Shivi Mudgal et al/J. Pharm. Sci. & Res. Vol. 14(5), 2022, 753-762

ISSN:0975-1459
Journal of Pharmaceutical Sciences and Research
www.jpsr.pharmainfo.in

Knowledge, attitude and practices towards the use of smartphones as a learning aid among undergraduate medical students: A questionnaire based study

***Shivi Mudgal[1], Murari Lal Dhanetwal[2], Mahmood Ali Sayed[3], Shraddha Sharma[4], Sandeep Dabral,[5] Deepak Juyal[6]**

**Shivi Mudgal[1], Assistant Professor, Department of Anatomy, Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly, Uttar Pradesh*
Murari Lal Dhanetwal[2], Assistant Professor, Department of Pathology, Jaipur National University Institute of medical Sciences and Research Center, Jaipur, Rajasthan
Mahmood Ali Sayed[3], Associate Professor, Department of Pathology, Government Medical College, Pali, Rajasthan
Shraddha Sharma[4], Tutor, Department of Microbiology, Soban Singh Jeena Government Institute of Medical Sciences & Research, Almora, Uttarakhand
Sandeep Dabral[5], Assistant Professor, Department of Biochemistry, Soban Singh Jeena Government Institute of Medical Sciences & Research, Almora, Uttarakhand
Deepak Juyal[6], Assistant Professor, Department of Microbiology, Soban Singh Jeena Government Institute of Medical Sciences & Research, Almora, Uttarakhand

** sm.8sep@gmail.com*

Abstract

Introduction: Use of smartphones has increased exponentially over the past few years and has its application in nearly all spheres of life including health and medical education. Recently, smartphones have become popular as well as an effective educational tool particularly among medical students.

Aim: To evaluate the use of smartphones as learning aid and awareness towards medical apps amongst the medical students.

Materials and Methods: This cross-sectional, observational study was conducted amongst medical students of a private medical institute in Uttar Pradesh. A validated, structured questionnaire was self administered to collect data from 295 students who voluntarily agreed to participate in the study.

Results: Out of the total 295 students, 237 returned the completely filled questionnaire, giving a response rate of 80.3%. Among these 237 students, 53.6% were males and 46.4% were females. 96.6% of students owned smartphone (75.1% Android; 18.3% iPhone; 6.6% Windows based Nokia phones). 93.0% students agreed of being aware of medical apps 91.3% had one or more medical apps installed in their smartphones. In addition to medical apps, 58.1% students agreed to use smartphones during their educational hours. 82.1% students agreed to use their smartphones for recreational purposes as well. Students' perceptions about medical apps on smartphones and the impact of smartphone use on clinical practice were also noted.

Conclusion: Learning through smartphone and smartphone based medical apps is increasingly popular among medical students and should be leveraged in promoting access and quality of medical education. The universities/educators should design educational methods, activities, and material compatible with smartphones and allow students to use this technology, thereby accommodating students' current diverse learning approaches.

Keywords: Android, iPhone, Medical Education, Medical College, Mobile applications (apps), Mobile phones, Social media

INTRODUCTION

Smartphones are the devices used for telecommunication as well as multiple other functions which were previously unthinkable on a hand held device. [1] The last decade has seen an exponential rise in spread and functionality of smartphones. [2] They have become increasingly popular in both personal and professional spheres and are now the pivotal element of the modern life. [3,4] Smartphones with touch screen, large displays, efficient operating systems and the capacious memories have made it feasible to assemble, read, manage, communicate and store huge amount of records digitally instead of carrying them manually. [5] Mobile devices including smartphones with the variety of functionalities and convergence of technologies have led to creation of exciting unprecedented opportunities for teaching/education and learning. [6] There is a significant impact of smartphones in educational sector as well, and they are being considered as a suitable tool for advancing education in developing region. [7]

Technological innovation has always produced a relevant impact on medicine and with advent of internet and smartphones there has been a paradigm shift in the learning activities throughout the medicine program. Medical students encounter many challenges when learning in clinical practice as they apply theoretical knowledge and practical skills gained in academic settings in the real world complex health care settings. Today almost all students have a smartphone with capability to search for relevant information and they are a potential *'learn anywhere'* resource for medical students. [3,4] Smartphones facilitate a self directed learning environment that gives students the opportunity to have frequent access to information and practice beyond physical and time limitations, moreover the students can enjoy a non judgmental learning environment where they can practice as much as they would like without the fear of making errors. [8] Ease of use, access to wealth of resources and portability are just a few of many features which have garnered popularity and

many institutions have incorporated smartphones and tablets as a learning tool in undergraduate curriculums.

Versatility in the content delivery ranging from text, videos, audio, graphics, animation and pictures makes smartphone-based learning more interesting and effective. [2] Along with the variety of features, there are various applications commonly referred as 'apps', which are now being widely used in various sectors including medical education and health fitness. There are more than 13000 apps present in the cyber world labeled under the "Medical" and "Healthcare and Fitness" categories. [1] These apps are being used for clinical guidelines, medical calculators, drug reference tools and other decision support aids, textbooks and literature search portals. Some apps also simulate surgical procedures and help in medical examination like hearing and visual tests. [9-12] Use of such apps provide better communication, consultation, record keeping, medical education, medical training and clinical decision making and help in better management of time and information. [13,14] Smartphone devices have further permitted the use of telemedicine and healthcare by remote access in still developing areas. [2] It is believed that the smartphones will be capable of obtaining heart rate, blood pressure, electrocardiogram, oxygen saturation, body temperature and point of care ultrasound at bed side, a futuristic approach which seems quite promising. [15]

In relation to medical education various studies have shown widespread use of smartphones by medical students varying from 51-98% depending on the country and year in which the study was undertaken, [1,3,7,11,16-18] and have suggested that smartphones serve as a useful learning aid and can have a significant contribution to modern health care education.

With the above background the current study was aimed to evaluate the knowledge attitude and practices of first, second and third year medical students of Hind Institute of Medical Sciences (HIMS), Mau, Uttar Pradesh towards smartphones being used as learning aid in their educational curriculum.

METHODS AND METHODOLOGY

Study site, study design and study population: This cross sectional, observational study was conducted at HIMS, Mau, Uttar Pradesh for a period of two months. The study protocol was approved by the Institutional Ethics Committee (IEC). The brief study protocol was explained to the entire first, second and third year MBBS course students of the institute and were asked for their voluntary participation in the study. A total of 295 students voluntarily agreed to participate in the study. A structured open-ended, self-administered questionnaire was constructed and was reviewed by an expert panel for content, validity and reliability. Previous literature and researcher's personal experiences were used to form and phrase the questions. [19,20]

Study questionnaire: The final questionnaire consisted of two parts: Part 1 and Part 2. Part 1 was divided into two subsections: Part 1(Section A) sought the demographic details of the study participants, whereas Part 1(Section B) consisted of 10 statements designed to assess the students' general awareness about smartphones, medical apps and their uses. The response to these questions was noted on a simple two-point scale of 'yes' or 'no'. Part 2 again was divided into two subsections: Part 2(Section A) noted the students' perceptions about medical apps on smartphones and consisted of seven statements, whereas Part 2(Section B) noted the students perceptions about impact of smartphone use on clinical practice and consisted of five statements. A 4-point likert scale, whose responses ranged from "strongly agree" to "totally disagree" was used to note the responses for Part 2 of the questionnaire. It also consisted of a final part in which students were asked to freely express their views on the utility of smartphones and smartphone based medical apps as a learning aid among medical undergraduates, and advantages and disadvantages of using smartphones. Any further issues or views were allowed to be discussed at the end of the questionnaire under the heading *'Additional Comments'*. Final version of the questionnaire is attached as **Annexure 1** at the end of this article.

Sample collection: The detailed study protocol was explained to the participants and prior to their enrollment; their signed written informed consent was sought. After seeking permission from the respective departments, the written informed consent and the questionnaire were distributed to the students in their lecture theaters before/after lectures and they were asked to fill and submit the same next day, without revealing their identity.

Except for the demographic data (age, gender, year of enrollment and type of smartphone), data regarding the usefulness of smartphone on various aspects was collected predominantly in following areas: students who use smartphones; awareness about medical learning apps, search engines, tutorials, e-books, videos being used as a learning aid, if yes then how often they are used; use of smartphones during educational hours; student's perception towards advantages and disadvantages of smartphones in medical education. In the final analysis, only the completely filled questionnaires were included.

Statistical Analysis: The data obtained was managed on an Excel spreadsheet. Simple descriptive statistics were used to generate frequencies, percentages, and proportions.

RESULTS

Out of the total 295 students enrolled in the study, only 237 returned the completely filled questionnaire, giving a response rate of 80.3%. Among these 237 students, 127(53.6%) were males and 110 (46.4%) were females with a male: female ratio of 1.2: 1. Almost all the students (229; 96.6%) had a smartphone and it was observed that in comparison to first year students smartphone use was more common among second and third year students. Table 1 depicts gender wise distribution of medical students in first, second and third year MBBS, using smartphones.

Out of the 229 students who used smartphones, 172 (75.1%) students owned Android based smartphones, 42 (18.3%) owned iPhone and 15 (6.6%) owned Windows based Nokia phones. Students agreed that they used the smartphones mostly to access social media platforms (Facebook, Watsapp, Instagram, Twitter), to make or

receive phone calls and emails. Around 213/229 (93.0%) students agreed of being aware of medical apps on smartphones and majority of them 209/229 (91.3%) had one or more medical apps installed in their smartphones. 141/229 (61.6%) of students revealed that their medical educators or their seniors recommended them to obtain/download a specific medical app. In addition to medical apps, 133/229 (58.1%) students agreed that they use smartphones during their educational hours (lecture theater, practical hall, OPD/wards during their clinical postings). Use of smartphones for recreational purpose was also evaluated and it was observed that 188/229 (82.1%) students agreed to use their smartphones for recreational purposes as well. Higher proportion of females (83.2%) and first year students (87.5%) reported to use their smartphones for recreational purpose than males (80.3%) and second/third year students (71.8%) respectively. Table 2 depicts the general awareness about smartphones, medical apps and their uses among the students.

Among the most common medical apps used by students were Oxford Medical Dictionary, MedPlus, Medscape, Oxford clinical handbooks, Uptodate, Prognosis/Diagnosis, ECG guide, PubMed mobile and Gray's Anatomy. The third year students reported to have more medical apps installed in their smartphones than first and second year students. Moreover, third year students reported to use the smartphones more in clinical context, whereas first and second year students used them mainly to learn educational content. Table 3 depicts the common medical apps being used by medical students.

Table 1: Gender wise distribution of medical students in first, second and third year MBBS, using smartphones.

Year of enrollment	Students using Smartphone (*n*=229)			Students not using Smartphone (*n*=8)		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
1st year	23	17	40	03	02	05
2nd year	41	38	79	01	01	02
3rd year	58	52	110	01	00	01
Total	122 (100%)	107 (100%)	229 (100%)	05 (100%)	03 (100%)	08 (100%)

Table 2: General awareness about smartphones, medical apps and their uses among the students.

Question	Response	
	Yes	No
Do you have a smartphone?	229 (96.6%)	08 (3.4%)
Are you aware about availability of medical apps on smartphones?	213 (93.0%)	16 (7.0%)
Do you have any medical apps installed in your smartphone?	209 (91.3%)	20 (8.7%)
Have any of your medical educators or seniors ever recommended you to obtain/download a specific medical app?	141 (61.6%)	88 (38.4%)
Do you use smartphone during educational hours (lecture theater, practical hall, OPD/wards)?	133 (58.1%)	96 (41.9%)
Do you access social media platforms (Facebook, Watsapp, Instagram, Twitter) with your smartphone?	218 (95.2%)	11 (4.8%)
Have you found any value in social media for your education?	153 (66.8%)	76 (33.2%)
Do you use smartphones for recreational purposes as well?	188 (82.1%)	41 (17.9%)

Table 3: Common medical apps being used by medical students.

Name of Medical apps	Number	Percentage
Oxford Medical Dictionary	177	77.3
MedPlus	141	61.6
Medscape	137	59.8
Oxford Clinical handbook	131	57.2
Uptodate	128	55.9
Prognosis/Diagnosis	122	53.3
ECG guide	118	51.5
PubMed mobile	81	35.4
Gray's Anatomy	68	29.7

Table 4: Students perceptions about medical apps on smartphones and the impact of Smartphone use on clinical practice. (*n*=229)

Students perceptions about medical apps on smartphones

Statements	Strongly agree	Somewhat agree	Somewhat disagree	Totally disagree
Medical apps are useful from medical education point of view and are easy to obtain and operate.	53.7%	34.5%	11.8%	0.0%
Looking to obtain more medical apps in future.	38.9%	13.5%	5.2%	42.4%
Would recommend the use of medical apps to my fellow students/juniors	54.6%	37.1%	8.3%	0.0%
Medical apps are essential tool to undergraduate medical studies.	60.7%	29.2%	7.9%	2.2%
Medical apps are superior to medical textbooks.	1.3%	3.5%	8.7%	86.5%
Medical apps are supplement to medical textbooks.	80.3%	11.8%	6.6%	1.3%
Medical apps provide useful information at 'point-of-care'.	62.4%	21.4%	9.6%	6.6%
Students perceptions about impact of smartphone use on clinical practice.				
Easy to make useful medical related calculations.	61.6%	21.4%	5.2%	11.8%
Allows faster access to reliable sources of medical knowledge.	62.9%	18.8%	16.6%	1.7%
Allows faster access to reliable sources of clinical skills.	57.2%	15.7%	5.7%	21.4%
Allows easy calculation of the drug dosage.	60.3%	17.9%	6.1%	15.7%
Allows faster access to evidence-based medical practice.	60.7%	21.4%	4.4%	13.5%

Students perceptions about medical apps on smartphones and the impact of smartphone use on clinical practice were also noted and are depicted in Table 4.

According to the study participants, the advantages of using a smartphone were mobility, easy access, ease of use and real time access to information. The most common disadvantages reported by them were short battery life, low Internet speed, limited data, phone memory and high cost of the smartphones. Overall a very positive response was obtained from the students.

DISCUSSION

Owning a smartphone is a global trend nowadays and medical students are not an exception to it. Our study results revealed that about 97% of the medical students owned a smartphone and their use differ according to the phase/year of the medical course. First and second year students used the smartphones and smartphone based mobile apps for understanding complex medical terminologies, to understand the human anatomy by animations and for searching knowledge whereas third year students used the same to acquire clinical knowledge, skills, therapeutic proposals or to understand the diagnostic criteria. Moreover predominance of the Android system smartphones was noted (75.1%), a finding which was in parallel to the studies conducted by Shah *et al*. [1] and Gavali *et al*. [7], but was in contrast to the studies conducted by Robinson *et al*. [3] and Tran *et al*. [18] who reported the predominance of iPhones in their studies.

Around 93% of the study participants were well aware about the medical apps and more than 91% had already installed one or more medical apps on their devices, these findings were found to be consistent with previous studies. [11,20] A study by Sayedalamin *et al*. [20] reported 99% of the study participants owning a smartphone with 89.1% having installed more than one medical app in their device. Similarly, in a survey conducted among medical students, Payne *et al*. [11] reported that over 75% owned a smartphone and most of them had one to five medical apps installed in their device.

Generally, the medical students using medical apps were of the opinion that medical apps are useful from medical education point of view and it was easy to obtain/download and use these apps. Moreover, majority of them showed their willingness to obtain more apps in future provided they are helpful from their study curriculum's point of view. Most of the students agreed to recommend the use of medical apps to their juniors or to their fellow mates in the institute or in some other institutes as well. Overall, this trend reflected the positive attitudes toward the utility of medical apps in medical education. Internationally also most of the medical schools are now using medical apps as part of their medical training by advising the students to use selected websites and apps during professional courses. Some of the universities even have their own app/s developed and they encourage the students to use them. [11]

Although most of the students were of the view that use of smartphone based medical apps is an essential tool for undergraduate medical students but they denied them of being superior to medical textbooks. Their opinion was that medical apps are very useful when instant access or quick revision/reference is required, but in order to gain in-depth/denser knowledge of the topic, the classical learning method is textbooks/reference books. However, they agreed that medical apps are supplement to textbooks and if both learning methods are combined will definitely improve the performance of the students. From our study findings we hypothesize that frequency of smartphone use and internet addiction were directly related to superficial/instant learning and inversely related to deep learning.

In a study by Ventola *et al*., [21] it was observed that medical students mostly used the medical apps for medical documentation, performing calculations, editing basic notes, accessing medical information and treatment guidelines. Another study by Waldmann *et al*. [22] reported that medical students preferred to use smartphone as a learning aid while attending conferences or clinical sessions. In the current study, students reported to use smartphones and smartphone based medical apps for variety of educational purposes *viz*. look up latest medical information; treatment protocols; medications or drug guide; revision purpose; preparation of presentation; during ward rounds clinical skills guide; online access of textbooks/reference books and access to medical journals. Our study participants also agreed to use their smartphones during educational hours, mostly during clinical postings to take pictures or videos of interesting cases or to click photographs of case history sheets and later referred them to revise/discuss or to make notes. In addition to the above they also agreed to use their smartphones during lecture theaters to record the audio of the lecture and in practical hall/museum to click photographs of the charts, models, spotters etc. and later referred them for revision. Some of the students in our study admitted of using smartphones in lecture theater/practical hall for non-educational reasons and this draws our attention. The reason they explained for the same was they were not interested in the lecture or lecture being boring. In addition students also reported to use smartphones for recreational purpose like watching videos, movies, serials and cricket matches online or on over the top (OTT) platforms.

Regarding the perception of the students about the impact of medical apps in clinical practice, the feedback was slightly on the positive side. The majority of medical students were convinced that clinical decision-making could be enhanced and be time saving with the help of medical apps and provided useful information at point-of-care. They agreed that, smartphone based medical apps/various search engines were helpful in attaining better access to laboratory reference ranges, reliable clinical knowledge or clinical skills. Similarly, they were convinced that accurate dose calculation could be carried out with the help of medical apps or can have faster access to evidence-based medicine. Our findings were in tandem with previous studies by Tran *et al*. [18] and Franko *et al*. [23] who reported that majority of students frequently used the medical apps, especially during ward rounds. They also reported that students found medical apps quite useful for various medical calculations, and drug dosage calculation. There is an increasing opinion among the general population that smartphones are mainly used for unprofessional purposes however our study results have reported that majority of the students were using it as a learning aid. Although students agreed to use their smartphones for other purposes like access to social media platforms or for recreational purposes as well but that's ought to be there, as one cannot be engaged all the time in studies and definitely needs a break.

CONCLUSION

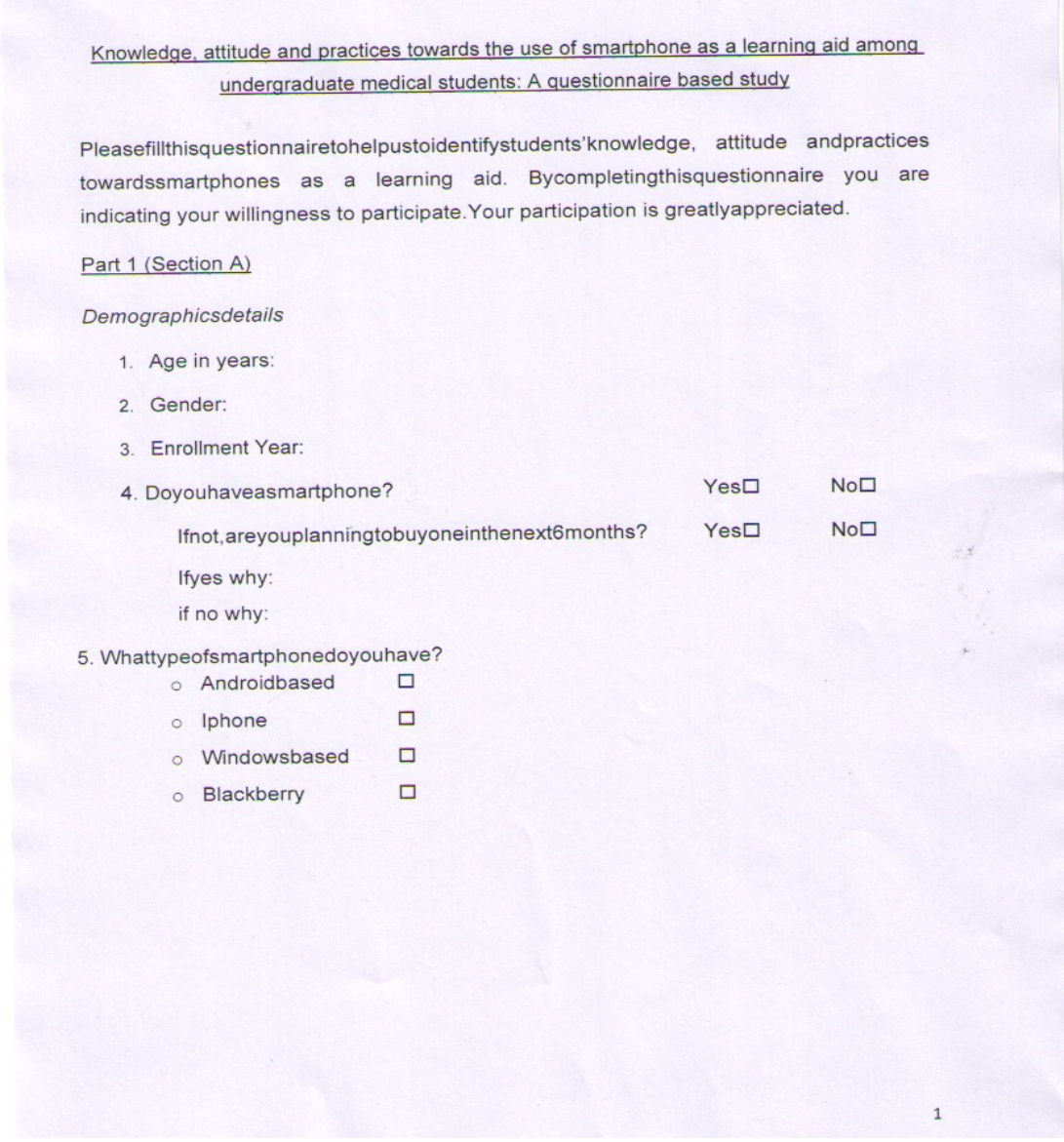
Data on smartphone usage in India is impressive. However, we do not know the patterns of the usage of smartphones for education among students including medical students. Despite of the fact that there are various International studies investigating the use of smartphones among undergraduate medical students there is still dearth of data in this regard from India. Little is known on how students perceive their smartphones as an educational tool. It must be stressed that more attention should be focused by the administrative authorities/faculty of medical colleges to guide and educate the students on appropriate use of smartphones and medical apps in their studies and clinical work for increased efficiency in the provision of patient care. At the same time, it is prudent to be conscientious about the use, misuse and abuse of smartphones. Students should also be cautioned about the detrimental effects due to it's long-term use and the associated health implications. The data extrapolated from our study can serve as a template for others to implement the positive aspects of our study at their center, however as the current study has been conducted at the single center, so our results cannot be generalized. A detailed multi-centric research study in this aspect would surely give a better insight into use of smartphones as a new learning tool in medical education.

REFERENCES

1. Shah J, Haq U, Bashir A, Shah SA. Awareness of academic use of smartphones and medical apps among medical students in a private medical college? J Pak Med Assoc 2016;66(2):184-6
2. Masika MM, Omondi GB, Natembeya DS, Mugane EM, Bosire KO, Kibwage IO. Use of mobile learning technology among final year medical students in Kenya. Pan Afr Med J 2015;21:127
3. Robinson T, Cronin T, Ibrahim H, Jinks M, Molitor T, Newman J, et al. Smartphone use and acceptability among clinical medical students: a questionnaire based study. J Med Syst 2013;37(3):9936
4. Yoo IY, Lee YM. The effects of mobile applications in cardiopulmonary assessment education. Nurse Educ Today 2015;35(2):e19-23
5. Burdette SD, Herchline TE, Oehler R. Surfing the web: practicing medicine in a technological age: using smartphones in clinical practice. Clin Infect Dis 2008; 47:117-22
6. Dent J, Harden RM. A practical guide for medical teachers. Netherlands: Elsevier Health Sciences; 2013.
7. Gavali MY, Khismatrao DS, Gavali YV, Patil KB. Smartphone, the New Learning Aid amongst Medical Students. J Clin Diagn Res 2017;11(5):JC05-JC08
8. Kim SJ, 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
9. Mosa AS, Yoo I, Sheets L. A systematic review of health care apps for smartphones. BMC Med Inform Decis Mak 2012;12:67
10. Chase J. IPads and other drugs. Medical Marketing & Media: The Interactive Guide 2013;10-1
11. Payne KB, Wharrad H, Watts K. Smartphone and medical related app use among medical students and junior doctors in the United Kingdom (UK): a regional survey. BMC Med Inform Decis Mak 2012;12:121
12. O'Neill KM, Holmer H, Greenberg SL, Meara JG. Applying surgical apps: Smartphone and tablet apps prove useful in clinical practice. Bull Am Coll Surg 2013; 98:10-8
13. Baumgart DC. Smartphones in clinical practice, medical education, and research. Arch Intern Med 2011;171:1294-6
14. Savel RH, Munro CL. Scalpel, stethoscope, iPad: The future is now in the intensive care unit. Am J Crit Care 2011;20:275-7
15. Baig MM, Gholam Hosseini H, Connolly MJ. Mobile healthcare applications: system design review, critical issues and challenges. Australas Phys Eng Sci Med 2015;38(1):23-38

16. Wallace S, Clark M, White J. 'It's on my iPhone': attitudes to the use of mobile computing devices in medical education, a mixed-methods study. BMJ Open 2012;2(4):e001099
17. Buchholz A, Perry B, Weiss LB, Cooley D. Smartphone use and perceptions among medical students and practicing physicians. J Mob Technol Med 2016;5(1):27–32
18. Tran K, Morra D, Lo V, Quan SD, Abrams H, Wu RC. Medical students and personal smartphones in the clinical environment: the impact on confidentiality of personal health information and professionalism. J Med Internet Res 2014;16(5):e132
19. Loredo E Silva MP, de Souza Matos BD, da Silva Ezequiel O, Lucchetti ALG, Lucchetti G. The Use of Smartphones in Different Phases of Medical School and its Relationship to Internet Addiction and Learning Approaches. J Med Syst 2018;42(6):106
20. Sayedalamin Z, Alshuaibi A, Almutairi O, Baghaffar M, Jameel T, Baig M. Utilization of smart phones related medical applications among medical students at King Abdulaziz University, Jeddah: A cross-sectional study. J Infect Public Health 2016 9(6):691-97
21. Ventola CL. Mobile devices and apps for health care professionals: uses and benefits. Pharm Ther 2014;39(5):356
22. Waldmann UM, Weckbecker K. Smartphone application of primary care guidelines used in education of medical students. GMS Z Med Ausbild 2013;30(1):Doc6
23. Franko OI, Tirrell TF. Smartphone app use among medical providers in ACGME training programs. J Med Syst 2012;36(5):3135-9

ANNEXURE 1
Questionnaire



Knowledge, attitude and practices towards the use of smartphone as a learning aid among undergraduate medical students: A questionnaire based study

Pleasefillthisquestionnairetohelpustoidentifystudents'knowledge, attitude andpractices towardssmartphones as a learning aid. Bycompletingthisquestionnaire you are indicating your willingness to participate.Your participation is greatlyappreciated.

Part 1 (Section A)

Demographicsdetails

1. Age in years:
2. Gender:
3. Enrollment Year:
4. Doyouhaveasmartphone? Yes☐ No☐

   Ifnot,areyouplanningtobuyoneinthenext6months? Yes☐ No☐

   Ifyes why:

   if no why:

5. Whattypeofsmartphonedoyouhave?
   - Androidbased ☐
   - Iphone ☐
   - Windowsbased ☐
   - Blackberry ☐

1

Part 1 (Section B)

General awareness about smartphones, medical apps and their uses

1. Normally, what do you use your smartphone for

a.E-Mail?	Yes☐	No☐
b.Chatwithfriends?	Yes☐	No☐
c.Addcommentsinsocialmediae.g.Facebook?	Yes☐	No☐
d.Listentomusic?	Yes☐	No☐
e.Managemyschedule?	Yes☐	No☐
f. Makebanktransactions/shopping?	Yes☐	No☐
g.Takepictures?	Yes☐	No☐
h.Recordmovies?	Yes☐	No☐
i. Uploadpicturesonthewebe.g.facebook?	Yes☐	No☐
j. Uploadmoviesonthewebe.g.youtube?	Yes☐	No☐
k.Editpictures?	Yes☐	No☐
l. Editmovies?	Yes☐	No☐
m.Createandedittexts?	Yes☐	No☐
n.Synchronizewithyourhomecomputer?	Yes☐	No☐
o.Other	Yes☐	No☐

2. Using your smartphone can you

a.Lookupyourcoursetimetable?	Yes☐	No☐
f. Watchinstructional/educationalmovies?	Yes☐	No☐
g.Dolibrary/literaturesearches	Yes☐	No☐
h.Surfthewebforlearningmaterial?	Yes☐	No☐

2

i. Sharenoteswithclassmates? Yes☐ No☐

3. Are you aware about availability of medical apps on smartphones? Yes☐ No☐
4. Doyouhaveany medical appsinstalled in your smartphone? Yes☐ No☐
5. Ifyes,whichapplicationsaremostvaluabletoyourstudies?

.....

6. Have any of your medical educators or seniors ever recommended you to obtain/download a specific medical app? Yes☐No☐
7. Do you use smartphone for learning activities during educational hours? Yes☐No☐

   If yes, Wheredoyounormallyuseit
   - Lecture Theater/Practical hall Yes☐No☐
   - OPD/Wards Yes☐No☐
   - Library/Elsewhere in campus Yes☐No☐

8. Do you access social media platforms (Facebook, Watsapp, Instagram, Twitter) with your smartphone? Yes☐No☐
9. Have you found any value in social media for your education? Yes☐No☐
10. Do you use smartphones for recreational purposes as well? Yes☐No☐

3

Part 2 (Section A)

Students' perceptions about medical apps on smartphones

S.no.	Statements	Strongly agree	Somewhat agree	Somewhat disagree	Totally disagree
1.	Medical apps are useful from medical education point of view and are easy to obtain and operate.				
2.	Looking to obtain more medical apps in future.				
3.	Would recommend the use of medical apps to my fellow students/juniors				
4.	Medical apps are essential tool to undergraduate medical studies.				
5.	Medical apps are superior to medical textbooks.				
6.	Medical apps are supplement to medical textbooks.				
7.	Medical apps provide useful information at 'point-of-care'.				

Part 2 (Section B)

Students' perceptions about impact of smartphone use on clinical practice.

S.no.	Statements	Strongly agree	Somewhat agree	Somewhat disagree	Totally disagree
1.	Easy to make useful medical related calculations.				
2.	Allows faster access to reliable sources of medical knowledge.				
3.	Allows faster access to reliable sources of clinical skills.				
4.	Allows easier and medicine dosage calculation.				
5.	Allows faster access to evidence-based medical practice.				

4

Final Section

Kindly express your views on

- Utility of smartphones and smartphone based medical apps as a learning aid among medical undergraduates

- Advantages and disadvantages of using smartphones.

- Additional Comments

5