

The Effect of an Early Exposure Training Course on Pharmacology Principles and Prescription Writing on the Satisfaction and Knowledge Level of Pre-clerkship Students

M. Mostafazadeh-Bora (MSc)¹ , M. Rafati Rahimzadeh (MSc)² ,
A. A. Moghadamnia (Pharm D, PhD)^{*3} 

1.Education Development Center, Babol University of Medical Sciences, Babol, I.R.Iran.

2.Department of Nursing, School of Nursing and Midwifery, Babol University of Medical Sciences, Babol, I.R.Iran.

3.Pharmaceutical Sciences Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, I.R.Iran.

***Corresponding Author: A. A. Moghadamnia (Pharm D, PhD)**

Address: Pharmaceutical Sciences Research Center, Babol University of Medical Sciences, Babol, I.R.Iran.

Tel: +98 (11) 32199592. **E-mail:** moghadamnia@gmail.com

Article Type	ABSTRACT
--------------	----------

Research Paper	
----------------	--

Background and Objective: Rational prescribing is one of the important and challenging tasks of physicians, and this part is often neglected. Given its importance, the present study was conducted to investigate the effect of a training course for early exposure to pharmacology principles and prescription writing on satisfaction and knowledge level of pre-clerkship students.

Methods: The present quasi-experimental study was conducted on 60 pre-clerkship students at Babol University of Medical Sciences. In the present study, students participated in a four-hour workshop that focused on familiarization with the principles of prescription writing and medications. In addition, questions related to prescription writing principles and familiarization with medications were completed before and after the intervention. Moreover, a satisfaction survey was completed after the intervention and the results were analyzed.

Findings: The mean scores of students regarding familiarity with the principles of pharmacology before the intervention were 5.90 ± 1.20 , which increased significantly to 6.80 ± 1.57 after the intervention ($p=0.001$). Furthermore, regarding familiarity with the principles of prescription writing and in general after the intervention, the average scores of students increased significantly ($p=0.001$). The average scores of students' satisfaction with the workshop were also high.

Conclusion: The results of the study showed that early exposure to pharmacology principles is effective in improving students' knowledge of pharmacology principles and prescription writing. Therefore, educational policymakers should plan for continuous education and training throughout their studies until they achieve competency in this field.

Keywords: *Prescribing, Medical Student, Medical Education.*

Received:

Feb 17th 2025

Revised:

Apr 5th 2025

Accepted:

May 5th 2025

Cite this article: Mostafazadeh-Bora M, Rafati Rahimzadeh M, Moghadamnia AA. The Effect of an Early Exposure Training Course on Pharmacology Principles and Prescription Writing on the Satisfaction and Knowledge Level of Pre-clerkship Students. *Journal of Babol University of Medical Sciences*. 2025; 27(Suppl 1): e4.

Introduction

The World Health Organization has stated that medication safety is an international priority for patient safety (1). Rational prescribing of medications is an important and challenging task for physicians and requires the right knowledge, skills, and attitudes regarding familiarity with different medications. Clinicians can achieve this important goal by combining these indicators (2). Studies on medication errors show that young doctors, who write a significant percentage of hospital prescriptions, make many mistakes in prescribing within the first 2 years after graduation, and the prescribing of medications by general practitioners is not in a good condition (3-5). A study of prescriptions written by senior medical students showed that senior medical students do not have the necessary qualifications and competence for rational and safe prescribing, and there is a need to change the educational procedures in clinical pharmacology for medical students (6). Regarding the students' ability in prescription writing in Iran, most medical students rated their skills as low to moderate, and students also had low knowledge of drug dosage, frequency of use, and duration of treatment in prescribing and did not have a proper understanding of this (7-9). The importance of training and considering continuous training during medical education can be very important for these students to achieve self-confidence. Early exposure can be an effective initiator of change in this approach and improvement of competence.

The implementation of a competency-based educational program requires a well-structured planning using appropriate educational strategies and methods in medical schools (10). Among these concepts, the concept of early clinical exposure as a new strategy in improving the teaching-learning process for students in various fields is showing its importance more than ever. This concept means that students should be exposed to clinical and real cases during the first year of entering the clinic (10, 11). During the transition from basic sciences, students face several challenges and a large conceptual gap is established between this part of education and its application in the clinic. This confusion and disruption in organizing concepts causes negative feelings in students and leads to demotivation. Early clinical exposure can be one of the solutions to solve this challenge to improve the components of competence among medical students (12, 13). This equivalence for entering the clinic can be very crucial in various aspects and can have a significant positive impact on improving students' attitudes and creating a medical professionalism for them. Despite the importance of educational courses in medical universities, this issue has been largely neglected. As mentioned, the need to establish a connection between different medications and diseases and to understand the mechanism of medications is highly important. Holding various educational classes periodically can help fill this gap. Given the numerous problems in establishing a connection between this science and various diseases among medical students, the present study was conducted to investigate the effect of a training course for early exposure to pharmacology principles and prescription writing on satisfaction and knowledge level of pre-clerkship students.

Methods

After approval by the Ethics Committee of Babol University of Medical Sciences with the code IR.MUBABOL.HRI.REC.1403.319, the present quasi-experimental study was conducted on pre-clerkship students studying at Babol University of Medical Sciences with the aim of determining the effect of early exposure to pharmacology principles and prescription writing on satisfaction and knowledge level of these students. The research population in this study included all pre-clerkship students studying at Babol University of Medical Sciences. The inclusion criteria for the study included being a student

studying in the medical field and taking clinical preparation courses. The sample size for this study was determined as a minimum of 60 students using the statistical formula $n = Z^2 S^2 / d^2$ and similar studies (14) considering 95% CI, an estimated standard deviation of 1.95, an estimation error of 0.5, and considering 10% dropout.

In this quasi-experimental study, based on the subject matter and inclusion criteria, after making arrangements with the students and explaining the details of the workshop, an attempt was made to obtain informed consent from the students. The objective of the study was explained to each study unit, and informed consent was obtained from them before the study began. Before the start of the course and after explaining the objectives of the workshop, students answered the study questionnaires. The principles of prescription writing and its related points, as well as the principles of familiarity with medications, were explained by the relevant professor. In this workshop, the pharmacologist introduced medications based on different forms and the necessary scenarios were presented for the explanation of each part. This workshop explained different dosage forms and the basic principles of presentation of different dosage forms, the method of producing each medication, and the clinical considerations related to each medication.

In this study, the collection tool consisted of three sections. The first section was related to the demographic information of the study students, and the second one was a survey related to satisfaction with the workshop, including ten questions on a 5-point Likert scale from strongly disagree (score 1) to strongly agree (score 5). In the section dedicated to assessment of pharmaceutical information, researcher-made questions regarding familiarity with different dosage forms (11 questions) and familiarity with prescription principles (2 questions) in the form of true and false questions were used, which were designed by a pharmacologist and reviewed by other pharmacologists in terms of writing structure and being scientific. Each correct answer was given a score of 1 and each incorrect answer was given a score of 0. In addition, the questions were evaluated for design principles based on the Millman checklist (15) and their face validity was confirmed by the reviewing professors. Before and after the training, questionnaires related to familiarity with prescription principles and medications were given to the students.

Complete completion of the questions by the students was considered as informed consent to participate in the study. In addition, before distributing the questionnaire, the study participants were explained about the confidentiality of the study data. Finally, the collected data were analyzed using descriptive statistics in the form of mean $\pm$ standard deviation and frequency percentage, and Wilcoxon and Mann-Whitney statistical tests in SPSS V.27, and $p < 0.05$ was considered significant.

Results

The results of the present study showed that out of 60 pre-clerkship students, 38 (63.3%) were male and the rest were female and in the age range of 20 to 24. None of the study participants had participated in specific prescription writing courses.

The results of the study showed that the mean scores significantly improved before and after the intervention in both studied areas and also in total (Table 1). Before the intervention, there was no difference between men and women in terms of gender, but after the intervention, women obtained significantly higher scores (Table 2). Regarding the level of satisfaction with the workshop, the mean scores of students' satisfaction with the workshop were high (Table 3).

Table 1. Mean scores of prescription principles and familiarity with medications before and after the intervention

Questionnaire	Before Mean±SD	After Mean±SD	p-value
Familiarity with dosage form	5.90±1.20	6.80±1.57	0.001
Introduction to the principles of prescription writing	0.46±0.59	1.60±0.49	0.001
Total	6.36±1.24	8.40±1.53	0.001

Table 2. Mean scores of the studied variables by gender

	Man Mean±SD	Woman Mean±SD	p-value
Prescription writing			
Before	0.34±0.48	0.68±0.71	0.065
After	1.47±0.50	1.81±0.39	0.009
Medication			
Before	5.78±1.33	6.09±0.92	0.624
After	6.47±1.24	7.36±1.91	0.002
Total			
Before	6.13±1.14	6.77±1.34	0.074
After	7.94±1.01	9.18±1.94	0.001

Table 3. A survey of students about the workshop regarding the principles of prescription writing

Survey	Mean±SD
Holding a workshop on dosage forms was useful in increasing awareness of different dosage forms.	3.81±0.50
The workshop was held at a convenient time.	3.85±0.51
It would be better to hold more of these workshops during the training process.	3.88±0.45
It is appropriate to hold a workshop on different dosage forms and prescription principles at this stage of the physiopathology course.	3.76±0.59
This workshop was able to introduce us to the principles of prescription writing.	3.83±0.45
Students should practice more in such workshops.	3.88±0.41
The workshop atmosphere was suitable.	3.81±0.53
It is appropriate to hold similar workshops at higher levels.	3.78±0.55
Learning about medications is more effective when introducing hypothetical cases.	3.71±0.61
Overall, this workshop is considered useful and effective.	4±0.31

Discussion

The results of the present study showed that the mean scores of the questions on the principles of prescribing and familiarity with medications improved significantly after the intervention. In addition, the satisfaction rate with the workshop was high.

The results of the present study showed that the mean score of familiarity with medications among medical students increased significantly after the intervention. A study by Unver et al. demonstrated that after training, the score of objective assessment related to familiarity with medications improved

significantly, which was in line with the results of the present study (16). The results of a study by Vairy et al. showed that the rate of prescribing errors in the intervention group (9.6%) decreased compared to the control group (11.3%). The results also showed that a two-hour lecture was not sufficient to reduce medication-related errors among pediatric residents and that further efforts are needed in this area (17). The final results of this study, despite the effectiveness of the course, were not in line with the results of the present study, which may be due to differences in the type of course and the samples in the two studies. In our study, pre-clerkship students were evaluated. There were many challenges among medical students regarding familiarity with medications. These challenges manifest themselves in various areas such as medication name, medication dosage, and their uses. Various studies show that the need for educational interventions is vital to increase students' skills (6, 18).

Other findings of the study showed that the mean score of familiarity with the principles of prescription writing increased significantly after the intervention. The results of a study by Javadi et al. showed that the students' skills in the field of pharmacotherapy, pharmaceutical information, and prescription writing improved significantly at the end of the course, which was in line with the results of the present study (19). A study by Mokrzecki et al. showed that post-intervention scores improved significantly in the group receiving training, which was consistent with the results of the present study (14). In a quasi-experimental study, Bebitoglu et al. showed that after the intervention, students' scores were high in the short term, which was consistent with the results of the present study. Nevertheless, other results of the study showed that students' prescription writing scores decreased one year after the training course. Moreover, the results of the study showed that the long-term effect of a rational pharmacotherapy course on treatment planning carried out in the later years of education is better than a course held in the early years of education. In our study, this challenging issue was examined in the form of early exposure. However, it should be noted that the effect of time on the recall of learned material is clear, and in this case, continuous and ongoing training should be provided to increase students' competence in prescription writing throughout their studies (20).

Other results of the present study showed that the level of student satisfaction with the workshop was high. In line with the results of the present study, the results of the study by Javadi et al. showed that after the workshop, the level of satisfaction was high and the majority of study participants (91.6%) recommended this course to other medical students (19). In a study by Hauser et al., the results showed that informal and formal feedback indicated high acceptance and satisfaction of the study participants with the course, which was in line with the results of the present study (21). In another study by Sikkens et al., a prospective controlled intervention was conducted to investigate the long-term effects of a short interactive e-learning course on antibiotic prescribing skills among fourth-year medical students at a university in the Netherlands. E-learning was implemented as a non-mandatory course for 6 weeks on a temporary basis. Six months later, all students underwent a structured clinical exam based on infectious disease with the aim of simulating prescribing. The results of the study showed that a high percentage of study participants were satisfied with the course and stated that their confidence in prescribing increased after the course, which was consistent with the results of the present study (22). Consistent with the results of the present study, another study by Allen et al. examined the effect of an interprofessional educational intervention by pharmacy students to medical students regarding prescribing. At the end of the workshop, second-year medical students were more confident in their ability to write prescriptions, and fourth-year pharmacy students were more confident in their ability to teach prescription writing. After attending an elective training session, second-year medical students were more confident in their ability to access resources related to over-the-counter medications and provide advice and counseling to patients about the use of over-the-counter medications (23).

This study had limitations. Among these limitations is the lack of follow-up of students over time, which did not assess retention of the presented material. In addition, the study was conducted in a quasi-experimental manner, which may limit the generalizability of the findings. It is recommended that future studies examine different scenarios with students at different levels. In addition, the use of different educational innovations in this case and their persistence over time may further clarify different aspects of prescribing competence in these students (24). The results of this study showed that holding a prescription course among pre-clerkship students is effective in increasing prescribing skills and familiarity with medications. However, educational policymakers should plan properly for continuous education and training throughout their studies until they achieve competence in this field.

Conflict of interest: The authors of the study have no conflicts of interest.

Acknowledgment

We would like to express our gratitude to the Vice Chancellor for Research and Technology of Babol University of Medical Sciences for supporting this study and to all the students and individuals who participated in this study.

References

1. Sheikh A, Dhingra-Kumar N, Kelley E, Kieny MP, Donaldson LJ. The third global patient safety challenge: tackling medication-related harm. *Bull World Health Organ.* 2017;95(8):546-546A.
2. McLellan L, Tully MP, Dornan T. How could undergraduate education prepare new graduates to be safer prescribers?. *Br J Clin Pharmacol.* 2012;74(4):605-13.
3. Ryan C, Ross S, Davey P, Duncan EM, Francis JJ, Fielding S, et al. Prevalence and causes of prescribing errors: the PRescribing Outcomes for Trainee Doctors Engaged in Clinical Training (PROTECT) study. *PLoS One.* 2014;9(1):e79802.
4. Ashcroft DM, Lewis PJ, Tully MP, Farragher TM, Taylor D, Wass V, et al. Prevalence, Nature, Severity and Risk Factors for Prescribing Errors in Hospital Inpatients: Prospective Study in 20 UK Hospitals. *Drug Saf.* 2015;38(9):833-43.
5. Moghadamnia AA, Zahed Pasha Y, Mir Blooki MR, Baradaran Aghili M. An analysis of prescription indices of Babol general practitioners prescriptions, 1999. *J Babol Univ Med Sci.* 2000;2(3):21-6. [In Persian]
6. Brinkman DJ, Tichelaar J, Graaf S, Otten RHJ, Richir MC, van Agtmael MA. Do final-year medical students have sufficient prescribing competencies? A systematic literature review. *Br J Clin Pharmacol.* 2018;84(4):615-35.
7. Alizadeh M, Yazdchi H, Mazouchian H. The Views of Interns of Tabriz University of Medical Sciences Iran Regarding Practical Education and Clinical Skills Based on the Basic Minimum Competencies Statement of General Practitioners in Iran. *Stride Dev Med Educ.* 2016;12(4):654-62. [In Persian]
8. Rashidi K, Afkhamzadeh A, Khodabandeh R. Prescription Writing Ability of Young Doctors and Medical Interns in Kurdistan Province Iran. *Stride Dev Med Educ.* 2013;10(1):42-9. [In Persian]
9. Safaeian L, Kebriaeezadeh J, Hashemi-Fesharaki M, Salami S. Assessing the Prescription Writing Principles in Medical Students' Prescriptions during Internship. *J Isfahan Med Sch.* 2014;32(277):282-91. [In Persian]
10. Kazemipoor M, Hakimian R. Evaluation of reflection level in the field of educational findings among dental students at Shahid Sadoughi University of Medical science in 2017-2018. *J Med Edu Dev.* 2018;13(3):229-37. [In Persian]
11. Verma M. Early clinical exposure: New paradigm in Medical and Dental Education. *Contemp Clin Dent.* 2016;7(3):287-8.
12. Ebrahimi Z, Sabzevari S, Khajeali N, Borhanzehi K, Ebrahimi H, Dadpisheh S, et al. Impact of Early Clinical Exposure by Peer assisted learning on Clinical Performance among First Year Nursing Students. *Educ Strategy Med Sci.* 2019;12(1):68-73. [In Persian]
13. Faraj Pour A, Yazdani S, Farmad SA. A conceptual model for practice-based learning and improvement competency in medicine. *J Family Med Prim Care.* 2022;11(6):3230-7.
14. Mokrzecki S, Pain T, Mallett A, Perks S. Pharmacist-Led Education for Final Year Medical Students: A Pilot Study. *Front Med (Lausanne).* 2021;8:732054.
15. Meyari A, Biglarkhani M, Zandi M, Vahedi M, Miresmaeili AF. The Effect of Education on Improvement of Multiple Choice Questions' Designing in Annual Residency Exams of Dental School. *Iran J Med Educ.* 2012;12(1):36-45. [In Persian]
16. Unver V, Başak T, İyigün E, Taştan S, Demiralp M, Yıldız D, et al. An evaluation of a course on the rational use of medication in nursing from the perspective of the students. *Nurse Educ Today.* 2013;33(11):1362-8.
17. Vairy S, Corny J, Jamouille O, Levy A, Lebel D, Carceller A. Can a two-hour lecture by a pharmacist improve the quality of prescriptions in a pediatric hospital? A retrospective cohort study. *Can Med Educ J.* 2017;8(4):e6-15.

- 18.Dyasanoor S, Urooge A. Insight Into Quality of Prescription Writing - An Institutional Study. *J Clin Diagn Res.* 2016;10(3):ZC61-4.
- 19.Javadi MR, Khezrian M, Sadeghi A, Hajimiri SH, Eslami K. An Interprofessional Collaboration between Medicine and Pharmacy Schools: Designing and Evaluating a Teaching Program on Practical Prescribing. *J Res Pharm Pract.* 2017;6(3):178-81.
- 20.Bebitoglu BT, Oguz E, Acet NG, Akdeniz E, Sarikaya Ö. The short- and long-term effects of a course on rational drug use: A comparative study between prefinal- and final-year undergraduate medical students who attended the course in different clinical years. *J Educ Health Promot.* 2021;10:213.
- 21.Hauser K, Koerfer A, Niehaus M, Albus C, Herzig S, Matthes J. The prescription talk - an approach to teach patient-physician conversation about drug prescription to medical students. *GMS J Med Educ.* 2017;34(2):Doc18.
- 22.Sikkens JJ, Caris MG, Schutte T, Kramer MHH, Tichelaar J, van Agtmael MA. Improving antibiotic prescribing skills in medical students: the effect of e-learning after 6 months. *J Antimicrob Chemother.* 2018;73(8):2243-6.
- 23.Allen SM, Kachlic MD, Parent-Stevens L. Pharmacy Students Teaching Prescription Writing and Nonprescription Product Selection to Medical Students. *Am J Pharm Educ.* 2020;84(3):306-10.
- 24.Khosravi Larijani AA, Malakoutinejad F, Yadollahzade AY, Rezaee Majd AM, Kavousi S, Mohammadi SM, et al. Learning Medical Pharmacology through Role-Playing Method. *J Babol Univ Med Sci.* 2023;25(1):88-101. [In Persian]