

A novel method for psychotropic drugs education: An interventional study

Zahra Tabandeh

Shiraz University of Medical Sciences

Ladan Zarshenas (✉ zarshenas@sums.ac.ir)

Shiraz University of Medical Sciences <https://orcid.org/0000-0002-8122-5126>

Manoosh Mehrabi

Shiraz University of Medical Sciences

Ali akbar Nekooeian

Shiraz University of Medical Sciences

Ebrahim Moghimi Sarani

Shiraz University of Medical Sciences

Research article

Keywords: Mobile learning, Group discussion, Psychotropic drugs

Posted Date: April 9th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-20025/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: Familiarity with and management of drugs side-effects are among nurses' main educational needs with respect to pharmacological care in psychiatry departments. This study aimed to determine the effects of psychoactive drugs education through mobile phone and group discussion on nursing students' attitude, satisfaction, and learning.

Methods: This interventional study was done in Shiraz University of Medical Sciences in 2018. The participants included 40 nursing students passing the mental health apprenticeship in their 6th educational semester. The 32 students with inclusion criteria were randomly divided into two groups each containing 16 subjects. The first group underwent the educational intervention through group discussion within the first two weeks of apprenticeship. The second group, on the other hand, received the educational intervention through mobile phones over the second two weeks of the course. The students' learning, attitude, and satisfaction were assessed before and two weeks after the intervention and were compared two groups. After all, the data were entered into the SPSS statistical software, version 16 and were analyzed using descriptive and inferential (paired and independent t-test) statistics. $P < 0.05$ was considered to be statistically significant.

Results: The results showed a significant difference in the two groups' rate of learning before and after the intervention ($p = 0.00$). However, no significant difference was found between the two groups in this regard ($p = 0.158$). The results also revealed a significant difference in the two groups' satisfaction with the instruction method before and after the intervention. A significant difference was also observed between the two groups in this regard ($p = 0.043$). Finally, the results indicated that the students in the mobile phone group developed a significantly more positive attitude after the intervention compared to baseline ($p = 0.038$).

Conclusions: The study results demonstrated that mobile teaching methods could be effective in students' learning, satisfaction, and attitude. Thus, further studies are recommended to be conducted on other medical and nursing apprenticeships, so that such methods can be used in clinical education in case of obtaining similar results.

Background

Clinical education is a basic component of medical sciences education without which nurturing qualified individuals would be difficult and even impossible(1).

Nursing students spend a considerable part of their course of education in clinical wards. Thus, evaluation of clinical education is considered to be the basis of educational planning in nursing schools(2). Identification of effective factors in clinical skills learning is effective in reduction of problems and empowerment of positive points. In this regard, students themselves are the best sources for evaluation since they are in direct contact with the process(3). Clinical skills should be learned in a way to be accompanied with the highest quality and accuracy, eventually increasing patients' physical safety

and trust. Hence, possessing sufficient knowledge and skills is highly essential for professional nurses. Moreover, due to the ever-increasing complexity of health and treatment and emergence of new roles for nurses, they have to be trained in pharmacology, as well(4, 5). Although nurses spend 40% of their time on giving medications to patients in hospitals(6), less attention has been paid to pharmacology training and learning among instructors and students(7). Evidence has also indicated that the common curricula have not provided students and nurses with the opportunity to improve their medication management skills(8) Students have also pointed out their weakness in pharmacology courses(9). Familiarity with and management of drugs side-effects are among nurses' main educational needs with respect to pharmacological care in psychiatry departments(10).

In these departments, pharmacological treatment aims at modification or reduction of pathological behaviors, thoughts, and moods in patients with mental disorders. Such medications affect individuals' behaviors and functions directly(11). Generally, educational goals can be achieved via application of appropriate instruction techniques(12). In fact, selection of a proper instructional method can play a critical role in learners' skills learning and changing their attitudes(13). Traditional educational methods encouraged passive learning, did not take the learners' individual differences and needs into consideration, and did not pay attention to problem-solving, critical thinking, and other high-level cognitive skills. Therefore, many experts have pointed to the necessity to modify or complement the traditional educational methods. Electronic learning is an emerging approach, which has overcome some challenges of the traditional educational methods and has provided easy and flexible access to learning (28).

The World Federation for Medical Education has developed standards for medical education, advising universities of medical sciences to encourage students to take active roles in the teaching-learning process and prepare them for continuous learning(14). In this context, novel educational methods have to be inevitably employed in medical sciences instruction(15), and nursing education should also get compatible with these changes(16). Education via group discussion is amongst such models, which provides the ground for learners to discuss issues with each other as well as with their instructor so as to exchange information, thoughts, and ideas and solve problems(17). Electronic learning is another novel technology-based educational method using computers, Internet, webpages, satellite applications, multimedia, virtual education, computer simulations, and mobile phones(16, 18). Nowadays, educational planners, instructors, and students are able to use mobile phones in the teaching-learning process(19). This multimedia technique enhances students' motivation to learn irrespective of time and place and provides them with valuable learning opportunities in both dynamic and static times(20, 21). It has also enabled educational planners to prepare electronic books by combining summaries or detailed contents of courses as well as clinical guidelines with images, animations, sounds, and educational clips and give them to students as educational aids(22, 23). However, there is still no specific comprehensive technical plan to make use of this strong technology in Iran's universities of medical sciences(19). Therefore, the present study aims to investigate the effects of psychotropic drugs education via mobile phone and group discussion on nursing students' attitude, satisfaction, and learning and to answer theses

hypothesis that psychotropic drugs education via mobile phone has more effective in accordance to group discussion in nursing students' attitude, satisfaction, and learning.

Methods

Study design

This quasi experimental study with pretest/posttest design was conducted in Shiraz University of Medical Sciences in 2018.

Sampling

The research population based on the research by Chang et al.(24). Considering $\alpha=0.05$, 10% loss, and using NCSS software and the following formula, a 40-subject sample size was determined for the study (20 subjects in each group).

$$n = \frac{2 \left(z_{1-\frac{\alpha}{2}} + z_{1-\beta} \right)^2 \sigma^2}{(\mu_1 - \mu_2)^2}$$

The inclusion criteria of the study were being involved in education at the time of study, having passed the theoretical courses of pharmacology and mental health prior to the study, being involved in mental health apprenticeship at the time of study, being willing to cooperate in the study, and signing written informed consents. The exclusion criteria were not taking part in group discussion sessions and lack of possibility to install the prepared application on mobile phones.

From 40 students who had taken mental health apprenticeship 32 students had inclusion criteria and were randomly assigned to two groups of 16 students in the intervention and control groups using the table of random numbers It should be noted that 4 students in the group trained via group discussion technique were excluded from the study (Figure 1).

Instruments

The study data were collected using a demographic information form, students learning scale, a questionnaire assessing the students' attitude towards mobile learning, and a questionnaire evaluating nursing students' satisfaction with the instruction methods. The demographic information form included age, sex, marital status, living place, educational semester, previous semesters' average point, type of mobile phone, membership in social groups, membership in scientific websites, and methods of access to course questions. Students learning scale was designed with 20 items, according to the main goals of learning questionnaire assessing the rate of learning of psychotropic drugs, including antipsychotics, anti-anxiety drugs, antidepressants, and mood stabilizers. Each question had one score and a total was twenty.

The questionnaire assessing the students' attitude towards mobile learning was designed by Naderi et al. in form of a test containing 13 items. The items were responded via a 5-point Likert scale with the following options: completely agree (5), agree (4), no idea (3), disagree (2), and completely disagree (1). The reliability of the questionnaire was approved by Cronbach's $\alpha = 0.90$. Additionally, its validity was confirmed by factor analysis(25).

The students' satisfaction with the instruction methods was evaluated using a researcher-made questionnaire designed by Breimnejad et al.(26).

This questionnaire consisted of 16 items responded through a 3-option Likert scale (completely, to some extent, never), ranging from 1 to 3. Thus, the minimum and maximum scores of the questionnaire were 16 and 48, respectively. ~~Accordingly, scores 0-16, 16-32, and above 32.~~

The face and content validity of the questionnaire were assessed by 15 experts using Waltz and Bausell's index and the required modifications were applied. Accordingly, the content validity index was 0.85. Moreover, the reliability of the questionnaire was found to be 0.9 using the test-retest method(26).

Procedure

After approval of the research proposal and gaining the approval of the University's Research Vice-chancellor and Ethics Committee, the researcher began searching in library resources as well as the related articles in order to collect the required content. The next stage involved preparation of the educational content, which included information about different categories of psychotropic drugs, pharmacology, pharmacokinetics, pharmacodynamics, clinical pharmacology, drug toxicity complications, names of different drug categories, nursing care, and advisable points. After preparing and designing the educational content and gaining the approval of the research team, the researcher referred to the virtual college (Comprehensive Center of Excellence for Electronic Learning in Medical Sciences) to set up a standard format for the software scenario. Then, sound recording from the educational content was done in two stages at the virtual college. After that, the researcher was introduced to a company to prepare the software that could be installed on mobile phones. The software was designed by engineers through meetings held with the researchers. Meanwhile, the researcher prepared the required images, animations, and videos regarding psychotropic drugs and gave them to the company. The videos were uploaded on the software in coordination with the virtual college. It should be noted that all stages were evaluated by the research team and deficiencies were resolved.

The prepared software included sounds, images, movies, animations, text files, searchability, chat room, and a final exam at the end of each drug category. The students observed eight icons on the software's homepage and could have access to the materials by clicking on each icon. It should be noted that the final exam icon could not be run until the end of the course.

After all, the educational software was organized in five main sections, namely antidepressants, mood stabilizers, antipsychotics, anti-anxiety drugs, and summary. Each section consisted of subsidiary

divisions, including the drug category's basic and clinical pharmacology, pharmacokinetics and pharmacodynamics, side-effects, drug interactions, drug toxicity, and nursing care and advice while receiving medications. The advantages of this software included the possibility to use the audio or written file based on the students' desire at the time of learning, existence of images related to drugs shapes and doses in order to make the students visually familiar with different types of psychotropic drugs, and existence of animations and videos regarding drugs side-effects in order to facilitate the students' learning of theoretical concepts.

In order to avoid information exchange, the educational interventions were conducted in the two groups with a specific time interval. In so doing, first group discussion sessions were held. A week after the end of the intervention and the related assessments, the educational intervention using mobile phones was started. In this group, the software including the educational content was installed on the students' Android mobile phones and the students received the content for two weeks. If they had any questions, would communicate with the researcher on the social network and the forum. The students in the group discussion group got familiar with group discussion in a training session. Then, based on a specific plan, they discussed various drug categories in the psychiatry department in the hospital where their apprenticeship course was held through six 45-minute sessions.

The two groups' learning and satisfaction with the instruction methods were assessed before and two weeks after the educational intervention. The second group was also required to fill out the questionnaire evaluating attitude towards mobile learning before and after the intervention.

Statistical methods

After all, the data were entered into the SPSS statistical software, version 16 and were analyzed using descriptive (quantitative and qualitative tables, mean, and Standard Deviation and inferential (paired and independent t-test) statistics. $P < 0.05$ was considered to be statistically significant. It should be noted that four students in the group discussion group were excluded from the study due to omitting the mental health apprenticeship.

Ethical considerations

After gaining the approval of the Ethics Committee of Shiraz University of Medical Sciences (code: 95-01-08-13957), the research objectives were explained to the students and their written informed consents were obtained. The students were reassured that their demographic information would remain confidential. Moreover, the control group students were provided with the educational software content after the end of the study.

Results

The study results revealed that the students' mean age was 22-23 years ($p=0.117$) and the mean of their average points was 15.58-15.87 ($p=0.575$) in the two groups, and the differences were not statistically

significant. Also, no significant differences were observed between the two groups with respect to sex distribution ($p=0.743$). The rate of participation in research activities was 67% in the group discussion group and 6.2% in the mobile phone group, and the difference was statistically significant ($p=0.001$). Nevertheless, the majority of students in both groups used the Internet to find answers to their course questions, and no significant difference was observed between the two groups in this regard ($p=0.408$). Overall, the two groups were similar with respect to all demographic characteristics, except for participation in research works (Tables 1 and 2).

Among the students receiving the educational intervention through group discussion, the mean score of learning increased from 9.29 (2.09) in the pretest to 15.88 (1.65) in the posttest. In the mobile phone group, this measure increased from 9.85 (2.74) before the intervention to 14.74 (2.31) after that. Thus, the educational interventions resulted in an increase in the rate of learning in both study groups. The results of paired t-test also revealed a significant in the two groups' learning scores before and after the intervention ($p=0.00$). However, no significant differences were detected between the two groups' learning scores at the two stages (Table 3).

The results of paired t-test revealed a significant difference in the group discussion group's scores of satisfaction with the instruction method before and after the intervention ($p=0.027$). The results also indicated that the mobile phone group's score of satisfaction with the instruction method increased significantly after the intervention compared to baseline ($p=0.21$). Moreover, the results of independent t-test showed that the students in the mobile phone group were more satisfied with the instruction method in comparison to those in the group discussion group ($p=0.43$) (Table 4). The results of paired t-test also revealed a significant difference in the students' attitude scores before and after education using mobile phone ($p=0.38$). (Table 5).

Discussion

This study aimed to compare the effects of psychotropic drugs education using group discussion and mobile phone on nursing students' attitude, satisfaction, and learning at Shiraz University of Medical Sciences. The results demonstrated an increase in the two groups' scores of learning and satisfaction with the instruction method after the intervention compared to baseline. Although the mobile phone group's score of satisfaction was higher than that of the group discussion group, the difference was not statistically significant. The results also revealed a significant difference in the mobile phone group's score of attitude after the intervention compared to before that. These results were consistent with those of numerous investigations. For instance, Yazdan Nik et al. conducted a study on using mobile phones for triage indicators among emergency nurses in 2018. The results demonstrated a significant increase in knowledge scores after the intervention compared to baseline(27). Zarshenas et al. (2017) also investigated the impacts of using educational booklets and interactive multimedia using CDs on prevention of osteoporosis among girl students. The results revealed a significant increase in both groups' learning scores after the intervention in comparison to baseline(28). Similarly, Ramezani et al. (2017) compared lecture method, electronic learning, and conceptual map on pediatric nursing education

and came to the conclusion that all three methods were effective in promotion of the students' knowledge and learning(29). Nasiri et al. (2014) also compared the effects of Anatomy instruction via mobile phone and lecture methods. The findings indicated an increase in both groups' learning scores after the training compared to baseline(30). In the present study, no significant difference was found between the two instruction methods with regard to changes in learning scores. This result was in agreement with those of some other studies. For example, Zarshenas et al. reported no significant differences between the two study groups with respect to learning scores(28). Dilles et al. (2011) also disclosed that cardiac patients' self-care training via computer and brochure caused an increase in knowledge scores in both study groups, but the difference between the two groups was not statistically significant(31). However, contradictory results were obtained in some other studies. For instance, Lee (2015) compared the effects of health education using mobile phone- and web-based discussion and reported that group discussion based on mobile phone provided more valuable opportunities for self-education, educational motivation, and interaction between the learners and the learning process(32). In the same line, Barbaz et al. (2012) compared the effects of lecturing, problem-solving, and self-education through computer on B.Sc. nursing students' drug calculation skills in the intensive care course. The results indicated that all three methods were significantly correlated to the students' learning levels, but self-education through computer was less effective compared to the other two methods(33). Lack of difference between the two groups' learning scores in the present study could be attributed to the advantages and disadvantage of the two instruction methods. The main strong points of education using mobile phone include lightness, small size, and portability of the educational device, accessibility to education at any time and place, flexible learning, application of multimedia techniques regardless of time and place, and provision of valuable learning opportunities at both dynamic and static times. On the other hand, the main disadvantages of this method include lack of face-to-face relationships, lack of concentration at the time of learning due to attractiveness of mobile phones, lack of network coverage in some regions, learners' inability to organize the learning process, lack of technical and support infrastructures, lack of educational standards for changing traditional materials into the electronic format, and mobile phones' small LCDs and keyboards(20, 21, 34, 35). Moreover, the main strong points of learning through group discussion include information exchange, ability to learn complicated materials, empowerment of reasoning, ability to evaluate viewpoints and make the best decisions, improvement of communication skills, and increasing learners' self-confidence. On the other hand, one of the limitations of this method is that a longer period of time is required for education because of the need for logical discussions among students, while a specific time is dedicated to educational plans in universities' curricula. Thus, students may not gain great benefits from this method. Additionally, group discussion requires the instructor to manage the groups quite effectively. In case of instructor's inefficiency, this method may not be accompanied with high success rates. Moreover, this method is not appropriate for large groups and meetings(36). In the current study, the results of paired t-test showed an increase in the two groups' scores of satisfaction with the instruction methods after the intervention compared to baseline. The results of independent t-test also revealed that the score of satisfaction with the instruction method was significantly higher in the mobile phone group compared to the group discussion group. These results were in agreement with those of the studies conducted by Hsu et al. (2018)(37), Ghazisaeedi et al. (2016)(38), Haghani et al. (2016)(39), and

Hyun et al. (2009)(40), The software utilized in the current study benefitted from repeatability, visual and audio attractions, videos, animations, possibility to use the written format, and summary of the materials, which were effective in the students' high satisfaction levels. However, the results were in contrast to those of some other studies, including the one conducted by Kim (2017) to evaluate the impact of education using mobile phone on nursing students' knowledge, skills, and self-confidence at the time of caregiving(41), Smiths et al. (2012) also reported no significant differences between the intervention and control groups regarding the rate of satisfaction, which was attributed to the small sample size as well as the students' inability to respond to E-mails due to large loads of homework(42), Similarly, Fani et al. compared the effects of traditional and novel instruction methods on dental students' knowledge and attitude and found no significant differences between the two groups with respect to satisfaction with the instruction method. Based on their perspective, this finding resulted from the novelty of the multimedia educational method(43), Chang (2008) also carried out a research to develop electronic learning for nurses. The results indicated no significant differences between the intervention and control groups, which was ascribed to the small sample size as well as loss of some participants due to limitations in location of using computer facilities(24), All above-mentioned studies showed no significant differences between the intervention and control groups. Students' interest in traditional lecture methods, Internet and mobile phone limitations, and bandwidth limitations could also play a pivotal role in learners' dissatisfaction.

The results of paired t-test revealed a significant increase in the mobile phone group's attitude scores after the intervention compared to baseline ($p = 0.038$). This result was in line with those obtained by Wu et al. (2011)(44), , Zare Bidaki et al. (2012)(19), Pourteimour (2017)(45), Khoramian Tusi (2016)(46), Naderi et al. (2014)(25), Sarani and Aayati (2014)(34), and de-Marcos (2010)(47), However, contradictory results were obtained by Smiths et al. (2012)(42) and Rad and Heidari (2011)(48). The controversy among the results could result from the advantages and disadvantages attributed to each of the educational methods. The main advantages included interaction, accessibility, high motivation, cooperative learning, and flexibility. On the other hand, low transfer speed, bandwidth limitations, limited memory space, low Internet speed for downloading images, videos, and animations, small LCD and keyboard, and relatively high cost were mentioned as the main disadvantages of mobile phones(34).

Limitations

One of the limitations of the present study was that it involved only one B.Sc. nursing course during a short time period. Another study limitation was its small sample size. Low Internet speed also caused a limitation in downloading educational videos.

Conclusion

The study results showed that psychoactive drugs education through mobile phone and group discussion enhanced the students' learning of psychoactive drugs. However, a significant difference was observed

between the two groups with respect to satisfaction with the instruction methodology. Indeed, the students developed a more positive attitude after the training in comparison to the baseline.

Considering the importance of students' learning of psychoactive drugs and its undeniable role in promotion of nursing processes, patient care, and medication management, educational interventions are required for nursing students to improve their nursing care and medication management. In this context, university professors are recommended to make use of electronic methods for educational planning and developing educational curricula. We can recommend to do this study with the third group with the traditional methods of teaching and compare with the group discussion and mobile learning.

Abbreviations

SPSS, Statistical Package for the Social Sciences; NCSS, numerical cruncher statistical software.

Declarations

Ethical approval and consent to participate

Written informed consents were obtained from all participants. The study was approved by the Ethics Committee of Shiraz University of Medical Sciences (**IR.SUMS.REC.1396.114**).

Consent to publish

Not applicable.

Availability of data and materials

The datasets during the current study are not publicly available due to confidentiality of the students' data, but they will be available upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

Not applicable.

Author's contributions

L.Z., M.M., and A.N. and E.M.S participated in study design, data collection, and data analysis. Z.T. participated in initial study design, data collection, and data analysis. All authors read and approved the final manuscript

Acknowledgement

This article was extracted from Zahra Tabandeh's M.Sc. thesis in psychiatric nursing approved by the Research Vice-chancellor of Shiraz University of Medical Sciences (proposal No. 13957). Hereby, the authors would like to thank the nursing students participating in the research as well as their apprenticeship professors for their cooperation. Thanks also go to Dr. Ghaemmaghani for her statistical assistance.

References

1. Azemian A. The standards of professionalism in nursing: the nursing instructors' experiences. *Evidence Based Care*. 2014;4(1):27-40.
2. Hosseiny N, Karimi Z. The situation of clinical education based on nursing students' opinion in Yasuj Nursing and Midwifery School. *Iranian Journal of Medical Education*. 2005;5(2):171-5.
3. Beech B. Aggression prevention training for student nurses: differential responses to training and the interaction between theory and practice. *Nurse Education in Practice*. 2008;8(2):94-102.
4. Lim AG, Honey M. Integrated undergraduate nursing curriculum for pharmacology. *Nurse Education in Practice*. 2006;6(3):163-8.
5. Lim AG, Honey M, Kilpatrick J. Framework for teaching pharmacology to prepare graduate nurse for prescribing in New Zealand. *Nurse education in practice*. 2007;7(5):348-53.
6. Armitage G, Knapman H. Adverse events in drug administration: a literature review. *Journal of nursing management*. 2003;11(2):130-40.
7. Manias E, Bullock S. The educational preparation of undergraduate nursing students in pharmacology: clinical nurses' perceptions and experiences of graduate nurses' medication knowledge. *International Journal of Nursing Studies*. 2002;39(8):773-84.
8. Purfarzad Z, Farmahini Farahani M, Ghorbani M. The Effect of Using Feedback Strategies with an Emphasis on Pharmaceutical Care standards on Nursing Students' Knowledge and their Medication Errors. *Iranian Journal of Medical Education*. 2013;13(7):577-87.
9. Zareie F, Shams S, Naseri O, Rasuli D, Orojlu S. Lack of Knowledge of Pharmacology in Nursing Students; Rate, Causes and Solutions. *The Journal of Urmia Nursing and Midwifery Faculty*. 2013;11(6):443-52.
10. Aminoroaia M, Attari A, Maracy MR, Hadipour K, Omranifard V. Assessment of educational needs of nurses working in psychiatric wards of hospitals in Isfahan, Iran. 2012.
11. Hojjati H. A comprehensive review of mental health nursing. 3 th ed: Jameenegar 2008.
12. A. S. General Methods and Techniques of Teaching. 16th ed. Tehran, Iran: Moaser; 2015.
13. Amanat D, Danaei SM, Amanat N. Evaluation of the students' attitude and satisfaction of educational situation in shiraz dental school. *Journal of Dentistry, Shiraz University of Medical Sciences*. 2010;10(4):356-60.
14. Moein A, Heydari Seraj M. Comparison of viewpoints of dermatology medical students involved in teaching-learning process about two methods of learning: group discussion versus lecture. *Journal*

Of Dermatology and Cosmetic. 2014;5(2):82-8.

15. Mark BA, Belyea M. Nurse staffing and medication errors: Cross-sectional or longitudinal relationships? *Research in nursing & health*. 2009;32(1):18-30.
16. Hosseininassab D, Abdullahzadeh F, Feizullahzadeh H. The effect of computer assisted instruction and demonstration on learning vital signs measurement in nursing students. *Iranian Journal of Medical Education*. 2007;7(1):23-30.
17. Saif AA. *Modern educational psychology: psychology of learning and teaching*. Tehran: Doran. 2013.
18. Moradi E, Mokhtari NJ, Khadem AS, Ebadi A, Salari MM. Effectiveness of medical nuclear care nursing training on levels of learning by multimedia software. 2010.
19. Zare bidaki M, Rajabpour sanati A, A. Rs. Design and manufacture of electronic books together, a new model of delivering learning content in Medical Sciences. *Strides in Development of Medical Education*. 2012;9(1):18 - 24.
20. Prensky M. What can you learn from a cell phone? Almost anything! *Innovate: Journal of Online Education*. 2005;1(5).
21. Ally M. *Mobile learning: Transforming the delivery of education and training*: Athabasca University Press; 2009.
22. Motiwalla LF. Mobile learning: A framework and evaluation. *Computers & education*. 2007;49(3):581-96.
23. Mostakhdemin-Hosseini A. Usability considerations of mobile learning applications. *International Journal of Interactive Mobile Technologies (iJIM)*. 2009;3:29-31.
24. Chang W-Y, Sheen S-TH, Chang P-C, Lee P-H. Developing an E-learning education programme for staff nurses: processes and outcomes. *Nurse Education Today*. 2008;28(7):822-8.
25. Naderi F, Ayati M, Zare Bidaki M, Akbari Bourang M. The effect of mobile learning on metacognitive self-regulation and attitudes of students of allied health sciences. *Iranian Journal of Medical Education*. 2014;13(12):1001-10.
26. Borimnejad L, Sajadi Hezaveh M, Khosravi S. The effect of learning contract on self-directed learning and satisfaction of nursing students in clinical education. *Iranian Journal of Medical Education*. 2015;14(12):1084-92.
27. Yazdannik A, Dsatjerdi EI, Mohamadirizi S. Utilizing mobile health method to emergency nurses' knowledge about Emergency Severity Index triage. *Journal of Education and Health Promotion*. 2018;7.
28. Zarshenas L, Keshavarz T, Momennasab M, Zarifsanaiey N. Interactive Multimedia Training in Osteoporosis Prevention of Female High School Students: An Interventional Study. *Acta Medica Iranica*. 2017;55(8):514-20.
29. Ramazani J, Hosseini M, Ghaderi M. Comparing the Effects of Lecture, E-Learning and Concept Mapping on Pediatrics Nursing Teaching. *Iranian Journal of Medical Education*. 2017;17:261-9.

30. Nasiri M, Nasiri M, Adarvishi S, Hadigol T. The effectiveness of teaching anatomy by mobile phone compared with its teaching by lecture. 2014.
31. Dilles A, Heymans V, Martin S, Droogné W, Denhaerynck K, De Geest S. Comparison of a computer assisted learning program to standard education tools in hospitalized heart failure patients. *European journal of cardiovascular nursing*. 2011;10(3):187-93.
32. Lee MK. Effects of mobile phone-based app learning compared to computer-based web learning on nursing students: pilot randomized controlled trial. *Healthcare informatics research*. 2015;21(2):125-33.
33. Barbaz A, Zareiyan A. Comparison of three instructional methods for drug calculation skill in nursing critical care courses: lecturing, problem solving, and computer-assisted self-learning. *Iranian Journal of Medical Education*. 2012;12(6):420-9.
34. Sarani H, Aayati M, The impact of Mobile phone using(SMS) on learning english vocabulary and the student's attitude. *Curriculum planning knowledge and research in educational sciences*. 2014; 11(13):48-60.
35. Morshedi L, Kazemi H, M. O. Attitudes of Students on Agricultural Education Promotion and Education of Tehran Science and Research Branch toward mobile learning. *Journal of Agricultural Extension and Education Research*. 2011;4(3):61 - 73.
36. Hosseinkhani H. Group Discussion Learning. *Marefat*. 2008; 119.
37. Hsu H-J, Weng W-K, Chou Y-L, Huang P-W. Mobile Augmented Reality as Usability to Enhance Nurse Prevent Violence Learning Satisfaction. *Studies in health technology and informatics*. 2018;250:75-6.
38. Ghazisaeedi M, Shahmoradi L, Ranjbar A, Sahraei Z, Tahmasebi F. Designing a Mobile-Based Self-Care Application for Patients with Heart Failure. *Journal of Health and Biomedical Informatics*. 2016;3(3):195-204.
39. Haghani F, Shahidi S, Manoochehri F, Kalantari B, Ghasemi G. The Effect of Distance Learning via SMS on Knowledge & Satisfaction of Pregnant Women. *Iranian Journal of Medical Education*. 2016;16:43-52.
40. Hyun KS, Kang HS, Kim WO, Park S, Lee J, Sok S. Development of a multimedia learning DM diet education program using standardized patients and analysis of its effects on clinical competency and learning satisfaction for nursing students. *Journal of Korean Academy of Nursing*. 2009;39(2):249-58.
41. Kim S-J, Shin H, Lee J, Kang S, Bartlett R. A smartphone application to educate undergraduate nursing students about providing care for infant airway obstruction. *Nurse education today*. 2017;48:145-52.
42. Smits P, De Graaf L, Radon K, De Boer A, Bos N, van Dijk F, et al. Case-based e-learning to improve the attitude of medical students towards occupational health, a randomised controlled trial. *Occup Environ Med*. 2012;69(4):280-3.
43. Fani MM, Mehravar S, Mehrabi M. Level of learning and satisfaction through traditional methods and the use of multimedia: a comparative study. *Interdisciplinary Journal of Virtual Learning in Medical*

Sciences (IJVLMS). 2014;5(2):72-8.

44. Wu P-H, Hwang G-J, Tsai C-C, Chen Y-C, Huang Y-M. A pilot study on conducting mobile learning activities for clinical nursing courses based on the repertory grid approach. *Nurse education today*. 2011;31(8):e8-e15.
45. Pourteimour S, Jasemi M, Hemmati Maslakpak M. The effect of e-learning on the knowledge, attitude and practice of nursing students about the prevention of drug errors in the pediatric unit. *The J Urmia Nurs Midwifery Fac*. 2018;16(1):12-21.
46. Khoramian Tusi S, Sheikh Fathollahi M, Rahnamaye Tamrooyee F, Akbari Javar M. Study of the Effect of Podcasting on Learning and Satisfaction in Dental Students. *Journal of Mashhad Dental School*. 2015;39(3):229-38.
47. de-Marcos L, Hilera JR, Barchino R, Jiménez L, Martínez JJ, Gutiérrez JA, et al. An experiment for improving students performance in secondary and tertiary education by means of m-learning auto-assessment. *Computers & Education*. 2010;55(3):1069-79.
48. Rad AK, Heidari A. Comparison of Two Self-Learning Methods (CD-Rom or Booklet) for Physician Education about Reporting Diseases Cases. *Iranian journal of Medical education*. 2011;11(2).

Tables

Table 1 Comparison of the two groups regarding qualitative demographic features

Variable		Mobile phone group	Group discussion group	P-value
Sex	Female	9 (56.2)	6 (50)	0.743
	Male	7 (43.8)	6 (50)	
Participation in research activities	Yes	1 (6.2)	8 (66.7)	0.001
	No	15 (93.8)	4 (33.3)	
Membership in scientific websites	Yes	5 (31.2)	5 (41.7)	0.698
	No	11 (68.8)	7 (58.3)	
Finding the course questions	Internet	12 (75)	8 (66.7)	0.408
	Other	4 (25)	4 (33.3)	

Table 2 Comparison of the two study groups regarding quantitative demographic features

Statistic	Mobile phone group	Group discussion group	
Variable	Mean \pm SD	Mean \pm SD	P-value
Age	22.78 (1.538)	22 (1.348)	0.173
Previous semesters' average point	15.87 (0.997)	15.58 (1.65)	0.575

Table 3 *Comparison of the two groups' learning scores before and after the intervention*

Group	Before the intervention	After the intervention	Difference between the two stages' scores	
	Mean \pm SD	Mean \pm SD	Mean \pm SD	P-value
Mobile phone	9.85 (2.74)	14.74 (2.31)	4.94 (3.32)	0.00
Group discussion	9.29 (2.09)	15.88 (1.65)	6.59 (2.81)	0.00
P-value	0.594	0.158	0.17	

Table 4 *Comparison of the two groups' scores of satisfaction with the instruction methods before and after the intervention*

Group	Before the intervention	After the intervention	Difference between the two stages' scores	
	Mean \pm SD	Mean \pm SD	Mean \pm SD	P-value
Mobile phone	31.56 (6.08)	38.44 (8.01)	6.88 (10.70)	0.021
Group discussion	29.25 (6.80)	32.75 (5.28)	3.50 (4.76)	0.027
P-value	0.352	0.043	0.329	

Table 5 *Comparison of the mobile phone group's mean scores of attitude before and after the intervention*

Variable	Before the intervention	After the intervention	P-value
	Mean \pm SD	Mean \pm SD	
Attitude	46.38 (10.31)	13.52 (8.43)	0.038

Figures

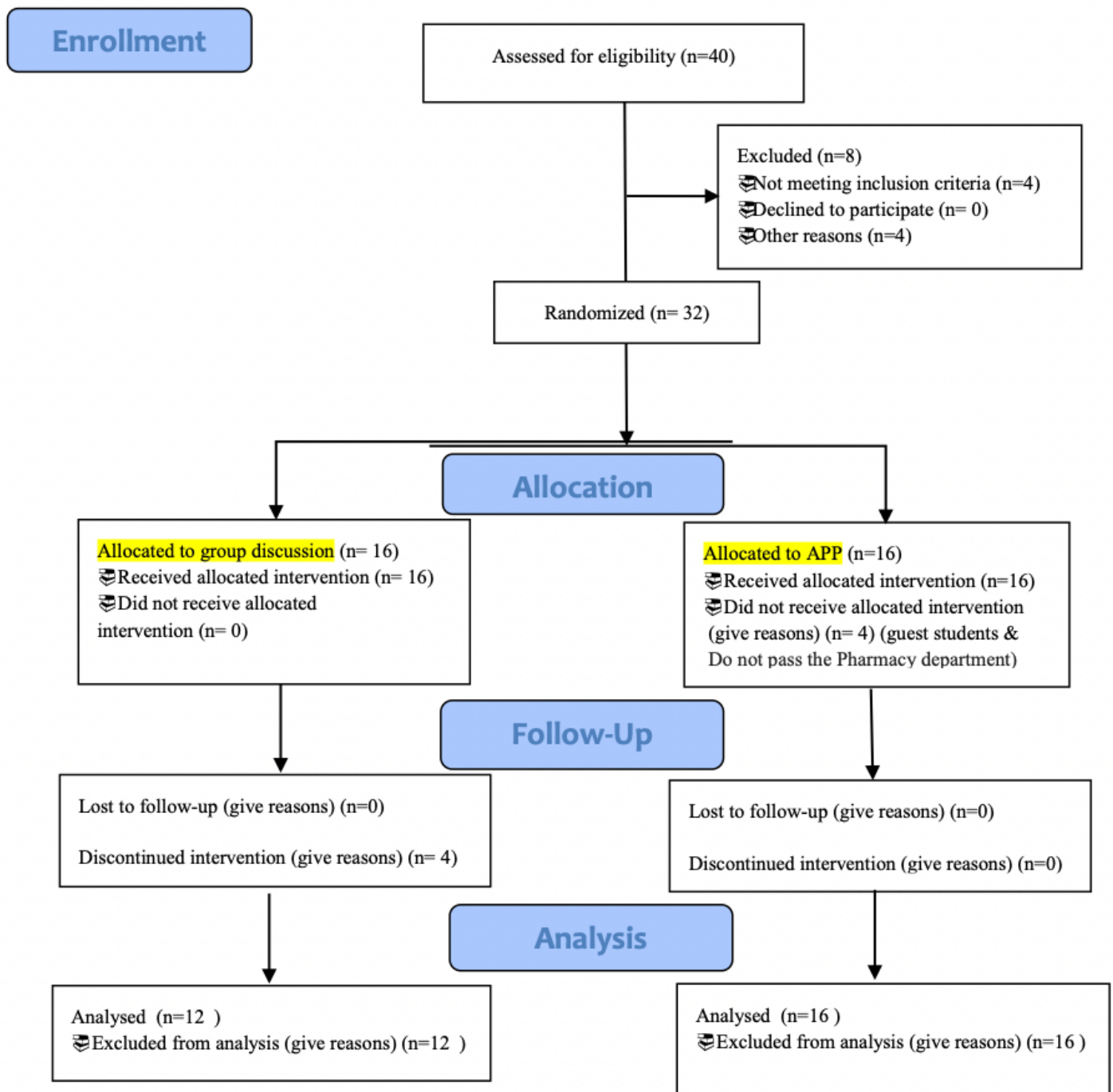


Figure 1

Flow chart of the study design