International Journal of Research in Dermatology
Nair PP et al. Int J Res Dermatol. 2021 Mar;7(2):171-176
http://www.ijord.com

DOI: https://dx.doi.org/10.18203/issn.2455-4529.IntJResDermatol20210464

Original Research Article

Application of smartphones in dermatology practice: a cross-sectional survey

Priya Prabhakaran Nair[1]*, Leela Manju[2]

[1]Department of Dermatology, [2]Department of Community Medicine, Sree Gokulam Medical College, Trivandrum, Kerala, India

Received: 01 January 2021
Revised: 18 January 2021
Accepted: 19 January 2021

***Correspondence:**
Dr. Priya Prabhakaran Nair,
E-mail: priyaprabac@gmail.com

ABSTRACT

Background: Smartphones have revolutionised medical practice including dermatology because of its multiple functions assisting practitioners at the point of care and beyond. We aimed to analyse the pattern of smartphone use by dermatologists and to explore their opinions and difficulties faced while using smartphone
Methods: This cross-sectional study included a population of dermatology consultants and residents in Kerala, India. A validated self-reported questionnaire was emailed to them using a survey tool to collect the data
Results: Overall 100 practitioners responded to the questionnaire with a response rate 10.6%. Consultants and residents accounted for 81% and 19% of the participants respectively. Females (78%) outnumbered males. Most (58.6%) belonged to age group 31-40 years. Everyone owned a smartphone with the most prevalent operating system (OS) being android (85.9%). Medical communication was done mostly using phone calls (92%). Drug reference (94%) was the most popular noncommunicative application. Most participants (85%) used smartphone camera for clinical photography. OS freezing was the biggest technical issue whereas inappropriate use and distraction were the biggest nontechnical challenges of smartphone use. Clinical photography was taken by 95% for disease monitoring with significantly higher usage in females. Those upto 40 years of age significantly took and shared clinical photographs for second opinion more than older ones. Only 17.2% with significantly higher males than females took written consent for photography.
Conclusions: Dermatologists use smartphone extensively for communication, information and photography with preferences varying with age, gender and level of training.

Keywords: Smartphone, Communication, Information, Photography, Challenges, Dermatology

INTRODUCTION

Smartphones are gaining immense popularity in the general population as well as among medical professionals in today's digital era. This is because of its numerous features like in-built cameras, instant messaging, phone calls and various medical apps helping in decision-making at point of care. This is especially true in dermatology which relies on visual examination for diagnosis and monitoring of diseases. Smartphones also have similar capabilities as a personal computer or a laptop enabling professionals to access medical information from different databases using internet for medical practice, academic and research purposes.

Previous studies have found capabilities of smartphone in teleconsultation, disease monitoring, teaching and research. But in parallel, certain challenges have come to

the fore with widespread use of smartphones.[1-4] Hence it is important to study users' knowledge, attitude and practices regarding smartphone technology. Current investigation was aimed to characterise the pattern of smartphone use by dermatologists in Kerala, India for medical practice and to analyse their perceptions and difficulties pertaining to smartphone technology.

METHODS

Current study was a cross-sectional survey conducted from January 2020 to February 2020 including all the dermatology consultants and residents working in both government and private healthcare sectors of Kerala. Those who were unwilling to participate were excluded. Convenience sampling was used for recruitment of participants. A validated questionnaire from a previous study[1] was modified to an anonymous multi-choice questionnaire based on feedback from ten practitioners. It consisted of 4 sections namely general demographic details (3 questions); preferences and uses of smartphones in medical practice (5 questions); perceptions and challenges associated with smartphones (4 questions) and application of smartphone for clinical photography (3 questions). The questionnaire was emailed to all dermatologists using an online survey tool (google forms). Institute Research Board exempted our study from review. Data was analysed using SPSS version 20 (IBM Corp). Descriptive statistics were used to present frequencies and percentages. Chi square test was employed to find association between categorical variables. Statistical significance was set at $p<0.05$.

RESULTS

Demographics

Emails were sent to 940 dermatologists out of which 100 valid responses were received with a response rate of 10.6%. Majority of the responses were from females (78%) and consultants (81%). More than half of the respondents belonged to age group 31-40 years (58.6%) (Table 1).

Table 1: Sample demographics.

Category	%
Designation (n=100)	Consultant: 81 Resident: 19
Age (years) (n=99)	21-30: 19.2 31-40: 58.6 41-50: 11.1 51-60: 3 More than 60: 8.1
Gender (n=100)	Male: 22 Female: 78
Operating system (n=99)	Android: 85.9 iOS: 14.1

Smartphone use

All of them (100%) owned a smartphone. Most prevalent OS (operating system) were android (85, 85.9%) and iOS (14, 14.1%). For practice related communication, most popular tools were phone calls (92%) and chatting (eg: whatsapp) (87%) (Table 2). Significantly, those above 40 years of age (16/22) used SMS than those younger (32/77) (phi=0.259, p=0.01). Compared to females (10/78), significantly more males (8/22) used video calls like skype (phi=0.254, p=0.011). Most popular noncommunicative applications were drug reference (94%) and literature search (88%) (Table 3). There was no significant difference between consultants and residents in terms of usage of noncommunicative applications except for medical reference (residents 19/19 versus consultants 62/81) (phi=0.235, p=0.019) and medical dictionary (residents 13/19 versus consultants 22/80) (phi=0.337, p=0.001). Majority found the smartphone useful for staff communication (82, 82.8%), reviewing patients' reports (61, 61.6%), critical alerts about patients (50, 52.6%) and for consultations about patients' condition (45, 45%). However, with regard to communication with patients' families, 38.1% (37) individuals had a neutral outlook and 35.1% (34) considered it harmful (Figure 1). Sixty five (65.7%) disagreed with the idea of integrating smartphone with hospital information system (HIS) while 13 (13.1%) agreed and 21 (21.2%) were unsure.

Table 2: Frequency of use of communicative tools in medical practice.

Interactive tools	Percentage (n=100)
Phone calls	92
Voice over internet	18
Text messages	49
Chatting	87
Social network	40
Official e-mail	34
Personal e-mail	54

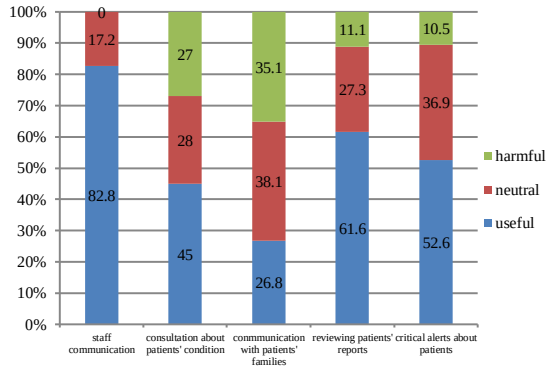

Figure 1: Perception of dermatologists regarding use of communicative tools for medical practice.

Difficulties faced

Poor mobile coverage was the most common issue felt on daily (26, 26.3%), weekly (17, 17.1%) and monthly basis (10, 10.1%). Occasional instances of freezing of OS were experienced by 67.3% (66) respondents (Figure 2). Android users (71/84) were significantly more likely to face sudden freezing of OS than iOS users (3/13) (phi=0.492, p<0.001). Most of the individuals faced distraction on a daily basis (46, 48.9%) and inappropriate use occasionally (46, 50.5%) Superficial learning was an issue for 12.6% (11) on monthly basis. Only 6.3% participants had no concerns about privacy and access (Figure 3).

Table 3: Frequency of use of non-communicative applications in medical practice.

Non-communicative applications	Percentage (n=100)
Drug reference	94
Medical reference	81
Aid in differential diagnosis	63
Medical dictionary	35
Literature search	88
Dictation of reports	15
Calendar	48
Medical calculations	44
Take notes	26
Medical photography	85

Table 4: Clinical photography in dermatology.

Parameter	Result
Using smartphone camera for photography. (n=100)	Yes: 85% No: 15%
Purpose of photography. (n=100)	For treatment and disease monitoring:95% For second opinion from peers/seniors: 81% For research/ publication: 68% For teaching/ education: 52%
Sharing of photographs for second opinion via email/text. (n=100)	Often: 17% Sometimes: 35% Occasionally: 40% Never: 8%
Written consent for photography. (n=99)	Yes : 17.2% No: 82.8%

Most participants considered social networking (eg: facebook) (71, 75.5%), chatting (60, 63.1%), video calls (55, 59.8%), phone calls (50, 56.2%) and SMS (42, 46.6%) unsecure whereas personal email was perceived secure by 39.2% (38). Thirty nine individuals (42.9%) were not sure about the security of work email (Figure 4).

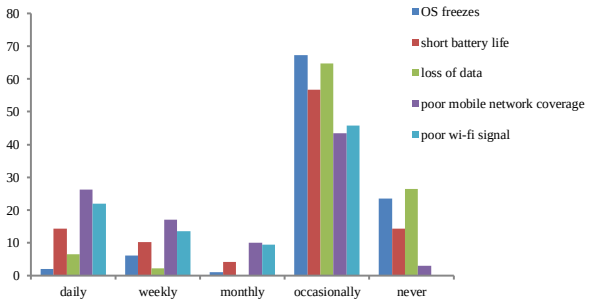

Figure 2: Distribution of technical difficulties of smartphones faced by practitioners in percentages.

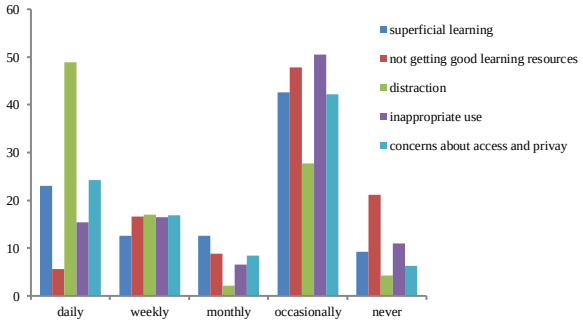

Figure 3: Distribution of nontechnical challenges in using smartphone (percentage).

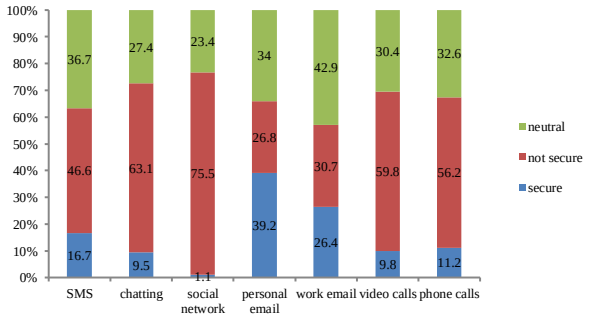

Figure 4: Concerns of dermatologists regarding security of communication tools for case discussions.

Clinical photography

Ninety five participants (95%) took clinical photographs for treatment and disease monitoring. Most participants reported sharing photographs to peers/ seniors for second opinion to occur occasionally (40, 40%). Only 17 practitioners (17.2%) took written consent for taking patient photographs (Table 4). Compared to those above 40 years, younger ones significantly took photographs for second opinion (younger ones 71/77 versus older ones 9/22) (phi=0.542, p<0.001) and for research purpose (younger ones 57/77 versus older ones 10/22) (phi= 0.254, p=0.012) as well as email/ message them (younger ones 75/77 versus older ones 16/22) (phi=0.376, p<0.001). With regard to gender, significantly more females (77/78 took clinical photographs for disease and

treatment monitoring than males (18/22) (phi=0.21, p=0.008). Sharing of photographs via email/message was also significantly higher in females (74/78) than males (18/22) (phi=0.199, p=0.046). Conversely, significantly more males (9/21) took written consent for photographs compared to females (8/78) (phi=0.353, p<0.001). More residents (16/19) took photographs for teaching/ education than consultants (36/81) (phi=0.312, p=0.002).

DISCUSSION

Current study found all the dermatologists including residents own smartphones implying 100% adoption rate consistent with the previous studies.[1,2,5] This shows the widespread use of smartphones irrespective of age, gender and designation. Most common OS used by our study population was android (85%) in spite of significant association with freezing of OS compared to iOS. This is probably because of wider range of android phones available in India which are also cheaper and more user friendly than iphones. This is in contrast to that of previous reports where iOS is the most common mobile platform by medical professionals possibly because of its better security.[1,2,6]

Internet is very crucial in dermatology practice for its speedy influence in decision making for patient care.[5,7] Like that of previous reports most respondents accessed internet for medical information with maximum use for drug reference followed by literature search.[1,2,8,9]

Among our study population, phone calls and chatting ranked highest for practice-related communication. As reported in recent literature, this indicates that chatting apps like whatspp is gaining popularity as much as phone calls.[10-13] This is in spite of perceiving chatting and phone calls unsafe by at least half of our study population.

Freezing of OS was the greatest technical difficulty for dermatologists in our study. But previous studies reported short battery life as the biggest issue.[1,2] This difference is probably due to variation in preference of OS. Inappropriate use and distraction were the most common nontechnical challenge in our study as previously reported.[1,9] But Wallace et al and Buabbas et al found superficial learning and finding good learning resource as most challenging.[2,14] Other obstacles raised are small screen size, potentially mistaken data input, virus, hampering of patient-physician interaction, loss or theft and breaches of data privacy and security.[15] Most respondents considered personal emails safe but were unsure about safety of work emails for discussing patient details. Low awareness of doctors on work emails is perhaps a reason for this. Caffery et al reported that the ability to encrypt ordinary email thereby securing patient confidentiality is regarded difficult when using ordinary email.[16] Hence web based email applications implementing encryptation using the more user friendly HTTPS (hypertext transfer protocol secure) have become popular for email based telemedicine and consultation between patient and doctors.

It was observed that staff communication was the most common interactive application in medical practice as reported in literature.[1,2] But majority of practitioners felt neutral regarding communication with patients family. It is important to use telephonic consultation with the patients family judiciously and in dire situations like covid-19 pandemic and should not be a replacement for face to face consultation. In this context, Indian medical association has said that consultations via phones has a possible risk of amounting to negligence by doctor in cases of any medico-legal issue hence should be done cautiously. Only 13% agreed with the idea of smartphone integration with HIS in contrast to 98% reported by Jamal et al.[1] This discordance is probably because of concerns about security. To this end, a mobile app development guideline for hospital settings for minimizing the security risks of "bring your own devices" policies has been published.[17]

In our study, most respondents email or message photographs to peers/seniors. Smartphone cameras was used by 85% for clinical photography. This is probably because of ease in taking, storing and sending photographs in smartphones. For protection of patients' images, use of security pin codes to lock smartphones is recommended which is not possible in most digital cameras.[3] At least three fourths of dermatologists took clinical photographs for tracking disease progression. This observation is similar to that of previous reports from dermatology and other specialities.[1,2,4,18,19] But in a visually oriented field like dermatology, special attention needs to be paid on zooming and resolution so as to take clear and authentic photos of the skin lesions. There were differences in gender and age with regard to clinical photography.

Those upto 40 years of age were significantly more likely to share photographs with colleagues or seniors for second opinion than the older ones maybe because of less clinical experience. We found female dermatologists were more likely to take clinical photographs for disease monitoring but less likely to take written consent from patients compared to males. This could be because of cultural factors favouring female doctors with lesser restriction in photographing skin lesions of both sexes. Leger et al reported that photographing is acceptable when written consent is taken and when the photograph is taken by doctor of same gender with hospital based camera.[20] Our study showed only 17% took written consent for photography while the rest were satisfied with implied consent. A study by Kunde et al[3] found 92% take verbal consent from patients. It could be argued that all physical information including photographs gathered during consultations are considered as part of the patient's medical record which does not require express written or verbal consent. But written consents are

helpful as they clearly state the purpose of image acquisition and limitations of use.

For discussing patients' details, most (63.1%) considered chatting unsecure. In case of email security, 39.2% replied in affirmative but 34% were unsure. Currently emails via gmail, yahoo mail are not end-to-end encrypted by default whereas whatsapp and telegram are, therefore more secure. In this context, using protonmail is also suggested.

Limitations

Limitations of current study were; low response rate (11%) and selection bias.

CONCLUSION

To conclude, smartphones are widely used in dermatology practice and the manner of use varied with age, gender and designation of practitioners. Because of its many functions, it is an asset in clinical practice, medical education and research. But clear consensus for secure use of smartphone at workplace would be beneficial.

ACKNOWLEDGEMENTS

Authors would like to thank Dr. Suja V., head of department, Dr. Simi S. M., professor and Dr. Devan Prakash, senior resident in the department of dermatology for their valuable inputs during the research. We also express our sincere gratitude to all the dermatologists who took time from their busy schedule to respond to our survey.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Jamal A, Temsah M-H, Khan SA, Al-Eyadhy A, Koppel C, Chiang MF. Mobile phone use among medical residents: a cross-sectional multicenter survey in Saudi Arabia. JMIR MHealth UHealth. 2016;4(2):e61.
2. Buabbas AJ, Sharma P, Al-Abdulrazaq A, Shehab H. Smartphone use by government dermatology practitioners in Kuwait: a self-reported questionnaire based cross-sectional study. BMC Med Inform Decis Mak. 2019;19(1):155.
3. Kunde L, McMeniman E, Parker M. Clinical photography in dermatology: ethical and medico-legal considerations in the age of digital and smartphone technology. Australas J Dermatol. 2013; 54(3):192-7.
4. Milam EC, Leger MC. Use of medical photography among dermatologists: a nationwide online survey study. J Eur Acad Dermatol Venereol. 2018;32(10):1804-9.
5. 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.
6. Franko OI, Tirrell TF. Smartphone app use among medical providers in ACGME training programs. J Med Syst. 2012;36(5):3135-9.
7. Choi JS, Yi B, Park JH, Choi K, Jung J, Park SW, et al. The uses of the smartphone for doctors: an empirical study from samsung medical center. Healthc Inform Res. 2011;17(2):131-8.
8. Yaman H, Güneş ED. Family practice in Turkey: Observations from a pilot implementation. Scand J Prim Health Care. 2016;34(1):81-2.
9. Patel PK, Sayers AE, Patrick NL, Hughes K, Armitage J, Hunter IA. A UK Perspective on Smartphone Use Amongst Doctors Within the Surgical Profession. Ann Med Surg (Lond). 2015;4(2):107-12.
10. Khanna V, Sambandam SN, Gul A, Mounasamy V. WhatsApp ening in orthopedic care: a concise report from a 300-bedded tertiary care teaching center. Eur J Orthop Surg Traumatol Orthop Traumatol. 2015;25(5):821-6.
11. Johnston MJ, King D, Arora S, Behar N, Athanasiou T, Sevdalis N, et al. Smartphones let surgeons know WhatsApp: an analysis of communication in emergency surgical teams. Am J Surg. 2015;209(1):45-51.
12. Giordano V, Koch HA, Mendes CH, Bergamin A, de Souza FS, do Amaral NP. WhatsApp messenger is useful and reproducible in the assessment of tibial plateau fractures: inter- and intra-observer agreement study. Int J Med Inf. 2015;84(2):141-8.
13. Anyanwu CO, Lipoff JB. Smartphones, photography, and security in dermatology. J Am Acad Dermatol. 2015;72(1):193-5.
14. 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).
15. McLeod RP, Mays MZ. Back to the future: personal digital assistants in nursing education . Nurs Clin North Am. 2008;43(4):583-92.
16. Caffery LJ, Smith AC. A literature review of email-based telemedicine. Stud Health Technol Inform. 2010;161:20-34.
17. Al Ayubi SU, Pelletier A, Sunthara G, Gujral N, Mittal V, Bourgeois FC. A mobile app development guideline for hospital settings: maximizing the use of and minimizing the security risks of "bring your own devices" policies. JMIR MHealth UHealth. 2016;4(2):e50.
18. Abbott LM, Magnusson RS, Gibbs E, Smith SD. Smartphone use in dermatology for clinical photography and consultation: Current practice and the law. Australas J Dermatol. 2018;59(2):101-7.

19. Putzer GJ, Park Y. Are physicians likely to adopt emerging mobile technologies? attitudes and innovation factors affecting smartphone use in the southeastern United States. Perspect Health Inf Manag. 2012;9:1b.
20. Leger MC, Wu T, Haimovic A, Kaplan R, Sanchez M, Cohen D, et al. Patient perspectives on medical photography in dermatology. Dermatol Surg Off Publ Am Soc Dermatol Surg Al. 2014;40(9):1028-37.

Cite this article as: Nair PP, Manju L. Application of smartphones in dermatology practice: a cross-sectional survey. Int J Res Dermatol 2021;7:171-6.