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DEVELOPMENT, CHANGE, AND IMPLEMENTATION IN THE CURRICULUM OF CLINICAL PHARMACOLOGY IN JAHROM UNIVERSITY OF MEDICAL SCIENCES: THE INTEGRATIVE WORKSHOP MODEL BY SIMULATION

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ABSTRACT

Introduction: One of the most important and basic necessities in order to prevent and treat diseases is proper understanding of pharmacology. The method of teaching pharmacology needs radical changes. The purposes of this study were training-needs assessment, design and implementation of an integrated workshop program for emulation and models in teaching Clinical Pharmacology and evaluating it. **Method:** By changing the course curriculum, this workshop program was held based on the assessment of students and teachers needs. Then, by using the Pharmacy model, medicine dosage forms were shown to students. Furthermore, prescriptions that had errors were presented to students in the form of a case study and a realistic simulator. Finally, a group discussion was conducted regarding cases. The forum was used to practice working on the bugs in prescriptions. As well as dealing with bugs in prescriptions, students studied them in an interactive environment and responded to a quiz designed in this area. **Results:** The results showed that the program had a significant role in improving students' knowledge of pharmacology. As well as attracting students consent, this program was applicable and had a favorable impact on the integration of theoretical and practical content and can be used applicably in the clinical setting (9.56 after intervention versus 6.45 before intervention). **Conclusion:** Teaching through workshops and the use of simulators and real models has a salutary impact on learning, helps students in real encounter with patients, making appropriate clinical decisions with high knowledge and skills while maintaining their confidence, in an environment free from anxiety.

INTRODUCTION

Annually, billions of dollars are allocated to continue activities in medical education sector [1, 2]. In many countries it has been shown that continuous medical education is performed under the supervision of organizations such as: professional health, health system and some other stimuli), which greatly contribute to increase activity in this field [3]. There is an assumption that continuous medical education can improve patient treatment [4, 5]. The way that teachers train students irrevocably affects the improvement and quality of learning. So it is widely considered in the development programs of Schools [6-12]. According to new learning methods, procedures and processes common in educational institutions that have acted well before training may be considered as a request from trainees [13,14]. Students' learning begins with a real problem or a mystery through which the educator tries to find the problem and work out an appropriate solution for it [15]. This is one of the issues and innovative approaches in medical education [16]. There are several methods in medical education. The traditional method of teaching has several advantages such as investing less time for teachers and for students as well. On the other hand, new educational strategies and methods demand more time and practice [17]. Training sessions are one of the most common activities in continuous medical education (1,17). Training sessions include courses and workshops and are different in shape. The nature of training sessions are whole different due to several factors including: the content, number of participants, the degree and type of interaction and target groups [18]. Educational workshop is a teaching method which concentrates on the mutual relationship between student-teacher in real situations. In this teaching method, students have enough time to think, analyze and use their knowledge to deal with the existing educational problems [19,20]. Medical school graduates across the country have the skills necessary to prevent and diagnose diseases and treat patients with mental and physical diseases [21]. Since medical students are in direct contact with the health of patients, it is very important to investigate the factors affecting their learning [23]. Several factors such as personality traits, the number and culture of students may affect teaching strategies. However, teaching methods is a critical factor that may improve the learning process of the students [22]. Interactive workshops can make a very big difference in professional practice [23]. Teaching correct principles and methods consistent with the choice of proper medicines will not be formally implemented in teaching medical students. As a result, at the start of clinical course, medical students do not have a clear vision of the principles of drug prescription and logical medication. On the other hand, due to overcrowding and lack of space in educational hospitals' pharmacies, these deficiencies will be felt more tangible. Conducted education is a means that present students, who would-be future doctors, can take advantage of it in order to perform prescribing in a conscious and rational way based on scientific and practical principles. Prescribing proper medication (rational drug prescribing), such as accurate and timely diagnosis and appropriate drug selection earns a significant importance. Irrational prescribing can lead to increased mortality, social and economic problems for the patient and the community as well. Another problem with medical students is their lack of awareness and usage of

KEY WORDS

Pharmacology course, simulators, educational workshops, case study

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medicine forms. The purposes of the present study are developing familiarity with medicine forms, their usage, precautions, and drug interactions and reducing existing errors.

MATERIALS AND METHOD

Given the importance of learning Pharmacology and the role of teaching this course appropriately in reasonable and appropriate prescribing of, a number of changes in presentation of Pharmacology course units were applied as follows:

1. Changing teaching pharmacology courses from compressed mode to continuous mode during the term in accordance with the blocks offered in each semester
2. Changing the course Pharmacology from four one-unit Pharmacology to two two-unit Pharmacology courses that each two units are presented during a semester.
3. Removing less important topics such as anti-malarial drugs and adding highly necessary and important topics such as anti-cancer drugs and drugs affecting bone.
4. Beginning early learning of how to prescribe logically.

In the next step

- Making a list of common drugs available and widely used in Jahrom health care centers and making them consistent with the course as much as possible.
- Providing simple, compact and thoroughly informative texts prepared for each drug regarding the resources referred to in the process.
- Ordering needed medicines and providing them from health care centers (preferably expired drugs).
- Evaluating purchased medicines and ensuring the accuracy of order and compliance with the scientific literature and fixing deficiencies.
- Classification of drugs with prepared text.
- PowerPoint presentations and training videos concerning medicine dosage forms during class.
- The presence of students in clinical skill centers and pharmacy model.
- Convening clinical pharmacology classes and workshops based on predicted objectives.
- Conducting pre-test and post-test from workshops regarding Pharmacology knowledge.
- Receiving their feedback and ideas to reform the proposed cases and modify the relevant defects.

In the next part

- Preparing raw prescription
- Collecting common prescriptions from medical centers or hospitals
- Collecting prescriptions errors which made by interns
- Preparing a bank of indigenous common clinical cases and logical prescription for treatment and conducting training sessions of clinical prescription for students.

1- Diversity in teaching the target (prescription) through prescription errors scenario in the forum (Problem Based Learning)

2- Forum is a cyber space in which we set a scenario of illness diagnosis and prescription errors to encourage students' higher involvement and increase more interactive learning. This makes group-reflection possible for students. The students' pre-test and post-test information was reviewed by a series of corresponding two-part questions and their satisfactions as well as the impact of workshops on their learning and performance were evaluated.

Pharmacology course is among courses which is presented through 4 units in the form of theory and 2 practical units (clinical pharmacology) to medical students in the third and fourth year of educational programs of GP and the second and fourth semester of nursing (2 of theory and one practical unit in the form of Clinical Pharmacology). The main objectives of this course are the familiarity of medical and nursing students with theoretical and practical knowledge for pharmaceutical dosage forms, cognitive traits, drug category, scientific and Persian names of drugs, their indication, adverse effects, rational drug prescription and the correct principles of prescription. Since the content of this course is such that it requires students to be connected continuously to these topics in order to learn and increase the level of their knowledge and skills to identify dosage forms and improve their vision in rational drug prescription, hence, the use of the new technologies that are helping educational methods, enhances their ability to enjoy more of the above areas. In this regard, providing a pharmacy model containing the most commonly prescribed medicines prepared by hospitals (Motahari and Peymanieh) and health centers along with a brief explanation including Persian name, accurate scientific name, dosages forms of drugs, clinical application, side effects, drug interaction and precautions were included in the agenda of an experimental pharmacology. The project, performed with the help of all students who have chosen this units in the semester, accounts for 30 per cent of the final score from the corresponding unit.

RESULTS

Pharmacy model provides educational materials to students and offers little information on each medicine using short texts. According to the results of this study, one can enumerates higher students' desire to study pharmacology, appropriate approach to logical prescription through facilitating learning and increasing their knowledge and skill level in the process of learning this lesson. The results of students' knowledge evaluation in pharmacology courses showed a significant difference before and after the intervention [Table 1].

Table 1: Results of clinical pharmacology courses before and after the intervention
N = 64

Test position	Number	Mean	Standard deviation	T	Significant values
Before	64	6.45	1.57	22/28	0.0001
After	53	9.56	0.72		

Other results showed that :

- Easy access to pharmacy model is effective in increasing willingness to learn. It can also be considered as a learning mode during education.
- Optimum satisfaction of student with supplementary pharmacology courses (90%)
- Significant improvement in students' knowledge score in Pharmacology
- Increasing the number of correct answers to checking prescriptions with errors in the forum
- Students' appropriate answers to quizzes on manuscripts containing the scenario discussed in the forum
- Changing the system and reducing medical errors in prescription writing.
- Students' tendency to have more access to pharmacy model to complete Pharmacology information and knowledge [Fig.2].

Workshop assessment by students showed in [Table 2] .



Fig.1 : Teaching prescription through prescription errors scenario in the forum.

Table 2: Descriptive indicators of assessment of workshop program impact on students

Title	Very weak	Weak	Average	Good	Very Good
Workshop content proportion with the students' required topics	-----	-----	-----	3(9/1)	50(90/9)
Quantity and quality of the program in terms of presenting new scientific topics	-----	-----	5(9/4)	10(18/8)	38(71/8)
The quantity of material presented in the workshop	-----	-----	-----	12(22/64)	41(77/36)
Eliminating defects in students' performance	-----	-----	-----	15(28/3)	38(71/7)
The impact of program on the students' clinical decision-making	-----	1(1/88)	3(5.6)	8(15/09)	41(77/35)
The impact of the program on the depth of learning and motivation	-----	2(3/77)	5(9/43)	14(26/42)	32(60/38)
The impact of the program on promotion of scientific knowledge in pharmacology courses	-----	2(3/77)	4(7/54)	15(28/30)	32(60/37)
The relationship between learn theoretical and practical material	-----	2(3/77)	3(5/55)	48(90/56)	-----
Using previous students' experiences and its relationship with new content	-----	1(1/9)	1(1/9)	6(11/32)	46(86/8)
The impact of program on practical skills in the clinical setting	-----	-----	-----	3(9/1)	30(90/9)
The rate of your overall satisfaction with the holding of the workshop program	-----	1(1.7)	-----	17(32)	35(66.3)
The teachers' mastery of the material and their ability to attract participants	-----	-----	-----	53(100)	-----

DISCUSSION

One of the most important and basic necessities in order to prevent and treat diseases is proper understanding of pharmacology. Bereft of any incentive to learn, most medical students learn this subject in a teacher-centered approach based on the theories of this science. The lack of an active role in this field makes the whole learning process incomplete. That is why they face difficulty in logical prescribing of appropriate and effective medications for the patients in clinical encounter. Therefore, reconsidering teaching methods and other measures to promote teaching and learning and ultimately enhancing the level of knowledge and skills of medical students seem essential. Having evaluated the clinical applications of the students' pharmacological knowledge, Vasundhara and his colleagues stated that the teaching method of pharmacology requires fundamental changes [24]. Due to its unique features such as: encouraging students to learn, providing critical thinking and cooperating with the teachers in the learning

materials (teacher-based), environmental simulation similar to real environment and therefore improving students' confidence etc, teaching by workshops creates a more profound learning for students and strengthens their knowledge and skills as well. Findings from this study that were compared in the form of pre- and post-test revealed a significant increase in the level of students' knowledge and skill. The results of this study were consistent with those of other studies established on teaching workshop. For example, The Accreditation Council for Pharmacy Education (CAPE) has dealt with providing production standards of pharmacy model simulators in pharmacy Universities [25]. Some, also, emphasize knowledge transfer originating from these simulations on patient care to set the ground for making training pharmacology courses practical (25). Furthermore, some of the researches have pointed out the necessity of using simulations in the initial phase of learning pharmacology and then extending it to other functional skills[26]. According to a new model of teaching pharmacology developed by Kanchan Gupta et al. (2014), the students think with the help of a simulated clinical environment. The simulation was as follows: a patient consulted his physician, complained about process of his disease and explained the administered medicines as well as the way of managing medication. In addition, this caused students to make an active effort to prescribe the appropriate drug. Ultimately, the students stated that factors such as familiarizing and preparing them prior to their presence at the bedside (pre-clinical) and forcing them to learn the basics and applicable issues of this lesson led to increased learning [27]. Students' comments about the effectiveness of the workshops are very valuable. Most participants in this study declared their satisfaction with holding this workshop classes and its positive effect on their knowledge and skills. Similarly, a number of other studies have indicated that patient-centered learning (a workshop) increases students' satisfaction with their learning and asserted that this method was much superior to traditional methods of teaching [28]. The results of these studies support the students' attitude towards the workshops and the use of models and simulations.

Workshop training methods can also be useful in other courses and professions. In the study by PuncikovaRaicharoen et al (2015) that was performed on 189 medical students, the students were divided into two categories. The first group included 77 students who completed the course in emergency medicine with traditional methods and the second group includes the rest of the students who attended the course by attending workshops. Finally, three workshops attained the highest rating in terms of medical students' satisfaction who took part in workshops, among which one can mention: trauma workshops (internal bleeding), training in the patient's presence and the workshop of Emergency Medicine Services. Finally, they came to the conclusion that training emergency medicine to medical students through workshops would lead to higher satisfaction of students with emergency medicine training. According to the same study, trauma workshops can put students in real situations and causes that each student plays the role of a member of the group in support of patients during advanced cardiopulmonary resuscitation. In the end, these workshops teach real practical hints to the students. There are four very important components in these workshops which may help them to learn: Simulation or real action, team learning, immediate feedback and clinical thinking [29]. According to the results of studies done by Bazrafkan et al (2015), resident-teacher educational workshops can be effective in improving residents' teaching skills [30]. A study by Roudbari M (2006)[29], carried out on medical students to examine their views on the influence of research workshops on the development of their thesis, finally came to the conclusion that such workshop programs should be reviewed and that a part of these workshops' time should be replaced by better cases in teaching [31]. According to the study carried out by Jennifer Yost et al.[41], physicians who had attended workshops showed significant changes in their knowledge base, compared to other physicians who had not participated in these courses [33]. According to the study done by L Fritsche et al. (2005), after holding a three-day course in evidence-based medicine, significant progress has been observed in the physicians' knowledge and practice [8]. The expressed results, in line with current studies, are indicative of positive effects of workshop programs on students' knowledge and high satisfaction with these programs.

CONCLUSION

As a conclusion we can say that, as it is clear from the findings of studies, teaching through workshops and using simulators and real models has a salutary impact on learning and helps students, in real encounter with patients, to make appropriate clinical decisions with high knowledge and skills while maintaining their confidence, in an environment free from anxiety.

CONFLICT OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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AUTHOR CONTRIBUTION

ST was responsible for design and implementing of research, and final editing. LM was responsible for idea of title, writing of paper, editing the manuscript and data analysis.

ETHICAL ASPECTS

The study protocol was approved by the Ethics Committee of the Jahrom University of Medical Sciences, Jahrom, Iran

FINANCIAL DISCLOSURE

None

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