

SMARTPHONE USE IN PAEDIATRIC PRACTICE: A NATIONAL SURVEY

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Introduction: Smartphones have become universal among the general public since their launch in 2007. Alongside this, the use of smartphones and mobile medical applications (apps) by clinicians has risen exponentially.

Objectives: The aim of this study is to present the current prevalence of smartphone ownership among Cypriot paediatricians and the patterns of their use in everyday clinical practice.

Study design: A standardized telephone survey was conducted by trained interviewers on a random sample of all 225 currently registered and active paediatricians across all districts of Cyprus.

Results: From a total of 78 randomly selected eligible participants, 75 (96%) paediatricians agreed to participate in the study. The majority of physicians reported that they owned a smartphone (n = 53, 71%) and the rest (n = 22, 29%) used a Symbian phone as their primary device. Of those who owned a smartphone, 40% (n = 21) reported using at least one app related to their clinical work. The mean number of applications used by these users was 3.5. The majority (44/53, 83%) responded that they did not use their smartphone as a tool for managing patient appointments, while 9 out of the 53 (17%) responded positively. Over 80% of participants used their smartphone to take or receive a picture or a video from their patients for professional purposes.

Conclusion: This study found a high level of smartphone ownership and usage among medical Cypriot paediatricians, corroborating with previous literature for other specialties in other countries. Despite the benefits they offer, more rigorous validation practices regarding mobile medical apps need to be established to ensure they are used safely and appropriately.

Introduction

Smartphones have become universal among the general public since Apple launched the first smartphone in June 2007. This technological leap allowed various functions such as internet browsing, e-mailing, voice, text and video communication, as well as the use of downloadable applications to be integrated

into one device. Subsequently, smartphones powered by the Android operating system were introduced in October 2008, followed by the introduction of downloadable applications (apps) on these devices. Apps are downloadable software programs that have been developed to run on a computer or mobile device to accomplish a specific purpose.

The utilisation of smartphones by clinicians and other healthcare workers has also evolved. Mobile health (mHealth), is the use of portable devices, such as smartphones and tablets, for medical purposes, including diagnosis, treatment, or support of general health and well-being.¹ Close to 100,000 apps are now available to assist health care professionals and the number of mHealth apps and its users is almost doubling year on year.^{2,3} It is estimated that by 2015 smartphone users worldwide will number more than 500 million and by 2018 there could be 1.7 billion mHealth users worldwide.^{1,4}

There are currently thousands of apps available for pediatricians and they are quickly becoming popular clinical tools, allowing instant, on-the-go access to textbooks, journals and offer resources such as medical calculators and drug formularies.⁵⁻⁷

A recent systematic review highlights the current paucity of evidence regarding the benefits that these apps provide for paediatricians, namely faster and more informed decision making, and more efficient practice.⁸ More research is clearly needed to provide us with answers regarding this aspect.

The aims of this study were to identify the current prevalence of smartphone ownership among Cypriot paediatricians, and the patterns/ extent to which they use them in their practice. To our knowledge this is the first time someone has looked at the current prevalence of smartphone usage among paediatricians, or any other specialty, in Cyprus. This survey was undertaken as a pilot study, to provide baseline data for future research being undertaken by the authors.

Material and Methods

Questionnaire design

A telephone-based questionnaire tool was developed to evaluate the ways that participants use their smartphone for their daily work in their clinical practice. The questionnaire was constructed by the lead researcher and reviewed by an expert panel consisting of ten paediatricians for content, validity and reliability. Modifications were made according to the comments of this focus group. The questionnaire consisted of 18 questions that were divided into two sections (Appendix 1):

- i. Demographic characteristics of the participant
- ii. Patterns of smartphone use

Questions were derived from the researcher's personal experience and that of other informants.

Data collection

A national, registry-based telephone survey of paediatricians based in Cyprus was undertaken for this research. The participants were selected at random using a computer-based random selection software from the National Paediatric Association Registry. This registry contains a list of all 225 currently registered and active paediatricians across all districts of Cyprus.

Participation was voluntary and verbal consent was obtained before the start of the telephone interview. Physician practices were contacted in July 2014, with at least six call attempts made to establish contact with each participant. If the participant declared at the start that he or she did not own a smartphone, the interview was terminated. The interviewer entered the survey answers directly into a database that included error and validity checks at point of entry. The interview was carried out by highly trained interviewers with experience in telephone surveys, medical and information technology (IT) terminology.

Statistical analysis

All variables were analysed descriptively. Continuous variables are reported as mean \pm standard deviation and categorical variables are presented as frequencies and percentages. All numerical data were entered and analysed using Statistical Package for Social Sciences (SPSS Version 21, Chicago, Illinois).

Results

From a total of 78 randomly selected, eligible participants 75 (96%) paediatricians agreed to participate in the study. Thirty five of the participants (47%) were female and 40 (53%) were male. The oldest participant interviewed was 71 years old and the youngest 29. Participants were grouped in two categories according to their age. Forty-two (56%) paediatricians were older than 50 years of age and 33 (44%) were younger than 50 years of age. The mean age was 51 years.

The interview was completed in 5.0 minutes on average, with no significant time difference between responders.

Of the 75 participants, the majority of physicians reported that they owned a smartphone (n = 53, 71%) and the rest (n = 22, 29%) used a Symbian phone as their primary device. The most common smartphone operating system (OS) was Google's Android (n = 26, 49%), closely followed by Apple's iOS (n = 25, 47%). The two other OS used were RIM's BlackBerry OS (n = 1, 2%) and Microsoft's Windows (n = 1, 2%) (Figure 1).

Of those paediatricians who owned a smartphone, 40% (n = 21) reported using at least one application related to their clinical work. The mean number of apps used by these users was 3.5, ranging from 1 to 8, and the most common number of apps was 2 (Table 1). The top 3 most frequently owned phone apps across all phone types were Medscape (n = 10), UpToDate (n = 7) and AAP (n = 4).

There was no statistical significance of smartphone ownership between the two age groups. 62% (n = 26) aged greater than 50 years of age owned a smartphone, whereas for participants aged less than 50 years of age, 82% (n = 27) owned a smartphone. Out of those who used smartphone apps for their work, 29% (n = 6) were aged >50 years of age and 15/21(71%) were ≤50 years of age.

The majority of smartphone users (39/53, 74%) did not use any computer software or the internet for their work, while 14 out of the 53 (26%) did. The top 3 most frequently computer-based software used were Medscape (n = 8), AAP (n = 6) and UpToDate (n = 6).

When asked whether the smartphone was used as a tool for managing patient appointments, the

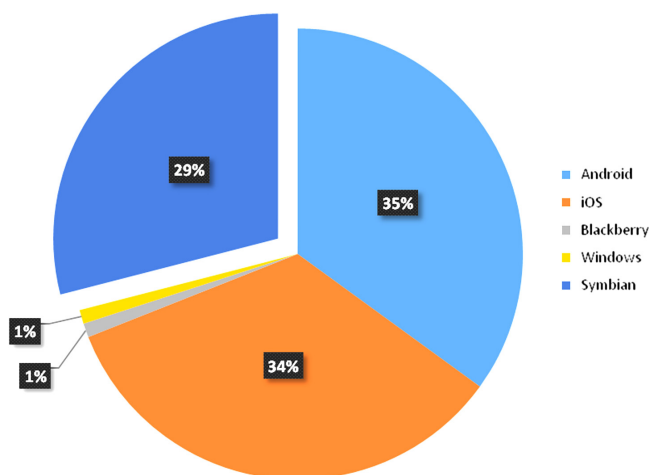


Figure 1: Types of smartphone operating system

	Paediatricians (n = 53)	%
None	32	60.4
1-2	13	24.5
3-5	7	13.2
> 6	1	1.9

Table 1: Usage of medical applications among paediatricians owning a smartphone

majority (44/53, 83%) responded negatively, while 9 out of the 53 (17%) responded positively (Figure 2).

The vast majority (51/53, 96%) used their smartphone for general internet browsing (Figure 2). A third of these (17/51, 33%) were browsing the internet for more than 60 minutes per day, 20/51 (39%) for less than 30 minutes per day, and 14/51 (27%) for between 31-60 minutes per day. When asked to compare their use of their smartphone for internet browsing with a desktop, laptop or tablet, 31 participants (61%) said they used their smartphone less, 2 (4%) said they used it about the same and 18 (35%) used their smartphone more frequently compared to other available devices.

The participants were also asked whether they ever used their smartphone to take or receive a picture or a video from their patients for professional purposes. The majority (44/53, 83%) replied positively. Of those who did, the mean frequency of picture/video usage was 9 times with the minimum and also most common 1 (13/44, 30%) and the maximum 40 times. Finally, of those 44 users, 21/44 (48%) used their smartphone to take or receive a picture, 23/44 (52%) to take or receive both a picture and a video, and none to take or receive a video only.

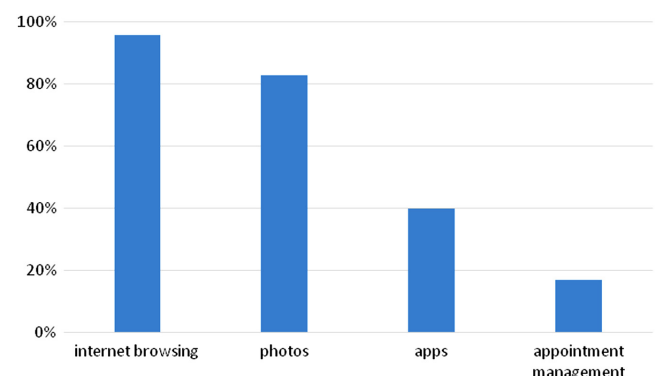


Figure 2: Smartphone function utilisation

Discussion

Since the launch of mobile medical apps in 2008, very few studies have been published evaluating the practice of health care professionals with regards to their smartphone applications usage. In fact, no such study has been published for paediatricians. As smartphones continue to revolutionise our demands for constant access to information, their usage in the clinical setting has become more and more widespread. The aim of this study was to provide early data regarding the ownership of smartphones amongst Cypriot paediatricians and their patterns of use of these devices with relation to their clinical practice.

The overall rate of smartphone ownership among paediatricians was 71%, which is lower than the ownership rate among interns (98.4%), among urology trainees (100%) and among junior doctors in UK (74.8%) in previous studies.⁹⁻¹¹ A systematic review by Garritty et al concluded that smartphone usage varied from 45% to 85% amongst healthcare providers, with younger doctors more likely to use them. However, in our study there was no statistical difference in smartphone ownership between the older and younger age groups (>50 years and ≤50 years), unlike the aforementioned study.¹²

Despite the high rate of smartphone ownership among Cypriot paediatricians, only 40% of them use smartphone applications to facilitate their everyday practice. The reasons for this are yet unclear but may be related to unfamiliarity with the technology, the numerous numbers of apps available to choose from and previous practices amongst clinicians.

When asked whether the smartphone was used as a tool for managing patient appointments, the majority (44/53, 83%) responded negatively, while 9 out of the 53 (17%) responded positively. Previous studies of medical interns show that 50% of them use their apps to aid in diagnosis, 43% use them for interpreting lab results and 55% found them useful in checking medical emergency protocols.⁹

Our findings are suggestive that Cypriot paediatricians are selective about the medical apps they download or use; the majority owned 3-4 apps that were related to their medical work. In previous studies, the most frequently used apps in the medical student cohort were those detailing medication/drug references.

Interestingly, smartphone usage amongst paediatric patients and their caregivers has also been studied. A US-based cross-sectional survey of teenagers and caregivers assessed smartphone ownership, primary use of devices and usage of health apps in urban paediatric clinics.¹³ The authors' results showed that the majority of participants expressed interest in medical apps, although caregivers were more motivated than teenagers. Similarly, caregivers were found to be more likely to search health topics and own medical apps in comparison to teenagers.

With regards to smartphone usage for photographing or videoing patients for professional purposes, the majority of Cypriot paediatricians stated that they had done this at least once. Clinical photography has long been an important aspect in the management of certain pathologies, for instance in dermatology. In a study by Kunde et al they surveyed dermatology registrars in Australia on their use of personal smartphones and digital equipment for photographing patients.¹⁴ The results showed that all of the 13 registrars who responded reported using their smartphones for photographing patients. In addition, 85% of them reported storing over 100 images of patients on their personal phones and 62% had more than 200 photos stored. Consent for these photographs was commonly gained from patients verbally by the dermatology doctors. It is important to note that clinicians must maintain ethical and medico-legal standards with the continuous evolution of smartphone and digital technology.

Limitations

Although the response rate in this study was very high, our results were obtained from a single group of physicians (namely paediatricians) in Cyprus. Rates of smartphone ownership and willingness to use mobile applications may be different in other specialties and also for other types of healthcare professionals such as nurses or pharmacists. Our sample size is not large and it would be important to examine these results in a larger sized survey. Finally, the use of telephone surveying may have yielded different results to face to face interviewing or paper and pencil questionnaires.

Conclusion

The majority of paediatricians either already own or will soon own smartphones. The market is currently flooded by apps, therefore making difficult for the paediatrician to select the most reliable and useful

ones. Despite the benefits they offer, more rigorous validation practices regarding mobile medical apps need to be established to ensure their safe and appropriate use. It is important to note that medical applications should be used effectively as facilitator and not as a replacement of clinical practice.

References

1. Cortez NG, Cohen IG, Kesselheim AS. FDA regulation of mobile health technologies. *The New England journal of medicine* Jul 24 2014;**371**(4):372–9.
2. Cortez N. The Mobile Health Revolution? *UC Davis Law Review* 2013; **47**:101–58.
3. research2guidance. Mobile health market report 2013-2017. March 4, 2013 http://www.research2guidance.com/shop/index.php/downloadable/download/sample/sample_id/262
4. Ventola CL. Mobile devices and apps for health care professionals: uses and benefits. *P & T: a peer-reviewed journal for formulary management* May 2014;**39**(5): 356–64.
5. Bhansali R, Armstrong J. Smartphone applications for pediatric anesthesia. *Paediatric anaesthesia* Apr 2012;**22**(4):400–4.
6. Lin M, Rezaie S, Husain I. Top 10 mobile apps in emergency medicine. *Emergency medicine journal: EMJ* May 2014;**31**(5):432–3.
7. Blackmon LB. 10 useful apps for everyday pediatric use. *Pediatric annals* May 2012;**41**(5):209–11.
8. Prgomet M, Georgiou A, Westbrook JJ. The impact of mobile handheld technology on hospital physicians' work practices and patient care: a systematic review. *Journal of the American Medical Informatics Association: JAMIA* Nov-Dec 2009;**16**(6):792–801.
9. O'Reilly MK, Nason GJ, Liddy S, Fitzgerald CW, Kelly ME, Shields C. DOCSS: doctors on-call smartphone study. *Irish journal of medical science* Dec 2014;**183**(4):573–7.
10. Nason GJ BM, Aslam A, Kelly ME, Akram CM, Giri SK, Flood HD. The use of smartphone applications by urology trainees. *Surgeon* 2014; Sep 5. pii: S1479-666X(14)00078-X. doi:10.1016/j.surge.2014.06.008.
11. Payne KB WH, 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. doi:10.1186/1472-6947-12-121.
12. Garritty C EEK. Who's using PDAs? Estimates of PDA use by health care providers: a systematic review of surveys. *J Med Internet Res* 2006;May 12(8(2):e7.).
13. Singh A, Wilkinson S, Braganza S. Smartphones and pediatric apps to mobilize the medical home. *The Journal of pediatrics* Sep 2014;**165**(3):606–10.
14. Kunde L, McMeniman E, Parker M. Clinical photography in dermatology: ethical and medico-legal considerations in the age of digital and smartphone technology. *The Australasian journal of dermatology* Aug 2013;**54**(3):192–7.

Appendix A:

Questionnaire for Smartphone Apps in Paediatric Practice

1. Name
2. Gender
 - a. Male
 - b. Female
3. Age group
 - a. ≤ 50
 - b. > 50
4. Workplace
 - a. Private
 - b. Public
5. Phone type
 - a. Symbian
 - b. Smartphone
 - c. I don't know

If the answer is b, then continue below

6. Which Operating System does your smartphone use?
 - a. iOS
 - b. Android
 - c. Blackberry
 - d. Windows
 - e. Other

7. Do you use any apps that are relevant to your practice?
 - a. Yes
 - b. No
8. If yes, which ones?
 - a. _
 - b. _
 - c. _
 - d. _
9. Do you use any web-based apps from your PC?
 - a. Yes
 - b. No
10. If yes, which ones?
 - a. _
 - b. _
 - c. _
 - d. _
11. Do you use your smartphone for managing your patient appointments?
 - a. Yes
 - b. No
12. Do you use your smartphone for web browsing?
 - a. Yes
 - b. No
13. If yes, for how many hours/day?
 - a. < 30 min
 - b. 31-60 min
 - c. > 60 min
14. If yes, how much compared to a PC/laptop/tablet?
 - a. More
 - b. Same
 - c. Less
15. Have you ever used your phone to take or receive a picture or video for professional purposes?
 - a. Yes
 - b. No
16. If yes, which one?
 - a. Picture
 - b. Video
 - c. Both
17. On average, how many times per month did you use your phone for the above reasons?