Knowledge, Attitude and Willingness to Use mHealth Technology among Doctors at a Semi Urban Tertiary Hospital in Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Context: Mobile Health technology emerged as an innovative and important Information Communication Technology tool with which to impact health for all.
Aims: This study aimed at assessing the knowledge, attitude and willingness to use mHealth technology in medical management and patient follow-up by doctors at the Federal Teaching Hospital, Ido-Ekiti.
Settings and Design: Descriptive cross sectional questionnaire based study.
Methods and Materials: Proportionate sampling was used to select 220 doctors; data were obtained with a self-administered questionnaire. Ethical approval was obtained from LUTH HREC. Data analysis was performed using SPSS 21.

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Results: The mean age was 35.2 ± 7.3 years with a Male: Female ratio of 2.39:1. Knowledge of mHealth technology was high, with a mean score of 94.31 ± 11.26, majority of respondents (97.6%) had positive attitude.

A weak association was observed between respondents' attitude and the statistically significant variables with multiple correlation coefficient of determination of 0.022.

Although 80% of respondents were willing to use mHealth, just about half were willing to expand the use of mHealth in bridging the digital divide even with higher fee charges. There was a significant association between the years of experience and willingness to use mHealth (p=0.049).

Conclusions: Although knowledge was high and attitude of respondents' positive, willingness to expand mHealth use was low. There is therefore a need to expand mHealth coverage in Nigeria.

1. INTRODUCTION

The utilization of smart phones and tablets has transformed communications, commerce, and entertainment among other fields; it has also improved service delivery, empowered businesses and changed the way people access information and make transactions [1].

The health profession is not left behind by the Information and Communications Technology revolution especially in areas of information access, storage, retrieval, analysis and dissemination [2]. This technology is poised to alter how healthcare is delivered, the quality of patient experience and the cost of healthcare [3,4]. Mobile health (mHealth) is the use of mobile and wireless technologies, such as mobile phones, patient monitoring devices, personal digital assistants, and mobile software applications to support the achievement of health objectives [1,5]. It is defined by the WHO as the health-related use of mobile telecommunications and multimedia technologies within health service delivery and public health systems [1,5]. It can be utilized for a wide variety of purposes including health promotion and disease prevention, health care delivery, training and supervision, electronic payments and information systems [5]. There is a big differential between developed and developing countries concerning levels of adoption of mHealth with the lowest adoption rates observed in African countries, and highest rates observed in North and South America [1]. The most common activity is the creation of health call-centre, followed by the short message services for appointments [1].

Recent studies have suggested that remote monitoring via mHealth is an effective and sustainable strategy for facilitating patient-provider communication, improve health outcomes, increase adherence to medical regimens and reduce costs in management of chronic illnesses [2,3,5,6]. Mobile phone- based monitoring is an attractive option due to their ubiquity, connectivity, computational power, portability and relatively low cost [6-8].

There are 6.8 billion mobile connections worldwide and this number is rapidly growing [9], 140,822,837 of these were in Nigeria [10]. There are many barriers encountered on a daily basis in assessing health information and services in Nigeria; these barriers include low doctor: patient ratio, high cost of transportation, long waiting period, non-availability of clinic space, and delay in decision-making due to non-release and/or loss of laboratory results. Mobile health therefore offers opportunities to breach these barriers and reach communities in ways that traditional health services cannot.

As low- and middle-income countries work to meet the health needs of their populations, mHealth can facilitate and support key processes such as improved access to services, disease diagnosis and treatment, patient monitoring and provision of client-centred health information. Mobile health can also offer unprecedented opportunities for real-time data collection, serve as a cost-effective way of identifying and monitoring health issues as well as a means of implementing health policies.

Studies done on mHealth in developing countries revealed low knowledge of mHealth, only 18.7% of respondents in Ethiopia had good knowledge [11], it was 27% in Nigeria [12] and 22% in India, this contrasts with findings in the United Kingdom, where all doctors had good knowledge about mHealth [13,14].

Doctors who are technology enthusiasts recognize the power and potentials of mHealth not only to improve the delivery of health care but also to change the structure and functions of

health care systems. These doctors embrace mHealth initiatives faster than doctors who are skeptical and glued to the pedagogic method of medical practice.

Factors contributing to the formation of attitude towards mHealth and information technology identified included flexibility of the system, whether they are 'fit for purpose', along with the confidence and experience of the users. Attitude therefore is a significant factor in the acceptance and efficiency of use of mHealth in practice [8,15,16]. In a Nigerian study, attitude was good in 54% of respondents and bad in 19% [12]. In similar studies done in Ghana and Tanzania, an overwhelming majority of health workers (95.3%) had positive attitudes towards mHealth [1]. Studies have shown that physicians had less positive feelings about mHealth than other professional groups and the reason for the negative attitude was the extra workload especially with paper work. Within the professional group, junior doctors were least enthusiastic about mHealth because they had to enter most data which some found cumbersome and time consuming [17,18].

Other factors that affect attitude include the previous use or expertise in mHealth, years of experience, flexibility in software design and project implementation. Acceptance increases over time as users become familiar with mHealth [17-21].

Reluctance in adoption and use of mHealth include perception that direct, face-to-face consultation was better, inability to explain symptoms to doctors over the mobile devices, perception that phone consultation cannot replace physical examination [17,19]. In a study done in the United State, 78% of respondents were willing to adopt mHealth solutions [22]. Studies have shown that younger health care professionals are more likely to use mHealth than older health professional [23-27]. Advanced levels of education improve willingness to use mHealth because of the increasing number of computer based tests/ tasks associated with further studies [11]. Many physicians are willing to overcome the challenges and difficulties in implementation of mHealth if they knew the long-term benefits [1,2,7,16,28].

This study sets out to determine the knowledge, attitude and willingness of doctors in Federal Teaching Hospital Ido-Ekiti, Ekiti State to the use of mHealth in medical management and patient follow-up.

2. SUBJECTS AND METHODS

This descriptive cross sectional, questionnaire based study was conducted between July and September 2015 at the Federal Teaching Hospital, Ido Ekiti, a semi urban tertiary institution located in South west Nigeria. Following ethical approval from LUTH HREC (ADM/DCST/HREC/APP/252) dated 17/06/2015; the questionnaire was administered to all cadres of Doctors working in the various departments of the hospital. Participation in the study was voluntary and oral approval was obtained from study participants. A multi-stage sampling method was employed to select 220 doctors. First stage was determination of participants per cadre by proportionate sampling, while second stage was non-probability method using convenience sampling technique. A self-administered questionnaire was utilised to collect information on demographic characteristics, mobile device and internet use, levels of knowledge, attitude and willingness to use mHealth. Respondents knowledge was graded into good and poor using composite scores attained from all the knowledge areas tested while attitude was assessed using a 5 point Likert scale with responses ranging from strongly agree to strongly disagree and subsequently graded as positive or negative using composite scores attained from the attitude areas tested. Data analysis was performed with SPSS version 21 statistical software and p<0.05 was taken as level of significance. Frequency and percentage distributions were obtained for data and chi square test was used for group comparisons.

3. RESULTS

Two hundred and twenty doctors participated in this survey, 207 fully completed and returned their questionnaires for analysis, response rate was 94.1%; all of them possessed at least one form of mobile device. Table 1 shows the socio-demographic characteristics of respondents.

Almost all the respondents had knowledge about the use of mobile technology in health care and its benefits to healthcare, 15% however did not know that mobile devices could be used for consultation, 12.1% believed use of mHealth can increase the cost of medical care and 5.3% felt mobile devices could not be used to make hospital appointments. The mean knowledge score was 94.31±11.26. Respondents with poor knowledge were males, younger than 35 years, single and had less than 10 years professional experience.

Most of the respondents agreed or strongly agreed on the use of mHealth to perform various functions ranging from sending reminders to patients; to using electronic data to access patient's information. A few respondents however disagree on issues of patients' confidentiality and privacy/security with the use of mobile devices on health. Majority of the doctors surveyed (97.58%) had positive attitude to the use of mHealth in health practice. The lowest attitude score recorded was 22 while the highest score was 45. The mean attitudinal score was 37.38 ± 3.85.

Table 2 is a summary of statistics; there was no statistically significant association between gender, religion, and designation with the attitude of respondents to mHealth.

One hundred and sixty-six respondents (80.2%) were willing to use mHealth; three quarters of the respondents were not willing to allow patients to use mHealth without provider input nor were they willing to allow patients send data to them about certain symptoms in place of hospital visits, 126 respondents (60.9%) were not willing that patients see all the notes written by the physicians while 58.5% were willing to use mobile health services as the fees charged gets higher. A hundred and fifty-seven respondents (75.8%) were willing to use mHealth in the diagnostic processes of patients while 69.1% of the respondents were willing that patient be given access only to the records they chose to share.

4. DISCUSSION

The mean age of respondents was 35.2 ± 7.3 years. The younger a population is, the more likely they are to be computer literate and the more likely they would be to try new things they are not familiar with. Three quarters of the respondents were males (70.5%). This is a reflection of the gender and educational inequalities in Nigeria; This is in contrast to a study on mobile phone usage by health practitioners in the UK where 62.2% of the respondents were females.

Table 1. Socio – demographic Characteristics of respondents

Variable		Frequency N = 207	Percentage %
Age group (in years)			
	Less than 30	56	27.1
	30 – 34	47	22.7
	35 – 39	33	15.9
	40 – 44	44	21.3
	45 and above	27	13.0
Mean Age ± SD		**35.2 ± 7.3**	
Sex			
	Male	146	70.5
	Female	61	29.5
Marital status			
	Single	76	36.7
	Married	128	61.8
	Widowed	3	1.5
Religion			
	Christianity	189	91.3
	Islam	16	7.7
	Traditional	2	1.0
Designation			
	Intern	56	27.0
	Medical Officer	25	12.1
	Resident	77	37.2
	Consultant	49	23.7
Duration of experience (in years)			
	Less than 10	140	67.6
	10 years and above	67	32.4
Mean Duration ± SD (in years)		**7.8 ± 6.5**	

Table 2. Association of socio-demographic characteristics and Knowledge, attitude and willingness to use mHealth

	Knowledge		Attitude		Willingness	
	χ^2	p- value	χ^2	p- value	χ^2	p- value
Age	13.402	0.099	24.185	**0.002***	6.734	0.151
Sex	4.317	0.115	2.743	0.254	0.634	0.426
Marital status	14.408	**0.006***	10.212	**0.030***	2.584	0.275
Religion	2.447	0.654	5.951	0.203	0.772	0.680
Designation	11.566	0.072	7.437	0.282	3.572	0.311
Duration of practice	10.296	0.113	13.925	**0.030***	8.202	**0.049***

Table 3. Willingness to use mobile devices for healthcare

Variable		Frequency N = 207	Percentage
1. I am willing to use mobile devices in the diagnostic processes of patients			
	Yes	157	75.8
	No	50	24.2
2. Patients should be allowed to diagnose using mobile devices without provider input			
	Yes	28	13.5
	No	179	86.5
3. Mobile devices should be used in sending data to doctors about certain physical symptoms in place of office visits			
	Yes	85	41.1
	No	122	58.9
4. Patients should be allowed to see their electronic health record			
	Yes	129	62.3
	No	78	37.7
5. Patients should have access only to the records that doctors choose to share			
	Yes	143	69.1
	No	64	30.9
6. Patients have the right to see all the notes taken by doctors during hospital visit			
	Yes	81	39.1
	No	126	60.9
7. Because of privacy concerns, I am hesitant to use mobile health devices			
	Yes	87	42.0
	No	120	58.0
8. I am willing to use mobile health devices as the fees charged gets higher			
	Yes	121	58.5
	No	86	41.5
9. I am willing to expand the use of mobile health devices			
	Yes	120	58.0
	No	87	42.0

The mean year of professional experience was 7.8± 6.5 years; this is comparable to other studies where average duration of work experience ranged between 9.7 years to 13.27 years [28-30]. All the respondents had a mobile device in one form or the other, all had a mobile phone, 43.99% had more than one type of mobile device, either a combination of phone, tablet or laptop making these respondents to be digital omnivores. A digital omnivore utilizes a smartphone, tablet, laptop/desktop computer routinely in a professional capacity [6]. Mobile devices enabled for internet use was possessed by almost all (95.2%) the respondents, this is higher than 68% of respondents in a study carried out in Peru [16]. Access to Internet services in Nigeria has increased over the years, placing Nigeria among the top ten countries with Internet access in Africa [9,32,33]. The drug authentication services provided by NAFDAC is an example of the use of mHealth even in hard to reach communities [34]. Access to online materials on smartphones within the hospitals that was once difficult due to poor signal quality

has been overcome by increasing access to Wi-Fi within hospitals in Nigeria [35]. The use of smartphones and other hand held devices in the discharge of duties are common to medical practitioners as demonstrated in surveys carried out in the United States [30,36,37]. The physicians in this study stated various methods by which they would want their patients to communicate with them using mobile technology; the most preferred method of doctor-patient communication was the use of Short Message Service (SMS) followed by making calls and emails. The preference for using SMS is not surprising as it is a succinct way of sending messages without the need to talk and offers a record of messages sent and received. It is an easy and cheap method of communication; it does not require internet connectivity in its application by both the sender and receiver alike. This is in consonance with a study where SMS was considered an efficient means of communication when compared to telephone conversation saving critical time even in emergencies [38].

The knowledge of mHealth among the surveyed doctors was high. This is not a surprising finding considering the cadre of these health professionals, their age and the expansion of technology in the last few years. The high knowledge demonstrated by these physicians is higher than that demonstrated by Doctors in Ile-Ife [29] and contrasts with findings in Ethiopia [31].

Nine out of ten respondents were aware of the use of mobile devices could be used for direct consultation, making hospital appointments and that it could serve as a reminder for hospital visits. They also knew that mHealth could be used for knowing the availability of clinic space and for clarification of prescriptions. This is in consonance with other studies where over 90% of physicians cited that the use of mobile health was of clinical value [38]. The higher proportion who reported that mHealth would save time and cut cost of service may be considering this from the angle of cost of transportation and absence at work when physical presentation at health facility is required. Designation was found to be associated with knowledge of mHealth. This agrees with studies in other parts of the world where junior doctors had poor knowledge on mHealth; this may be associated with the level of experience [31,35]. Age and duration of professional experience were surprisingly not associated with the knowledge of respondents on mHealth, although most of those with low knowledge scores were younger than 35 years, single and were doctors who had worked for less than 10 years.

Attitude is described as a relatively enduring organization of beliefs, feelings, and behavioural tendencies towards socially significant objects, groups, events or symbols [38]. Attitude influences an individuals' choice of action and responses to challenges, incentives and rewards [39]. The attitude of the doctors in this study was positive to most issues raised on mHealth, this is similar to findings from a study conducted in India where a positive attitude was demonstrated and the opinions were similar across the various age groups [39].

Concerns on the issue of patients' privacy and confidentiality were raised by many respondents, these were the same concerns raised by physicians in the USA [36], where privacy was viewed as a major constraint to mHealth. There are legitimate concerns about the security of patient's information by physicians using mHealth and up to 50% of current users of mHealth are of the opinion that security, data privacy and confidentiality are of utmost concern [36]. This is not surprising with the level of insecurity of most applications and data theft that is on the increase across all application platforms.

The findings of a high proportion of doctors with positive attitude at this centre is higher than was obtained in an earlier Nigerian study which revealed good attitude in 54% of participants. Adequate training and retraining of doctors was noticed to be responsible for the good attitude and utilization [29]. In a study done in Peru, positive attitude was attributed to a higher level of skill and an increasing frequency of the use of ICT. Age was significantly associated with attitude. The general observation of life is that the younger an individual is, the more receptive he is to new ideas. However, the observation from this studied population is contrary as a higher proportion of respondents older than 44 years had a positive attitude, which may be a reflection of their desire for a more efficient health care service delivery in the country. The older groups had probably through the years, seen the use of mHealth in their practices and tend to have a less favourable attitude to its implementation in their clinical practices.

With linear regression of attitude with age group and professional experience, a weak association was found (R^2= 0.022). This underscores the complex factors that influence the attitude of an individual on any single issue in life.

Designation/Cadre was found to be significantly associated with the attitude of the respondents. The level of exposure to technology in the practice of respondents may have an effect on this or the background training at both the under graduate and postgraduate levels. Gender was found to be significantly associated with attitude to mHealth among doctors in India where more females had positive attitude to mHealth [39], although gender was not significantly associated with attitude in this study.

Four out of five Doctors were willing to use mHealth. This is comparable to findings from other studies in developed countries [39-43]. In a study conducted in a developing country, 97.2% of respondents were willing to use the proposed mHealth initiative in scheduling appointments at a Family Practice Unit [41]. In a survey done in the United States, 6 in 10 doctors indicated their willingness to adopt new mobile technology especially where they see a clear benefit. More doctors were interested in technologies that enabled Electronic Health Record access as it improved time and cost efficiency [39].

Although, more than 80% of respondents were willing to use mHealth, only a few were willing to expand the use of mHealth in their practices. This unwillingness to expand was further demonstrated by the number willing to use mHealth even in the face of higher remunerations.

In a study conducted to assess doctors' willingness to share medical practice with their patients [42], 69% were willing that mHealth be used in the diagnostic process. This is comparable with the findings in this study of 75.8%. In the aforementioned study, 17% of respondents were willing to use mHealth as long as the provider was the one who made the final diagnosis. This contrasts findings in this study where 13.5% of the doctors were willing that patients self diagnose without provider imput [42].

In the United States, where the law supports that patients be allowed to see their own health records, 96% of physicians agreed with patients seeing their own health records [42]. This is in contrast with the current study which revealed that 62.3% of doctors were willing that patients be allowed to see their records. This could be as a result of the lack of law in Nigeria that can give rights to patients to inspect, review and receive copies of their medical records whether held by healthcare providers or health plans [42]. Giving full access to detailed medical records could increase patients' anxiety, increase unnecessary requests for more medical tests and alter the coping mechanisms of patients.

Concerning patients' right to see all the notes, written by their physicians during an office visit, 39.1% of respondents in the current study were willing to allow this. This contrasts with the findings from a study in the US where 64% of the physicians were willing to share their notes with their patients thereby strengthening doctor-patient relationships [42].

Surprisingly, six of ten doctors were not worried about privacy and security issues and mHealth. This is comparable to other studies where doctors felt patients could' opt in or opt out' of the data exchange and decide on what kinds of information should be made available to other providers [40,42]. A common area that doctors agreed on was on patients' record and level of access by their patients, while they are willing to allow patients have access to own medical records, it has to be at the physicians' discretion and to what extent that access is. This is a reflection in change of attitude in medical practice in the country. The use of mHealth in any society will invariably lead to ease of access to medical records and of course an improvement in the level of service delivery. A study of Ayurveda doctors also concurred that it decreased duplication of documenting work, it was easy and had an intact processing and real-time access to patient's information. Eighty-five percent of the doctors concluded that collection and accessibility to patient's data were easier and could serve as a platform for multidisciplinary collaborative research and patient care [43].

Duration of professional experience was significantly associated with willingness to use mobile health with the degree of willingness increasing as the year of experience increased. This could be because the older in the profession one gets, the more receptive to innovations in one's field of practice or as a result of acceptance over time as users became more familiar with the concept.

It is also of note that even though eighty percent of respondents were willing to commence the use of mHealth, a little over half of the respondents were willing to continue as the fees gets higher and willing to expand the use of mHealth. This could be because in countries where mHealth is being practiced, doctors are not getting reimbursed for mHealth diagnostic tests and until incentives are re-aligned to enable doctors be paid for using mHealth, adoption levels will still be [40] low [36-42].

5. CONCLUSION

It is concluded from this study that Doctors at Ido Ekiti are digital omnivores. Knowledge level about mHealth was high; almost all respondent had a positive attitude and were willing to adopt mHealth. Marital status was significantly associated with knowledge of the respondents, while attitude was significantly associated with age, designation/cadre and duration of experience of respondents, though this was a weak association on multiple regression analysis. Although about 80% were willing to use mHealth only about half of respondents are willing to expand use even with an increase in service charge.

Recommendations based on the findings of this study include these amongst others: Inclusion of mHealth in medical education curriculum. Although the level of knowledge of mHealth was high with a commensurate positive attitude among respondents, doctors with poor knowledge and negative attitude were the younger doctors who were still in training. Inclusion of mHealth in the curriculum exposes the doctors early enough to the benefits and cost-effectiveness of mobile technology.

Increased telecommunication coverage, provision of faster networks and availability of high-performance devices at an affordable price in developing countries will contribute to an improvement in attitude of doctors, and acceptance of mHealth by their clients. Development of secured applications to address security concerns of physicians on medical data.

CONSENT

All authors declare that informed consent was obtained from all the participating doctors in this survey.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the author.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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