Use of Mobile Apps: A Patient-centered Approach

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Abstract

Objectives—This study explored what smartphone health applications (apps) are used by patients, how they learn about health apps, and how information about health apps is shared.

Methods—Patients seeking care in an academic ED were surveyed about their health apps: use, knowledge, sharing, and desired app features. Demographics and health information were characterized by summary statistics.

Results—Of 300 participants, 212 (71%) owned smartphones, 201 (95%) had apps, and 94 (44%) had health apps. Most frequently downloaded health apps categories were exercise 46 (49%), brain teasers 30 (32%), and diet 23 (24%). The frequency of use of apps varied as six (6%) of health apps were downloaded but never used, 37 (39%) apps were used only a few times, and 40 (43%) health apps were used once per month. Only five apps (2%) were suggested to participants by health care providers, and many participants used health apps intermittently (55% of apps   once a month). Participants indicated sharing information from 64 (59%) health apps, mostly within social networks (27 apps, 29%), and less often with health care providers (16 apps, 17%).

Conclusions—While mobile health has experienced tremendous growth over the past few years, use of health apps among our sample was low. The most commonly used apps were those that had broad functionality, while the most frequently used health apps encompassed the topics of exercise, diet, and brain teasers. While participants most often shared information about health apps within their social networks, information was less frequently shared with providers, and physician recommendation played a small role in influencing patient use of health apps.

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INTRODUCTION

Since the introduction of smartphones, adoption has been rapid. As of January 2014, 58% of Americans owned smartphones, with most demographic groups reaching ownership of at least 40%.[1] The growth of smartphone capabilities has been accompanied by the availability of applications (apps) to help manage activities, including over 40,000 apps for health.[2] An estimated one-third of cellphone owners use mobile phones for health information, and 19% of smartphone users have at least one health app.[3] Little is known, however, about how patients learn about and use available health care apps.

Mobile health (mHealth) is defined as the use of mobile and wireless technologies for various health goals.[4] Researchers and policy makers believe mHealth has the potential to improve health care delivery and outcomes, provide a platform for individualized medicine, and assist patients in disease management.[5,6] However, only a minority of apps are evidence-based or evaluated for patient-specific experience or health outcomes.[7]

Insight into the patient perspective on use, barriers to utilization, and desired app features could inform our understanding of the potential reach and efficacy of mHealth.[8] We queried patients about categories of specific health apps used, frequency of use, sharing behavior, how they learned about the apps (e.g., physician recommendation), potential barriers to health app use, and desired features of apps.

METHODS

Study Design and Population

This was a survey study using a convenience sample of emergency department (ED) patients and was approved by the institutional review board. Included were stable (Emergency Severity Index [ESI] between 3 and 5) adult patients (>18 years of age) presenting to an urban, academic, ED (> 66,000 annual patient volume). Patients were approached three days a week from April 2013 to September 2013 due to research assistant scheduling. Ineligible patients included those younger than 18 years old, ESI level 1 or 2, non- English speakers, cognitively impaired, suicidal, or severely emotionally distressed. Written informed consent was obtained from subjects.

Survey Content and Administration

The survey was designed with input from previous protocols, and data from the Pew Mobile Health 2012 Report.[3,9] Questions were pilot-tested with co-authors and refined iteratively. The final survey (Data Supplement 1) included 43 open-ended and multiple-choice questions and was read aloud to participants to ensure completeness, and mitigate survey fatigue and any literacy concerns.

Survey questions focused on specific apps used, frequency of use, sharing of information from health apps, methods of learning about health apps (e.g. physician recommendation), potential barriers to health app use, and desired features of health apps. Sex, age, and ethnicity were extracted from the medical record. Additional demographics (education, income) and health provider status were asked to participants directly.

Data Analysis

Descriptive statistics were used to characterize the demographics, health, and app usage of the study participants. All analyses were performed using SAS (Version 9.3).

RESULTS

Patient characteristics can be found in Table 1. Five hundred and seventeen patients were screened, 425 (82%) met eligibility criteria, and 300 (71%) completed the survey. Two hundred twelve (71%) individuals owned smartphones. The median age of smartphone users was 29 years (SD ± 11 years), 33% were male, and 52% were white.

Heath Applications Use and Characteristics of Users

Of participants with smartphones, 201 (95%) had apps and 94 (44%) had health apps. Reasons for not using health apps included lack of knowledge (63 apps, 44%) and privacy concerns (12 apps, 8%). The most frequently downloaded apps were those with social media, internet searching, and networking capabilities (e.g. Google, Facebook, Twitter). The most frequently downloaded health apps by category were exercise and fitness 46 (26%), brain teasers and games 27 (13%), diet 23 (11%), sexual and reproductive health 23 (11%), and medical reference 18 (8%).

Use of Health Apps

Six (6%) health apps were downloaded but never used, 37 (39%) apps were used only a few times, and 40 (43%) apps were used once per month. Many reported they found the health apps through app store searches (111, 52%), while 5 (2%) health apps were discovered through health care providers. Participants indicated sharing information from 64 (59%) health apps. Apps were mostly shared within social networks, (27 apps, 29%), and less often with health care providers (16 apps, 17%).

Many participants (n = 99, 68%) indicated they would likely look for health apps post-survey. Participants were interested in using health apps to make appointments (n = 77, 52%) and video chat with their providers (n = 48, 32%).

Seeking Care

Most participants did not use any resources to determine whether to seek emergency care (n = 130, 87%). Only 5% indicate they used web or phone searches to influence their decisions.

DISCUSSION

Health Apps Utilization and Physician Recommendation

It has been suggested that physicians do not endorse apps because they are unfamiliar with what is available and do not want to provide their patients with uninformed recommendations.[6] As many apps are not rigorously evaluated, physicians may be reluctant to prescribe app use in the absence of effectiveness data.[6,10] In light of this, there has been a call for the development of an app certification process based on characteristics such as accuracy, security, and accessibility to serve as a point of reference for physicians.[10] And

while the FDA provides oversight for apps that pose patient safety risks, such as those with diagnostic capabilities or those intended to cure, treat, or prevent diseases, the majority of health apps remain unregulated.[11] Bills have been placed before Congress to more explicitly define products necessitating FDA review, and others have suggested a unique approval pathway for apps and post-marketing surveillance to decrease risks associated with app use.[12]

While some apps have evaluated efficacy through randomized controlled trials, the time to completion may be impractical as the technology may have evolved by the time the study is over. Apps could incorporate behavior change theory, as research suggests that health promotion interventions that use behavior change theories are more effective than those that do not.[13]

The most commonly reported apps in our study were those that had broad functionality and social networking functions. Streamlining health monitoring and other capabilities into a single app that allows for connectedness with others may facilitate greater utilization by patients. Others were interested in apps that allowed them to make appointments or video chat with providers, again suggesting that connectivity features might encourage use by patients.

Mobile health and the ED

There is the potential for mHealth to be used in the care of ED patients. Participants in our study rarely used technology-related resources (e.g. websites, mobile apps) to influence their decisions to seek acute care. Beyond deciding to seek care, prior work has demonstrated that a majority of patients do not completely understand the care they receive in the ED, including their diagnoses, tests received in the ED, and follow-up instructions.[14] Patients also struggle with discharge information, specifically when to return to the ED, and how to care for themselves at home.[15] An app could help with many of these areas while protecting patient privacy and maintaining confidentiality. Upon discharge, the date of care and specific diagnosis could be imported into the app, along with any specific instructions for post-ED care and follow-up. The patient could use this app also as a checklist to make sure recommended care is being completed and as a reference to determine if a return trip to the ED is needed. Health app use in this setting is contingent on numerous factors, including app availability, app validity and safety, buy-in from providers, and an infrastructure to support additions to the discharge process.

LIMITATIONS

We selected lower-acuity patients and may have excluded patients with chronic problems who may have been using apps. Patients were also identified at an urban academic medical center, and may not be representative of broader patient populations. A qualitative analysis may also have provided additional information with regard to patient perspectives and motivations surrounding mHealth.

CONCLUSIONS

While mobile health has experienced tremendous growth over the past few years, utilization of health apps among our sample was low. The most commonly used apps were those that had broad functionality, while the most frequently used health apps encompassed the topics of exercise, diet, and brain teasers. While participants most often shared information about health apps within their social networks, information was less frequently shared with providers, and physician recommendation played a small role in influencing patient use of health apps.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

References

1. Pew Research Center. Cell Phone and Smartphone Owner Demographics. Pew Internet & American Life Project; Washington, D.C.: Available at: http://www.pewinternet.org/data-trend/mobile/cell-phone-and-smartphone-ownership-demographics/ [Accessed Mar 19, 2015]

2. IMS Institute for Healthcare Informatics. [Accessed Mar 19, 2015] Patient apps for improved healthcare from novelty to mainstream. Available at: http://www.imshealth.com/deployedfiles/imshealth/Global/Content/Corporate/IMS%20Healt h%20Institute/Reports/Patient_Apps/IIHI_Patient_Apps_Report.pdf

3. Fox, S.; Duggan, M. Mobile health 2012. Pew Internet & American Life Project; Available at: http://www.pewinternet.org/2012/11/08/mobile-health-2012/ [Accessed Mar 19, 2015]

4. World Health Organization. [Accessed Mar 19, 2015] mHealth: New horizons for health through mobile technologies: based on the findings of the second global survey on eHealth. Available at: http://www.who.int/goe/publications/goe_mhealth_web.pdf

5. Sebelius K. mHealth Summit Keynote Address by Secretary Kathleen Sebelius. NCI Cancer Bull. 2011; 8(24):4.

6. Steinhubl SR, Muse ED, Topol EJ. Can mobile health technologies transform health care? JAMA. 2013; 310:2395–6. [PubMed: 24158428]

7. Nilsen W, Kumar S, Shar A, et al. Advancing the science of mHealth. J Health Commun. 2012; 17:5–10. [PubMed: 22548593]

8. Huckvale K, Car J. Implementation of mobile health tools. JAMA. 2014; 311:1447–8. [PubMed: 24715083]

9. Ranney ML, Choo EK, Wang Y, et al. Emergency department patients' preferences for technology-based behavioral interventions. Ann Emerg Med. 2012; 60:218–27. [PubMed: 22542311]

10. Powell AC, Landman AB, Bates DW. In search of a few good apps. JAMA. 2014; 311:1851–2. [PubMed: 24664278]

11. Food and Drug Administration. [Accessed Mar 19, 2015] Mobile medical applications: guidance for industry and Food and Drug Administration staff. Available at: http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDo cuments/UCM263366.pdf

12. Cortez NG, Cohen G, Kesselheim AS. FDA regulation of mobile health technologies. N Engl J Med. 2014; 371:372–9. [PubMed: 25054722]

13. Glanz K, Bishop DB. The role of behavioral science theory in development and implementation of public health interventions. Annu Rev Public Health. 2010; 31:399–418. [PubMed: 20070207]

14. Engel KG, Heisler M, Smith DM, Robinson CH, Forman JH, Ubel PA. Patient comprehension of emergency department care and instructions: are patients aware of when they do not understand? Ann Emerg Med. 2009; 53:454–61. [PubMed: 18619710]

15. Engel KG, Buckley BA, Forth VE, et al. Patient understanding of emergency department discharge instruction: where are knowledge deficits greatest? Acad Emerg Med. 2012; 19:1035–44.

Table 1

Study Population Characteristics

Characteristic	No Smartphone n = 88 n (%)	Had Smartphone n = 212 n (%)	Smartphone With Health Apps n = 94 n (%)	Smartphone Without Health Apps n= 118 n (%)
Sex				
Male	51 (60)	69 (32.5)	63 (67)	38 (32)[†]
Age, yrs				
18–24	16 (18)	68 (32)	32 (34)	36 (31)
25–32	7 (8)	61 (29)	32 (34)	29 (25)
33–45	21 (24)	52 (25)	23 (24)	31 (26)
>45+	44 (11)	29 (14)	7 (7)	22 (19)
Race[*]				
Black	64 (72)	78 (37)	32 (34)	46 (39)
White	22 (25)	110 (52)	55 (59)	55 (47)
Asian	1 (1)	8 (4)	2 (2)	6 (5)
Other	3 (3)	15 (7)	5 (5)	10 (8)
Household Income[*]				
<$30,000	36 (41)	58 (27)	27 (29)	31 (26)
$30,000–$49,999	8 (9)	40 (19)	18 (19)	22 (19)
$50,000–$74,999	6 (7)	22 (10)	13 (14)	9 (8)
$75,000+	0 (0)	27 (13)	16 (17)	11 (9)
Education Level[*]				
Less than high school	8 (9)	20 (9)	6 (6)	14 (12)
High school graduate or GED	46 (52)	64 (30)	15 (16)	49 (42)
Some college	18 (20)	82 (39)	43 (46)	39 (33)
Completed college	7 (8)	25 (12)	18 (19)	7 (6)
Completed graduate degree	3 (3)	16 (8)	9 (10)	7 (6)
Provider Information				
Health care provider	5 (6)	32 (15)	18 (19)	14 (12)
Non health care provider	83 (94)	173 (82)	76 (81)	104 (88)

[*] May not add to sum of participants as some did not disclose information, or may have fit into multiple categories t Percentages may not add to 100 due to rounding GED = General Education Development test.

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