



ORIGINAL ARTICLE

Investigating the Effect of Pharmaceutical Calculations on Performance skills of nurses in Specific units

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ABSTRACT

Medication is a common nursing activity and the nursing is a demanding task. Some of the reasons for incorrect performance of pharmaceutical calculations includes lack of skills, lack of medical calculate regular basis at work, lack of adequate and appropriate equipment, long shifts, the factor of lack of proper training in universities, pharmaceutical calculations as well as the lack of accuracy in calculating the drug. This study investigated the effects of pharmacological intervention computing on the skills of nurses in specific units. In this quasi-experimental study, the sample is formed by nurses in specific parts (ICU,CCU, DIALYSIS). 45 nurses working in the province, particularly social security hospitals were selected using stratified random sampling. Data collected included demographic questionnaire and the questionnaire of executive cognitive skills and drug calculation and a check list of performance. Data collected were examined and analyzed by SPSS software and methods of descriptive and inferential statistics. Cognitive Skills pharmaceutical calculations of samples with an average of 60.72 and SD 13.21 before intervention increased to the mean and standard deviation of 96.77 and 4.78 after the intervention. Test and Paired t - test showed a significant difference between the mean pre- and post-intervention ($P = 0.000$). The mean scores and standard deviations of the performance checklist before the intervention was 77.64 and 30.55, respectively and increased to the mean and standard deviation of 97.70 ± 6.60 after the intervention. Test and Paired t - test indicated significant difference between the mean and the standard deviation of the pre-intervention and post-intervention ($P = 0.000$). The results show the impact of intervention of medication calculation on performance skills of nurses in the specific units. The results suggest that to improve the quality of nursing care, it is essential to have nursing continuing education in the field of drug calculation skills.

Keywords: Intervention, Pharmaceutical Calculation, Nurses performance

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INTRODUCTION

Medicine is the most common used products provider of health services. Medicine is a chemical substance that can influence how we feel and function (1). One of the most common pharmacological activities of nursing is prescribing medicine and it is a demanding task. Safe and effective prescription of medicines requires knowledge in various fields including theoretical knowledge and clinical drug administration, knowledge of clinical pharmacology and the ability to calculate medication. Hospital nurses spend on average 40 percent of their time to medication administration (2). Tang et al (2007) suggest that changing the rules of the hospital and staff shortages reduces medical errors and increases the quality of the hospital staff. They also studied and cited staff negligence (86.1%), heavy workload (37.5) and new employees (37.5%) as the major cause of medical errors (3). In a study of how et al (2005) 112 common medical mistakes were examined the it was showed that individual factors such as work-related fatigue was one of the biggest causes of medication errors nurse's perspective (4). There are no accurate statistics on the incidence of medication errors and other control measures to detect medical errors for voluntary reporting of errors or certain medication. However, experts speculate that this rate is too high and increase of cases referred complaints from doctors and nurses. The Medical Council and the courts can be a proof of the conjecture (5). One of the principles that should apply drug calculations for nurses to

prescribe the correct medication is the ability to calculate accurate drug enforcement as essential skills for nurses all over the world [6]. Dissemination of the knowledge and attitudes of nurses can be an educational tool to demonstrate the weakness of nursing and training needs of nurses and if necessary change in educational planning as well as continuing education classes for nurses are done to compensate for the weaknesses and training needs as well as the skills essential drug calculation skills, the focus will be on continuing education [7]. Despite the medicinal importance of computing and its impact on the proper use of medications an especially medicine that are crucial and are used in critical situations, unfortunately, this issue has not been adequately addressed in the chapter Courses for Nursing. So, it is discussed as part of the course and nursing skills offered in the first semester since this course (Nursing Fundamentals and Skills) contains a lot of titles that are the most important and basic usually less attention is paid to medicines computation [8]. According to the above mentioned issues and the importance of nurses skill in prescribing medicine in special centers and the issues related to it, this study is done to investigate the effect of intervention of the medical calculation skill on the performance of the nurses working in special center.

MATERIAL AND METHODS

This study is based on the objectives and nature of the study is a clinical trial. Data from a three-part questionnaire and a self-made check list Qualified nurse researcher in the study to assess their skills in pharmaceutical calculations were used. The questionnaire included 9 questions about demographic characteristics of samples. And the second part consisted of 18 questions calculating pertaining to drug in relation to cognitive skills (basic knowledge in pharmacology, drug name, drug class, and the classification of medicines, effects, types of medication orders), respectively. Questions were multiple choice having four options to choose. From among the four provided choices, one choice was correct response and marked with crosshairs.

Scoring the responses on the assessment of cognitive skills was based on the number of correct answers to the questions, so that the correct answer awarded [1] and incorrect responses (0) points. A total score of correct answers was considered as pharmaceutical calculations cognitive skill score and based on the amount of points, the points were categorized in three levels of good (greater than 66%), moderate (33% - 66%) and poor (less than 33 %) and thus the levels of pharmaceutical calculations cognitive skills would be good, fair or poor.

Check list included 33 visible items (drug identification units of measurement, mathematical formulation of the administration, preparation and administration) which the researcher directly observed the process of preparation of drugs and medicines to the patient to record performance in the form of questions and answers. In order to determine the performance and also observation as well, scoring administrative skills was done based on correct answers to the questions and observations.

So that in the options Yes, No, the correct points were given [1] and the wrong points (0). A total score of correct options were rated as was the result of good administrative skills. According to the points, points were classified at a good level (above 66%), moderate (33% - 66%), poor (less than 33%) and thus indicated good, moderate and weak administrative skills, respectively.

Validity method was used in this study to investigate the validity of the designed check list (scientific validity) content. To determine reliability test-retest was used and the correlation coefficient was accepted at the level of 0.8. Researcher gathered information by visiting the Social Security hospitals in Mazandaran and after the selection of the sample and introducing him and providing a sufficient description of the purpose of the study and their written consent, participants voluntarily completed the questionnaire.

First, in regard to medication calculations cognitive skills, the test was taken, the pre-test was completed and, the subjects were collected on the same day. Also on the same day, when the medication was done by nurses, researcher observed data for the preparation of drugs and how the medication was given to the patient directly and according to a description on how to calculate the drug, the nurse recorded performance was analyzed using in the Check list.

Then CD, booklets and teaching cognitive and executive skills were given for medication calculations. After a week on the questionnaire provided data were collected in the same day and again, at the day of the performance when the drug preparation and how the drug was given to the patient was directly observed and according to a description on how nurse calculated the drug and their performance recorded on check List was assessed and check List was assessed after re-intervention. Overall, data were collected over a period of 8 weeks. The evaluation results were assessed before and after intervention based on the educational objectives. To analyze the data, descriptive statistics in tables and indices such as mean, standard deviation and inferential were used.

FINDINGS

Most subjects aged 25-35 years (60%) and lowest in subjects aged 57-47 years (8.9%), respectively. The median age was in the range of 68.35 to 79.8 SD. 2.62 percent of the subjects were women. The majority of samples (68.9%) were tenured minority of patients (31.1%) were working based on contract. Most subjects (22%) and lowest in the ICU unit of study (15.6%) were employed in the dialysis unit. The highest percentage of patients (86.7%) had a bachelor's degree. None (0%) of the subjects had passed a training course of medication calculations. The majority of samples had (46.7%) 0- 10 years of experience and a minority of patients (17.8%) had between 30-21 years of work experience.

The majority of patients (51.1%) filled questionnaires in the morning and a minority of patients (20%) at night shift. All subjects (100%) stated that they were interested at working in their part. Table 1 shows the demographic data. Results of this study showed that in relation to cognitive skills pharmaceutical calculations.

The mean pre-test scores of 60.72 and (SD) of 21.13 increased to 96.77 mean and SD 78.4 in the questionnaire after the intervention . Test and Paired t - test revealed that there was a significant difference between the mean pretest before intervention and post-intervention SD of the questionnaires (P = 0.000) (Figure 1). The mean pre-test scores of the checklist before intervention were 77.64 and (SD) of 55.33 increased to 97.70 mean and SD 6.60 in the questionnaire after the intervention . Test and Paired t - test revealed that there was a significant difference between the mean pretest before intervention and post-intervention SD of the checklist (P = 0.000) (Figure 2).

Most percentage of the pre-intervention had average performance level (22.42%) which after intervention got good performance (88.89). The t test results showed a significant relationship between the mean score before and after (P = 0.000) (Table 2).

Table (1): relative frequency distribution of the sample in terms of demographic features

variable	range	Number	percent
Age (year)	25-35	27	60
	36 - 46	14	31.1
	47 - 57	4	8.9
gender	female	28	62.2
	male	17	37.8
employment	tenure	31	68.9
	contract	14	31.1
education	B.S	39	86.7
	M.S	6	31.3
Related section	CCU	16	35.6
	ICU	22	48.9
	Dialysis	7	15.5
Spending pharmaceutical course of calculation	Yes	0	0.0
	No	45	100.0
Work experience (year)	0 - 10	21	46.7
	11 -20	16	35.6
	21 -30	8	17.8
Shift of filling questionnaire	morning	23	51.1
	evening	13	28.9
	night	9	20
Interested to work in the related part	yes	45	100.0
	no	0	0.0

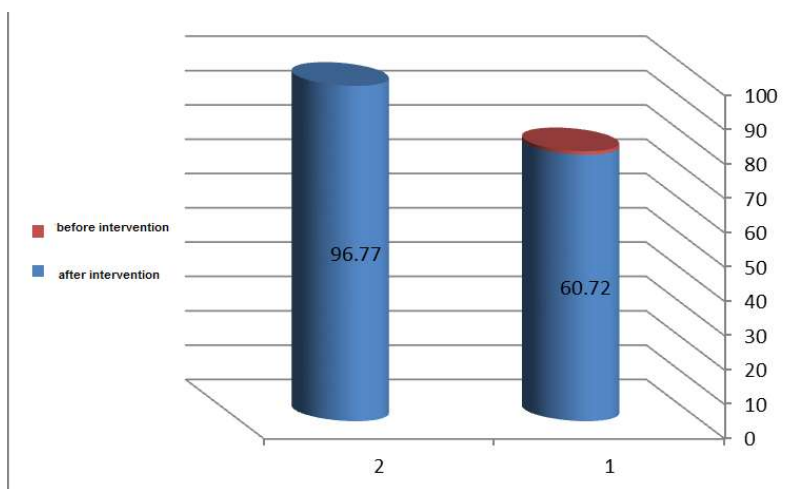


Fig1: Effect of intervention on cognitive skills of pharmaceutical calculations in the studied units before and after the intervention in specific parts Social Insurance Hospital of Mazandaran province in 2013

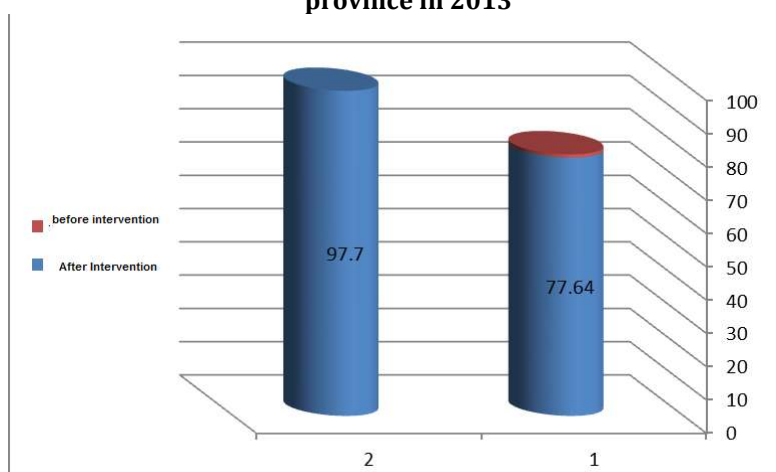


Fig2: Effect of intervention on administrative skills of pharmaceutical calculations in the studied units before and after the intervention in specific parts Social Insurance Hospital of Mazandaran province in 2013

Table 2: Distribution and frequency of intervention on performance skills of pharmaceutical calculations in the studied units before and after the intervention in specific parts Social Insurance Hospital of Mazandaran province in 2013

Observation	Before intervention		After intervention	
	number	percent	number	percent
Weak (less than 33%)	16	35.55	0	0.0
Average (33-66%)	19	42.22	10	11.11
Good (more than 66%)	10	22.23	35	88.89
total	45	100.00	45	100.00

DISCUSSION

In relation to "the impact of intervention on cognitive skills of pharmaceutical calculations on nurses", the results of this study showed that average cognitive skills in pharmaceutical calculations after intervention increased from 60.72 to 96.77.

Results of the study indicated the same. As in the present study, it was concluded that the nurses need more education on pharmaceutical calculations. Holding the educational classes or internal conference can be helpful in this field. In addition, it is better that the universities teach the students in pharmaceutical calculations and spend more time to this discussion. On the other hand, Glaister in 2007,

showed that the anxiety of mathematical calculations can lead to negative effect of pharmaceutical calculation of the nurses and since the high tension of the nursing lead to the error in calculation in the medications. The results indicated that with classic education one can lead to improvements in pharmaceutical calculations. It was also concluded that teaching mathematical calculations is effective in this regard (10).

The results of Santamaria and colleagues (2012) indicated that due to variety of patients conditions considering the type, kind and environmental sensitivities in special sections and different crisis of the patients in special sections, the pharmaceutical calculations in the medications which got ready in density and percentage have been poor (11). The present study calculated the nurses skills in calculating the medication doses as average and since the correct calculation of medication doses is necessary for the nurses, so continuous education is necessary.

The results indicated that the nurses needed educational curriculum, pamphlets, CDs and others in the field of pharmaceutical calculations.

Miracle (2009) investigated the pharmaceutical skills of the nurses. He believed that in order to improve the quality of nurses' task, they need continuous education. It was found that the nurses need classic and theoretical education based on educational frameworks for being prepared for medication distribution (12). Kuhestani and Baghcheghi (2004) showed that although pharmaceutical calculations are one of the necessary skills for nurses, however, a few number of participants can do it correctly. This indicates the need and importance of controlling and remembering the pharmaceutical calculations in teaching the nursing students (8). This result is also similar to conclusion of the study of Kuhestani and Baghcheghi. Knowledge of how to develop training programs to meet the needs of that specific medication needs and a basic knowledge of pharmacology (pharmacodynamics, pharmacokinetics) name of drugs, types of medication orders, classification and function of knowledge about medications and resources that can be useful when faced with a question about the drug, including the determination of drug dosage and techniques ... are the cases needed in the nurses of cognitive skills.

Kasaeian study (1391) showed that education on nurses' knowledge and skills was useful in medication dosage calculation. As nurses have severe needs in special training for calculating dose of medications and injectable medications. The results of this study demonstrate that all over the world continuing education is essential for nurses to improve the quality of patient care. He indicated that although the pharmaceutical calculations and correct use of them is important in critical conditions, unfortunately this is not considered in the educational subjects of nursing.

Given that nursing skills course and a lot of titles that are most basic, usually "less attention to medicines computing comes to action (13). These results are also in line with the present study. Due to the need to prepare nurses as the health care workforce with the critical conditions encountered and the exact significance of drugs in the shortest possible time, better in-service training for all nurses presented in the field of Drug calculations and pay more attention to this issue in nursing education.

In relation to the "Executive Skills of pharmaceutical calculations on nurses", the results of this study showed that executive skills in pharmaceutical calculations mean of 64.77 increased to 70.97 after the intervention. Rubin and colleagues (2011) conducted a study to evaluate a number of demographic data and attitudes pharmaceutical and training to perform basic math calculations and discussions in Nursing Students perform calculations. The results of this study showed that nursing students are required to complete training in mathematics in order to correctly perform pharmaceutical calculations (14). The study also found that pharmaceutical calculation training on effective nursing performance. Educational authorities should make hospital to training programs or classes for training in medical computing.

Clark (2009) showed that the drug calculation skills of nursing students and nurses are not desirable. Given the role of nurses in prescribing drugs, teaching dosage calculation for nursing students and nurses is an important educational need and it is appropriate to note that the training program (15).

In relation to "drug computing performance levels before and after drug calculation intervention", the results of this study showed that the highest percentage of patients (22.42%) had an average performance level while the majority of interventions (88.89%) had good levels of performance. Hogan in 2011 showed that classical training can improve nursing students' skills of medication dosage calculation. He believed that some of the reasons for non-performance of pharmaceutical calculations, including lack of skills, the equipment automatically perform calculations, long shifts factors, lack of proper education in universities, pharmaceutical calculations as well as the lack of accuracy in calculating the drug is that teachers need to take this issue more carefully and more training programs should be held for students (16).

The results of this study correspond with the results of the present study. In the present study, we determined that the training is needed to strengthen and promote the performance level and medication calculation skills of nurses. Teaching hospital authorities should realize the fact that the training program

can increase the level of nurses in medication calculations to better quality care to patients in drug enforcement. The results of this study suggest improving nurses' knowledge and skills in calculating and determining the dose of prescribed drugs based on questionnaire scores and promotion of the check list was performed before and after intervention.

CONCLUSIONS

The results showed that cognitive skills and executive interference of pharmaceutical calculations affects the performance of nurses. According to the results of this study and similar studies in other parts of the world, it is suggested that the drug is one of the most common nursing activities and this is the most demanding job as a nurse. Therefore, nurses should be very understanding and give the correct medication to avoid the risks and possible complications due to medication errors. The nurse, who does medication, needs the basic information about drug treatment including the name of the medication, method of preparation, labeling and adverse drug effects and factors affecting drug performance. This indicates that nurses must pass a drug computing course and educational authorities should give more attention to this point.

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