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Research Article

Undergraduate medical student's perceptions and experiences of m-learning in pharmacology

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ABSTRACT

Background: The current generation of medical students has grown up surrounded by information and communication technology (ICT). The ICT has been a critical component of teaching and learning in higher education over the last few decades. Mobile devices, such as smart phones, can have a significant contribution to modern medical education. Mobile learning or m-learning is a new concept in learning process. M-learning is supported by a variety of devices including smartphones. These devices integrate a series of features used in various learning environments. Pharmacology is a crucial subject for medical students who are going to be future medical practitioners. The aim of this study was to know how pharmacology students perceive mobile phones as an educational tool?
Methods: Prevalidated Questionnaires were distributed among 145 pharmacology students by simple randomization out of which 105 were returned completely filled. Analysis was done by manual calculators, Vassar Stats, and SPSS. Results are expressed in frequencies and percentages.
Results: Among the respondents 56.2% were males and 43.8% were females. All the respondents owned a mobile phone. 77.1% revealed that they mainly use mobile phones for internet purposes. 26.7% revealed that they use it solely for social networking, 9.5% for educational purposes and 63.8% used it for both social networking as well as educational purposes. Educational activities smartphones were used for included: reading lecture notes (24.8%), downloading lecture related videos (38.1%), downloading medical e-books (29.5%), medical dictionaries (27.6%), opening doc and pdf files (35.2%), lab references (10.5%), medical calculators (6.7%). 78.1% had the opinion that m-learning has a positive impact on learning and 68.6% indicated that mobile phone has improved their learning. Small screen size of phone (13.3%), costly bundled data (49.5%), limited phone storage (25.7%), low battery backup (28.6%), slow internet (48.6%), theft risk (3.8%), and parental prohibition to mobile phone use (12.4%) were the various barriers to m-learning, indicated by the respondents.
Conclusions: The results of this study indicate that medical students have a positive attitude toward m-learning. M-learning will facilitate the learning process without being tied to a physical location.

Keywords: m-learning, Information and communication technology (ICT), Pharmacology, Medical Students,Smart phones

INTRODUCTION

The emergence and advancements of information and communication technologies (ICTs) have changed the way teaching, and learning processes are conducted. ICTs facilitate immediate access to information resources needed for teaching and learning. In the teaching and learning process, ICTs are known to be a more cost-effective as they facilitate collaboration among learners and teachers and enhance pedagogical improvement through simulations, virtual experiences, and graphic presentations. This takes place through different ICT tools like computers, radio, television, mobile phones, and some other devices.[1]

"M-learning is the use of mobile technology to aid in the learning, reference or exploration of information useful to an individual at that moment or in a specific use context." Typically, it is accessed via a mobile device like mobile phones, tablets, kindle, and iPad. M-learning facilitates just-in-time and on-demand learning at the moment it is

needed. It is flexible, self-paced, and self-directed.[2] As noted by Irwin Jacobs, the founding chairman of Qualcomm, Inc., "always on, always connected, mobile devices in the hands of the students has the potential to dramatically improve educational outcomes."[3] M-learning makes it possible to extend the education beyond the physical confines of classroom.[4]

The current generation of the students grew up with ICT as an integral part of life. This generation of learners is called "digital natives"[5] or "net generation"[6] due to their familarity and reliance on ICT.

The widespread availability of mobile devices and wireless networks offer enormous opportunities for knowledge acquisition both in terms of interaction with the source of information and in terms of colloboration.[7] Use of mobile phones has become an important and useful component of medical education. With increasing amount of medical information available today, use of these portable devices help in quick access to medical information. Today, a wide range of digital content is available on these devices for students and teachers. It is a natural progression for students to continue learning using technology and associated methods.[8] Educational methods must be dynamic and continuously adapt to an ever-changing social environment.[9] The Medical Council of India's (MCI) vision 2015 document has put an emphasis more on non-didactic teaching-learning methodology. In addition, this document proposes newer teaching methodology in the form of e-learning and simulations. MCI in this vision documents hopes that "the introduction of a restructured curriculum and training program with the emphasis on early clinical exposure, integration of basic and clinical sciences, clinical competence and skills and new teaching-learning methodologies will lead to a new generation of medical graduates of global standards." The vision document also lays greater emphasis on self-directed learning.[10] M-learning has a great potential of facilitating self-directed learning.

Pharmacology is a crucial subject for medical students. Traditionally, the teaching of Pharmacology in medical colleges follows a discipline-based and lecture-based approach.[11] The emerging trend of using computer simulations as an alternative to animal experiments to duplicate live dissections is having a greater advantage of lesser involvement of time and labor, and repeatability. Most importantly computer-assisted learning (CAL) prevents the unethical killing of animals. *In-vitro in-vivo* correlations can be made with the help of pharmacokinetic software's therefore saving the usage of animals. Reduction in manual intervention and the user-friendly nature of these softwares make their use highly favorable.[12]

The use of mobile technology can significantly enhance blended learning and can have a major role in supporting on-campus teaching also.[13] This technology integrates a series of features used in various learning environments. Mobile phones can be used for sharing information resources. Other applications like emails, Google drive and social media can easily be used for sharing academic information resources. Teachers can also share learning material with the students.[1] M-learning can facilitate students in various ways like not only learning contents easily but also interacting with others anytime and any place at his or her convenience.[14]

As young population is the future of the country, their views are of utter importance. Feedback from the students on adopted teaching and evaluation methodology is considered to be the best method to bridge the gap between teachers and students.[15] Students are often viewed as a reliable and valid source of information in curriculum evaluation as they observe teaching daily.[16] The current study, therefore, assesses how mobile phones facilitate the teaching-learning process; identifies the commonly used mobile phone pharmacology applications and types of learning activities facilitated by mobile phones: and determines the factors limiting the usage of mobile phones in teaching and learning.

METHODS

Study design

We conducted a single institution, questionnaire-based survey of medical students to assess their current utilization of smartphones, the perceived advantage as well as barriers to the use of the device.

Study population

After institutional Ethics Committee approval and written informed consent, a total of 145 3rd and 5th semester students of 2nd professional MBBS studying at SKIMS Medical College Srinagar and enrolled in the Pharmacology department were given the questionnaire by simple random sampling method. The study was conducted in October 2015. Participants were informed about the objectives of the study and were assured that their response shall be anonymous. The participation was voluntary and without compensation.

Questionnaire

The structured questionnaire used in this study was created by reviewing relevant literature and questionnaires used previously in similar studies. The questionnaire was pretested for content and design on 10 students to clarify any ambiguities and suitable modifications were done. The final version of the questionnaire was divided into five parts. The first section described the gender and level of study (semester). In the second section, different questions about the mobile phone(s) used were asked. In the third section, questions about the various activities for which the students use their mobile phones were recorded. In the fourth section, questions regarding the barriers to using

mobile phones for learning activities were asked. In the fifth section, student's views about perceived advantages and disadvantages of m-learning were recorded. They were also allowed to make other comments if they so desired. The participants were asked to tick the option(s) which they felt was/were the best. They were also allowed to offer their own suggestions for certain items in addition to available options.

Data analysis

Analysis was done by combination of manual calculators, Vassar Stats, and SPSS v20. Analysis was carried out using descriptive statistics at 95% confidence intervals. Results were expressed in frequencies and percentages. Some of the questions had multiple options to choose from; therefore the sum total of % ages is not always 100.

RESULTS

105 students returned the completely filled questionnaire, giving a response rate of 72.41%. Among the respondents, 56.2% were males and 43.8% were females. All the respondents owned a mobile phone. 5.7% also owned a tablet. 43.8% respondents also owned a laptop. 85.7% owned android phones, 6.7% windows phone and 1%, and iPhone. Only 4.8% owned a java phone with limited utility. 85.7% respondents indicated that they always carry mobile phone with them. Majority (22.9%) used mobile phone for nearly 3 hrs a day and 11.4% revealed that they use their mobile phones for more than 6 hrs a day. 77.1% revealed that they mainly use mobile phones for internet purposes. Only 22.9% indicated that they mainly use it for calling/texting/listen to music or playing games. As high as 93.3% respondents had subscribed for a data connection, and 50.5% had both 2G and 3G data connection. While inquiring about main purpose for using mobile internet, 26.7% revealed that they use it solely for social networking, 9.5% for educational purposes and 63.8% used it for both social networking as well as educational purposes. 23.8% respondents used mobile internet to visit course related educational sites and 33.3% general medical sites. 42.8% visited both. The mostly visited site was Wikipedia (73.33%). Educational activities smart phones were used for include: reading lecture notes (24.8%), downloading lecture related videos (38.1%), downloading medical e-books (29.5%), medical dictionaries (27.6%), opening doc and pdf files (35.2%), lab references (10.5%), medical calculators (6.7%). As high as 61% respondents had various educational apps installed on their mobile phones. 62.9% revealed that they also use social media as learning tool. 78.1% had the opinion that m-learning has a positive impact on learning and 68.6% indicated that mobile phone has improved their learning. 50.5% wished that MBBS course specific mobile applications (apps) should be developed to make m-learning more effective. Small screen size of phone (13.3%), costly bundled data (49.5%), limited phone storage (25.7%), low battery backup (28.6%), slow internet (48.6%), theft risk (3.8%), and parental prohibition to mobile phone use (12.4%) were the various barriers to m-learning, indicated by the respondents. (Table 1)

DISCUSSION

In a short span of 10 years, mobile learning (m-learning) has moved from being a theory, explored by academic and technology enthusiasts, into a real and valuable contribution to learning.[17] A mobile device complements other learning methods, it does not replace them. A mobile device can contribute to learning in a number of different ways. Mobile devices are very widely used. Widespread ownership of these devices provides a unique opportunity, which can be harnessed to enhance education and training.

Medical education/training needs to ensure it continues to embrace the benefits of the online context to optimize learning experiences for students.[8]

Pharmacology like any other branch of medicine is progressing rapidly. Consequently, reforms in undergraduate pharmacology teaching are the need of the hour. Reviewing and modifications in the teaching methodologies are a must. Didactic lectures have decreased. Teachers make use of new technologies.[18] The MCI vision 2015 document proposes newer teaching methodology in the form of e-learning.[10] An emerging trend as an alternative to animal experiments is use of computer simulations to duplicate live dissections. These have the advantage of lesser involvement of time and labor, repeatability, ease of dissemination of information even over global distances and most important, CAL does not speak arguments over ethics.[19] In the recent years, the undergraduate training in pharmacology has been revolutionized with the adoption of several innovative teaching approaches such as small group discussions, role plays, CAL, use of audio-visual aids, clinical and community pharmacology studies.[20] Handheld devices like mobile phones provide a cheap alternative to computers. It is much easier to accommodate several mobile phones in a laboratory or a classroom than several desktops. Having material on your mobile phone means that it is always accessible to you.[7]

In the present study, 56.2% participants were males while 43.8% were females. This is in concurrence with another similar study where 58% were males and 42% were females.[21]

All the participants in this study owned mobile phones with 93.33% owning multitasking and feature rich smartphones. In another study also, all the participants owned a smartphone.[21]

42.9% participants were advanced mobile phone users, who could utilize all the functions of the phone, besides being able to format and upgrade mobile phone firmware.

The majority of the participants (77.1%) in this study, used their mobile phones to access internet mostly through a combined 2G plus 3G network (50.5%). 26.7% used internet

only for social networking. However, majority (63.8%) used it both for social networking and educational purposes. 73.33% surfed Wikipedia to search for syllabus related and other medical content. Major academic uses of mobile phones among students, in this study were, reading lecture notes (24.8%), downloading medical videos (38.1%), downloading medical e-books (29.5%), accessing medical dictionaries (27.6%), opening and reading word and pdf files (35.2%), and accessing college website (45.7%). In another study, 63% used their phones to read scholarly articles, 58% reading textbooks, 84% online dictionaries, 42% sharing information resources.[1]

In this study, 62.9% used social media as a learning tool. In another study, 77.1% found social media valuable for their education.[22] 61% had educational apps installed on their phones. Pharmacology mobile apps used by the students were Medscape, Micromedex, Epocrates Plus, Med Calc, Clinical Pharmacology Mobile, NCLEX Pharmacology, Medical Pharmacology, Pharmacology study guide, New drugs and pharmacology, Drug guide, Drug.com medication guide, dosage Calc, Drug index and Guide, and Pharmacology encyclopedia. 89.5% respondents were in favoring of implementation of institution based m-learning. 68.8% revealed that use of mobile phones improved their learning. In another study also the strongest attitude expressed was that smartphones improve access to course learning material.[22] The common factors identified to limit the usefulness of mobile phones in learning and teaching were data cost, slow internet, poor battery backup, parental prohibition, and small screen size. In another study, respondents reported that text size on the mobile phone is uncomfortably small and difficult to read for prolonged periods.[1]

This study adds to our understanding of mobile phone use in undergraduate medical education with a special reference to pharmacology. It also reveals the use of a broad spectrum of learning resources by undergraduate medical students in pharmacology.

The majority among our students found mobility, ease of use, and quick access to current information and resources as the main advantage in the use of smartphones in medical learning.

Our students appeared comfortable with the use of the device for routine personal applications and searching academic resources. They could be encouraged to use their mobile phones for more academic activities.

Limitations of the study

Mobile phone usage and pattern may differ for students of other disciplines, institutions or academic levels. The present study is, therefore, exploratory in nature and provides a basis for future multicenter confirmatory studies with larger sample size.

Table 1: Demographics,pattern of mobile phone usage and views about m-learning

Variable	no. (%)
Gender	
Male	59 (56.2)
Female	46 (43.8)
Hosteller	
Yes	67 (63.8)
No	38 (36.2)
Having a mobile phone	
Yes	105 (100)
No. of phones owned	
One	97 (92.4)
Two	8 (7.6)
Owning a tablet	
Yes	6 (5.7)
Owning iPad	
Yes	1 (1)
Operating system	
Android	90 (85.7)
Windows	7 (6.7)
iOS	1 (1)
Java	5 (4.8)
Other	2 (2)
Mobile phone skills	
Basic	15 (14.28)
Intermediate	45 (42.9)
Advanced	45 (42.9)
Owning a laptop too	
Yes	46 (43.8)
No	59 (56.2)
Pattern of mobile phone use	
Always carry phone with you	
Yes	90 (85.7)
No	15 (14.3)
Average usage a day (hrs)	
1	6 (5.7)
2	20 (19.0)
3	24 (22.9)
4	19 (18.1)
5	16 (15.2)
6	8 (7.6)
>6	12 (11.4)
Main utilization	
Internet	81 (77.1)
Calling/texting/music/games	24 (22.9)
Have a data connection	
Yes	98 (93.3)
No	7 (6.66)

(*Contd...*)

Table 1: Demographics,pattern of mobile phone usage and views about m-learning

Variable	no. (%)
Connection type	
2G	29 (27.6)
3G	23 (21.9)
2G+3G	53 (50.5)
Main purpose of internet use	
Social networking	28 (26.7)
Educational	10 (9.5)
Both	67 (63.8)
Main search engines used	
Google	102 (97.1)
Others	3 (2.9)
Types of educational sites visited	
Course related	25 (23.80)
General medical	35 (33.3)
Both	45 (42.8)
Main educational sites visited	
Wiki	77 (73.33)
PubMed	04 (3.80)
WHO	09 (8.6)
Others	15 (14.28)
Educational usage pattern	
Read lecture notes	26 (24.8)
Lecture related videos	40 (38.1)
Share lecture notes/videos	15 (14.3)
Visit college website	48 (45.7)
Download e-books	31 (29.5)
Medical dictionaries	29 (27.6)
Read Medical journals	09 (8.6)
Record lectures	07 (6.7)
Preparing for exams	17 (16.2)
Opening Doc and Pdf	37 (35.2)
Lab references	11 (10.5)
Medical calculators	07 (6.7)
Using social media as a learning tool	
Yes	66 (62.9)
No	39 (37.1)
Educational apps installed	
Yes	64 (61.0)
No	41 (39.0)
Phone improves access to course material	
Yes	95 (90.5)
No	10 (9.5)
Mobile phones should be used more by students/teachers for learning/teaching	
Yes	88 (83.8)
No	17 (16.2)
Has improved my learning	
Yes	72 (68.6)
No	33 (31.4)
M-learning should be implemented in Medical education	
Yes	94 (89.5)
Neutral	06 (5.7)
No	05 (4.8)
M-learning has positive impact on education	
Yes	82 (78.1)
No	23 (21.9)
Wish to have free internet access in the campus	
Yes	75 (71.4)
Wish to have access to teacher lecture notes	
Yes	52 (49.5)
Wish to have MBBS course specific medical apps	
Yes	53 (50.5)
Barriers to mobile phone use for learning	
Small screen size	14 (13.3)
Data cost	52 (49.5)
Phone storage	27 (25.7)
Battery backup	30 (28.6)
Theft risk	04 (3.8)
Slow internet	51 (48.6)
Parental prohibition	13 (12.4)

N.B: Due to multiple options respondents could select, sum of %age is not always 100

CONCLUSION

Technology-rich activities can sustain high levels of student engagement as compared to less technology focused activities. Among the ICT tools mostly used and owned among the students are the mobile phones. These tools can provide suitable learning platforms as they have a lot of applications teachers and students may use in their academic activities. It is tempting to speculate that current undergraduate students are likely to embrace m-learning as a major medium for learning. As technology is a necessary prerequisite for better understanding of different scientific realities and theories, hence it is quite predictable that m-learning can provide the medical students their much needed data and vast knowledge base.

The results from this study corroborate that students use mobile phones for their learning activities even though this technology has not been formally included in the curriculum.

It is hoped that this study will contribute to a better understanding of undergraduate student's perceptions towards introducing m-learning in pharmacology as well as other disciplines. M-learning in pharmacology is still in infancy. Sustainable concepts have to be developed. M-learning can supplement existing programs in pharmacology. It fosters autonomous learning more than classical learning scenarios do.

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