that optimizes safe, effective, and appropriate pharmacological therapy administered in conjunction with patients and their health care team(s)" (CPSI, 2016). Regarding the correlation between nurses' and patients' outcomes of the application of the World Health Organization's five moments for medication safety tool, our findings illustrated that there was a positive significant correlation between nurses' and patients' outcomes in the overall responses especially in the Second Stage (Taking medication), and in Fourth Stage (Reviewing medication) where ($p = < 0.001^*$). This finding could be attributed to the patient understanding, agreeing with, and actively participating in the medication regimen, thus optimizing each patient's medication experience and clinical outcomes. And post-training efforts of nurses to engage patients and families to actively participate with them in developing a complete and accurate medication system. Patients are asked to bring in all the medications they take, both prescribed and over the counter. These include non-oral medications such as injections, inhalers, ointments, and drops, as well as medications they only take occasionally, nurses within practice work with patients and their families to develop a complete and accurate medication safety practice. All of the patients in Mctier et al study on patient engagement in medication safety (Mctier et al., 2015b) had adjusted their medication management. This entailed starting new drugs and stopping existing ones. As a result, their ability to offer a comprehensive list of their current prescriptions and explain the purpose and adverse effects was lower than their preintervention knowledge. Comprehensive medication management, according to (McInnis et al., 2012), should comprise a customized care plan that meets the therapy's stated aims with adequate supervision and follow-up to evaluate actual patient results.

When patients are taught about their drugs and encouraged to ask questions and seek satisfactory answers, they may play a critical role in minimizing medication errors. Because patients are the final link in the chain, health care professionals should teach them how to avoid prescription mistakes and include them in quality improvement and safety programs (Satku, 2011). Regarding the effect size of the intervention, it was evident that the intervention of the World Health Organization's five moments for medication safety tool had a large effect size on the overall patients' outcome where effect size (0.873).

Meanwhile, this intervention had a medium effect size on nurses' outcomes where overall effect size (0.734). According to (Rebolledo et al., 2021), Patient education and drug safety, and effectiveness monitoring are critical approaches. A fundamental transformation in the way nurses now offer care is necessary to enhance the potential for patients to engage in drug management (Mctier et al., 2015b). In controversy with this finding (Alqenae et al., 2020) reclaimed that the great majority of the research in their evaluation were from developed countries (namely, the United States and the United Kingdom), with scant data from poor countries (e.g., Africa and South America, n = one study) showing low levels of patient support after discharge. Furthermore, except for the United States, countries with numerous research included in their analysis seldom had data across all of our outcome indicators. They also mentioned that a recent systematic review and meta-analysis of preventable harm in healthcare throughout the world found a pooled incidence of 6%, with pharmaceuticals being the leading cause of damage. Only two studies found that between 11 and 16 percent of discharged patients had avoidable adverse medication events. The WHO's Third Global Patient Safety Challenge: Medication Without Harm would benefit from more research on the prevalence and causes of avoidable adverse drug events.

Client education is a crucial part of medication delivery. Whether a nurse is providing medicine to a client at a hospital, a clinic, a client's home, or after they are released from the hospital, it is the nurse's job to ensure that the client gets all of the information they need concerning the drug(s) they are getting. The name of the medication, its purpose, expected effects, appearance, directions for taking the medication, correct storage, and any cautions such as side effects or unfavorable consequences due to abrupt discontinuation of medication should all be included in client education. Supplementing customer education with handouts and pamphlets may be beneficial. Ascertain that all client instruction, including the client's comprehension of the material delivered, is recorded in the client's file (Health Care Association of New Jersey, 2012). The present study findings showed that the outcomes of a multiple linear regression analysis designed to predict patients' response to the World Health Organization's Global Patient Safety Challenge "five moments for medication safety" (as the dependent outcome) from the (independent predictor) nurses' implementation of world Health Organization's Global Patient Safety Challenge "five moments for medication safety" shows that the overall significance of the model was high where $t = 31.184$, $P = < 0.001^*$. as well, the second stage (Taking medication) intervention is the strongest independent predictor of nurses where $\beta = .0167$ and $p\text{-value} = 0.001$. A quasi-experimental study conducted by (Hajibeglo et al., 2018) on a population consisting of nurses working at a hospital affiliated with Golestan University of Medical Sciences and a sample of 40 nurses at the emergency department of this hospital was selected through a census. A patient safety training program was designed and implemented for the selected emergency nurses in the form of a two-day workshop. Results showed that the rate of the majority of nurses (80.62%) scored low in terms of the frequency of medication errors; after the training, a significantly greater number of nurses scored low in terms of this index (90.31%; $P < 0.001$). The analyses showed the effectiveness of the patient safety training program for nurses and concluded that patient safety training can be effective on nurses' medication errors, retraining courses on safe medication administration are necessary regarding nurses' significant role in the prevention of medication errors. Beyond these findings, the Maryland Board of Nursing establishes guidelines for

pharmaceutical delivery. Medication administration is a nursing act, according to these requirements, which are contained in the nurse practice act. Patients should tell the nurse when a new medication is ordered, an old one is discontinued, or a new one is altered, before posting a new medication or discontinuing an old one. when a medication error has occurred, as well as when a new medication does not specify a clock time (Howell, 2014).

Conclusions

The findings of the present study support the World Health Organization's five moments for medication safety tools. It revealed significant differences between patients' and nurses' outcomes regarding medication safety at the two evaluative times of intervention (pre and post). there is improvement in the total patients' response, the highest response was for the first stage (Starting medication); followed by the second stage (Taking medication). Nurses' total mean score was improved post-intervention where the highest stage was the Fifth Stage (Stopping medication); followed by the Second Stage (Taking medication). there was a positive significant correlation between nurses' and patients' outcomes in the overall responses especially in the Second Stage (Taking medication), and in Fourth Stage (Reviewing medication). The large effect size on the overall patients' outcome. And, a medium effect size on nurses' outcomes. Also, the outcomes of a multiple linear regression show that the overall significance of the model was high. as well, the second stage (Taking medication) intervention is the strongest independent predictor of nurses.

Recommendations

Findings of the present study proposed that,

- The World Health Organization's Five Moments for Medication Safety tool had a positive impact on patient medication management and was recommended for use in various health care settings in Egypt.
- Designing policies based on the World Health Organization's Five Moments for Medication Safety to ensure the safe administration of medication, and making these policies available to all units and health care providers.
- A sufficient number of skilled nurses and pharmacists should be on hand at all times to ensure that patients in intensive care units receive the best possible treatment.
- Patients should be engaged by healthcare professionals (physicians, nurses, and pharmacists), who should assist them in incorporating the World Health Organization's Five Moments for Medication Safety tool into consultations.
- Medication administration includes a significant amount of client education. Whether medicine is given to a patient at a hospital, a clinic, a client's home, or when they are discharged from the hospital, it is the responsibility of the health care providers to ensure that the patient gets all of the information they need concerning the medication(s) they are getting.

- The name of the medicine, its purpose, expected effects, appearance, directions for taking the medication, correct storage, and any cautions such as side effects or unfavorable effects due to abrupt discontinuation of medication should all be included in client education.
- Client teaching can be supplemented by handouts and brochures; however, health care providers should ensure that all client teaching, including the client's grasp of the material delivered, is noted in the client's chart.
- Further research is recommended related to the application of the World Health Organization's Five Moments for Medication Safety tool at Egyptian different care settings.

Abbreviations

WHO: World Health Organization; IOM: Institute of Medicine; CPSI: Canadian Patient Safety Institute.

Declarations

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Authors' contributions

R.I. was responsible for the study's conceptualization and design. B.K. was in charge of questionnaire collecting and data analysis, while R.I. and B.K. were involved in the study design, statistical analysis, paper preparation, and manuscript review. The final paper was read and approved by both authors.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

All performed procedures in the study were approved and followed the ethical standards of the Egyptian Network of Research Ethics Committee(ENREC) and with the 1964 Helsinki Declaration. The privacy of the participants was well protected. Only patients who signed the informed consent document attended the interview and participate in the program. Patients' names and personal identification information were secured by researchers. This research was approved by the ethics committee of Alexandria's new

medical center. The district nurses were informed that their participation was voluntary and that they can withdraw from the study at any time.

Competing interests

The authors declare that they have no competing interests.

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Consent for publication

Not applicable

References

1. Abdulmutalib, I., & Safwat, A. (2020). Nursing Strategies for Reducing Medication Errors. *Egyptian Journal of Nursing and Health Sciences*, 1(1), 26–41. <https://doi.org/10.21608/ejnhs.2020.80266>
2. Alqenae, F. A., Steinke, D., & Keers, R. N. (2020). Prevalence and Nature of Medication Errors and Medication-Related Harm Following Discharge from Hospital to Community Settings: A Systematic Review. In *Drug Safety* (Vol. 43, Issue 6, pp. 517–537). <https://doi.org/10.1007/s40264-020-00918-3>
3. Aspden, P., Wolcott, J., & Bootman, L., (2007). Committee on Identifying and Preventing Medication Errors, & Board on Health Services. Preventing medication errors. National Academies Press.
4. Bengtsson, M., Ekedahl, A. B. I., & Sjöström, K. (2021). Errors linked to medication management in nursing homes: an interview study. *BMC Nursing*, 20(1), 1–10. <https://doi.org/10.1186/s12912-021-00587-2>
5. Canadian Patient Safety Institute (CPSI), "Medication Management," (2016), [http://www.patientsafetyinstitute.ca/en/Topic/Pages/Medication Management. aspx](http://www.patientsafetyinstitute.ca/en/Topic/Pages/Medication%20Management.aspx)
6. College of Licensed Practical Nurses of Alberta. (2021). Practice Guideline. Medication Management. *AJN, American Journal of Nursing*, 94(6), 9. <https://doi.org/10.1097/00000446-199406000-00003>
7. Dijkstra, N. E., De Baetselier, E., Dilles, T., Van Rompaey, B., da Cunha Batalha, L. M., Filov, I., Grøndahl, V. A., Heczkova, J., Helgesen, A. K., Jordan, S., Kafková, Z., Karnjus, I., Kolovos, P., Langer, G., Lillo-Crespo, M., Malara, A., Padyšáková, H., Prosen, M., Pusztai, D., ... Sino, C. G. M. (2021). Developing a competence framework for nurses in pharmaceutical care: A Delphi study. *Nurse Education Today*, 104(March). <https://doi.org/10.1016/j.nedt.2021.104926>
8. Donaldson, L. J., Kelley, E. T., Dhingra-Kumar, N., Kieny, M. P., & Sheikh, A. (2017). Medication Without Harm: WHO's Third Global Patient Safety Challenge. *The Lancet*, 389(10080), 1680–1681. [https://doi.org/10.1016/S0140-6736\(17\)31047-4](https://doi.org/10.1016/S0140-6736(17)31047-4)

9. Elden, N. M. K., & Ismail, A. (2015). The Importance of Medication Errors Reporting in Improving the Quality of Clinical Care Services. *Global Journal of Health Science*, 8(8), 243.
<https://doi.org/10.5539/gjhs.v8n8p243>
10. Hajibeglo, A., Tafreshi, M. Z., & Kamrani, F. (2018). The Impact of Training on Medication Error Rate of the Emergency Department in Hospitals Affiliated to Golestan University of Medical Sciences. *Advances in Nursing & Midwifery*, 28(1), 32–36. <https://doi.org/10.22037/anm.v27i3.15638>
11. Health Care Association of New Jersey. (2012). Medication management guideline. National Guideline Clearinghouse, 13. <https://www.guideline.gov/summaries/summary/39268/medication-management-guideline?q=medication+management>
12. Heczková, J., & Bulava, A. (2018). Nurses' knowledge of the medication management at intensive care units. *Pielęgniarstwo XXI Wieku / Nursing in the 21st Century*, 17(1), 18–23.
<https://doi.org/10.2478/pielxxiw-2018-0003>
13. Howell, M. (2014). Medication Technician Training Program Review. 1–18.
14. Huisman, B. A. A., Geijteman, E. C. T., Dees, M. K., Schonewille, N. N., Wieles, M., Van Zuylen, L., Szadek, K. M., & Van Der Heide, A. (2020a). Role of nurses in medication management at the end of life: a qualitative interview study. <https://doi.org/10.1186/s12904-020-00574-5>
15. Huisman, B. A. A., Geijteman, E. C. T., Dees, M. K., Schonewille, N. N., Wieles, M., Van Zuylen, L., Szadek, K. M., & Van Der Heide, A. (2020b). Role of nurses in medication management at the end of life: A qualitative interview study. In *BMC Palliative Care* (Vol. 19, Issue 1).
<https://doi.org/10.1186/s12904-020-00574-5>
16. Jha, A. K., Larizgoitia, I., Audera-Lopez, C., Prasopa-Plaizier, N., Waters, H., & Bates, D. W. (2013). The global burden of unsafe medical care: Analytic modeling of observational studies. *BMJ Quality and Safety*, 22(10), 809–815. <https://doi.org/10.1136/bmjqs-2012-001748>
17. Magalhães, A. M. M. de, Kreling, A., Chaves, E. H. B., Pasin, S. S., & Castilho, B. M. (2019). Medication administration - nursing workload and patient safety in clinical wards. *Revista Brasileira de Enfermagem*, 72(1), 183–189. <https://doi.org/10.1590/0034-7167-2018-0618>
18. Magalhães AMM, Dall'Agnol CM, Marck PB. (2015), Nursing workload and patient safety - a mixed-method study with an ecological restorative approach.;21(spe):146 – 54.
<http://dx.doi.org/10.1590/S0104-11692013000700019> <http://dx.doi.org/10.1590/S0104-11692013000700019>.
19. Magalhães AMM, Moura GMSS, Pasin SS, Funcke LB, Pardal BM, Kreling A. (2013). The medication process, workload and patient safety in inpatients units.;49(spe):43–50.:
<http://dx.doi.org/10.1590/S0080-623420150000700007> <http://dx.doi.org/10.1590/S0080-623420150000700007>
20. Manias, E., Kusljic, S., & Wu, A. (2020). Interventions to reduce medication errors in adult medical and surgical settings: a systematic review. *Therapeutic Advances in Drug Safety*, 11.
<https://doi.org/10.1177/2042098620968309>

21. McInnis, T., Strand, L., & Webb, C. E. (2012). Integrating Comprehensive Medication Management to Optimize Patient Outcomes. Resource Guide, June, A-26.
22. Mctier, L., Botti, M., & Duke, M. (2015a). Patient participation in medication safety during an acute care admission. *Health Expectations*, 18(5), 1744–1756. <https://doi.org/10.1111/hex.12167>
23. Mctier, L., Botti, M., & Duke, M. (2015b). Patient participation in medication safety during an acute care admission. In *Health Expectations* (Vol. 18, Issue 5, pp. 1744–1756). <https://doi.org/10.1111/hex.12167>
24. Mohaini, M. Al, Mutairi, A. Al, Rabaan, A. A., Awad, M., & Al-omari, A. (2021). and Improving Reporting Systems. 1–12.
25. Mohsin-Shaikh, S., Garfield, S., & Franklin, B. D. (2014). Patient involvement in medication safety in hospital: An exploratory study. *International Journal of Clinical Pharmacy*, 36(3), 657–666. <https://doi.org/10.1007/s11096-014-9951-8>
26. Mulac, A., Taxis, K., Hagesaether, E., & Gerd Granas, A. (2020). Severe and fatal medication errors in hospitals: Findings from the Norwegian Incident Reporting System. *European Journal of Hospital Pharmacy*. <https://doi.org/10.1136/ejhpharm-2020-002298>
27. Mutair, A. Al, Alhumaid, S., Shamsan, A., Zaidi, A. R. Z., Mohaini, M. Al, Al Mutairi, A., Rabaan, A. A., Awad, M., & Al-Omari, A. (2021). The Effective Strategies to Avoid Medication Errors and Improving Reporting Systems. *Medicines*, 8(9), 46. <https://doi.org/10.3390/medicines8090046>
28. Park, J., & Seomun, G. (2021). Development and Validation of the Medication Safety Competence Scale for Nurses. <https://doi.org/10.1177/0193945920969929>
29. Pham, J. C., Aswani, M. S., Rosen, M., Lee, H., Huddle, M., Weeks, K., & Pronovost, P. J. (2012). Reducing medical errors and adverse events. *Annual Review of Medicine*, 63, 447–463. <https://doi.org/10.1146/annurev-med-061410-121352>
30. Rebolledo, J. A., Rhodes, N. J., Valdes, A. M., Kulekowskis, A., & Kliethermes, M. A. (2021). Implementation of a clinical pharmacist-driven comprehensive medication management program in an outpatient wound healing center. *Journal of the American Pharmacists Association*, 2021. <https://doi.org/10.1016/j.japh.2021.10.021>
31. Salar, A., Kiani, F., & Rezaee, N. (2020). Preventing the medication errors in hospitals: A qualitative study. *International Journal of Africa Nursing Sciences*, 13, 100235. <https://doi.org/10.1016/j.ijans.2020.100235>
32. Satku, K. A. H. G. (2011). medication safety. practice guidelines&tools. In *Journal of Electron Microscopy* (Vol. 60, Issue 3). <https://doi.org/10.1093/jmicro/dfp040>
33. Shehata, Z. H. A., Sabri, N. A., & Elmelegy, A. A. (2016). Descriptive analysis of medication errors reported to the Egyptian national online reporting system during six months. *Journal of the American Medical Informatics Association*, 23(2), 366–374. <https://doi.org/10.1093/jamia/ocv096>
34. Studer, H., Boeni, F., Hersberger, K. E., & Lampert, M. L. (2021). Pharmaceutical Discharge Management: Implementation in Swiss Hospitals Compared to International Guidelines. *Pharmacy*, 9(1), 33. <https://doi.org/10.3390/pharmacy9010033>

35. Subakumar, K., Franklin, B. D., & Garfield, S. (2020). Analysis of the third WHO Global Safety Challenge Medication without Harm' patient-facing materials: Exploratory descriptive study. *European Journal of Hospital Pharmacy*, 1–15. <https://doi.org/10.1136/ejhpharm-2020-002434>
36. Thomas, B., Paudyal, V., MacLure, K., Pallivalapila, A., McLay, J., El Kassem, W., Al Hail, M., & Stewart, D. (2019). Medication errors in hospitals in the Middle East: a systematic review of prevalence, nature, severity and contributory factors. *European Journal of Clinical Pharmacology*, 75(9), 1269–1282. <https://doi.org/10.1007/s00228-019-02689-y>
37. WHO. (2019). 5 Moments for Medication Safety. World Health Organization.
38. Williams, D. J. P. (2007). Medication errors. *The Journal of the Royal College of Physicians of Edinburgh*, 37, 343–346.
39. World Health Organization. (2017). Global Patient Safety Challenge on Medication Safety: WHO Global Patient Safety Challenge. 1, 12. [file:///D:/Manual/Referências/Global Patient Safety Challenge on Medication Safety.pdf](file:///D:/Manual/Referências/Global%20Patient%20Safety%20Challenge%20on%20Medication%20Safety.pdf)
40. World Health Organization (WHO). (2019). Medication safety in transitions of care. In World Health Organization (p. 52).

Figures

5 Moments for Medication Safety

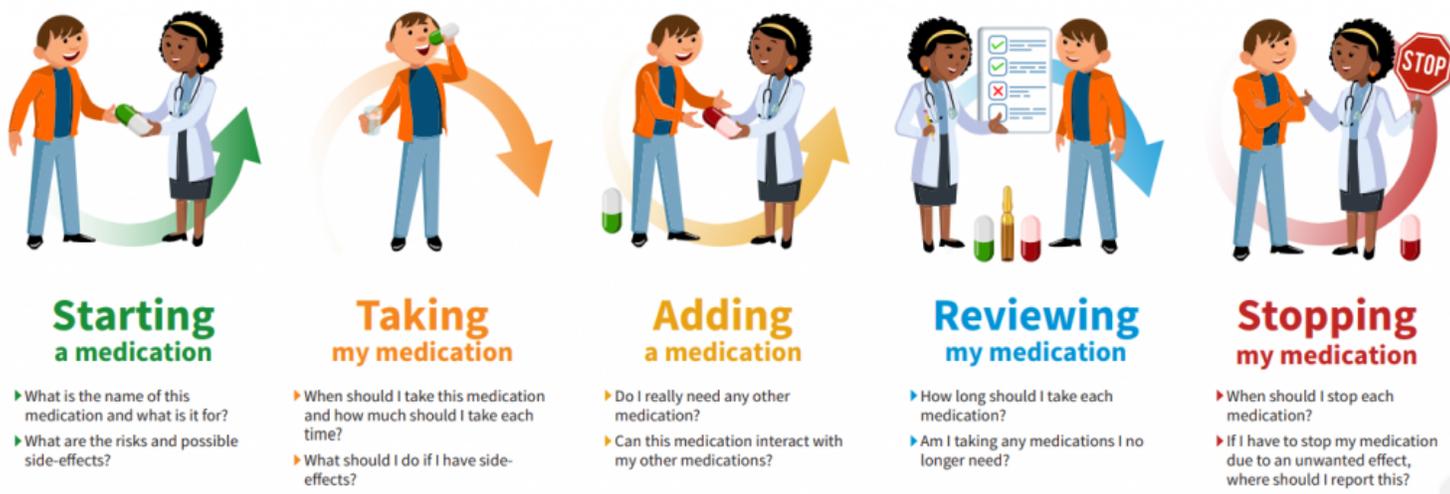


Figure 1

WHO. (2019). 5 Moments for Medication Safety. World Health Organization.