

### The Effect of Mobile Learning in Clinical Learning in Birjand University of Medical Sciences

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**Background:** Today, mobile phone technology has provided an opportunity for teachers and students to improve their continuous teaching/learning process. The purpose of this study was to determine the effectiveness of learning via mobile phone in the course of clinical pharmacology of medical students at pediatric ward.

**Methods:** In this semi-experimental study, 40 medical students at their last year of internship were studied with easy census method. Students were divided into two groups, case and control. Training in the case group was based on the e-content in pharmacology software installed on their mobiles and also the usual form of training in clinic and ward. In the control group, the learning was only based on usual form of training in clinic and ward. At the beginning and at the end of each period two groups were assessed by Objective Structured Clinical Examination OSCE. Data entry into SPSS 16.5 software were analyzed using descriptive statistics and independent and paired T-Test test at the level of P.

**Results:** Comparing mean scores in both case and control groups of medical students who were learning clinical pharmacology showed no significant difference before intervention ( $P = 0.1$ ), but the progress of case group were significantly higher than the control group after intervention ( $P = 0.001$ ). The means of detecting use of drugs ( $P = 0.02$ ), calculation of doses ( $P = 0.001$ ) and cognition of side effects ( $P = 0.04$ ) were significantly higher in case group.

**Conclusions:** Due to the results of this study, educational software installed on mobile phones is potentially capable of learning improving in medical students. It is recommended that officials use the software for the effectiveness of educational programs, and promotion of educational quality in medical science.

**Keywords:** Mobile phones; E- learning; education; Pharmacology

### تأثیر استفاده از آموزش الکترونیک (تلفن همراه) در یادگیری بالینی دانشجویان پزشکی بخش اطفال

**مقدمه:** امروزه از طرفی تکنولوژی تلفن همراه فرصت مناسبی را برای مدرسان و نیز دانشجویان فراهم کرده است تا از آن برای استمرار فرآیندهای یاددهی - یادگیری بهره بگیرند. این فرایند خصوصاً در آموزش بالینی اهمیت ویژه ای دارد. یکی از موارد یادگیری درمان دارویی در کودکان است که می بایست دوز دقیق برحسب وزن کودک محاسبه و تجویز شود. هدف از مطالعه حاضر تعیین اثر بخشی آموزش از طریق تلفن همراه در درس فارماکولوژی دانشجویان پزشکی بخش اطفال می باشد.

**روش کار:** در این مطالعه نیمه تجربی تعداد ۴۰ نفر از دانشجویان پزشکی سال آخر که کارورزی بخش اطفال داشتند به روش سرشماری آسان مورد بررسی قرار گرفتند. دانشجویان به دو گروه مداخله و کنترل تقسیم شدند. آموزش در گروه مداخله از طریق نرم افزار فارماکولوژی نصب شده در تلفن همراه و در گروه کنترل به طریق معمول انجام گردید. در پایان دوره هر دو گروه به روش OSCE توسط استاد مربوطه ارزیابی گردیدند. دادهها بعد از ورود به نرم افزار SPSS 16.5 و با استفاده از آمار توصیفی و آزمون های T-Test مستقل و زوج شده در سطح  $P < 0.05$  مورد تجزیه و تحلیل قرار گرفتند.

**نتایج:** میانگین نمره درس فارماکولوژی در گروه مداخله  $75/8 \pm$  و کنترل  $70/2 \pm$  بود. مقایسه میانگین این نمرات در دو گروه و از نظر آماری اختلاف معنی داری داشت. ( $P = 0/001$ ) همچنین میانگین نمرات تشخیص به کارگیری نوع دارو ( $P = 0/02$ )، محاسبه دوز دارو ( $P = 0/001$ ) و شناخت عوارض دارو ( $P = 0/04$ ) در دانشجویان استفاده کننده از نرم افزار در مقایسه با دانشجویان گروه کنترل در حد معنی داری بالاتر بود.

**نتیجه گیری:** با توجه به نتایج مطالعه حاضر، تلفن های همراه قادرند محیط یادگیری را دگرگون و جذاب نمایند و سبب تسهیل یادگیری در دانشجویان گردند.

**کلمات کلیدی:** فارماکولوژی، نرم افزار آموزشی، تلفن همراه، یادگیری بالینی

### تأثیر استعمال الموب التعليم الإلكتروني (الجوال) في التعلم السريري عند طلاب الطب في قسم الاطفال

**المقدمة:** يعتبر اليوم استعمال الجوال فرصة جديده للمتعلمين والمعلمين في مجال التعلم والتعليم. هذا الأمر له الصية كبيرة خصوصاً في مجال التعليم السريري. إحدى موارد التعلم هو في مجال علاج الاطفال بالادوية. لذا يجب معرفه المقدر الدقيق حسب الوزن. الهدف من هذه الدراسة هو تعيين مستوى تأثير التعليم عبر الجوال في درس الفارماكولوجيا عند طلاب الطب في قسم الاطفال.

**المطوب العمل:** في هذه الدراسة النصف تجريبية اشترك 40 طالب من طلاب الطب في السنة الاخير في التعليم السريري في قسم الاطفال تم تعليم فريق التداخل بواسطة برنامج فارماكولوجيا تم وضعه على الجوال و فريق المقياس بالادوية الاعتيادية. في نهاية الدورة تم تقييم الفريقين بواسطة الاستاذ عبر اختبار OSCE. تم تحليل النتائج بواسطة البرنامج الإحصائي SPSS 16.5 و الاختبارات الإحصائية T-TEST المستقل و الزوج في سطح  $P < 0.05$ .

**النتائج:** معدل علامة درس الفارماكولوجيا عند فريق التداخل  $75.8 \pm$  و فريق المقياس  $70.2 \pm$ . كان هناك اختلاف ذو قيمة عند الفريقين من جهة احصائية ( $P = 0.001$ ) و أيضاً معدل علامات تنخيص استعمال نوع الدواء ( $P = 0.02$ ). محاسبه مقدار الدواء ( $P = 0.001$ ). معرفة عوارض الدواء ( $P = 0.04$ ) عند طلاب مستعملي البرنامج كان اعلى مقارنة بطلاب فريق المقياس بشكل ملفت.

**الاستنتاج:** نظراً للنتائج الحاصلة بعد استعمال الجوال في المجالات العلمية امر مستع جدا و يسر التعلم عند الطلاب.

**كلمات المفتاح:** الفارماكولوجيا، برنامج التعليمي، الجوال، التعلم السريري.

### امراض اطفال کے شعبے میں کلینیکل تعلیم میں الیکٹرانیک تعلیم کے مفید اثرات

**ہیک گراؤنڈ:** آج کی دنیا میں موبائل ٹیلیفون ٹکنالوجی نے معلموں اور طلباء کے لئے بڑی آسانیاں فراہم کر دی ہیں۔ مدرس اور طلباء اس ٹکنالوجی سے تدریس اور تعلیم کے لئے فائدہ اٹھا رہے ہیں۔ موبائل فون ٹکنالوجی کلینیکل تعلیم میں بے حد فائدہ مند ہے۔ اس سے امراض اطفال کے شعبے میں کافی فائدہ اٹھایا جاسکتا ہے کیونکہ بچوں کو ان کے وزن کے حساب سے دوا دینا ضروری ہوتا ہے۔ اس تحقیق کا هدف امراض اطفال کے شعبے میں فارماکولوجی کے طلباء کے لئے موبائل ٹکنالوجی کی افادیت کا جائزہ لینا ہے۔

**روش:** اس نیم تجربی تحقیق میں شعبہ امراض اطفال کے چالیس طلباء کو شریک کیا جو انٹرن شپ گذار رہے تھے انہیں دو گروہوں میں تقسیم کیا گیا۔ پہلے گروہ کے موبائل فونوں میں فارماکولوجی کا سافٹ ویئر نصب تھا جبکہ دوسرے گروہ کے کو عام طریقے سے تعلیم دی گئی۔ کلاسوں کے بعد متعلق استاد نے او ایس سی ای ٹی روش سے کلاسوں کا جائزہ لیا جبکہ ڈیٹا کا تجزیہ ایس پی ایس ایس ۱۶.۵ سافٹ ویئر سے کیا گیا۔

**نتیجے:** جس گروہ کے موبائل فونوں میں فارماکولوجی کا سافٹ ویئر نصب تھا اس کی کارکردگی بہتر تھی اور اس گروہ کے طلباء دیگر گروہ کی نسبت دواؤں کی بہتر شناخت رکھتے تھے۔

**سفارش:** اس تحقیق کے پیش نظر موبائل فون سے طلباء کی پڑھائی پر مثبت اثر پڑتا ہے اور وہ سافٹ ویئر سے بہتر تعلیم حاصل کر سکتے ہیں۔

**کلیدی الفاظ:** فارماکولوجی، طلباء، سافٹ ویئر موبائل فون۔

## INTRODUCTION

Education is referred to any activity or measure aiming to create an inclusive learning in students. Learning is relatively a permanent change in potential behavior of learner provided that this change occurs as a result of experience (1, 2). In education, effective teaching is characterized by two features:

First, it leads to learning which should be sustainable (3). The aim of electronic learning is to support teaching and learning activities on an effective base. Development of Information and Communication Technology in educational programs is an effective and lasting step that can create a qualitative transformation in the goals, programs and procedures (4). E-learning is one of the modern methods of education in the age of technology, that provides and manages learning opportunities via the Internet and computer networks has been the stability of learning in addition of learning stabilization (5). In general, it can be said that e-learning is a way of learning that is based on the use of Information and Communication Technology and computer networks (6). The main aspects of e learning, is accessing to information and communicative and interactive features to it. On the other hand, the active participation of learners in training situations is essential for the realization of further learning (7) so that Maylhym (1996) considered the role of computer-based interactive training material. He described the interaction as a two-way communication between student and instructor, and states the benefits of interactive learning environment that connects computer users such as: Educational interactive environment increases the students' interest and skills-based learning as well as the development of the cognitive process of students (8). One of the difficult issues of learning in clinical medicine is related to the pharmaceutical treatment. These are the most important problems that general practitioners after graduation and at the beginning of the work encounter: Lack of skills in prescription, lack of accurate information about the drug, dosage and forms of the pharmaceutical marketing and side effects of them. The problem causes serious problems in the children, because in pediatrics, unlike adults, the dose is dependent to weight and low –doses are ineffective and high doses have adverse side effects. Considering the importance and sensitivity of the use of drugs in pediatrics and the need to complete learning concepts such as the type of drug, dosage and side effects of medications and to continue the process of teaching - learning. The purpose of this study was to determine the effectiveness of education via mobile phone in the course of clinical pharmacology of medical students at pediatric ward.

## METHODS

A Semi – experimental study was conducted in 2013 – 2014. Potential participants were recruited from students at the internship stage at the Birjand University of Medical Sciences. 40 students were selected by census method. Participant inclusion criteria included all students who were passing trimester pediatrics internship. Excluding criteria including all transfer and guest students.

Data collection was done in 3 trimester period of pediatrics internship. All students were divided into two groups, intervention (20 students in trance in 2007). Control (20 students who in trance in 2006). In intervention grope, the pharmacological software was installed on their Mobil phone that educated the pharmacology. Control group received the common education. Software had list of all drugs in 2 language including English and Persian. Student could search all drugs that they want. Each Page of drugs, including, therapeutic category, Pharmacologic category, drugs formation, dosage, pharmacokinetic, indication and side effects. This current software was prepared by the student that supervised with pediatrics and Pharmacology.

A confirmed multiple choice exam developed by professors and validated by specialists was used to evaluate students. These questions were filled before and after intervention. The whole questions were 50 in 3 domains: recognition of using special drugs (10 question with 2 scores), calculate the drugs dosage (2 questions with 2 scores), cognition of side effects (16 questions with 1.5 scores). Furthermore, the objective structured clinical examination (OSCE) was used for assessing students' skill 6S cores was devoted for this exam and designed in 3 sections. Participates in 2 groups filled the questions form by email after 3 month of intervention. Finally, the data of 40 students in 2 groups was gathered.

Was performed using SPSS software (version 16.5). Descriptive statistics, in dependent T – test and paired test calculated all variables. Ethical consideration included informed consent and score privacy. Finally, the pharmacological software was provided for control group.

## RESULTS

A total of 40 students participated in this study, 28 (69.3 %) were female and 12 (30.8 %) were male. The mean age was  $(23.36 \pm 1.64)$ .

There were no statistically significant differences between participant in 2 groups in sex and age.

Also, there were no statistically significant differences between participants in 2 group in regard with pharmacological information in 3 domains ; - Recognition of using special drugs – calculated the drug dosage and cognition of side effects before intervention.

However, there are statistically significant differences in 3 domains of, recognition of using special drugs, calculating the drug dosage and cognition of side effects after intervention. (Table 1)

The whole mean after 3 month show statistically significant differences. (Table 2)

## DISCUSSION

The results of this study showed that the use of educational software of cell phones for the pediatric pharmacology can improve clinical learning of medical interns. Studies carried out by the Zare Bidaki 2010 (9) and 2014 (10), Davis 2012 (11), Maag 2006 (12), Owen 2008 (13), Moradi –Dirin 2012 (14), Motamednejad 2012 (15), Heidari 2010 (16), Safarin 2010 (16), Shobeiri 2007 (18), Almekhlafi 2006 (19) and Jimoyiannis 2001 (20) are consistent with the findings of our

Table1. Comparison of the means score clinical training of medical students study in pharmacology in both groups before and after intervention				
Group		case	control	Independent samples T-test
<b>using</b>	Before	12.60±2.98	10.40±3.94	p=0.1
	After	16.80±3.07	13.20±3.69	p=0.02
<b>Paired-samples T-test</b>		p=0.002	p=0.01	
<b>dosing</b>	Before	15.80±7.50	11.20±9.93	p=0.5
	After	38.6±7.48	25.80±7.16	p=0.001
<b>Paired-samples T-test</b>		p=0.001	p=0.001	
<b>Side effect</b>	Before	11.45±1.09	10.10±1.97	p=0.1
	After	17.9±13.91	13.95±2.56	p=0.04
<b>Paired-samples T-test</b>		p=0.001	p=0.001	

Table2. Comparison of the means total score clinical training of medical students study in pharmacology in both groups before, after and 3 month after intervention				
Group		Case	control	Independent samples T-test
<b>before</b>		44±12.68	34±13.32	p=0.2
<b>After</b>		75.8±8.65	56.6±8.02	p=0.001
<b>3 month after</b>		77.75±9.08	53.52±4.43	p=0.003

study. Concluded that the use of multimedia educational content in a portable system, such as mobile phones leads to students' progress. This shows the importance of the application of new technologies in education without restrictions of time and place, such as mobile phones and related equipment. This is particularly and practically important to use the contents of multimedia in teaching and learning, because these tools strengthen social skills of the students and provide academic achievements. The results of this study were not aligned with findings of Yadollahi and Rastegarpour 2003(21) that did not find any relationship between the use of educational software and student achievement. However, it can be justified by the differences in sample size and the nature of using educational software. Among the possible reasons for an increase in the performance of students in the case group compared to the control group, we can point out delivering content in small pieces, repeated practice and feedback in a timely manner and using several time intervals and widespread multi senses, the availability of the device without time and space limitations. Multimedia capabilities of the device provides easy connection between learning and teaching environment in compare with the traditional method, using most of the time, informal learning environment to formal connection, the flexibility of this method compared to traditional methods of learning and makes easier communication without any pressure with professor (22). The entry of new technologies in the educational system has evolved teaching - learning process (23). In addition, by looking at the results

of this study it can be concluded that mobile technology has changed the role of trainers and teachers in training and instead, learners are changed to active elements in the process of teaching and learning and can be considered as a new horizon in the educational process. By providing materials so that students are part of the construction of cognitive education and with teaching met cognitive strategies to these, students can create a better learning environment for them to achieve effective learning. Due to the results of this study, mobile-based educational software is capable to improve learning of medical students. It is recommended that educational authorities facilitate using mobile-based e-content in clinical courses.

### LIMITATIONS

This study has several limitations. It is suggested to conduct the study on a large number of students and also repeat it several years after graduation to see if still there is a significant difference between these two types of training. Regarding the strengths, this study is highlighting the dissemination of new educational methods and the supply of new technologies in the educational system.

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