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Research Article

COMPARING DIFFERENT EFFECTIVENESS OF EDUCATING TWO PHARMACEUTICAL CALCULATION SKILLS ON NURSES KNOWLEDGE WORKING IN ICU WARD

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ABSTRACT

Doing pharmaceutical calculations is one of the most risky duties of nurse's duties in ICU wards. Failures in learning of such important act could lead in catastrophic outcomes. This study aimed to investigate the effects of educating pharmaceutical skills via posters workshop on nurse's knowledge working on ICU wards. In a quasi-experimental two-group pre and post-test study, we selected 80 nurses from ICU wards of two hospitals of Sari-Iran. We execute normal educational workshop method in one of the hospitals and in another we execute an educational workshop in addition to fixing posters regarding pharmaceutical calculations on the walls of the ICU ward. At firth the nurses had a low skill in doing pharmaceutical calculations. Pre-test mean scores for the workshop and workshop plus posters groups were 18.78 ± 5.81 and 18.76 ± 4.63 respectively. The scores increased to 39 ± 1.62 and 39 ± 1.3 two weeks after the educating program. Variance analysis of repeated measures showed that the pharmaceutical calculation skills has been increased in both groups ($p<0.001$). Two months after the program it was seen that the mean scores for the workshop and workshop plus posters groups are 28.92 ± 4.18 and 35.63 ± 3.6, respectively. So although the groups had no considerable differences in the first post-test, but the second post-test depicted a significant one ($p< 0.001$). According to our findings, both groups loose some skill scores during the time but the workshop group loose more scores. It shows the effects of installing posters in their workplaces.

Keywords: *Drug Calculation Skill, Workshop, Poster Installing, Nurse's Learning*

INTRODUCTION

Giving drugs to the patients is one of the major basics of nursing performance. This requires skill, technique, attention and taking care of patients (Anderson *et al.,* 2001). Todays more than 20 thousand drugs are available that all could be dangerous. So any nurse should be aware of recognizing and prescribing drugs to avoid possible dangers and side effects of drugs due to pharmaceutical failures (Young *et al.,* 2008). Pharmaceutical failures are defined as mistakes in giving drugs, due to neglecting their side effects (Camire *et al.,* 2009). Pharmaceutical failures are a major wariness in health care system that is used as an index to providing security for patients in hospitals (Cheraghi *et al.,* 2012). Pharmaceutical failures could occur in any phase of drug prescribing. The study showed that a considerable amount of Pharmaceutical failure belongs to executing pharmaceutical orders (Camirel, 2009). Roykenes claimed that most of the failures are due to nurse's failure in accomplishing Pharmaceutical calculation (Roykenes *et al.,* 2006). Wolf also showed that nursing students estimated 2.56% of pharmaceutical failures due to wrong pharmaceutical calculations (Wolf, 2006). A Japanese researcher also showed that the major pharmaceutical mistake among beginner nurses is related to wrong prescribing about venous injections that the most prevalent cause of the mistake was low pharmacological knowledge among them (Kawamura *et al.,* 2001).

In the United States thousands of people are dead because of pharmaceutical mistakes and drug side effects imposing a cost near 77 billion dollars (Kelly, 2011). In different ICU wards that emergency or

critical situations are usual concerns, the mistake could be more probable (Cheraghi *et al.*, 2012). A research reported pharmaceutical mistakes rate in ICU wards to be 52.2% that 25.2% of them were due to calculating mistakes (Agula, 2011). Nasiri also reported that nursing efficacy in 55.5% of ICU nurses is moderate regarding to calculate drugs amount, and low in 22% of them (Nasiri *et al.*, 2009). According to these statistics in ICU wards, it should be regarded that patients in ICU wards couldn't actively participate in medical treatment due to their physical incapability and they are mentally incapable of undergoing more damages, hence they are more vulnerable to pharmaceutical failures (Camire *et al.*, 2009). The first and natural consequences of these failures consist of: longer hospitalization period, more therapeutic expenses, and in some cases serious damages or death (Agula, 2011). So it is necessary to increase nurse's pharmaceutical calculation skills so that they can work more efficiently in clinical situations. This could lead to improved levels of health in patients (Wright, 2006). According to pharmaceutical calculation nature, it is needed to instruct the issue via methods that could lead to critical thinking and problem solving and learning through feedback (Pishgooie *et al.*, 2012). To achieve an effective training, there are a variety of teaching methods that regarding to their characters for the purpose of education, we could use any of them properly (Salimi *et al.*, 2007). One of these methods include executing training workshops. In a study aimed to explore the effects of such workshops on pharmaceutical calculation skills of nursing students in Iran, it showed that although the workshop increased the skills, but the effects vanished during three months after the program (Baghcheghi *et al.*, 2010). So with current educational curriculums and traditional methods of preparing students for professional environments and also with regard to pressing need of medical departments to upgrade the medical teams through a vast amount of knowledge, student- centred and self-directed methods with enriched rationales are needed (Pishgooie *et al.*, 2012). Another method of training in this study included posters. A numerous amounts of research are done on the effectiveness of mass media include posters and a vast volume of results is available. Jannie and colleagues believe that the biggest function of mass media is to support person-to-person communications. So they should be known and used according to their priority. It also should be mentioned that mass media could be a complementary to face to face teaching not a substituting method (Jannie *et al.*, 2000). Regarding importance of pharmaceutical calculation skills and that most of foresaid studies were done on academic environments and persist on promoting training techniques during academic courses, and that we couldn't find any studies about increasing the skill via posters, we tried to evaluate training effects of workshop method in comparison with workshop plus the posters method on pharmaceutical calculation skills of nurses working in ICU wards of medical science universities of Mazandaran- Iran. It could be expected that decreasing pharmaceutical failures may lead to decreasing costs of harmful consequences and improving health care systems that are the most preferred objectives of health care systems.

MATERIALS AND METHODS

Method

This research is a two group quasi-experimental design with pre-test and post-test. Target population included nurses of Sari-Iran that were working in ICU wards of educational hospitals in the city. Sampling method included an available sample that had our inclusion characteristics: having an at least expert degree in nursing, working in ICU wards of Sari-Iran hospitals and willingness to participate in our research. Exclusion criteria included: a history of taking part in pharmaceutical calculation training programs and changing their workplace during this study.

Data gathering tools included: a researcher designed questionnaire that had two major parts, one to explore demographic characteristics and the second to explore pharmaceutical calculation skills. The second part included 20 questions of four optional answers. Each question had 1 score so that a maximum score of 20 was attainable. To evaluate the reliability and validity of the questionnaire, we sent it for a number of university professors and applied their suggestions and recommendations. Formal reliability of the test was acquired based on readable writing of questions and not having spelling and writing mistakes.

Then a retest was done on a sample of 18 nurses working on ICU wards and a satisfying Chronbach alpha (0.74) accomplished. In the questionnaire we used a content validity ratio (CVR) to assure that the most important and appropriate contents are selected, and used content validity Index (CVI) to get assured about the goodness of measuring. The estimated CVR was 0.79 that regarded to relativeness, simplicity and transparency were accepted by CVI of 1, 0.95 and 0.75 respectively. In the research we had permission from the authority and letter of satisfaction from participants and they assured that they could exclude from the study whenever they want. They also assured about confidentiality. At first a pre-test was executed in both groups then the units underwent a 4-hour workshop on pharmaceutical calculation training. In a hospital we installed 2 posters with training contents similar to the workshop. The posters were in 70*100 cm and installed in nursing station and treatment room. Then two weeks after that we took a post-test to estimate the effects of our trainings. Two months later we took a follow up test with a same contents of pre-test and post-test.

Finally the data was entered in Exell software and checked the correctness. For each false answer we specified zero code, for "I don't know" the zero number and each correct answer specified 2 codes. Then the data transformed to SPSS 16 and chi square, Wilcoxon and U Man-Witney were estimated.

RESULTS AND DISCUSSION

Results

General results from 80 participants showed that 13 (16.2%) were male and 67 (83.8%) were female. Average age was 31.7± 5.9 in the workshop plus poster group and 32.72 ± 5.95 in the workshop group. Record of service for 51 participants (63.7%) below ten years, for 18 participants (22.5%) was 10-20 years and for 11 participants (13.8%) was upper than 20 years.

The majority of participants (95%) held a bachelor degree in nursing and a few (5%) held a master degree. In addition our results showed that 50% of the participants were conventional nurses, none of them had passed pharmaceutical calculation trainings in the past years.

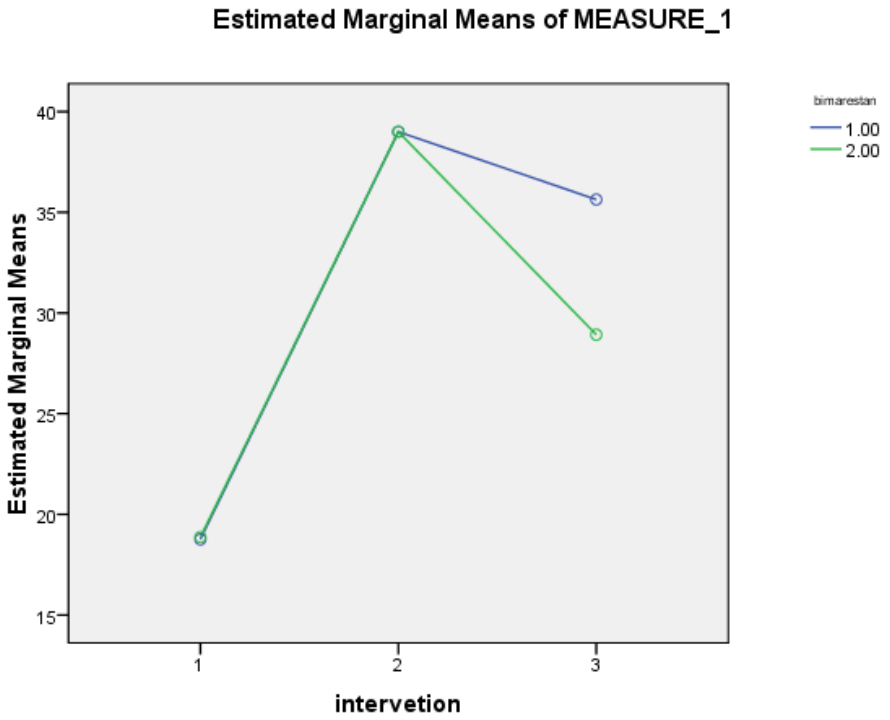
Comparing the two groups based on age, gender, employment, education and a record of service showed no significant differences. Mean scores of pre-test, post-test and follow-up are shown in table number 1.

Table 1: comparing mean scores of research groups on three phases (pre-test, post-test, follow-up).

Groups	(1)Hospital Fatemeh Zahra		(2)Hospital Emam		Comparison of two hospitals
	Mean	SD	Mean	SD	
Before intervention	18/76	4/63	18/87	5/81	P=0/922
2 Weeks after intervention	39	1/30	39	1/62	P=1/000
2 Months after intervention	35/63	3/6	28/92	4/18	P=0/00

Results of table 1 show that mean and standard deviation in the groups were 18.76 ± 4.63 and 18.87± 5.81 respectively. Results of statistic test showed that the groups had no significant differences in pre training phase (p=0. 92). The mean score of the groups (39±1.3, and 39± 1.62)) also didn't show any significant differences in post -test (p=1. 0). Two months after the intervention the mean scores in the workshop plus poster and workshop only groups were 35.63 ± 3.6 and 28.92 ± 4.18 respectively. So although the post-test scores are not significantly different, analysis of repeated measures showed that the groups mean scores had a significant difference (p=0. 001). In the graph 1 amounts of pharmaceutical skills of different groups on the phases of intervention are depicted. So although apparently both groups lost some scores on

follow-up, but the decreases are sharper in the workshop only group. This showed that the posters had a positive role in participant's learning.



Graph 1: Comparing degree of pharmaceutical calculation skills of ICU wards, before and after intervention

Discussion

This research aimed to compare the effectiveness of two methods, workshop only and workshop plus poster, namely. Finding showed that both methods had a positive effect on the group skills, in other worlds the mean scores of pre-test and post-test were significantly different. This was similar to others findings (Salimi *et al.*, 2007; Ford *et al.*, 2010; Rainboth *et al.*, 2006). Our results showed that degrees of skills were decreased during 2 months after the intervention. That could be due to the complicity of the calculations and the time it that refers to need for periodic retraining (Kazaoka *et al.*, 2007; Page *et al.*, 2007). In the follow-up phase that accomplished 2 months after the intervention, it was seen that the mean scores of the workshop plus poster group was more than the other group. That is contrary to Soha and colleague's findings (Saha *et al.*, 2005).

It seems that the need to increase nurse's skills of mathematical calculations should be satisfied because the more skills could result in improving health levels of patients (Camire *et al.*, 2009). Maintaining the capability in the after graduating years is crucial.

Conclusion

This research showed that training could be an effective way to improve the pharmaceutical calculation of nurses. As it could be seen in the findings, training in the shape of workshop may increase the skills on short time, but its effectiveness may decrease during the time. In the workshop plus poster group it showed that the degrees of pharmaceutical calculation skills were less decreased in comparison to the only workshop group. The training had a more permanent effect. In this research, nurse's free time

regarded as a training opportunity and show that it had a positive effect on maintaining learning related to pharmaceutical calculation skills.

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