Traditional Health Education Versus Clinical Supervision Model: Effect on Pediatric Nurses' Adherence to High Alert Medication Safety

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Abstract: High alert medications have an increased potential to cause serious harm to patients if they are taken improperly, medication errors are a major cause of morbidity and mortality in health care system. **Purpose**: To examine the effect of traditional health education versus clinical supervision model on pediatric nurses' adherence to high alert medication safety. **Design**: A Quasi- experimental design was utilized. Sample: Convenient sample of 80 pediatric nurses. **Setting:** This study was conducted at post-natal and neonatal intensive care units in "Menoufia university hospital and Shebin el-kom teaching hospital". **Instruments:** Three instruments were used to collect data; Instrument one includes social characteristics of studied nurses. Instrument two, structured interview questionnaire sheets to assess nurses' knowledge about high alert medication safety. Instrument three, observational checklist for nurses' adherence to high alert medications safety. **Results**: Nurses who receive educational intervention based on a clinical supervision model have a higher level of adherence to high-alert medication safety (81.8%) than nurses who receive traditional health education (72%). There were highly statistically significant differences between nurses adherence in study group 2 and study group 1 on pre- and post-tests (P=0.001). **Conclusion**: Implementation of educational intervention guidelines based on clinical supervision model improved pediatric nurses' knowledge and adherence to high alert medication safety that could help to reduce medication error and decreased morbidity and mortality of children in ICUs. **Recommendations**: Continuous education programs should be designed and implemented for nurses about safe use of high alert medications to improve their knowledge and practice.

Keywords: Clinical supervision model, Health education, High alert medications, Nurses' adherence, Safety.

Introduction:

Medication errors are a serious and complex problem in clinical practice, especially with critically ill child whose suffer from very serious consequences (Escrivá et al,. 2019). Medication errors are ongoing problems among hospitalized patients and may occur during preparing,

prescribing, auditing, prescription, dispensing, administration, and monitoring. Medication administration errors (MAEs) are those errors that actually occurred and threats patient safety (Tariq RA, 2023).

Most medications have a wide margin of safety, few drugs have a high risk of causing patient injury or death if they are misapplied. These types of medications called high alert medications. So, Special precautions are needed to reduce their risk of errors. High alert medication errors account for over 80% of all medication-related deaths. Poor results occur even in cases where errors are not fatal. The Institute for Safe Medication Practices (ISMP) classified these medications as high-alert, meaning that extra precautions are needed to lower the possibility of patient harm (Geravandi et al., 2016).

The following categories of drugs have been identified by the American Pharmaceutical Association to determine high alert medication: benzodiazepines, chemotherapeutic agents, anticoagulants, opioids and their derivatives, cardiovascular medications,certain electrolytes like potassium chloride. These medications may not be more vulnerable to errors than other prescriptions. but their consequences can be more devastating. These medications can cause patients' sufferings and additional costs associated with their care, the most frequently adverse effects attributed to these drugs are bradycardia, psychosis, hypotension, hypoglycemia, and lethargy (Alves, et al., 2021).

The most frequent risk factors for high alert medications are: Inaccurate dilution methods, incorrectly written prescription orders, and confusion between intramuscular, intravenous, epidural preparations, misidentification of various dosage strengths of the same drug, unclear labeling about medication concentration and total volume, incorrect infusion rate, identical or nearly identical products, and comparable packaging (Abdullah, A. 2021).

Factors accompanied with health care professionals as inadequate drug knowledge, and experience insufficiency of therapeutic training, inadequate knowledge of the patient, inadequate comprehension of risk, physical and emotional health issues and overworked or fatigued health care professionals (Kane et al., 2017).

The primary administrators of medicine orders are nurses. the most frequent causes of adverse medication errors and events are nurses' lack of knowledge and skills, such as not knowing the patient's name, diagnosis, or the purpose of the medication, using the incorrect venous catheter, being unable to prepare the medication before administration, not knowing how to operate an infusion pump, and not being aware of the side effects of the medication. (Esfahani et al., 2016).

Consequently, high alert medication errors can be prevented obviously by improving nurses knowledge by ensuring that nurses are taught the basic principles of therapeutics and tested on their practical application and those prescribers are kept up to date (Kane et al., 2017).

Governmental organizations and healthcare professionals had focused their efforts on enhancing the standard and safety of patient treatment. The clinical supervision model is one clinical educational approach that helps increase the application of learning and reduces the theory-practice gap (Driscoll et al., 2019).

Ensuring the safety of high alert medications is currently seen as one of the most complex nurse roles in healthcare system. Nowadays, little is

known about what nurses are doing in practice to improve the safety of high alert medications. If nurse's roles are better understanding and well practicing, the health care organizations are able to anticipate and solve any errors that could arise in the future. Also, they achieve many benefits regarding the patient, nurses, and heath care outcomes (Ibrahim et al., 2019).

Clinical supervision is a "process of professional support and learning in which nurses are assisted in developing their practice through regular discussion time with knowledgeable and experienced colleague "(Franklin, N. 2013).

Clinical supervision model " support educators in their professional development through collaborative planning, observation, and feedback" This model has a number of recommended positive outcomes, such as enhancing patient safety when they are exposed to potential risks as a result of nursing and medical interventions, improving treatment efficacy and lowering medical errors, fostering staff members' evidence-based clinical skills in treatment, identifying and determining clinical standards, and closing the gap between current practice and standards. Through a system of positive feedback and processes (Mokhtari et al., 2022)

The clinical supervision model cycle has five stages. Each stage is an indispensable part of the cycle. Stage one: preconference; organize a meeting with the trainer prior to teaching to provide a plan for future observations.

Stage two: Perform an organized and non-judgmental observation and data collection.

Stage three: analyzing the data collected prior to the teaching conference.

Stage four: arrange a conference after the teaching to analyze the teaching performance, deliver supportive feedback and make plans for improvement for future teaching.

Stage five: Assess reflection on their performance (Gürsoy etal.,2013).

Ultimately, in order to lower the rate of medication errors among all healthcare professionals, particularly nurses, it is imperative to raise awareness about the dangers of high alert medications and develop efficient techniques to disseminate the most recent information about it. Determining how well an educational intervention improves nurses' understanding of high-alert drugs is the main goal of this study.

Significance of the study

According to the Centers for Disease Control and Prevention, drug errors account for 98,000 deaths a year in the US, making them the third most common cause of death (Makary & Daniel, 2016). As a result, if high alert medicines (HAMs) are used incorrectly, the patient may suffer serious health consequences or maybe death unexpectedly. HAMs have higher adverse event risks than regular medications (Salman et al., 2020).

The Egyptian National Online Reporting System indicates that 23% of medication errors in Egypt originated in intensive care units. Errors involving prescriptions accounted for 54% of medication errors, with monitoring (25%) and administration (16%) administration errors. Incorrect drug, dosage, and frequency were the most common errors (20%), followed by drug interactions, the majority of errors were potential (25%), preventable (11%), or innocuous (51%). The primary causes of MEs were inadequate prescriptions, unreliable

drug information sources, environmental variables, and ignorance. The primary suggestions for managing MEs were staff training, local ME reporting, and improving work environment (Shehata et al., 2016).

From this point, this current study was done to highlight on performance of nurses regarding high alert medications. Because children are in a vulnerable age to any errors, the pediatric nurse is the corner stone of saving those children.

Purpose of the study

The purpose of the current study was to examine the effect of traditional health education versus clinical supervision model on pediatric nurses' adherence to high alert medication safety.

Research Hypothesis

- Nurses who receive educational intervention based on clinical supervision model will have higher level of knowledge of high alert medication safety than who receive traditional health education.
- Nurses who receive educational intervention based on clinical supervision model will have higher level of adherence to high alert medication safety than who receive traditional health education.

Definition of variables

▪ Clinical supervision model

It describes process in which the knowledge and skills of trainees are developed in practice (Pajek, 2003). In this study, Clinical supervision will involve the researcher translating observation, analysis, and planning for nursing management of high alert medication as supervisory task. The researcher's observational checklist (Instrument 3) will be used to evaluate it.

▪ Traditional health education

In this study, it will include two lectures about high alert medications safety and will be done in groups; nurses will be provided with booklet about high alert medications safety.

▪ Nurses' Adherence

In this study, it is the accuracy of nurses' utilization of guidelines for high alert medication storage, distribution, description, preparation, clinical monitoring, patient education and administration. It will be measured by the observational checklist developed by the researcher (Instrument three).

▪ High Alert Medications

These are medications that have an increased potential to cause serious harm to patients if they are taken improperly. (Institute for Safe Medication Practices, US [ISMP], 2017).In this study high alert medications include Adrenergic agonists, IV (e.g. adrenaline, noradrenaline), Inotropic medications, IV (e.g. dobutamine, dopamine), Magnesium Sulphate Injections, Potassium salt injections.

Methods

Research design

A Quasi- experimental design was utilized for this study (no equivalent group design).

Research Settings

This study will be conducted at neonatal and postnatal intensive care Unit in Menoufia University Hospital and Shebin Elkom teaching hospital.

Sampling

A convenience sample of 80 nurses from two selected hospital. Shebin Elkom Teaching hospital there were 25 pediatric nurses (10 nurses at NICU and 15 nurses at PICU) (study group 1) they received traditional health education. While In Menoufia University Hospital there were 55 nurses (30 nurses at NICU and 25 nurses at PICU) (study group 2) they received health education based on clinical supervision model. Inclusion criteria all nurses who provide care for children from birth to sixteen years old

Data collection instruments

The data for the study is collected via three instruments.

▪ **Instrument one: Social characteristics of studied nurses.**

It included questions about age, unit/department, sex, years of nursing experiences and qualification, and number of patients.

▪ **Instrument two: Structured interview questionnaire sheet.**

It was used to assess nurse's knowledge about high alert medication. It was developed by the researcher and guided by Sallam, (2016) and Youssef, (2018). It contained 33 questions about high alert medication Types (adrenaline, nor adrenaline, potassium chloride, dopamine, douptamine, magnesium), definition, administration, prescription, monitoring, storage, dispensing, causes of errors, and strategies for prevention of these errors, and patient education were included.

Scoring system:

Each right answer took one mark. Scores less than 70% considered as unsatisfactory, 70-85% considered

satisfactory. In order to determine the consistency of this instrument. The current study examined internal consistency and determined if an instrument's items measure the same variable by Cronbach's alpha test, which measures reliability and revealed a satisfactory level was (0.842).

▪ **Instrument three: An observational checklist for nurses' adherence to high alert medications safety.**

It developed by the researcher after a review of literature (Sallam, 2016) and Guideline on safe use of high alert medication, 2011 . it will include storage, distribution, description, preparation, clinical monitoring, patient education and administration of high alert medications.

Scoring system:

Right complete practice took two marks. Incomplete practice took one mark and wrong practice /not done took zero mark. Scores less than 70% practices considered not done, 70- 85% practices considered incomplete adherence, while If score ≥85% considered complete adherence to high alert medication.. The current study assessed internal consistency and determined if an instrument's items measure the same variable. Cronbach's alpha, a test of reliability, revealed a satisfactory level reflected (0.762).

Validity

For validity assurance, the instruments were provided to a jury of three professors of pediatric nursing. All necessary modifications were done (e.g .repetitions were avoided).

Ethical Consideration

The Ethics Research Committee of the Faculty of Nursing approved this study. an initial interview was done to inform nurses about the purpose, benefits of the study and to ensure that their participation was voluntary and they could withdraw from the study at any time. The researched pediatric nurses provided written consent indicating that they were willing to participate in the study.

Nurses were informed that the study was anonymous and their responses were confidential.

Pilot study

It was done on eight nurses in order to evaluate the study instrument's applicability, clarity, and relevance as well as identify barriers before data collection even began. Estimating the duration of time required to complete the questionnaire. to ensure the stability of the outcome

Procedure

An official permission to perform the study was obtained from the manager of each setting after submitting an official letter from the dean of the faculty of nursing clarifying the purpose of the study and the method of data collection.

Data collection was started on April 2020 and lasted until April 2021. Researcher started to collect data from pediatric nurses in Shebin-Elkom Teaching hospital. At the beginning of the study, the researcher introduced herself and explained the purpose and nature of the study to nurses.

For study group (1) (Traditional health education)

Pediatric nurses in Shebin-Elkom teaching hospital were interviewed to assess their knowledge about high alert medications safety (group 1). An observational checklist for their performance regarding administration of high alert medication was used to assess their adherence to high alert medication (pre test).

Traditional health education program was provided to pediatric nurses in Shebin-Elkom teaching hospital. Nurses divided into 5 groups Each group contained 3 nurses, each nurse was received 2 sessions about high alert medications safety (definition, types, uses, side effects, proper administration, prescription, monitoring, storage, dispensing, causes of errors, and strategies for prevention of these errors). Nurses were provided with booklet and mobile based material about high alert medications safety. Each health education session lasted for 45 min. Sessions were held twice weekly (Monday and Wednesday) during morning shift.

- **First Session**: The researcher explained theoretical knowledge about high alert medication (definition, types, uses, side effects, proper administration, prescription, monitoring, storage, dispensing, causes of errors, and strategies for prevention of these errors).
- **Second Session** included practical procedure of proper utilization of high alert medications (proper administration, prescription, monitoring, storage, dispensing, causes of errors, and strategies for prevention of these errors).
- Posttest was done after implementation of traditional health education program to assess knowledge of nurses and practice. A follow up was conducted three months following the application of traditional health education program.

For study group (2) (Clinical supervision model)

- **Stage 1**: Preconference; organize a meeting with the nurses prior to teaching to provide a plan for future observations.
- **Stage 2**: Perform an organized data collection and non-judgmental observation and by assess knowledge in relation to high alert medications safety (definition, types, uses, side effects, proper administration, prescription, monitoring, storage, dispensing, causes of errors, and strategies for prevention of these errors) this assessment guided by clinical supervision model. Nurses adherence to high alert medications safety was assessed by observational checklist for their performance regarding storage, distribution, description, preparation, clinical monitoring, patient education and administration. (pre test).
- **Stage three**: Analyzing the data collected preceding to the teaching conference, after assessment the researcher analyze the date and applied the clinical supervision model
- **Stage four**: organize a conference for the teaching to analyze the performance, deliver supportive feedback and make plans for improvement for future teaching sessions.
- In teaching session, the number of nurses who had a lack of knowledge about basic knowledge of HAM was identified, nurses who have improper practices related to HAM was identified.
- The education and training provided was based on the weak points and deficit knowledge and practices.
- A educational and training session was held for the participants in groups of 3 to 5 nurses, usually based

on nurses have the same adequate knowledge and practices .
- A educational and training was provided during session including definition, types, side effects, standard precautions, the impact of nursing care on these children, an awareness of the clinical supervision model. The duration of the session (from 30 min to 1 hours) for three days per week.
- The nurses redemonstrated the recommended guidelines care plan for HAM based on the checklist. The researcher observes their performance and answered their questions.
- **Stage five**: Assess reflection on their performance, post-test was done one after implementation of clinical supervision model.
- A follow up was conducted three months following the application of clinical supervision.

Statistical Analysis

Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 23. Quantitative data were presented by mean (X) and standard deviation (SD). It was analyzed using student t- test for comparison between two means and LSD: post hoc test for comparison between three means . Qualitative data was analyzed by chi-square ($\chi2$) test. And presented in the form of frequency distribution tables, number and percentage. Level of significance was set as P value <0.05 for all significant tests.

N.B: The total sample size was used for data analysis and there were no missing data or cases.

Results

Table1: displays social characteristics of the two studied nurses' group. It was obvious from this table that more than

half of nurses in the two study groups don't have previous training courses in administration of high alert medications. In addition, there aren't unit manuals available for regulations administration of high alert medications for the two study groups.

Table 2: displays knowledge of nurses about high alert medication on pre, post and follow-up tests between the two study groups. The findings revealed that on posttest nurses in groups 2 and 1 had more satisfactory knowledge about definition of high alert medication (76.4% vs 68.0%), indication (63.3.5% vs 48.0%). For this reason, there were statistically significant differences between nurses' knowledge about high alert medication in the two study groups (P =.05).

Table 3: displays mean and standard deviations of knowledge of nurses about high alert medication required right medical prescription sheet on pre, post and follow-up tests between the two study groups. Nurses had the highest level of mean scores of knowledges about high alert medication required right medical prescription sheet on post and follow-up tests between the two study groups. Therefore, there were highly statistical significant differences between levels of nurses knowledge on pre, post and follow up tests (P=0.001).

Table 4: displays mean and standard deviations of knowledge of nurses about high alert medication administration on pre, post and follow-up tests between the two study groups. Nurses had the highest level of mean scores of knowledges about high alert medication administration on post and follow-up tests between the two study groups. Therefore, there were very highly statistically significant differences between levels of nurses' knowledge on pre, post and follow up tests (P<0.001).

Table 5: displays mean and standard deviations of knowledge of nurses about high alert medication monitoring on pre, post and follow-up tests between the two study groups. Nurses had the highest level of mean scores of knowledge about high alert medication monitoring on post and follow-up tests between the two study groups. Therefore, there were very highly statistically significant differences between levels of nurses knowledge on pre, post and follow up tests (P<0.0001).

Table6 displays mean and standard deviations of knowledge of nurses about high alert medication storage on pre, post and follow-up tests between the two study groups. Nurses had the highest level of mean scores of knowledges about high alert medication storage on post and follow-up tests between the two study groups. Therefore, there were highly statistically significant differences between levels of nurses' knowledge in the study group 2 than the study group 1 on pre, post and follow up tests (P=0.0001).

Figure 1: shows mean of total knowledge of nurses about high alert medication on safety pre, post and follow-up tests between the two study groups. Nurses who receive educational intervention based on clinical supervision model had high level of knowledge to high alert medication safety on posttest than pretest. As indicated in the figure, mean scores of total nurses' knowledge on pre intervention were 18.53±3.42 compared to 29.37±3.89and 28.35±4.37on post and follow-up tests for the study group 2, versus on pre intervention were 20.44±3.54compared to 25.00±3.53and 24.20±3.54on post and follow-up tests for the study group 1 Therefore, there were highly statistically significant differences

between levels of nurse's knowledge on pre, post and follow up tests (P=0.001).

Table 7: displays level of knowledge of nurses about high alert medication safety on pre and posttests between the two study groups. Nurses who receive educational intervention based on clinical supervision model (group 2) had high level of knowledge to high alert medication safety on posttest than pretest. Therefore, there were highly statistically significant differences between levels of nurses' knowledge in the study group 2 than the study group 1 on pre and posttests (P=0.001).

Table 8: displays observation of nurses for their adherence to high alert medication storage on pre, post and follow-up tests between the two study groups. The findings revealed that on posttest nurses in groups 2 and 1 had more complete adherence to high alert medication storage place labeling (70.9% vs 84.0%), stock separation (70.9% vs 52%) and checking the temperature of the refrigerator (63.6% vs 52%). For this reason, there were statistically significant differences between nurse's adherence to high alert medication storage in the two study groups (P <0.05).

Table 9: displays observation of nurses for their adherence to right high alert medication prescription sheet on pre, post and follow-up tests between the two study groups. The findings revealed that on posttest nurses in groups 2 and 1 had more complete adherence to Required information in the medical prescription sheet (70.9% vs 68.0%) and the order to stop the medication (72.8.0% vs 68%). For this reason, there were statistically

significant differences between nurses adherence to right high alert medication prescription sheet in the two study groups (P <0.05).

Table 10: displays observation of nurses for their adherence to high alert medication preparation on pre, post and follow-up tests between the two study groups. The findings revealed that on posttest nurses in groups 2 and 1 had more complete adherence to high alert medication preparation in separate place (80.0% vs 68.0%) , Role of the nurse pre and during preparation (74.5% vs 72.0%) and labeling after preparation (82.2% vs 76.0%). For this reason, there were statistically significant differences between nurse's adherence to high alert medication preparation in the two study groups (P <0.05).

Table 11: displays mean of total observation of nurses' adherence to high alert medication safety on pre, post and follow-up tests between the two study groups. Nurses who receive educational intervention based on clinical supervision model had high level of adherence to high alert medication safety on posttest than pretest.

Table 12: displays level of adherence of nurses about high alert medication safety on pre and post tests between the two study groups. Nurses who receive educational intervention based on clinical supervision model (group 2) had high level of adherence to high alert medication safety on posttest than pretest. Therefore, there were statistically significant differences between levels of nurse's adherence in the study group 2 than the study group 1 on pre and posttests (P=0.05).

Traditional Health Education Versus Clinical Supervision Model: Effect on Pediatric Nurses' Adherence to High Alert Medication Safety

Table 1: Social Characteristics of The Two Studied Nurses Group.

		Group (2)		Group (1)	
		No.	%	No.	%
Unit	PICU	25	45.5%	15	60.0%
	NICU	30	54.5%	10	40.0%
Qualifications	Diplome	15	27.3%	9	36.0%
	Institute	28	50.9%	12	48.0%
	High qualified	12	21.8%	4	16.0%
Sex	Male	6	10.9%	0	0.0%
	Female	49	89.1%	25	100.0%
Age	20-30	34	61.8%	4	16.0%
	>30-40	17	30.9%	6	24.0%
	>40	4	7.3%	15	60.0%
Experience	Less than 1 year	12	21.8%	0	0.0%
	From 1-3 years	10	18.2%	0	0.0%
	More than 3 years	12	21.8%	18	72.0%
	> 10 years	21	38.2%	7	28.0%
Number of patients for each nurse	Two	34	61.8%	4	16.0%
	Three	17	30.9%	15	60.0%
	More than 3	4	7.3%	6	24.0%
Do you have training courses for high alert medications	Yes	4	7.3%	10	40.0%
	No	51	92.7%	15	60.0%

Table 2: Knowledge of Nurses About High Alert Medication on Pre, Post and Follow-up Tests Between the Two Study Groups

High alert medication		Group 2						Group 1						X2 P value
		Pre		Post		Follow up		Pre		Post		Follow up		
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Definition	un satisfactory	20	36.4%	13	23.6%	15	27.3%	10	40.0%	8	32%	8	32%	P1=0.002** P2=0.305 ns P3=0.041*
	Satisfactory	35	63.6%	42	76.4%	40	72.7%	15	60.0%	17	68%	17	68%	
Indications	un satisfactory	37	67.3%	20	36.4%	22	40%	14	56.0%	13	52%	13	52%	P1=0.001** P2=0.036* P3=0.004**
	Satisfactory	18	32.7%	35	63.6%	33	60%	11	44.0%	12	48%	12	48%	
Verification of administration in emergency	un satisfactory	33	60.0%	17	30.9%	17	30.9%	15	60.0%	6	24%	6	24%	P1=0.003** P2=----- ns P3=0.036*
	Satisfactory	22	40.0%	38	69.1%	38	69.1%	10	40.0%	19	76%	19	76%	
Nurses' role	un satisfactory	23	41.8%	14	25.5%	17	30.9%	8	32.0%	8	32.0%	8	32.0%	P1=0.011* P2=0.234 ns P3=0.625 ns
	Satisfactory	32	58.2%	41	74.5%	38	69.1%	17	68.0%	17	68.0%	17	68.0%	
Side effects	un satisfactory	29	52.7%	18	32.7%	19	34.5%	10	40.0%	8	32%	8	32%	P1=0.033* P2=0.049* P3=0.841 ns
	satisfactory	26	47.3%	37	67.3%	36	65.5%	15	60.0%	17	68%	17	68%	
Precautions	un satisfactory	38	69.1%	19	34.5%	21	38.2%	10	40.0%	8	32%	8	32%	P1=0.002** P2=0.004* P3=0.071 ns
	satisfactory	17	30.9%	36	65.5%	34	61.8%	15	60.0%	17	68%	17	68%	

P1: pre *vs* post in group 2   P2:pre2 *vs* pre1   P3: post 2 *vs* post1
NB: * si gnificant.   ** Highly significant.   ns non-significant

Table 3: Mean and Standard Deviations of Knowledge of Nurses About High Alert Medication Required Right Medical Prescription Sheet on Pre, Post and Follow-up Tests Between the Two Study Groups

Groups	Pre		Post		Follow up		LSD test Significance
	Mean	**S .Deviation**	**Mean**	**S .Deviation**	**Mean**	**S. Deviation**	
Group2 (n=55)	**3.13**	**1.49**	**4.78**	**1.44**	**4.54**	**1.48**	P1=0.001**
Group1 (n=25)	**3.52**	**1.29**	**4.46**	**1.03**	**4.31**	**1.35**	P2=0.042* P3=0.051*

LSD: post hoc test   P1: pre vs post in group 2   P2:pre2 vs pre1   P3:post 2 vs post1
NB: * significant.   ** Highly significant.

Table 4: Mean and Standard Deviations of Knowledge of Nurses About High Alert Medication Administration on Pre, Post and Follow-up Tests Between The Two Study Groups

Groups	Pre		Post		Follow up		LSD test Significance
	Mean	**S . Deviation**	**Mean**	**S . Deviation**	**Mean**	**S .Deviation**	
Group2 (n=55)	**3.13**	**1.35**	**4.30**	**1.64**	**4.09**	**1.66**	P1<0.001**
Group1 (n=25)	**3.44**	**1.76**	**4.46**	**1.03**	**4.31**	**1.35**	P2=0.011* P3=0.008**

LSD: post hoc test   P1: pre vs post in group 2   P2:pre2 vs pre1   P3:post 2 vs post1
NB: * significant.   ** Highly significant.

Table 5: Mean and Standard Deviations of Knowledge of Nurses About High Alert Medication Monitoring on Pre, Post and Follow-up Tests Between the Two Study Groups

Groups	Pre		Post		follow up		LSD test Significance
	Mean	**S .Deviation**	**Mean**	**S .Deviation**	**Mean**	**S .Deviation**	
Group2 (n=55)	**3.64**	**.82**	**5.59**	**1.04**	**5.41**	**1.22**	P1<0.001**
Group1 (n=25)	**4.16**	**1.57**	**5.15**	**1.19**	**5.15**	**1.19**	P2=0.028* P3=0.006**

LSD: post hoc test   P1: pre vs post in group 2   P2:pre2 vs pre1   P3: post 2 vs post1
NB: * significant.   ** Highly significant

Table 4: Mean and Standard Deviations of Knowledge of Nurses About High Alert Medication Storage on Pre, Post and Follow-up Tests Between the Two Study Groups

Groups	Pre		Post		follow up		LSD test Significance
	Mean	S .Deviation	Mean	S .Deviation	Mean	S .Deviation	
Group2 (n=55)	1.15	0.52	1.67	.48	1.63	0.56	P1=0.001**
Group1 (n=25)	1.32	0.63	1.54	0.65	1.54	0.65	P2=0.030* P3=0.004**

LSD: post hoc test   P1: pre *vs* post in group 2   P2:pre2 *vs* pre1   P3:post 2 *vs post*1
NB: * significant.   ** Highly significant.

Figure 1: Mean of Total Knowledge of Nurses About High Alert Medication Safety on Pre, Post and Follow-up Tests Between The Two Study Groups
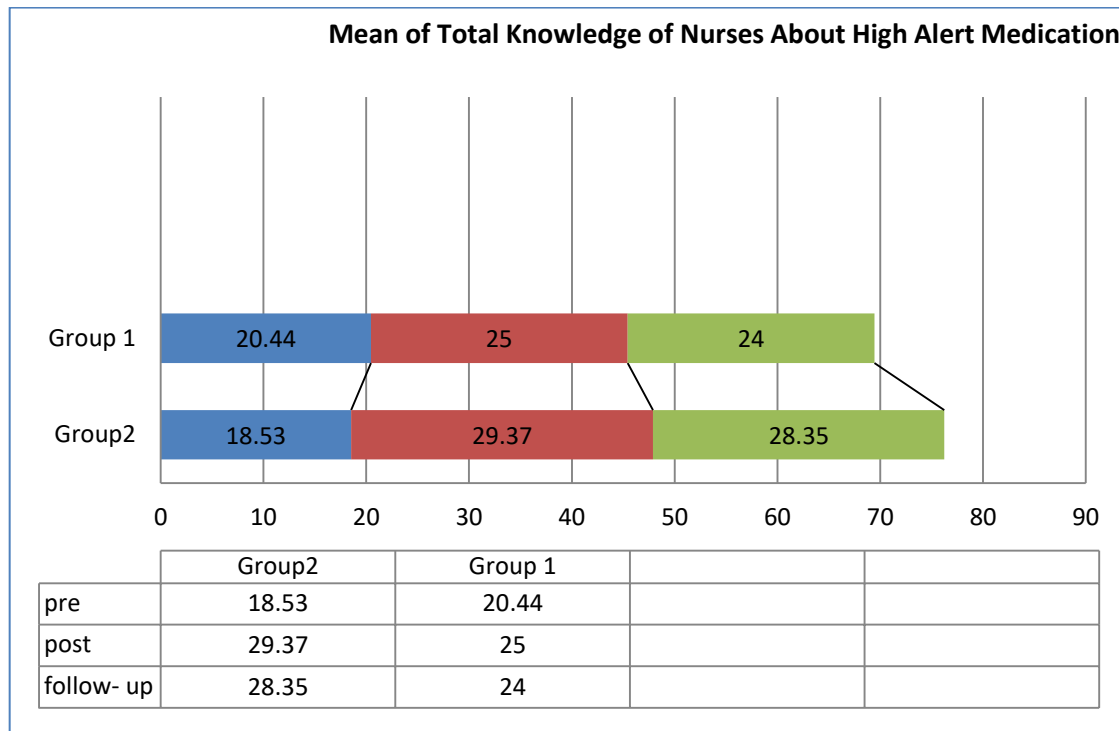

Mean of Total Knowledge of Nurses About High Alert Medication

	Group2	Group 1		
pre	18.53	20.44		
post	29.37	25		
follow- up	28.35	24		

Table 7 : level of Knowledge of Nurses About High Alert Medication Safety on Pre and Post Tests Between the Two Study Groups

Level of knowledge	Group2(n=55)				Group 1(n=25)				LSD test Significance
	Pre		post		Pre		Post		
	No (N=55)	%	No (N=55)	%	No (N=25)	%	No (N=25)	%	
Satisfactory knowledge	22	40%	49	89.09%	15	60%	21	84%	P1=0.001**
UnSatisfactory knowledge	33	60%	6	10.9%	10	40%	4	16%	P2=0.044* P3=0.056*

LSD: post hoc test   P1: pre *vs* post in group 2   P2:pre2 *vs* pre1   P3:post 2 *vs* : * significant.   **
Highly significant.

Table 8: Observation of Nurses for Their Adherence to High Alert Medication Storage on Pre, Post and Follow-up Tests Between the Two Study Groups

Adherence to high alert medication storage		Group 2						Group 1						X2 P value
		Pre		Post		Follow up		Pre		Post		Follow up		
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Medication place labeling	Not done	55	100.0%	8	14.5%	7	12.7%	25	100%	4	16%	5	19%	P1<0.001**
	Incomplete	0	0.0%	8	14.5%	10	18.1%	0	0%	0	0%	0	0%	P2=----- ns
	Complete	0	0.0%	39	70.9%	38	69.1%	0	0%	21	84%	20	80%	P3=0.048*
Checking the validity date	Not done	7	12.7%	0	0.0%	2	3.0%	0	0%	0	0%	0	0%	P1=0.001**
	Incomplete	10	18.1%	0	0.0%	0	0.0%	25	100%	8	32%	9	36%	P2=0.002**
	Complete	38	69.1%	55	100.0%	53	96.4%	0	0%	17	68%	16	64%	P3=0.019*
Medication labeling and sign	Not done	55	100.0%	4	7.3%	4	7.3%	20	80%	0	0%	0	0%	P1=0.012*
	Incomplete	0	0.0%	26	47.3%	28	50.9%	5	20%	0	0%	2	8%	P2=------- ns
	Complete	0	0.0%	25	45.5%	23	41.8%	0	0%	25	100%	23	92%	P3=0.020*
Stock separation	Not done	14	25.5%	8	14.5%	8	14.5%	25	100%	0	0%	0	0%	P1<0.001**
	Incomplete	25	45.5%	8	14.5%	7	12.7%	0	0%	12	48%	13	52%	P2=0.026*
	Complete	16	29.1%	39	70.9%	40	72.7%	0	0%	13	52%	12	48%	P3=0.032*
Checking the temperature of the refrigerator daily	Not done	51	92.7%	4	7.3%	4	7.3%	10	40%	4	16%	4	16%	P1<0.001**
	Incomplete	4	7.3%	16	29.1%	15	27.3%	11	44%	8	32.0%	9	33.0%	P2=0.026*
	Complete	0	0.0%	35	63.6%	36	65.5%	4	16%	13	52%	12	51%	P3=0.050*

Availability of personnel for checking temperature daily	Not done	55	100.0%	6	10.9%	6	10.9%	15	60%	4	16%	5	20%	P1=0.007*
	Incomplete	0	0.0%	30	54.5%	32	58.2%	10	40%	20	80%	19	76%	P2=----- ns
	Complete	0	0.0%	19	34.5%	17	30.9%	0	0%	1	4%	1	4%	P3=0.016*

P1: pre vs post in group 2　　P2:pre2 vs pre1　　P3: post 2 vs post1
NB: * significant.　　** Highly significant.　　　　ns non-significant

Table 9: Observation of Nurses for Their Adherence to Right High Alert Medication Prescription Sheet on Pre, Post and Follow-up Tests Between the Two Study Groups

Adherence to high alert Medication Prescription		Group 2						Group 1						X2 P value
		Pre		Post		Follow up		Pre		Post		Follow up		
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
The prescription is clear and readable	Not done	10	18.2%	6	10.9%	7	12.7%	13	52%	2	8%	3	12%	P1=0.056 *
	Incomplete	29	52.7%	21	38.2%	27	49.1%	6	24%	11	44%	12	48%	P2=0.067 ns
	Complete	16	29.1%	28	50.9%	21	38.2%	6	24%	12	48%	10	40%	P3=0.057 *
Utilization of abbreviations	Not done	4	7.3%	2	3.6%	3	5.5%	10	40%	4	16%	7	28%	P1=0.040 *
	Incomplete	31	56.4%	20	36.4%	30	54.5%	7	28%	6	24%	5	32%	P2=0.051 *
	Complete	20	36.4%	33	63.4%	22	40.0%	8	32%	15	60%	10	40%	P3=0.045 *
Following oral orders in emergency Order renewal prescription to continue	Not done	37	67.3%	4	7.3%	7	12.7%	0	0%	0	0%	0	0%	P1=0.001**
	Incomplete	18	32.7%	10	18.8%	18	32.7%	10	40%	7	28%	8	32%	P2<0.001**
	Complete	0	0.0%	41	74.5%	30	54.5%	15	60%	18	72%	17	68%	P3=0.028*
Required information in the medical prescription sheet	Not done	21	38.2%	8	14.5%	8	14.5%	21	84%	4	16%	5	20%	P1<0.001**
	Incomplete	22	40.0%	8	14.5%	7	12.7%	4	16%	4	16%	5	20%	P2=0.039*
	Complete	12	21.8%	39	70.9%	40	72.7%	0	0%	17	68%	15	60%	P3=0.018*
Doctor orders in emergency cases	Not done	12	21.8%	4	7.3%	6	10.9%	9	36%	5	20%	6	24%	P1=0.046*
	Incomplete	33	60.0%	16	29.0%	31	56.4%	9	32%	5	20%	6	24%	P2=0.049*
	Complete	10	18.2%	35	65.4%	18	32.7%	7	28%	15	60%	13	52%	P3=0.039*
The order to stop the medication	Not done	14	25.5%	5	9.4%	12	32.7%	9	36%	3	12%	4	16%	P1<0.001**
	Incomplete	25	45.5%	10	21.8%	10	21.8%	11	44%	5	20%	5	20%	P2=0.036*
	Complete	16	29.1%	40	72.8%	33	60.0%	4	16%	17	68%	16	64%	P3=0.027*

P1: pre vs post in group 2　　P2:pre2 vs pre1　　P3: post 2 vs post1
NB: * significant.　　** Highly significant.　　　　ns non-significa

*Traditional Health Education Versus Clinical Supervision Model: Effect on
Pediatric Nurses' Adherence to High Alert Medication Safety*

**Table 10: Observation of Nurses for Their Adherence to High Alert medication Preparation on Pre,
Post and Follow-up Tests Between the Two Study Groups.**

Adherence to high alert medication preparation		Group 2						Group 1						X2 P value
		Pre		Post		Follow up		Pre		Post		Follow up		
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Responsible personnel for the preparation	Not done	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	P1= ---- ns
	Incomplete	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	P2= --- ns
	Complete	55	100.0%	55	100.0%	55	100%	25	100%	25	100%	25	100%	P3= ---- ns
Preparation in separate place	Not done	46	83.6%	11	20.0%	16	29.0%	14	56.0%	6	24.0%	5	20.0%	P1<0.001**
	Incomplete	9	16.4%	0	0%	0	0%	7	28.0%	2	8.0%	2	8.0%	P2<0.001**
	Complete	0	0%	44	80.0%	39	70.9%	0	0%	17	68%	18	72%	P3=0.052 *
Role of the nurse pre and during preparation	Not done	32	58.2%	7	12.7%	9	16.4%	0	0%	0	0%	0	0%	P1<0.001**
	Incomplete	21	38.2%	7	12.7%	13	23.6%	12	48.0%	7	28.0%	11	44.0%	P2<0.001**
	Complete	2	3.6%	41	74.5%	33	60.0%	13	52.0%	18	72.0%	14	56.0%	P3=0.028*
Labeling after preparation	Not done	12	21.8%	5	9.0%	12	21.8%	0	0%	0	0%	0	0%	P1=0.010*
	Incomplete	30	54.5%	5	9.0%	13	23.6%	12	48.0%	6	24.0%	11	44.0%	P2=0.006*
	Complete	13	23.6%	45	82.2%	30	54.5%	13	52.0%	19	76.0%	14	56.0%	P3=0.0442 *
Return doses when stopped	Not done	23	41.8%	2	0%	0	0.0%	11	44.0%	0	0%	2	8.0%	P1<0.001**
	Incomplete	24	43.6%	12	21.8%	22	40.0%	10	40.0%	7	28.0%	8	32.0%	P2=0.0359 *
	Complete	8	14.5%	41	74.5%	33	60.0%	4	16.0%	18	72.0%	15	60.0%	P3=0.028*

P1: pre *vs* post in group 2   P2: pre2 *vs* pre1   P3: post 2 *vs* post1
NB: * significant.   ** Highly significant.   ns non-significant.

**Table 11: Mean of Total Observation of Nurses Adherence to High Alert Medication safety on Pre,
Post and Follow-up Tests Between the Two Study Groups.**

Items	Group 2	Group 1	t test	P value
Pre	24.44±2.46	29.48±7.09	4.72	P2=0.087ns
Post	49.37±3.21	41.46±3.57	2.4	P=0.019*
Follow up	48.87±3.45	40.46±3.57	1.69	P=0.095ns

Student t test   P1: pre vs post in group 2   P2:pre2 vs pre1   P3: post 2 vs post1
NB: * significant.   ns non-significant.

Table 12: level of Adherence of Nurses About High Alert Medication Safety on Pre and Post Tests Between the Two Study Groups

Level of adherence	Group 2(n=55)				Group 1(n=25)				X^2 P value
	pre		post		Pre		Post		
	No (N=55)	%	No (N=55)	%	No (N=25)	%	No (N=25)	%	
Not done	19	34.5%	2	3.6%	9	36.0%	5	20.0%	P1=0.001**
Incomplete	24	43.6%	8	14.6%	10	40.0%	2	8.0%	P2=0.034*
Complete	12	21.8%	45	81.8%	6	24.0%	18	72.0%	P3=0.004*

X2= chi square test   P1: pre vs post in group 2   P2:pre2 vs pre1   P3:post 2 vs post1
NB: * significant.   ** Highly significant

Discussion

These days, medication errors are a primary concern for patient safety and treatment quality, high alert medicines (HAMs) could result in patients' deaths or serious medical conditions if used improperly.

When compared to ordinary medications, HAMs have higher adverse event rates. Most of these drugs are utilized in emergency and acute care units.. One of the most important tasks done by nursing staff is administering medication to the specific patients in accordance with the prescriber's prescription. (Salman, 2020).

The current study hypothesized that ,nurses who receive educational intervention based on clinical supervision model will have higher level of knowledge of high alert medication safety than who receive traditional health education. Nurses who receive educational intervention based on clinical supervision model will have higher level of adherence to high alert medication safety than who receive traditional health education.

The nurses' knowledge about high alert medications, it was observed that nurses had low level of knowledge of high alert medication on pretest in both study groups. This result was consistent with Salman (2020) who found that around 84% of the study nurses had poor knowledge of HAMs administration on pretest. Also, Zyoud, et al., (2019) who found that around two-thirds of respondents (67.1%) had poor knowledge regarding HAMs administration. In the present study, it was observed that100% of nurses didn't receive any health education training program regarding high alert medication safety.

The present study illustrated that nearly two third of studied nurses had poor level of knowledge at pretest phase. Afterwards, the majority of them were knowledgeable about how to utilize high alert medications safely in PICUs according to post-educational guidelines. This result may indicate that the educational program had a high improvement effect on nurses'

knowledge regarding safe use of high alert medications.

This result is supported by Ahmed et al., (2020) who showed that the overall level of understanding regarding HAM safety measures was unsatisfactory for less than two thirds (63.5%) of the studied staff nurses. While 36.5% of the staff nurses who participated in the study showed a satisfactory overall level of awareness of HAM safety measures. In spite of that, a study conducted by Pierobon, et al., (2022) clarified that 79.4% of nurses had a general understanding of how to administer and regulate HAM.

Meanwhile, the findings showed that the medication safety score increased after the provision of clinical supervision model, application of clinical supervision model increased nurses' abilities to adhere to safe medication utilization more than traditional health education method. The present study findings show that nurses' knowledge improved after implementing the clinical supervision model.

In the sane line, the results of the study by Esfahani et al (2016) who showed that the clinical supervision model can improve the safe utilization of high-risk drugs in the intensive care units.

Also, Heshmati et al., (2008) who carried out a study on the clinical supervision framework as a means of enhancing nursing personnel's educational performance and found those nurses' professional skills and knowledge in patient education could be improved through observation, discussion, feedback, and investigation when applying the framework. Also, the application a clinical supervision model

could be done through observation, teaching, feedback, and investigation developed nurses' knowledge and professional skills.

Also, results of this study were consistent with Lu et al., (2013) as well as Apolinario,(2015). They showed that nurses' knowledge of high-alert medications was improved in the study group as compared to control group. Improvement of nurses' knowledge in this study could be attributed to educational workshops and group education method. They helped to increase nurses' knowledge which could diminish medication errors. Also, Zein Eldin et al (2018) Found that pediatric nurses who followed medication safety strategies guidelines will have fewer medication errors, and increase medication administration safety.

Findings of the current study showed that clinical practice errors were reduced after the utilization of clinical supervision model on posttest than pretest. The findings were consistent with Lesar, et al., (2006) who conducted a study about medication safety for critically ill children and found the same result. From the researcher point of view in the present study, implementation in the form of clinical supervision not only reduced medication errors, but also improved medication safety and administration as well.

The results of the current study also revealed that the clinical supervision model helped to improve nurses' skills and practices related to safe utilization of high alert medications. This study was similar to Reid Searl, et al., (2012) who conducted a study about supervising nursing students'

administration of the medication. Nurses stated that this could be attributed to conducting educational workshops that provide positive enforcement in the form of acknowledgement certificate.

With regards to the results of the current study, it seems that clinical supervision model can promote high alert medication safety. Also, it helps nurses to identify their own needs, determine their specific goals and set knowledge based solutions. Additionally, the group members express their opinions and ideas and remove new meanings from the occurrences, which encourages them to own up to their errors and change their practices.

Adverse drug event and incidents are typically broad problems requiring the use of numerous strategies and approaches. By identifying potential dangers and implementing preventative measures, the probability of such errors and incidents can be reduced. As a result, the safety of appropriate drug administration, particularly patient medicine, can be improved.

Regarding the total adherence about high alert medication of the studied nurses, the current work mentioned that more than two thirds of them were incompetent. This result was consistent with Engels and Ciarkowski,(2015). Who mentioned that, two thirds of the studied nurses were inadequet in monitoring of high alert medications. The current work demonstrated that there was a significant improvement in nurses' total practices related to high alert medications. This was in agreement with Graham et al., (2018), He stated that there was a positive

connection between the study nurses' overall knowledge and practices regarding high alert drugs.

Also, this study revealed that there were high statistical significant differences between pre-test, posttest and three months post-test in total mean adherence score. This finding is agrees with Charalampopoulos, (2016)who conducted research on the retention of theoretical knowledge and skills. It was discovered that the introduction of an educational program resulted in a statistically significant improvement in the level of nurses' overall practices. The same study also stated that nurses practice level was higher immediately post intervention and diminished after three-months post nursing educational guidelines, but was still better than the pre-intervention data.

Also, results of the study are consistent with M Abd-Elrahman, et al.,(2022) who conducted a study about effect of designed nursing protocol on nurses knowledge and practice regarding high alert medications, found that the baseline mean scores for total nurses' practice were high post implementation of designed nursing guidelines. Also, there were great improvements in the practice score levels obtained by nurses after the application of the nursing education guidelines regarding high alert medications. They concluded that however, This might point out attention to the significance of integrating high alert medication education recommendations into practice and their value in enhancing and preserving the high-quality of nurses' practices, attitudes, and understanding about the safe use of high alert medication.

Conclusion

Based on the finding of the present study, the following is concluded:
Implementation of nursing practice guidelines based on clinical supervision model improved pediatric nurses' knowledge and adherence to high alert medication safety on post and follow-up tests than on pretest.

Recommendations

In the light of the findings obtained from the current study and its conclusion, the following recommendations are suggested:
Ongoing in-service education programs about promoting high alert medication should be designed and implemented in all pediatric intensive care units to improve nurses' knowledge and practices on the basis of nurse's actual needs.

Integrating nursing practice guidelines regarding high alert medication safety (administration, prescription, storage, preparation, registration, monitoring, and patient &family education) into the daily routine care of all pediatric patients in all pediatric intensive care units to promote pediatric nurses' adherence to high alert medication safety.

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