Iran J Public Health, Vol. 51, No.5, May 2022, pp.1020-1029

Original Article

Design and Application of Health Education Apps Based on WeChat for Self-Management among Patients

Hai-Ling Yang [1,2], ***Xiao-Rong Luan*** [3], ***Ling-Ling Zhao*** [4], ***Jun-Wen Wang*** [5], ****Yuan-Yuan Chen*** [1]

1. *Department of Logistics Support, Qilu Hospital of Shandong University, Jinan 250012, Shandong, China*
2. *Philippine Women's University, Manila, Philippines*
3. *Department of Infection Management, Qilu Hospital of Shandong University, Jinan, Shandong, China*
4. *Department of Nursing, Qilu Hospital of Shandong University, Jinan, Shandong, China*
5. *Department of Gastroenterology, Qilu Hospital of Shandong University, Jinan, Shandong, China*

***Corresponding Author:** Email: syer4i@163.com

(Received 10 Sep 2021; accepted 18 Nov 2021)

Abstract

Background: We started to design and test health education Apps for self-management among patients to provide a rich source of clinical support and information for patients to increase their ability of self-management.

Methods: First, a multidisciplinary research team worked together to design and conduct the research. With their help, we redesigned an apps to incorporate some personalized changes for patients' needs. Second, we chose a questionnaire from the Comprehensive Service Platform for the Elderly self-designed by CHENYu. Finally, a purposive sample of 34 users were tested experiences and satisfaction of users in Jul 2021.

Results: This research was successfully conducted in 22 wards among 23159 patients and 40440 chapters about healthy information sent to patients from Mar 2019 to January 2021 by smartphone. The data showed that 91.2% of participants resolved that the evaluation effect of the proposed application was better, in comparison with the paper version as routine verbal instruction. Additionally, 85.3% of participants wanted to continue to receive medical education information after discharge from the hospital. The top four most popular medical education information that they would like to receive included drug administration, disease prevention, nursing, and home care. Moreover, the top four most popular types of user suggestions were one-on-one online Q & A, continue to see every session, accelerate the speed of browsing and page updated, and free Wifi. The user satisfaction of the application was considerably high.

Conclusion: The apps was welcomed by patients who wanted to increase their knowledge level of disease and perform self-management better.

Keywords: Smartphone apps; Health education; Patient; Nursing; Self-management

Introduction

Smartphone-based applications (apps) have become inescapable (1). The National Health Commission of People's Republic of China (2) encourages medical staff to utilize new technologies such as mobile apps and wearable devices to promote remote services and mobile medical care

(3). There is a large variety of apps related to the heath field, which can be used for various purposes such as nursing care, heath education, and medical communication (4). Self-management support is the assistance given to patients with chronic disease (5). Mobile applications are suitable as an approach for health management (6-10). Currently, mobile application interventions are becoming increasingly essential for supporting self-management (11-13).

We aimed to provide an effective source of clinical support and information for patients to increase their ability of self-management.

Materials and Methods

Design of Health Education Apps based on Wechat

A multidisciplinary research team, including physicians, nurses, software engineers from different technology companies, and patients and their caregivers, worked together to design and conduct the research (14). Researchers conducted semi-structured and focused group interviews pertaining to the patients' needs for optimization of the apps. After bidding, the researchers decided to sign a contract with a technology company (15) whose apps can be downloaded from the apps store for free. With its help, the researchers redesigned the apps to incorporate some personalized changes for patient's needs (Fig. 1).

Fig. 1: The Apps screenshot

The study participants downloaded the apps onto their smartphones with the help of nurses. After verifying patients' information, they were added to a disease group QR code by nurses Method to use the apps (Fig. 2-4):

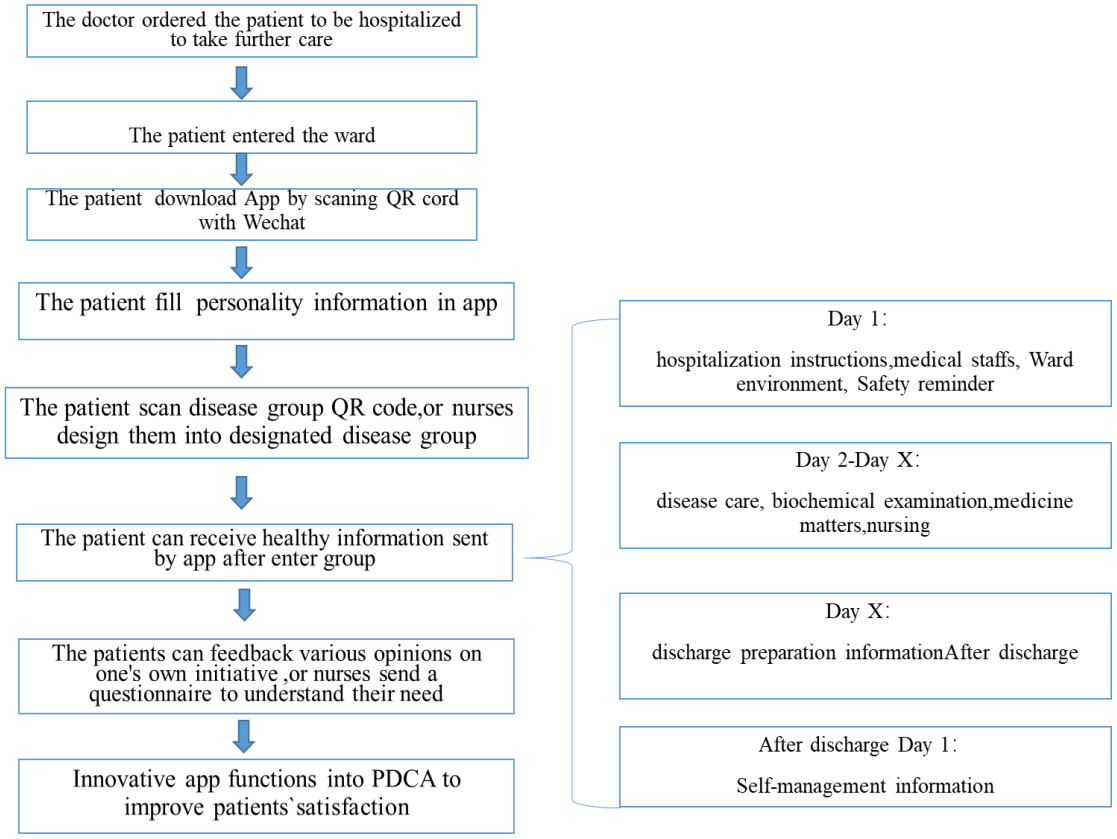

Fig. 2: Method of application for patients

Fig. 3: Introduction of the apps for chest surgery department (I)

Fig. 4: Introduction of the app for chest surgery department (II)

1) Patients were assigned to the different groups by scanning the disease group QR code according to the classification of diseases. 2) After being assigned to a special disease group, patients can receive educational information by Wechat regarding hospitalization instructions, disease care, biochemical examination, medicine matters, nursing, discharge preparation information, etc.. This information, includes messages, pictures, videos (Fig. 5), flashes, records, and flow charts sent by nurses. 3) Nurses also made questionnaire surveys online to investigate patient needs and shortcomings. Additionally, they can receive feedback and suggestions from patients. For instance, a research from our team concluded that the education based on these apps , a prospective, endoscopist-blinded, randomized, controlled trial were at Qilu Hospital of Shandong University between Oct 2017–Mar 2018, was effective (16). This method was successfully applied in 22 wards among 23159 patients. 40440 chapters (or messages) of health information was delivered via a medical smartphone sent to patients from Mar 2019 to Jan 2021. For instance, if a patient who was at a higher risk owing to falling down, nurses would send a vivid flash about how to prevent a fall (Fig. 5) and teach them how to perform the prevention better. If a patient was worried about the side effects owing to some cure, injection, medicine, or operation, nurses must send information pertaining to it every day, according to the progress of the cure.

Fig. 5: Apps screenshot of video on fall

Application of Apps

How was the experience of users? We conducted one research to test experiences and satisfaction of users in Jul 2021.

Participants: A purposive sample of 34 users, who have used the apps and agreed with this survey, have tested to evaluate whether they could effectively use it to fulfil the tasks and figure out their user experiences, to reflect their satisfaction. The study was approved by the hospital ethics committee, and the document number is: (Ke) Lun Shen No. (Ke) Lun Shen No.2019 (055).

Measurement: We chose the questionnaire on the Comprehensive Service Platform for the Elderly, Self-designed by CHENYu in July, 2020 (17). It included socio-demographic questions and questions related to Apps of users (like patients or caregivers) and user satisfaction. In addition to the basic personal information, from the system response speed, page design, overall layout, color collocation, font size, operating habits, the ease of finding information several aspects, reflects user satisfaction with the overall use of the platform, each question was to be answered using a five-point Likert-type scale, ranging from 1 (absolutely dissatisfied) to 5 (absolutely satisfied). Meanwhile, we also prepared two questions to collect users' suggestions. We sent them the questionnaire which is based on www.wenjuan.com, so that it can be read and rebacked by Wechat.

Quantitative variables and Statistical methods

Stata Software（Version14.2）was used to analyses the data. Socio-demographic information and suggestions related users of Apps (like patients or caregivers) were obtained via descriptive and frequency analysis. The satisfaction of the application variables was calculated as $X \pm S$.

Results

Table 1 presents the situation of the application in the top 10 departments in our hospital. It shows that more and more patients are likely to use the apps to read or learn all kinds of health information.

Table 1: Present usage situation of the apps application

Department	***Amount of health education***	***Types of health education information***								***Timetable of useags(months)***
		Public information about patient safety	Disease care	Hospitalization instructions	Biochemical examination	Nursing education	Perioperative education	Medicine care	Discharge preparation	
Anus & intestine surgery	7942	293	1795	492	2091	2832	4	0	728	36
Chest surgery department	7876	293	840	1394	642	4995	5	0	0	36
Gastroenterology department	7068	293	564	1844	2062	1494	0	6	1098	36
Endocrinology department	4926	293	4079	9	134	27	0	479	198	30
Reproductive medicine	4516	293	1086	0	2887	0	0	0	543	36
Cardiology department	3164	293	1153	174	774	66	444	0	553	18
Hepatology department	3048	293	616	974	406	889	0	163	0	18
Hematology department	1449	293	163	231	456	349	4	66	180	18
Neurology department	345	293	144	3	22	135	0	17	24	18
Breast surgery department	76	293	2	0	42	4	28	0	0	12

Table 2 shows socio-demographic information and suggestions related to users of Apps. Overall 91.2% of participants concluded that the evaluation effect of the apps was good compared with the paper version. Overall 85.3% of participants wanted to continue to receive medical education information after discharge from the hospital. The popular medical education information that they would like to receive included drug administration, disease prevention, nursing, and home care. The top four most popular types of users' suggestions were one-on-one online Q & A, continue to see every session, accelerate the speed of browsing and page updated, and free Wifi.

Table 2: Socio-demographic and suggestions related Apps of users [N=34 ,n(%)]

Item	***Characteristics***	***Frequency& Percentage (N &%)***	***Item***	***Characteristics***	***Frequency& Percentage (N &%)***
1.Gender	Male	10(29.4)	9.Age	25~30y	3(8.8)
	female	24(70.6)		31~40y	19(55.9)
2.Province	Shandong	31(91.2)		41~50y	3(8.8)
	Neimenggu	1(2.9)		51~60y	5(14.7)
	Hebei	2(5.9)		≥61y	4(11.8)
3.Education	Middle school	6(17.6)	10.Profession	civil servant	5(14.7)
	High school	4(11.8)		Business Manag-	3(8.8)
	Junior College	8(23.5)		General Staff	5(14.7)
	undergraduate	14(41.2)		Professionals	5(14.7)
	Master or PhD	2(5.9)		worker	2(5.9)
4.Type of health insur-	Provincial medical insurance	4(11.8)		Commercial attendant	1(2.9)
	Provincial medical insurance	21(61.8)		Self-employed person	3(8.8)
	others	9(26.5)		Freelancer	3(8.8)
5.Compared with the paper version, how do you evaluate the evalua-	Better	19(55.9)		farmer	1(2.9)
	Good	12(35.3)		retirement	3(8.8)
	Similarity	3(8.8)		Unemployment	2(5.9)
				others	1(2.9)
6.Do you want to continue to receive medical education information after discharge from	Yes	29(85.3%)	11.User role	Inpatient	10(29.4)
	No	2(5.9)		outpatient	17(50)
	Unknown	3(8.8)		Caregiver of Inpatient	7(20.6)
7. Which health education presentation do you prefer? (Multiple choice)	Video/flash	20	12.What is your experience of using this Apps? (Multiple choice)	Slower web browsing	5
	Picture	15		hard to find information	7
	sound	8		without quick find key	10
	well-written one interspersed with nice pictures	24		Without one-on-one coaching	20
	writing	12			
8.What kinds of medical education information would you like	Disease Prevention	25	13.User` suggestions (Multiple choice)	Speed up your web browsing	9
	Inpatient care	17		Improve the speed of information updating	9
	Drug Administration	26		Free Wifi	14
	nursing	25		Personalization provides infor-	7
	Hospital Environment	5		one-on-one online Q & A	18
	Discharge procedure and medical expendi-	17		Continue to see every session	15
	Home Care	22			

Table 3 shows satisfaction of the apps about users, the score was high. All the scores about speed of apps response, page design, overall layout, color scheme, font size, operating habit, convenience, and information abundance, met the needs of health education being above 4.5. The data displayed that the apps received feedback 43 messages.

Table 3: Satisfaction of apps application [N=34, n (%)]

Number	*Item*	*Minimum*	*Maximum*	*X±S*	
1	System response speed	3	5	4.71	±0.58
2	Page design	3	5	4.59	±0.74
3	Overall layout	2	5	4.62	±0.74
4	Color Scheme	3	5	4.62	±0.74
5	Font size	3	5	4.65	±0.69
6	Operating Habit	3	5	4.62	±0.7
7	Convenience	2	5	4.56	±0.79
8	Information abundance	2	5	4.53	±0.83
9	Meet the needs of health education	2	5	4.59	±0.74

The information from the feedback demonstrated that this apps is convenient, understanding, and vivid. The following are some of the feedback:

Patient A:*This apps could tell me what I wanted to know. It is very convenient to read by myself instead of asking others again and again, or waited blindly and worriedly.*

Patient B:*That was good for free for patients, however, those medical staff how to upload Apps.*

Patient C:*Now Wechat was so popular, this Apps based on it was convenient, easy of use, easy of learn.*

Patient D:*That saved much time to ask and consult, patients or caregivers could understand healthy knowledge by themselves, knowledge of those people were still poor, it can be an useful and welcomed tools.*

Patient E:*This Apps was smarter, I can do self-management by reading messages vivid,instead of disturbing others in most times.*

Discussion

The concept of USABILITY has been developed and improved since it was put forward in 1985. The International Organization for Standardization (ISO) is currently the most widely used organization (18). Usability evaluation is one of the most commonly used methods to evaluate the usability of an information system or website, as an important field of human-computer interaction research (19). A high-availability website should be one that users can easily use to accomplish specific tasks and enjoy using. On the contrary, users will give up if their needs are not met (19). The more the satisfaction, the more apps are welcomed. This way, it could improve nursing education efficiency contributing to chronic disease management (20). So we were likely to take usability evaluation to measure Apps function of effective, efficient, and satisfactory.

Nurses have to appreciate users' experience to send more popular medical education information such as drug administration, disease prevention, nursing, home care to satisfy theirs' needs.

The top four most popular kinds of user' suggestions were one-on-one online Q & A, continue to see every session, accelerate the speed of browsing and page updated, and free Wifi. Those point out that our medical staff need to concentrate on those healthy needs in the future. For example, all the team require to upskill to Apps function with artificial intelligence technology to improve Intelligence (21). Some wards have not supported free Wifi equipment for users led to their unsatisfactory, in the next step, it will be addressed as a

vital problem. Apps can receive feedback suggestions from patients, or nurses could also answer online according to the patients' questions, so that it can save time on face-to –face consulting service back and forth, but nursing staff cannot on duty for 24-h shift, most of questions had delayed replied. That's matter.

Limitations

There were some limitations of our study. First, it was a single-center study. Thus, the participants were not representative of the whole field and more medical centers are needed to replicate this apps and application. Second, This Apps have been to enhance the function to meet varied needs from patients. For example, Some patients suggested to design healthy information that is more suitable for different ages to get their attention, just like bigger font size for aged ones, polychrome font style for children .Third, Some patients could not receive information without smartphones due to financial difficulties, traditional booklet-based and verbal instructions have to maintain in some period.

Conclusion

As an effective tool, this apps can help nurses to promote health education, improve efficiency of nursing management, and help patients do self-management better.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgements

This work was funded by:
1) The Project from National Health Care Industry Foundation of Shandong University
2) Undergraduate Teaching Reform Project from Cheeloo College of Medicine of Shandong University (No.qlyxjy-202054)
3) Shandong Natural Science Foundation of China (ZR2019LZL006)
The authors would like to thank all the participants who patiently participated in our study.

Conflict of interest

The authors declare that there is no conflict of interest.

References

1. Ferguson C, Jackson D (2017). Selecting, appraising, recommending and using mobile applications (Apps) in nursing. *J Clin Nurs*, 26(21-22):3253-3255.
2. The General Office of the State. Council (2015). Outline of national medical and health service system planning (2015-2020). Available from: *http://www.gov.cn/zhengce/content/2015-03/30/content_9560.htm.*
3. Guo B, Zuo X, Li Z, et al (2020). Improving the quality of bowel preparation through an app for inpatients undergoing colonoscopy: A randomized controlled trial. *J Adv Nurs,* 76(4):1037-1045.
4. Hai-ling Y, Xiao-rong L, Ping W (2016). Design and application of transitional care platform under the linkage of hospital-community-family. *Chin J Nurs*, 09(51):1133-1137.
5. Hofer F, Haluza D (2019). Are Austrian practitioners ready to use medical Apps? Results of a validation study. *BMC Med Inform Decis Mak*, 19(1):88.
6. Seo JM, Kim SJ, Na H, Kim JH, Lee H (2021). The development of the postpartum depression self-management mobile application "happy mother". *Comput Inform Nurs*, 39(8):439-449.
7. Bendixen RM, Fairman AD, Karavolis M, Sullivan C, Parmanto B (2017). A user-centered approach: Understanding client and caregiver needs and preferences in the development of mHealth apps for self-management. *JMIR Mhealth Uhealth,* 5(9):e141.

8. Li X, Wyatt TH, Velur Rajashekaran P, Bayless AK, Odom L (2020). Using a systems engineering approach to design an interactive mobile health application for improving asthma self-management. *Comput Inform Nurs,* 39(4):221-228.
9. Park KH, Song MR (2020). Development of a web exercise video for nursing intervention in outpatients with low back pain. *Comput Inform Nurs,* 38(9):466-472.
10. Cho S, Lee E (2021). Effects of self-education on patient safety via smartphone application for self-efficacy and safety behaviors of inpatients in Korea. *Healthc Inform Res*, 27(1):48-56.
11. Dicianno B, Peele P, Lovelace J, et al (2012). University of Pittsburgh Medical Center case study. http://www.amga.org/PI/Collabs/MPMCC/Compendiums/UniversityofPittsburgh.pdf. University of Pittsburgh. [2017-08-30]. Best practices in managing patients with multiple chronic conditions.
12. Free C, Phillips G, Galli L, et al (2013). The effectiveness of mobile-health technology-based health behaviour change or disease management interventions for health care consumers: A systematic review. *PLoS Med,* 10(1):e1001362.
13. de Jongh T, Gurol-Urganci I, Vodopivec-Jamsek V, Car J, Atun R (2012). Mobile phone messaging for facilitating self-management of long-term illnesses. *Cochrane Database Syst Rev*, 12(12):CD007459.
14. Wang S, Ye Z, Pan Z, et al (2021). 'Shared Decision Making Assistant': A smartphone application to meet the decision-making needs of patients with primary liver cancer. *Comput Inform Nurs*, 39(12):984-991.
15. Hangzhou Jianhai Technology Co., Ltd (2021). https://www.justhealth.cn/
16. National Health Commission of PRC. Outline of National Health Service System planning (2015-2020) (2015). http://www.gov.cn/zhengce/content/2015-03/30/content_9560.htm
17. Chen Y, Yuan C, Lin C, Huang X (2021). Usability evaluation of Comprohensive service platform for the elderly based on the user experiences. *Nurs J Chin PLA*, 38(3):14-17.
18. Intetnational Orgnization for standardization (1998). ISO 924-11:. Ergonmic requirement for office work with visual display termninal(VDTs)-Part11: Guidance on usability. *Geneva: International Organization for Standization*, 1998:1-23.
19. Dumas JS, Salzman MC (2006). Usability assessment methods. *Rev Hum Factors Ergon,* 2(1):109-140.
20. Wulfovich S, Fiordelli M, Rivas H, Concepcion W, Wac K (2019). '*I Must Try Harder*': Design implications for mobile apps and wearables contributing to self-efficacy of patients with chronic conditions. *Front Psychol*, 10:2388.
21. Qunyi Z, Ying Z, Xiao-Ying W (2014). Application of mobile information technology in the continuity care for orthopaedic patients. *Chin J Nurs*, 49(7):795-797.