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Original Article

FEASIBILITY AND ACCEPTABILITY OF MY ELECTRONIC PERSONAL HEALTH RECORD MONITOR (MY-EPHRM)

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ABSTRACT

Objectives: Smartphones could be used as a novel approach to improve medication adherence and patient's behaviour; due to constant accessibility, and the provision of a repository for health and medication information. This study aimed to assess the feasibility and acceptability of the use of My Electronic Personal Health Record Monitor (My-ePHRM), a newly-developed application (software) for personal health record monitoring as well as the factors that predict its acceptability.

Methods: A cross-sectional study using structured questionnaire was conducted on 363 potential users. Statistical analyses were performed using SPSS version 20.0. Description statistics and multiple logistic regression analysis were employed.

Results: Majority of the participants were females (69.7%) with the mean age of 22 y (SD±1.7). Of the total number of the participants, 63.9% agreed that My-ePHRM was easy to operate and 50.7% thought that the language used was simple and easy to understand. Most of the participants found the features of My-ePHRM attractive (61.7%) and 52.1% would like to own it in the future. The majority agreed that My-ePHRM could increase health knowledge (57.0%), increase drug knowledge (54.0%) and could improve drug adherence (56.5%). Overall, (52.6%) believed that it was a good programme and (54.3%) would recommend it to others. Multiple logistic regression analysis revealed that ethnicity, gender and programme of the study participants did not predict My-ePHRM acceptance.

Conclusion: My-ePHRM has been shown to be acceptable, simple and practical by its target users creating a huge potential in patients participation in documenting health-related activities.

Keywords: Smartphone, Health record, Pharmacy, Mobile phone apps.

INTRODUCTION

Community pharmacists represent an important source of drug information not only for public and patients but for healthcare providers as well [1, 2]. For people to achieve or maintain their health, access to information is critical. There are many sources of relevant health formation; the individual himself or herself, healthcare providers, devices which measure health parameters and the rest of the individual's world. The Personal Health Record (PHR) becomes a "place" for an individual to keep this information. Consequently, developing a PHR system which would always be available to the person, i.e. mobile (at least) and contains the relevant information, for use by the individual himself/herself and by healthcare providers could be advantageous. A PHR contains information about the symptoms, medicines taken, special diets, exercise programmes and information of home monitoring devices. It also includes details on allergies, illnesses, hospitalisations, surgeries, vaccinations and lab results. PHR may be used by medical personnel, so the information should contribute to medical diagnosis and treatment, much like a person's health history [3]

It is widely accepted that pharmacists should document their patient care activities in some way. However, pharmacist's level of documentation has been found to be poor, with the lack of formal training being a possible contributor [4-6]. Additionally, it was a common experience in Malaysia that patients usually engage in activities like buying OTCs and herbal preparations from community pharmacies and such activities are not usually recorded by the patients and in some cases, the pharmacists. This could lead to loss of information that may form an important part of patient health record in the long run. Fortunately, these can be prevented if both the patients and the pharmacists start to work together in ensuring that most, if not all activities in pharmacies and at home are documented in one way or another.

Smart phones are internet-ready multipurpose devices that allow constant access to communication and information and perform many tasks [7]. Most tasks are performed by specialised applications (apps) that consumers can easily download and use to assist them in variety of functions. Essentially, smart phones could help to improve medication adherence and patients' behaviour; as it is constantly accessible, involves and educates the patient, and provides the means for storage of health information [8, 9].

With telecommunication and related technology advancement, empowering patients with a smartphone app that would assist in capturing health-related activities could offer a solution to loss of information important to healthcare. The underlying philosophy of a patient-held record, in comparison to a clinic held record, is to empower patients with knowledge so that they can become more active in managing and controlling their own health [3]. However, there is limited literature on the rapidly advancing mobile phone technology industry for such purpose [10]. Therefore, there is lack of assessment of the usefulness of various smartphone applications which may be the driving force for smartphone use by many healthcare professionals [10].

Aims of the study

This study aimed to assess the feasibility and acceptability of the use of My-ePHRM as a health monitoring tool among potential users as well as the factors (if any) that predict its acceptability.

MATERIALS AND METHODS

Ethical approval

The UniSZA Human Resources Ethic Committee reviewed and approved this study [reference number: UniSZA. N/1/628-(67)]. The students' lists and permission to recruit were obtained from all deans of the chosen faculties upon a formal request. Participation in this study was voluntary and completion of the questionnaire was used as consent. No findings which could identify individual participants were published.

Description of My-ePHRM

My Electronic Personal Health Record Monitor (My-ePHRM) app was developed on an android smart phone and was designed to help

empower people to manage their basic health record and also to assist healthcare providers to improve their service delivery. The app has seven main features; 'Profile', 'Patient Health Record', 'Vital Signs', 'Medication Reminder', 'Appointment Reminder', 'Tell A Friend' and 'Contact Us'. Examples of screenshots are provided in the Appendix. The 'Profile' contained a template for recording socio-demographic information of the user while 'Patient Health Record' kept information on allergies, past prescriptions and, OTC and Herbals records. The latter two records were linked to the phone camera so that a photo of the medicine or any medicinal preparation can be recorded and uploaded to the app. This was important for easy identification of brands as customers commonly visit different pharmacies and also for prescribers to know the exact brand a patient is taking. Temperature, Blood Pressure, Vital Sign etc. were all contained in the 'Vital Signs' section. Medication Reminder and Appointment Reminder forms were linked to the android calendar so that reminders on medication-taking time or hospital visitation time can be set up. These were aimed to help patients improve medication adherence and prevent missed appointments. In 'Tell A Friend'; users could share the app with others through links such as Email, Facebook, Whatsapp. 'Contact Us' has the address of the app owners. My-ePHRM represents a new attractive android-based electronic health record programme to enhance patients' participation in their health records-keeping. Examples of such activities are buying over the counter (OTCs) from different pharmacies and taking medicinal preparations. This may ensure better pharmaceutical care by providing community pharmacists complete information about their customers' medication choices and usage habits. For example, an allergy specific to certain brands of medication on a given customer can easily be avoided through records from My-ePHRM. My-ePHRM is so far a demo app which could be further developed into a fully functional web-based personal health record in the future.

Assessment instruments

The instrument consists of two parts; demographic section and My-ePHRM assessment section. In the demographic section, students were asked to provide their age, gender, ethnicity, marital status and whether they possess a smartphone. Questions about the various activities they do with their mobile phone were also asked. My-ePHRM assessment section has 13 questions. Participants were asked about the ease of operation of My-ePHRM, its' attractiveness, perceived usefulness, whether they would like to own it in the future, and whether they would recommend it to friends and family. Responses were based on Likert scale of 0 (strongly disagree) to 4 (strongly agree). The maximum score that could be obtained from this section was 52.

The questionnaire was based on the previous study that determined the feasibility and acceptability of an Interactive Animated Epilepsy Education Programme (IAEEP) to children [11]. Prior to the data collection, the questionnaire was pre-tested among 30 graduate students selected at random from different faculties of UniSZA. These faculties were Economy and Business Management (FESP), islamic contemporary Studies (FKI), Languages and Communications (FBK), Law, Accountancy and International Relations (FLAIR), Informatics and Computing (FIK), Design Arts and Engineering Technology (FSTK) and Bioresources and Food Industry (FBIM). The entire questionnaire took about 15 min to be completed. Favourable reliability (overall Cronbach's α was 0.88) and acceptability were demonstrated. The detailed results are out of the scope of this article.

Study design and sample selection

This was a cross-sectional study in which target population of the potential users were final year students (due to the relatively better level of exposure and academic maturity) of Universiti Sultan Zainal Abidin (UniSZA), a public university in Terengganu, Malaysia. For this study, the calculated sample size was 329, based on the purpose of estimating a parameter in a single proportion [12]. Students were then divided into eight strata represented by eight faculties in UniSZA. These faculties were (FESP), (FKI), (FBK), Applied Social Sciences (FSSG), (FLAIR), (FIK), (FSTK) and (FBIM). Students from the Faculty of Medicine and Faculty of Health Sciences were excluded from the study to avoid sample bias due to their assumingly better knowledge about health and health-related matters compare to students of other programmes.

Participants were chosen from each stratum using a simple random technique. The number of program in each stratum (faculty) was obtained from the various deans and each programme has at least 50 students which were sufficient for the required sample for the study. Each of these programmes was assigned a unique number and the numbers were then entered into Microsoft Excel and were then chosen according to a computerised random number generated. Deans of all the faculties involved were contacted and facilitators of the selected programmes were later introduced to the investigators by the deans. Arrangements were made between the investigators and the facilitators on the suitable dates for recruiting the students, demonstration of My-ePHRM and subsequent data collection.

Data collection

The study was conducted for approximately one month, in February 2015. Data collection was carried out by initially demonstrating the features and operations of My-ePHRM to the recruited participants after which participants were briefed about the survey and were informed that participation was voluntary. Questionnaires were then distributed to the agreed participants and completion of the questionnaire was used as the consent for participation. This exercise was repeated with all the remaining strata (faculties) as previously mentioned and the data obtained was analysed.

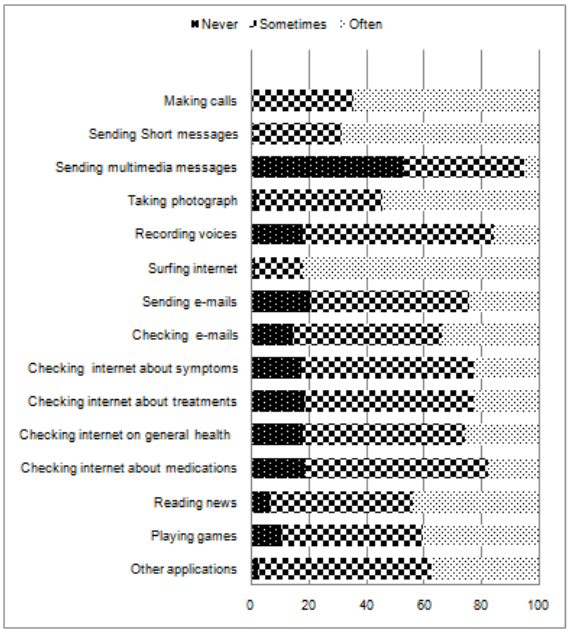

Fig. 1: Activities respondents do with their mobile phones (%)

Statistical analysis

Data analysis was conducted using SPSS version 20.0. All demographic variables were presented descriptively as frequencies and percentages. Tests of data normality were initially performed. The Kolmogorov–Smirnov statistics generated values of greater than 0.05, indicating that the assumption of normality test has been complied with. Multiple logistic regression analysis was employed to determine factors that predict acceptability of My-ePHRM among potential customers. This was conducted by testing acceptability against independent variables such as gender, faculty and ethnicity of the respondents [13,14]. whereby the *Overall Score* was treated as dichotomous binary outcomes, i. e, "More Favourable Acceptance" and"Less Favourable Acceptance". (More Favourable Acceptance ≡ overall score>mean score; Less Favourable Acceptance ≡ overall score ≤ mean score). The mean score for the acceptance was 40.6.

The regression model fitted reasonably well and all assumptions were met. No interactions and multicollinearity problems were identified. Statistical significance was set at $p<0.05$.

RESULTS

Demographic characteristics of the respondents

Three hundred and sixty-three students participated in the study. The socio-demographic characteristics of the participants were presented in table 1. The majority of the participants were females (69.7%) with the mean age of 22 (SD±1.7). Most were Malay (91.7%), single (97.5%) and from non-science programme (67.5%). With regard to owning a mobile phone, all the participants have at least one mobile phone and 99.7% owned a smartphone. The most common activities the respondents do with their phone were surfing the internet (82.1%), sending SMS (68.3%) and making calls (64.5%). Participant utilisation of their mobile phones on health related issues such as checking the internet about medication or treatment was relatively low, ranging only from 20.7 % to 22.9%. For details, see fig. 1.

Table 1: Selected characteristics of study participants (n=363)

Variable	Frequency / Mean±SD	Percentage (%)
Age	22.9 ±1.2 years	-
Gender		
Male	110	30.3
Female	253	69.7
Marital status		
Single	354	97.5
Married	9	2.5
Ethnicity		
Malay	333	91.7
Chinese	17	4.7
India	3	0.8
Others	10	2.8
Programme		
Science	118	32.5
Non-Science	245	67.5
Number of mobile phones owned		
1	67	87.0
2	8	10.4
3	2	2.6

Acceptability of My-ePHRM

Of the total number of the participants, 63.9% agreed that My-ePHRM was easy to operate and 50.7% thought that the language used was simple and easy to understand (table 2). Most participants found the features of My-ePHRM attractive (61.7%) and 52.1% would like to own it in the future.

The majority agreed that My-ePHRM could increase health knowledge (57.0%), drug knowledge (54.0%) and drug adherence (56.5%). Overall, 52.6% believed that it was a good programme and (54.3%) would recommend it to others. For further details see table 2.

Predictability of acceptance towards My-ePHRM

Multiple logistic regression analysis shows that ethnicity, gender and programme of the study participants did not predict My-ePHRM acceptance (table 3).

However, a pattern was established such that females have decreased odds of acceptance of My-ePHRM by 54% and students studying science-based programmes have increased the tendency of accepting My-ePHRM 1.2 times than students from non-science programmes. Additionally, Malay has an increased tendency of acceptance 1.4 times than non-Malay.

Table 2: Acceptability of My-ePHRM(n=363)

Statement	Response n (%)				
	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
1. My-ePHRM is easy to operate.	95 (26.2)	232 (63.9)	30 (8.3)	3 (.8)	2 (0.6)
2. The language used in My-ePHRM is simple and easy to understand.	153 (42.1.3)	184 (50.7)	18 (5.0)	3 (.8)	5 (1.4)
3. The colour scheme of My-ePHRM is good and attractive.	31 (8.5)	187 (51.5)	109 (30.0)	34 (9.4)	2(0.6)
4. The features in My-ePHRM are catchy.	53 (14.6)	224 (61.7)	69 (19.0)	15 (4.1)	2 (0.6)
5. My-ePHRM will help to increase health knowledge.	115 (31.7)	207 (57.0)	36 (9.9)	4 (1.1)	1 (0.3)
6. My-ePHRM will help to increase drug knowledge	100 (27.5)	196 (54.0)	62 (17.1)	4 (1.1)	1 (0.3)
7. My-ePHRM will help improve drug adherence.	89 (24.5)	205 (56.5)	64 (17.6)	4 (1.1)	1 (0.3)
8. My-ePHRM will be beneficial to me.	130 (35.8)	190 (52.3)	35 (9.6)	7 (1.9)	1 (0.3)
9. My-ePHRM attracts my attention.					
10. I would like to own My-ePHRM in the future	120 (33.1)	204 (56.2)	34 (9.4)	3 (.8)	2 (0.6)
11. I like My-ePHRM.					
12. Overall, I think My-ePHRM is a good programme.	123 (33.9)	189 (52.1)	44 (12.1)	5 (1.4)	2 (0.6)
13. I would recommend My-ePHRM to other patients/customers.	117 (32.2)	202 (55.6)	40 (11.0)	3 (.8)	1 (0.3)
	147 (40.5)	191 (52.6)	20 (5.5)	4 (1.1)	1(0.3)
	132 (36.4)	197 (54.3)	31 (8.5)	2 (0.6)	1(0.3)

Table 3: Factors predicting more or less favourable acceptance of My-PHRM (n = 363)

Variables		Adjusted OR (95%)	Wald statistics (df)	P value
Gender	Male	1.00	3.66 (1)	0.06
	Female	0.46 (0.21, 1.02)		
Faculty	Non-Science	1.00	0.58 (1)	0.45
	Science	1.19 (0.76, 1.85)		
Ethnicity	Non-Malay	1.00	2.16 (1)	0.14
	Malay	1.41 (0.89, 2.21)		

Multiple logistic regressions. The model reasonably fits well. Model assumptions are met. There are no interaction and multicollinearity problems. Statistical significance was set at $p<0.05$

DISCUSSION

Medication errors and adverse drug reactions (ADRs) are the most common cases among all medical errors according to the US Institute of Medicine in 1999. According to the report, poor communication on medical information at transition points is responsible for as many as 50% of all medication errors and up to 20% of ADRs. These ADRs caused significant costs including medication expenses, income and productivity loss, and damages the reputation and morale of healthcare professionals. Most of these errors are however, preventable [15]. Furthermore, these errors most likely occur each time a patient moves from one clinic or setting to another, requiring healthcare providers to review previous medication orders alongside new orders and plan for better care and reconciliation of any differences. If this process does not occur in a standardized manner that is designed to ensure complete reconciliation, medication errors could lead to ADRs and patient harm [16]. Essentially encouraging consumers to keep record of all their health consumptions and related activities would help facilitate healthcare providers' understanding of the activities patient does away from professional monitoring that may be vital in the diagnosis and subsequent pharmaceutical care delivery.

Our study demonstrated that there was good acceptance of My-ePHRM among the participants whereby they agreed that health knowledge, drug knowledge and drug adherences could be positively affected. This could in turn translate into better quality of care and hence, better health outcomes. A similar finding was reported in a study conducted in the US [17] in which the effects of an electronic personal health record on quality of care in a community mental health setting were evaluated. It was found that having a personal health record resulted in significantly improved the quality of care and increased use of medical services among patients [17]. Personal health record could provide a relatively low-cost strategy for improving care for patients with comorbid conditions in which patients are empowered to manage their general healthcare and medications.

Participants in our study also agreed that My-ePHRM would help to educate patients about health and medicines. Studies have shown that personal electronic record could serve as a means of educating patients about disease conditions, treatments, and preventive measures. For example, a 2006 study conducted by Markle interestingly demonstrated that two-thirds of respondents (65%) were interested in accessing their own personal health information electronically while 88% believed that online records would be crucial in reducing the number of unnecessary or repeated tests and procedures they undergo. Additionally 90% said it would be important for them to be able to track their symptoms or changes in health care online. This indicated the strong need to develop devices/apps which are conveniently available and affordable to users [18].

Similar to our study, other investigations further revealed that use of technology in pharmaceutical care delivery especially mobile phones could improve medication adherence [14, 19-21]. Additionally, an investigation conducted in the US by Park *et al.*, [22] to promote medication adherence for patients with coronary heart disease through text messaging intervention found significantly increased adherence to antiplatelet therapy. This suggested that mobile health interventions held good promise in promoting medication adherence and that the wide usage of mobile phones across all populations was greatly advantageous in effectively implementing numerous interventions for health promotion and education. However, our study did not find the predictors of My-PHRM acceptability although a trend was observed (see acceptability of My-ePHRM section). Predictors may be more confirmatory when a study involving users actually using the app is conducted instead of only a demonstration to them.

Although the study has a large number of respondents, some limitations still exist. The results were slightly biassed towards females due to their bigger number compared to males. This was due to the higher proportion of female students which was becoming a common trend in the universities all over Malaysia [23]. Additionally, the effects of My-PHRM on actual pharmaceutical care such as patient compliance to medication, preventing medication errors and patient education could not be firmly determined because it was a cross-sectional study. As such longitudinal studies should be conducted in future to determine the effects of My-ePRHM on bonafide patients.

CONCLUSION

This survey revealed high interest among respondents towards using the My-ePHRM regularly for recording and exchanging health information, including specific medications, medical history reconciliation and patient education. My-ePHRM has been shown to be acceptable, simple and practical by its target users opening a huge opportunity for patients' participation and empowerment in documenting health-related activities.

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CONFLICT OF INTERESTS

Declare None

REFERENCES

1. Cole SW, Berenson NM. Comparison of drug information practice curriculum components in US colleges of pharmacy. Am J Pharm Educ 2005;69:240.
2. Zehnder S, Beutler M, Bruppacher R, Ehrenhofer T, Hersberger KE. Need and use of drug information sources in community pharmacies: a questionnaire-based survey in German-speaking Switzerland. Pharm Wold Sci 2004;26:197-02.
3. Simon SK, Seldon HL. Personal health records: mobile biosensors and smartphones for developing countries. Global Telehealth 2012;182:125-32.
4. Pullinger W, Franklin BD. Pharmacists' documentation in patients' hospital health records: issues and educational implications. Int J Pharm Practice 2010;18:108–15.
5. Lacy CF, Saya FG, Shane RR. Quality of pharmacists' documentations in patients' medical records. Am J Health-Syst Pharm 1996;53:2171–5.
6. Strand LM, Cipolle RJ, Morley PC. Documenting the clinical pharmacists' activities: back to basics. Drug Intell Clin Pharm 1988;22:63–7.
7. Dayer L, Seth H, Paul A, Paul OG, Bradley CM. Smartphone medication adherence apps: Potential benefits to patients and providers. J Am Pharm Assoc 2013;53:172-81.

8. Cafazzo JA, Casselman M, Hamming N, Debra KK, Mark RP. Design of am Health app for the self-management of adolescent type 1 diabetes: a pilot study. J Med Intern Res 2012;14:e70.
9. Vervloet M, Linn AJ, van Weert JCM, de Bakker DH, Bouvy ML, van Dijk L. The effectiveness of interventions using electronic reminders to improve adherence to chronic medication: a systematic review of the literature. Jamia J 2012;19:696–04.
10. Cartwright LA, Spina SP. Smartphones in clinical pharmacy practice: Is it evidence-based? Health Policy Technol 2014;3:85-9.
11. Lua PL, Neni WS, Lee JKF, Zariah AA. The interactive animated epilepsy education programme (IAEEP): how feasible, acceptable and practical is the technology to children? Technol Healthcare 2013;21:557-66.
12. Pourhoseingholi MA, Vahedi M, Rahimzadeh M. Sample size calculation in medical studies. Gastroenterol Hepatol 2013;6:14–7.
13. Vibhuti A, Sharrel P, Tasmiya K. Awareness of and readiness for medication therapy management among community pharmacist in New York City: result from a focus group. Innovation Pharm 2013;4:116.
14. Sankaranarayanan J, Sallach RE. Rural patients' access to mobile phones and willingness to receive mobile phone-based pharmacy and other health technology services: a pilot study. Telemedicine e-Health 2014;20:182-5.
15. Aspden P, Wolcott J, Bootman JL, Cronenwett LR. Institute of medicine (US). Committee on identifying and preventing medication errors. Preventing medication errors. Washington DC: National Academies Press; 2006.
16. Irani S, Seba P, Speich R, Boehler A. Medication errors: an important component of non-adherence to medication in an outpatient population of lung transplant recipients. Am J Transplant 2007;7:2561-6.
17. Druss BG, Ji X, Glick G, von Esenwein SA. Randomized trial of an electronic personal health record for patients with serious mental illnesses. Am J Psychiatry 2014;171:360-8.
18. Markle Foundation. The personal health working group final report; 2003. Available from: www.providersedge.com/ehdocs/ehr_articles/The_Personal_Health_Working_Group_Final_Report.pdf. [Last accessed on 04 May 2015].
19. Mao Y, Zhang Y, Zhai S. Mobile phone text messaging for pharmaceutical care in a hospital in china. J Telemed Telecare 2008;14:410-4.
20. Pop-Eleches C, Thirumurthy H, Habyarimana JP, Zivin JG, Goldstein MP, Walque D, *et al.* Mobile phone technologies improve adherence to antiretroviral treatment in a resource-limited setting: a randomized controlled trial of text message reminders. AIDS 2011;25:825-34.
21. Al-Dhawailie AA, Al-Enezi AN, Al-Qhtani BF, Al-Enezi KT, Al-Harbi NM, Al-Tulaian NS, *et al.* Mobile phone text messaging for pharmaceutical care in Saudi Arabia: a pilot study. Int J Pharm 2013;3:312-5.
22. Park LG, Howie-Esquivel J, Chung ML, Dracup K. A text messaging intervention to promote medication adherence for patients with coronary heart disease: a randomized controlled trial. Patient Education 2014;94:261-8.
23. Ministry of Higher Education (Internet). Statistics of higher education of Malaysia; 2010. Available from: htpp://www.mohe.gov.my/web statistic/perangkaan. [Last accessed on 18 May 2015].

APPENDIX

Screen-shots of My-ePHRM