

# Telemedicine inside the Pocket: The Impact of Smartphones on Daily Patients' Evaluations

<sup>1</sup>Phillipe Abreu-Reis, <sup>2</sup>Tayron Bassani, <sup>3</sup>Iwan A Collaco, <sup>4</sup>Guilherme D Pereira, <sup>5</sup>Heloisa Z Faggion  
<sup>6</sup>Guilherme V Sawczyn, <sup>7</sup>Erick P Uchida, <sup>8</sup>Adonis Nasr, <sup>9</sup>Flavio S Tomasich, <sup>10</sup>Juliano A Lopes

## ABSTRACT

**Objective:** To evaluate the perception of doctors, residents, and medical students of smartphone use on daily medical practice.

**Materials and methods:** Cross-sectional study with data collected online by questionnaire on Google Docs®, with closed multiple-choice questions regarding smartphones use in medical practice and its impact on decision-making and patients' privacy.

**Results:** There were 118 questionnaires, mostly from students (61%), followed by medical residents (31%) and medical preceptors (8%). All preceptors confirmed eventual use of smartphones on clinical cases discussions, 77.8% of whom use it in less than half of the time. Among the residents, 94.6% use their smartphones, 77% of them in more than half of the time. On the contrary, 12.5% of the students do not use this kind of resource, and among those that do use it, 50% do so more than half of the time. All preceptors, 94.6% residents and 80.6% of the students believe its use does not expose the patients' privacy.

**Conclusion:** Preceptors and residents use smartphones more often than medical students. Most agree its use helps on daily decision-making and does not jeopardize the patients' privacy.

**Keywords:** Patient's privacy, Smartphones, Telemedicine.

**How to cite this article:** Abreu-Reis P, Bassani T, Collaco IA, Pereira GD, Faggion HZ, Sawczyn GV, Uchida EP, Nasr A, Tomasich FS, Lopes JA. Telemedicine inside the Pocket: The Impact of Smartphones on Daily Patients' Evaluations. *Panam J Trauma Crit Care Emerg Surg* 2016;5(2):88-92.

**Source of support:** Nil

**Conflict of interest:** None

## INTRODUCTION

Since the beginning of the computer era, medical information privacy became a frequent matter of discussion. In 1993, Lincoln already expressed his doubts

on the subject.<sup>1,2</sup> The topic became even more important with the technological development of smartphones, truly portable computers, accessible every moment, making communication and image sharing easier. They are so accessible that they have already begun to influence medical students in their learning processes.<sup>2-4</sup> With lower costs, the smartphones are getting more popular, having 5 billion users around the world.<sup>5</sup>

Telemedicine is the telecommunication technology applied on distance provided health services.<sup>6</sup> It seemed to be effective in helping to cease deleterious habits, such as smoking and alcoholism, as well as improving treatments results.<sup>7</sup>

Despite being thought as working tools in telemedicine, the smartphones are not always used to labor. A Californian study showed that most nurses use their personal phones to send messages, access news, check and post on social networks, to buy and play games.<sup>8</sup> Others studies reaffirm those data.<sup>3,9</sup>

This shadowy area between personal and professional use needs to be handled with care. The line between the correct and the improper use of the smartphones and telemedicine on decision-making related to patients is thin. The term "privacy paradox,"<sup>10</sup> used originally to describe social network subjects concerned with their privacy, but that post detailed personal information on their profiles, has been extrapolated to all fields of digital data sharing.<sup>11</sup> With easy access to this technology, medical students, residents, and doctors share lots of information and patients images among each other, most of them in nonencrypted ways.<sup>12</sup>

There are studies showing the high prevalence of smartphones use for medical purposes among medical students.<sup>12</sup> A study in a pediatric hospital showed that doctors use messages as a way of quick work-related communication with other doctors, residents, and subspecialties consultants.<sup>13</sup>

Medical students always not act in a professional way. The 1st years of the course generally are theoretical with great emphasis in abstract concepts.<sup>14</sup> The students abruptly start in the medical practice, with lots of ethical concerns, eventually acting unprofessionally.<sup>15</sup> This lack of preparation results in information sharing without proper ethic reflection and care about patients' privacy.<sup>16</sup>

<sup>1,2,6</sup>Resident, <sup>3,8,9</sup>Professor, <sup>4,5,7,10</sup>Medical Student

<sup>1,2,9</sup>Department of Surgery, Hospital Erasto Gaertner, Curitiba Paraná, Brazil

<sup>3-8,10</sup>Department of Surgery, Hospital do Trabalhador, Curitiba Paraná, Brazil

**Corresponding Author:** Phillipe Abreu-Reis, Resident Department of Surgery, Hospital Erasto Gaertner, Curitiba Paraná, Brazil, Phone: +554199143236, e-mail: phillipeareis@gmail.com

Doctors and patients have different perception on the subject. Despite very receptive to new technology assistance and medical records on their smartphones, the so-called "mHealth", mobile phone-based health technology,<sup>17</sup> the doctors are concerned to share information for research and medical records. A study from Chicago University with dermatological patients revealed that they prefer to be photographed with a hospital camera than by a personal use smartphone. Despite that, they feel that the use of smartphones as reference sources by doctors is acceptable.<sup>18</sup>

Hospital do Trabalhador (HT) is a reference center to trauma patients in the city of Curitiba, Brazil. It is responsible for the assistance of approximately 60% of trauma urgencies and emergencies of the city and surroundings; it is a teaching hospital, reference in human health resource formation.

The emergency unit works as a dual mechanism of patient's admission: Spontaneous and referenced by the prehospital services. In 2010, it attended 63,057 patients, mostly victims of trauma. At the initial patient evaluation, there are active participation of medical students during their third year of graduation or higher. They work under supervision and orientation of medical residents and preceptors, being the lasts responsible by the therapeutic decisions.

In this context, we performed this study to evaluate the perception of the impact of smartphone use on daily practice by Brazilian medical preceptors, residents, and students.

## MATERIALS AND METHODS

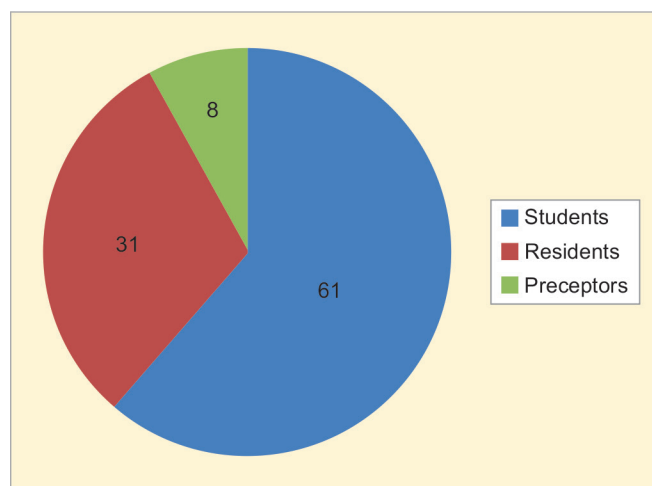
This is a quantitative cross-sectional study about smartphones use in daily medical practice. The data was collected from March to April 2015, among voluntary medical students, residents, and preceptors working at the Hospital do Trabalhador.

Medical literature was reviewed through PubMed, MEDLINE, and Scielo databases, with the keywords like smartphone, privacy, and communication.

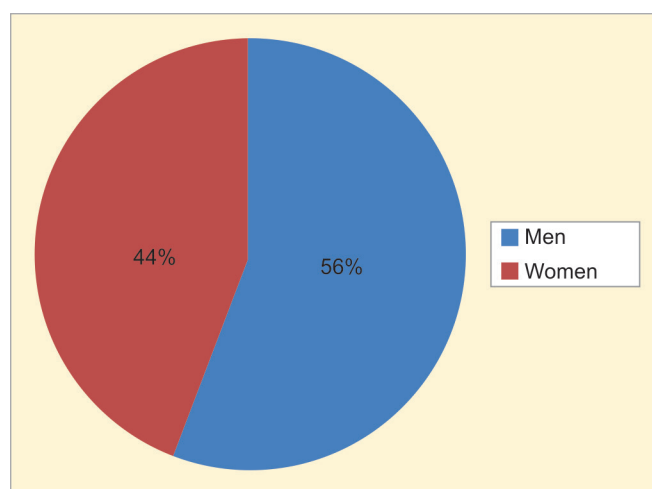
Data was collected through a multiple-choice questionnaire, regarding daily use of telemedicine on clinical cases discussion and the perception of their impact on patients' privacy. We also collect epidemiological data of the study participants. The questionnaire was applied online through a Google Docs<sup>®</sup> platform, which automatically compiled the data.

The chi-square test was used for statistical analysis of the data.

The Research Ethics Committee from Hospital do Trabalhador approved the study.



**Graph 1:** Number of study participants according to their level of formation



**Graph 2:** Sex distribution of participants

## RESULTS

One hundred eighteen subjects filled the questionnaire, mostly (61%) medical students, followed by residents (31%) and preceptors (8%) as shown in Graphs 1 and 2. They were 66 men and 52 women. On clinical cases discussions, 100, 94.6, and 90.3% of preceptors, residents, and medical students respectively confirmed the use of smartphones. The mean age of nonusers was lower than among the users (24.3 vs 26.1 years,  $p=0.003$ ) as demonstrated in Tables 1 and 2.

**Table 1:** Use of smartphones to decision making by sex and level of graduation

	Uses	Does not use	Total
Men	60	6	66
Women	49	3	52
Preceptors	9	0	9
Residents	35	2	37
Students	65	7	72
Total	109	9	118

**Table 2:** Percentage of clinical cases discussions through the smartphone by sex and level of graduation

	Less than 50%	More than 50%	Total
Men	30	32	62
Women	17	28	45
Preceptors	7	2	9
Residents	8	27	35
Students	32	31	63
Total	47	60	107

Fifty-six percent of the study participants use smartphones in more than half of the time, that being 22, 77, and 49% of the preceptors, residents, and students respectively. Those that use it more than half of the time were younger (25.5 vs 26.7 years,  $p < 0.001$ ). Preceptors used smartphones less often than residents and students, with an odds ratio (OR)=0.20 (0.04–0.99), as shown in Table 2.

Among the smartphones users, 97.5% think it helps on clinical decision-making. This was similar between both sexes [100% of women vs 95.2% of men – OR=0.20 (0.04–0.99)], as represented by Graph 3. Two people, one preceptor and one resident, think smartphone does not help in decision-making, and one student thinks it have a negative influence on it.

Graph 4 shows that most participants (86.4%) think that the use of smartphones does not expose patients’ privacy. That thought was less frequent among the students (80.6%), compared with preceptors (100%) and residents (94.6%), with an OR=0.19 (0.04–0.87). Those who think it does compromises patients’ privacy were younger (24.6 vs 26.1 years,  $p < 0.001$ ). There was no difference among sexes, OR=2.44 (0.25–24.2) for females.

## DISCUSSION

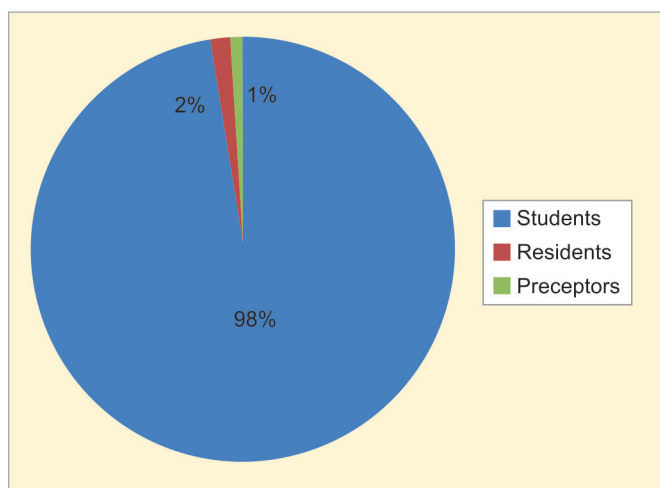
Smartphone use is becoming more frequent on daily medical assistance.<sup>19</sup> Tran et al<sup>12</sup> showed a prevalence of 86% of work-related smartphone use among medical students. That was similar to our results, as well as the results from other studies.<sup>20-22</sup>

The lower mean age among those who do not use the smartphone can be explained by the expressive number of students in the nonuser group. That could be related to the lack of knowledge on the advantages of its use. Illiger et al<sup>23</sup> did not find an age difference among users and nonusers of smartphones in medicine.

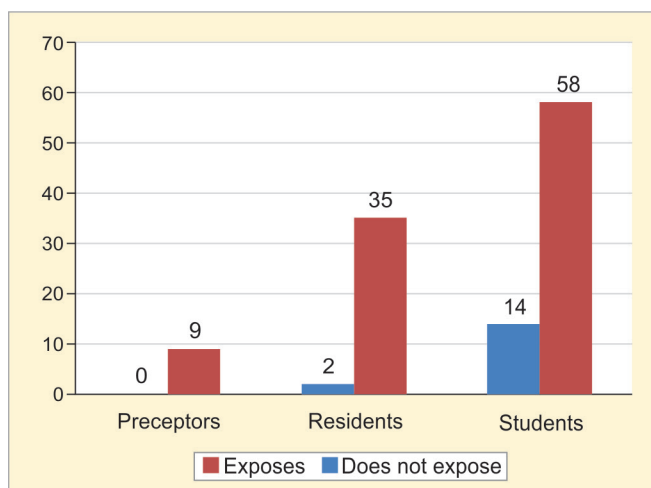
Most of our participants use smartphones in more than half of the time on clinical cases discussions. Students and residents constitute the majority of our sample, and they are known to use portable computers more often than medical preceptors.<sup>24</sup> A study showed that residents who use smartphones were more available to their patients, but also suffer more interruptions during staff meetings and study.<sup>3</sup> The lower use rate among preceptors could be explained by their greater clinical experience, especially among the doctors who deal with students daily.<sup>23-25</sup>

In our sample, 86.4% of participants considered that case discussions through smartphones do not expose patients’ privacy. In contrast, Tran et al<sup>12,26</sup> showed that 68% of their participants thought that smartphone use threatens patients’ privacy. Most phone users do not block them nor use cryptography on their records,<sup>16</sup> risking eventual leak of confidential information.

Telemedicine shortens distances and helps making medical preceptors and residents closer in patient care. Many ways of tele-mentoring have being developed the past decades, along with advances in telecommunications. Smartphones are not only telephones anymore, but also truly personal computers inside the pocket.



**Graph 3:** Subjects perception of the smartphone influence on decision-making



**Graph 4:** Perception of privacy exposure among participants, according to their level of graduation (number of subjects)

## CONCLUSION

Smartphone use is a reality in daily medical practice. It can be extremely helpful if used with caution to medical privacy. Residents are the individuals that most use it in medical practice as a common tele-mentoring tool.

## REFERENCES

- Lincoln TL. Privacy: a real-world problem with fuzzy boundaries. *Methods Inf Med* 1993 Apr;32(2):104-107.
- Robinson T, Cronin T, Ibrahim H, Jinks M, Molitor T, Newman J, Shapiro J. Smartphone use and acceptability among clinical medical students: a questionnaire-based study. *J Med Syst* 2013 Jun;37(3):9936.
- Wu RC, Tzanetos K, Morra D, Quan S, Lo V, Wong BM. Educational impact of using smartphones for clinical communication on general medicine: more global, less local. *J Hosp Med* 2013 Jul;8(7):365-372.
- Farooq A, White J. #Nomoretextbooks? The impact of rapid communications technologies on medical education. *Can J Surg* 2014 Aug;57(4):E119-E120.
- Källander K, Tibenderana JK, Akpogheneta OJ, Strachan DL, Hill Z, ten Asbroek AH, Conteh L, Kirkwood BR, Meek SR. Mobile health (mHealth) approaches and lessons for increased performance and retention of community health workers in low- and middle-income countries: a review. *J Med Internet Res* 2013 Jan;15(1):e17.
- Marttos AC, Kuchkarian FM, Abreu-Reis P, Pereira BM, Collet-Silva FS, Fraga GP. Enhancing trauma education worldwide through telemedicine. *World J Emerg Surg* 2012;7(Suppl 1):S4.
- Ossip-Klein DJ, McIntosh S. Quitlines in North America: evidence base and applications. *Am J Med Sci* 2003 Oct;326(4):201-205.
- McBride DL, LeVasseur SA, Li D. Non-work-related use of personal mobile phones by hospital registered nurses. *JMIR Mhealth Uhealth* 2015 Jan 13;3(1):e3.
- Katz-Sidlow RJ, Ludwig A, Miller S, Sidlow R. Smartphone use during inpatient attending rounds: prevalence, patterns and potential for distraction. *J Hosp Med* 2012 Oct;7(8):595-599.
- Büschel I, Mehdi R, Cammilleri A, Marzouki Y, Elger B. Protecting human health and security in digital Europe: how to deal with the "privacy paradox"? *Sci Eng Ethics* 2014 Sep;20(3):639-658.
- Utz S, Kramer NC. The privacy paradox on social network sites revisited: the role of individual characteristics and group norms. *Cyberpsychology* 2009;3(2).
- 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 May 22;16(5):e132.
- Kuhlmann S, Ahlers-Schmidt CR, Steinberger E. TXT@WORK: pediatric hospitalists and text messaging. *Telemed J E Health* 2014 Jul;20(7):647-652.
- Goldstein EA, Maestas RR, Fryer-Edwards K, Wenrich MD, Oelschlager AM, Baernstein A, Kimball HR. Professionalism in medical education: an institutional challenge. *Acad Med* 2006 Oct;81(10):871-876.
- Sobani ZU, Mohyuddin MM, Farooq F, Qaiser KN, Gani F, Bham NS, Raheem A, Mehraj V, Saeed SA, Sharif H, et al. Professionalism in medical students at a private medical college in Karachi, Pakistan. *J Pak Med Assoc* 2013 Jul;63(7):935-939.
- Whipple EC, Allgood KL, Larue EM. Third-year medical students' knowledge of privacy and security issues concerning mobile devices. *Med Teach* 2012;34(8):e532-e548.
- McGillicuddy JW, Weiland AK, Frenzel RM, Mueller M, Brunner-Jackson BM, Taber DJ, Baliga PK, Treiber FA. Patient attitudes toward mobile phone-based health monitoring: questionnaire study among kidney transplant recipients. *J Med Internet Res* 2013 Jan;15(1):e6.
- Hsieh C, Yun D, Bhatia AC, Hsu JT, Ruiz de Luzuriaga AM. Patient perception on the usage of smartphones for medical photography and for reference in dermatology. *Dermatol Surg* 2015 Jan;41(1):149-154.
- Al-Hadithy N, Gikas PD, Al-Nammari SS. Smartphones in orthopaedics. *Int Orthop* 2012 Aug;36(8):1543-1547.
- 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 Oct 30;12:121.
- O'Connor P, Byrne D, Butt M, Offiah G, Lydon S, Mc Inerney K, Stewart B, Kerin MJ. Interns and their smartphones: use for clinical practice. *Postgrad Med J* 2014 Feb;90(1060):75-79.
- Haroon M, Yasin F, Eckel R, Walker F. Perceptions and attitudes of hospital staff toward paging system and the use of mobile phones. *Int J Technol Assess Health Care* 2010 Oct;26(4):377-381.
- Illiger K, Hupka M, von Jan U, Wichelhaus D, Albrecht UV. Mobile technologies: expectancy, usage, and acceptance of clinical staff and patients at a university medical center. *JMIR Mhealth Uhealth* 2014 Oct;2(4):e42.
- Garrity C, El Emam K. Who's using PDAs? Estimates of PDA use by health care providers: a systematic review of surveys. *J Med Internet Res* 2006 Apr-Jun;8(2):e7.
- Roswarski TE, Murray MD. Supervision of students may protect academic physicians from cognitive bias: a study of decision making and multiple treatment alternatives in medicine. *Med Decis Making* 2006 Mar-Apr;26(2):154-161.
- Tran K, Morra D, Lo V, Quan S, Wu R. The use of smartphones on General Internal Medicine wards: a mixed methods study. *Appl Clin Inform* 2014 Sep 10;5(3):814-823.

### **La telemedicina en el interior del bolsillo: El impacto de los teléfonos inteligentes en evaluaciones diarias de los pacientes**

Los autores presentan la percepción del médico hacia el uso de los teléfonos inteligentes en el día a día de la toma de decisiones clínicas. La difusión de las nuevas tecnologías de la comunicación ha impactado los profesionales médicos que desean tener una respuesta inmediata a su problema clínico. Esta investigación demuestra los beneficios y la popularidad de estos dispositivos entre el personal en formación y sus preceptores.

La mayoría del personal que respondieron a la encuesta consideran, desde su perspectiva, que la confidencialidad del paciente no se vio comprometida. Hoy en día, las asociaciones médicas y hospitales recomiendan que los médicos sean especialmente conscientes de las consecuencias de la violación de la confidencialidad del paciente. La recomendación actual es obtener siempre el permiso del paciente por escrito, incluso para utilizar una imagen con una parte del cuerpo paciente con un problema médico.

**Maria Fernanda Jimenez MD**

Profesor

Departamento de Cirugía

Hospital Universitario Mayor MEDERI

DC, Bogota, Colombia

### **Telemedicine inside the Pocket: The Impact of Smartphones on Daily Patients' Evaluations**

The authors present the perception of physician toward the use of smartphones on daily clinical decision-making. The spread of the new communication technologies has impacted medical professionals desiring to have an immediate answer to their clinical problem. This research demonstrates the benefits and the popularity of these devices among personnel in training and their preceptors.

Most of the personnel who answered the survey consider from their perspective that the patient's confidentiality was not jeopardized. Nowadays, medical associations and hospitals recommend that doctors be especially aware of the implications of breaching patient confidentiality. The current recommendation is to obtain always permission from the patient in writing, even to use an image featuring a part of the body's patient with a medical problem.

**Maria Fernanda Jimenez MD**

Professor

Department of Surgery

Hospital Universitario Mayor MEDERI

DC, Bogota, Colombia