Article

A cross-sectional study of the knowledge, skills, and 6 rights on medication administration by nurses at emergency department

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Abstract

Introduction: Medication errors occur when a patient is given the wrong drug or receives incorrect pharmacological therapy. Incorrect drug administration can cause fatal errors resulting in the patient's death. Approximately 44,000-98,000 patients die each year due to medication errors and this condition is found often in the Emergency Room (ER) due to the complexity. Therefore, this study aims to analyze the relationship between nurses' knowledge, skills, and 6 rights on medication at Emergency Department.

Design and Methods: This is an analytical observational study involving 70 nurses randomly selected using consecutive sampling and working at the ER department of Saiful Anwar Hospital Malang. Data were collected through a questionnaire and analyzed descriptively to determine the knowledge and skills of nurses and the implementation of the correct principles of medication administration.

Results: The results showed that most of the emergency room nurses had good knowledge and skills in applying the correct principles of medicine. However, the majority could not calculate the drug dose accurately. The spearman rank results showed that there was a relationship between knowledge and the 6 correct drug principles (p<0.001, α= 0,05; r = 0.491) with a percentage of 44%. This indicates that a higher knowledge results in the correct implementation of the drug. Similarly, there was a significant positive correlation between skills and proper medicine (p<0.001, α= 0,05; r = 0.378).

Conclusions: It can be inferred that a higher nurse's knowledge and skill results in a better administration of medicine.

Introduction

Medication errors can be classified into dispensing, prescribing, and administration.[1,2] These errors were detected in 85% of wrong doses with a prevalence rate of 32.1%.[3] It is the third leading cause of death in the United States, such that one in every 4 hospitalized patients suffers from harm caused by medication errors.[4] Furthermore, more errors were detected during drug administration than in the preparation stage with the successive occurrence of 62.5% and 37.5%. Overall, a total of 43 errors (14.3%) were found to be potentially severe with work conditions, transcription, and pharmacies accounting for 51.5%, 9.9%, and 1.2%, respectively.[5] Statistics showed that 38% of medication errors were related to nurses,[6] and this is consistent with the reports of the study that the occurrence of errors was significantly associated with their experience and level of education.[7] Nurses have a low level of knowledge of the pharmaceuticals they use the most, which leads to a higher rate of medication errors in the ICU.[2] Around 84% of nurses have poor knowledge of High Alert Medications (HAMs) administration.[8]

Some factors that are significantly associated with medication administration errors include poor knowledge and communication, stress, as well as interruption during medication administration. [8,9] Clinicians initially expressed negative attitudes towards existing medication management, citing their dissatisfaction with current policies and procedures, as well as their skepticism about the relevance and utility of potential changes to medication management.[10] It is likely that nurses' lack of information about the drugs, how it is administered, and the legal aspects of their actions will result in errors in drug administration error. In addition, nurses' skills in carrying out action are important due to their impact on the patient's condition. Nurses with good knowledge will have better behavior (skills) in preventing *medication errors*.

Nurses play an important role in the implementation of drug administration, preventing medication errors, and administering safe drugs. Therefore, before working in real-life care, nursing students should have adequate competencies regarding medication safety.[2] They need to understand the indications, dosage, method of administration, and possible side effects to be able to administer drugs correctly and effectively because of lack of knowledge may result in adverse patient outcomes.[8] Nurses in giving drugs to patients have 6 rights on medication administration, these include correct patient, drug, dose, route, time, and documentation. According to several analysts, expanding nurses' pharmaceutical information can be a critical technique for decreasing medication errors.[11]

A preliminary study conducted on 6 rights of medication administration at the ER showed that the ER receives approximately 70-100 patients a day for referrals and walk-ins. There is a

Significance for public health

Medication administration contributes to the large literature on patient safety in healthcare settings. It is the complexity inherent in emergency services and the critical factors for enhancing teamwork and work procedures to avoid negligence or unrecorded mistakes. Furthermore, medication safety is a drug control technique that is heavily reliant on good safety culture. It is therefore important to determine nurses' knowledge and skill to develop and implement strategies for maintaining medication safety. This study describes the correlation between knowledge, skill, and 6 rights medication administration.

high complexity of services and risk in the ER due to the pressure of working quickly resulting in negligence or unrecorded errors. Furthermore, the majority of the nurses in the ER could not calculate the drug dose and the administration was not timely due to the long length of stay at work. The emergency department (ED) is a hospital setting that poses many patient safety challenges, including highly unpredictable conditions, and frequent use of high-risk medications, which increases the risk of error.[12,13] This study contributes to the broad literature on medication management and safety in healthcare settings, especially the ED. It also emphasizes the complexity inherent in emergency services and the important points for improving teamwork and work procedures. In addition, the study evaluates the complexity of emergency services and the high risk of pressure to work quickly, which results in negligence or unrecorded errors. A study showed that the decision errors, crew resource management, inadequate supervision, and organizational climate contained more types of subfactors than other error factors in medication.[14] Furthermore, medication safety is both a process and the product of management that relies heavily on strong safety culture. Building a safety culture involves creating an alignment between the individual, group, and institutional values, which impacts attitudes, perceptions, and generally the patterns of clinicians' behaviour.[15] Therefore, the interest of most study is to examine the relationship between nurses' knowledge and skills with the implementation of the 6 rights medicine principle.

Design and Methods

A quantitative, direct, observational study was conducted on the ED nursings, which treat approximately 100 patients a day. This study uses a cross-sectional, non-experimental design to identify the correlation between knowledge, skill, and 6 rights on medication administration. An information session was held to create awareness about the study, then the individual nurses were approached to solicit for their participation. After the informed consent, observers closely shadowed nursings for up to 3-hour intervals during day shifts. Specifically, it was hypothesized that a nurses' knowledge and skill are associated with good medication administration performance. The simple random sampling was used to draw a final sample size of 70 and data were collected using a validated structured pretested self-administered questionnaire that was adapted from previous studies. Separate tools were used to collect data regarding the knowledge of nurses on medication administration. The result of construct validit index was between 0.595 – 0.895. Cronbach's Alpha for knowledge instrument was 0.967 and skill instrument was 0.953, while reliability coeficient was 0.468. An observational checklist was developed and used to gather data by observing nurses while medicating patients to determine whether or not they followed the 6 rights of medication administration. Furthermore, the Spearman Rank statistical test was adopted to determine the correlation between the two variables using SPSS for Windows version 16 with a significance limit of $p < 0.05$.

Results and Discussions

Based on the data presented in Table 1, the majority of nurses (38) were aged 20-35 years accounting for 54.28%. Based on the gender of the respondents, it was discovered that there were 42 nurses (60%) and the majority (25 nurses) worked in hospitals for 1-5 years with a percentage of 35.71%. As shown in Table 2, based on the p-value < 0.001, it can be inferred that there is a correlation between nurses' knowledge and implementation of 6 rights medication administration. Furthermore, there was a significant relationship between nurse skills and 6 rights medication administration by nurse ($p < 0001$, $\alpha = 0.05$, $r = 0.378$).

The nurse's level of knowledge

Content analysis showed that the most errors include improper dosage, mistaken drug choice, knowledge-based mistakes, skill-based slips, and memory lapses.[16] Knowledge, often referred to as cognitive, is obtained from an individual's or others' experiences and it helps to determine the activities and obedience of a person. Before individuals can have new behaviour or activities, they must have knowledge first. When the acceptance of this new behaviour is based on knowledge, awareness, and a positive attitude, then it will last long. On the contrary, a behavior that is not knowledge-based will not last long.

The results showed that the education level of most ED nurses was Diploma. Education has a significant effect on the learning process because a higher level makes it easy for an individual to receive information. Furthermore, it is needed to increase knowledge because an educational model must memorize formulas, def-

Table 1. Demographics of respondents.

Characteristics	n	%
1. Age group		
20-35 years	38	54.28
36-50 years	26	37.14
> 51 years	6	8.57
2. Education		
High School	3	4.28
Diploma	45	64.27
Bachelor	20	28.57
Master	2	2.85
3. Sex		
Male	28	40
Female	42	60%
4. Work tenure		
1-5 years	25	35.71
6-10 years	12	17.14
11-15 years	8	11.42
16-20 years	7	10.00
21-25 years	13	18.57
> 25 years	5	7.14

Table 2. The relationship between knowledge, skill, and the implementation of 6 rights medication administration.

Correlations	Sig. Value	Correlation Coefficient	Interpretation
Knowledge – Implementation of 6 rights medication administration	0.000	0.491	Moderate correlation
Skills - Implementation of 6 rights medication administration	0.001	0.378	Weak correlation

initions, and how to take action. It can be reached by simulation, which supports skill and improves medication administration knowledge of some concepts. The use of simulation helped to identify a consistent knowledge gap.[17]

Ensuring that the drug is safe for the patient and monitoring the side effects of its administration is the duty of the nurse. Consequently, nurses or health workers must be equipped with knowledge in carrying out their roles. In this case, education can be used as a parameter to determine a person's level of knowledge about the implementation of the principle of 6 correct medicines, especially regarding steps towards patient safety and understanding of *medication errors*. In addition, follow-up should be carried out by increasing the manager's or ER director's responsibility in providing training, seminars, and facilitating relevant activities in other hospital operations. Based on the results, most ED nurses were aged 20-35 years old with a percentage of 54.28%, this is because the young adult stage is the peak development of the physical condition. In this stage, an individual has cognitive abilities and more complex moral judgments, they use their knowledge to achieve their goals, such as career and family. Therefore, age plays a significant role in implementing the principle of 6 rights medicine.

Lack of knowledge may result in inadequate skills, consequently develops into a system failure because there is no sufficient education regarding drug administration. Previous studies reported that there is a lack of education regarding pharmacology in the basic undergraduate program,[18] especially in the field of knowledge.[19] Some of the common errors in drug administration include the wrong dose, followed by missed dose, and lack of prescription. Furthermore, errors in administering reached the patients more often than prescribed due to shortcomings in knowledge, skills, and abilities, as well as workload. [20] Therefore, it is important to improve nurses' knowledge about the preparation and administration of intravenous medications.[21] Pharmacology knowledge acquisition and application, as well as lack of opportunities in practice to undertake medication administration roles and responsibilities, were major factors.[22]

Nurse skill level

The results showed that the majority of ED nurses have high skills to implement the 6 correct principles of medicine. Skills can be acquired by performing repeated actions frequently to create a condition where skills become a work culture. Furthermore, nurses could make errors due to a lack of adequate access to guidelines or unclear organizational routines.[23] Medication management is a complex process that involves prescribing, transcribing, preparation, checks, administering to patients, observation, documenting reactions and side effects, as well as reporting any deviations. Nurses require good educational preparation including a full understanding of pharmacology to ensure safe medication and fulfill their roles efficiently.[24] Regardless of the strategies implemented, the formation of a culture that fosters the skills of reporting medication errors, and a systematic, nonpunitive approach to their elimination is where its prevention begins and ends.[25]

Right patients have the lowest incidence rate with practically no error in the application of the correct principle of medicine. This is because the care system in the ED is divided based on the level of emergency and each level is held by several nurses, therefore, they memorize their patients' names.

The most common incident at ED is the right dose, which includes precise and accurate calculation. To ensure that the drug is given to the patient at the right dose, the nurse must be able to carry out the calculation accurately and also *double-check*. Furthermore, the nurse must administer the appropriate amount of medication based on the calculation results to provide the patient with the right dose. The results of this study indicate that for the right dose component, only 25 people (35.71%) had a high application rate. The existing studies regarding calculating medications indicate that nursing students have poor mathematical and drug dose calculation skills.[26] According to the results, strategies were recommended to be adopted for reducing or limiting medication errors, such as improving work conditions, and communication between healthcare workers.[5]

Correlation between knowledge and the implementation of the 6 rights medication administration

In this study, nurses' knowledge of medication and the principles of drug administration to patients, such as the appropriate drug, right dose, time, patient, and route as well as documentation was examined. The results showed that some nurses in the ED had good knowledge about the implementation of the six rights medication administration. Meanwhile, a small proportion has less knowledge about the implementation of the 6 principles of correct medicine. Nurses' pharmacological knowledge, inevitable errors, and complications were mentioned in a previous study.[27]

Knowledge is needed to obtain new informations, such as things that support appropriate action in order to improve the patient's quality of life. Knowledge influences a person's decision-making, motivating nurses to behave and participate in improving patient health by providing appropriate treatment measures. Knowledge about medication administration is useful in clinical reasoning for safe medication and also as a precursor of error reporting.[28] It is influenced by how much or at least the kind of information obtained by an individual. Nurses who do not have access to information on medication administration and the implementation of the 6 rights will not have the knowledge to apply the principles correctly. Meanwhile, knowledge-based results from prescribing and administration,[13] dismissals of policies/procedures or guidelines, and human resources issues.[29] Increasing nurse's knowledge could be through integrated educational interventions that allows nurses to assume a care provider role for patient.

Correlation between skill and the implementation of the 6 right medication administration

As the largest group of healthcare providers, nurses play a significant role in the continuity of care by maintaining health at different levels of the system. It is therefore expected that the nurse provides the highest level of care based on scientific evidence and acquires the necessary skills and abilities to make clinical decisions through the service of control maintenance methods.[30] According to a previous study, experienced nurses were more likely to practice beyond scope of practice to reduce error.[23] Furthermore, overhauling nurses' information, particularly about unused medicines is an important factor in decreasing medication error.[11]

The majority of ER nurses' skills in implementing the principle of 6 correct medicine are still high because the behavior is carried out continuously, subsequently it becomes a culture or habit. The ability of nurses to implement these principles is also a moral responsibility for a profession that must fulfill its obligations. The results of the study showed that nurses' work tenure significantly affects medication errors based on experience. Statistically, good techniques eliminate the deficiencies in basic math knowledge, problem-solving skills, and correct dosage calculation.[31] In the ED, there is a lot of skill mix that will contribute to the implementation of 6 rights medication administration. Hospitals that increase the nursing skill mix and improve the work environment may achieve a reduction in the number of adverse events.[32]

Skill practice programmes like simulation in medication administration are important. According to a study, there was an improvement when the teaching programme was implemented and medication errors were reduced.[33] Furthermore, an understanding of the simulation program provides feedback to participants, thereby contributing to the reduction of medication errors.[34] Managers should focus on enhancing nursing practices by managing and organizing nurses' work in a way that creates a feeling of supportiveness, motivation, and security.[35] Furthermore, in comparison to single profession education, in which individuals learn in isolation and only in their profession, interprofessional education helps to promote interprofessional collaboration and patient care by promoting multiple health professions to increase interprofessional collaboration. Therefore, an interprofessional medication safety education program in ICUs can help to reduce errors and improve patient safety.[36] Limitation of the study include single institution, the short term of the observational. Because this study uses cross - sectional, results are not generalizable. Therefore, more studies are needed to assess by increasing the number of observers and other hospital's emergency department.

Conclusions

Based on the results, the conclusion drawn is that most of the ED nurses have a high level of knowledge and skill about 6 rights medication administration. The implication of this study for professional healthcare is to increase the ED nurses' knowledge of the right medical principles, especially in calculating drug titration and a small part of the incorrect administration of drugs. Therefore, the strategies recommended to be adopted for reducing or limiting medication errors include building a stronger pharmacology knowledge-base in nurses and nursing students, improving work conditions, and communication between healthcare workers.[5] The result also showed that there is a significant relationship between information literacy and evidence-based nursing with the knowledge and attitude of nurses toward medication error.[30] It was, therefore, suggested that learning by simulation will provide additional support in educational programs for healthcare professionals by increasing knowledge and skill of medication administration.[34]

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