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Medication Adherence Support Applications for Chronic Arthritis Patients: Healthcare Providers' Perspective in Saudi Arabia

Saleh ALTUWAYRIB[a,b,1], Khin Than WIN[a] and Mark FREEMAN[a]
[a]*University of Wollongong, New South Wales, Australia*
[b]*University of Hail, Hail city, Saudi Arabia*
ORCiD ID: Saleh Altuwayrib https://orcid.org/0000-0002-6148-9546, Khin Than Win https://orcid.org/0000-0002-7810-6388, Mark Freeman https://orcid.org/0000-0002-5142-6007

Abstract: Mobile health applications provide chronic disease patients with different capabilities and resources to support medication adherence. The study aims to understand the health care providers' (HCP) perceptions and recommendations about the design features and content of medication adherence support apps for individuals with chronic arthritis conditions in Saudi Arabia. Individual interviews were conducted with ten participants, such as rheumatologists, health educators, pharmacists, informaticians, and representatives from the Saudi Arthritis Association. The thematic analysis is utilised to code data and develop themes that help researchers in the design process. Four themes are identified: informational content, utilitarian, motivational, and socialisation features. The app content should improve arthritis patient awareness about medication management and adherence. Provide features that enable patients to set medication management and self-monitoring goals. The application design should be trustworthy, usable, enjoyable, and accessible for a diverse group of patients and respect patient privacy.

Keywords. Medication nonadherence, mobile health applications, chronic arthritis conditions, health care providers

1. Introduction

Chronic arthritis is due to chronic inflammation in one or different joints in the human body caused by genetic or environmental factors. Chronic pain, stiffness, difficulty moving, and joint deformity are among the symptoms experienced by patients [1]. Poor adherence to arthritis medications negatively impacts treatment outcomes and the patient's quality of life [2]. As a result, there is increasing demand for arthritis care services across diverse cultural groups, genders, and socioeconomic statuses [3]. Mobile apps are valuable tools that could be used to support arthritis patients in managing their conditions, and patients are willing to use self-management technologies [4,5]. There are

[1] Corresponding Author: Saleh A. Altuwayrib, email: sasa948@uowmail.edu.au.

different types of mobile apps designed to support arthritis patients in health education, communication with HCPs and self-management. Apps that support patient self-management enable users to set reminders, track symptoms, and connect with health professionals [5]. Thus, there is a need for arthritis mobile apps that attract and engage users in collaborative self-management activities with HCPs to improve the patient adherence [6,7]. HCPs are considered key stakeholders who can provide insightful information in the design process. The involvement of HCPs in designing and developing medication adherence applications is scarce, which could minimise the effectiveness and credibility of these systems among patients [8]. Therefore, stakeholders' involvement in designing mobile health applications is essential, and this should be considered from the early stages [9]. User-centered design is a practical approach involving users in the development process to ensure that the app meets user needs and expectations [10]. In this study, we aim to explore the perceptions and recommendations of HCPs about designing a medication adherence app for people with chronic arthritis conditions.

2. Methods

The qualitative research design was adopted by conducting individual interviews with HCPs to explore medication adherence barriers, current interventions employed to support medication adherence, their experiences in providing medication adherence support, and their perceptions of mobile apps that support medication adherence for chronic arthritis patients. Participants were provided with examples of medication management apps that demonstrated how mobile apps supported medication adherence behaviour for various chronic health conditions. Sampling is purposively, and we recruited health professionals working in the Ministry of Health (MOH) hospitals and directly dealing with arthritis patients. Ten individuals participated in the interviews, including two rheumatologists, two health education specialists, two pharmacists, two health informaticians and two representatives from the Saudi Arthritis Society. The Health and Medical Human Research Ethics Committee at the University of Wollongong and the MOH in the Kingdom of Saudi Arabia approved the study (Ethics number: 2021/314). The interviews were conducted between January and March 2022. Inductive thematic analysis was utilised for data analysis, and the verbatim transcripts were coded using Nvivo version 12 Plus.

3. Results

Four themes emerged from the thematic analysis regarding the design of an arthritis medication adherence support app; these included informational content, utilitarian, motivational and socialisation features (see Table 1).

3.1. The Informational Content

The app content should improve patient awareness and be written in simple language that can be understood by ordinary people and avoid medical jargon. The app should provide educational information for patients and caregivers about medication use, healthy lifestyle, and available health support services. The educational information

needs to be presented in different languages and formats, such as audio, video, images, and text. The app content should be developed by non-profit organisations and follow the ethical standards of designing health applications to ensure data confidentiality and patient privacy. This could help HCPs trust the app and advise it for arthritis patients to use.

Table 1. Key themes and participants' quote.

	Subthemes	Initial codes	Quotes
Informational content	Patient awareness	Medications	*"…the medication side effects and the medication benefits on their health, … to motivate them to be adherent." [P10]*
		Healthy lifestyle	*"Once they have ideal weight … some foods lead to rheumatic diseases such as gout …. Physical exercise is important..."[P5]*
		Support programs	*"…different medication support programs offered by charity and governmental health institutions."[P6]*
	Presentation of content	Languages	*"…educational content in different languages to help different patients …"[P5]*
		Different formats	*"…visual person learns by seeing things, and others read the information to make sure, … or hear information through audio broadcasts..."[P9]*
		Clarity	*"clarity of content, "we don't use medical jargon", … written in simple and clear language…"[P5]*
	Credibility	Accuracy	*" …. assessment tools…based on scientific and medical foundations … to make patients trust the results …"[P10]*
		Trustworthy	*"…developed by governmental health institutions that provide reliable health educational content."[P3]*
		Confidential	*"…maintain patient privacy… could motivate the user continue use the app… feel safe."[P4]*
Utilitarian	Manage medications	Schedules	*"…alarms & the ability to create medication schedules."[P4]*
		Reminders	*"…set the medication taking times… organise refill times …help patients avoid forgetting medications."[P9]*
		Medications diary	*"…locating the weekly injection site,… When chooses the same site, the app reject…, and the advice patient to change."[P10]*
	Self-monitoring	Health assessment	*"…use assessment tools…Disease Activity Score-28, Health Assessment Questionnaire and define number of symptoms if they exist, patients need see the clinician."[P3]*
		Adherence assessment	*"…adherence indicators that show if the patient is taking medications or not."[P1]*
		Goal setting	*"… providing goals related to medication taking, doing exercises, complying with medical appointments and examinations."[P9]*
		Feedback	*"… features that assess the symptoms should provide feedback based on the user data."[P6]*
	Usability	Easy to use	*"…no complex tasks... for setting reminders or searching information …"[P6]*
		Easy to learn	*"… show how to add medications and this process should be smooth."[P10]*
		Safe to use	*"… appropriate and safe services for patients … children group should use the app under the family supervision…"[P5]*
		Interactivity	*"… visual graphics and stimulating sounds when clicking on the buttons…and compliment after taking the medication."[P8]*
		Customizability	*"… personalized services designed to help diverse patients with different arthritis conditions …"[P10]*
	Accessibility	Diversity of users	*"… serve different categories of society with health or digital literacy levels"[P3]*

			Internet access	*"Offline browsing to help different patients utilize the app services when they don't have network access."[P6]*
Motivational		Hedonic	Challenges	*"…challenges related to medication taking or health education,…"[P10]*
			Progression	*"...shows the levels of adherence,...move from one level to another level within the app..."[P10]*
			Achievement	*"… make the patients feel the sense of achievement …"[P7]*
		Rewarded	Relevance	*"…valuable and relevant rewards to encourage patients maintaining an appropriate level of adherence."[P8]*
			Sponsored	*" … sponsorship and partnership with institutes…to support chronic patients in our community."[P7]*
			Prevent cheating	*"…ensure that the user does not fill data just to earn the rewards…"[P2]*
Socialization		Social support	By health professionals	*"Sharing medication schedules with family and friends…" [P10]*
			By family and friends	*"… connect the physician to the patient to improve their relationship and follow-up."[P7]*
		Social learning	Share experiences	*"…app community…help patients to share experiences and learn from others …" [P5]*
		Social comparison	Competitions	*"…compare the adherence levels with the application community and avoid individual comparisons ..." [P10]*

3.2. Utilitarian Features

Provide users with app features that are useful and usable for different groups of patients. Features that facilitate the medication management tasks such as schedules and reminders. Self-monitoring features that help in tracking symptoms, disease activity and adherence levels. Rheumatologists suggested some health assessment tools to track disease activity. The app design should be attractive and interactive by providing users with meaningful visualization and personalized feedback.

3.3. Motivational Features

Provide users with an enjoyable and rewarded medication management experience to engage and motivate arthritis patients to improve adherence behaviour. The app should provide users with challenges related to medication management and enable users to view their progression and achievements. The app should be designed to reward healthy behaviours and has strategies that prevent users from cheating to earn rewards. Partnerships with profit and non-profit health organisations are an important aspect to sponsor rewards that motivate different arthritis patients.

3.4. Socialization Features

Provide users with social support from family, friends, and health professionals. Enable users to communicate with health professionals in an emergency, especially when there are flare-ups or abnormal results. Build an online arthritis community that empowers patients to discuss important topics and share their experiences with arthritis treatment. Compare the user's adherence with the app community or compare adherence levels for specific medication across different cities.

4. Discussion

The study investigated the perceptions of HCPs and the Saudi arthritis association in the design of medication adherence support applications. It was found that participants focused on the app content and utilitarian, motivational, and socialising features. The participants believed that the app should be designed to improve patient awareness of arthritis treatment and the importance of adherence. The app can be seen as an opportunity that assists arthritis patients in finding helpful information about medications and arthritis management from credible resources. In addition, inform the users about the medication support services provided by governmental institutions and the Saudi Arthritis Association. The app should also provide utilitarian features that empower users to manage medications, improve self-monitoring, and strengthen the patient-rheumatologist relationship. Usability, accessibility, and patient privacy are essential aspects that should be considered to improve the user experience. Users should be provided with hedonic and non-hedonic rewards that can be earned by completing health tasks, building healthy habits, progressing in learning, and participating positively within the arthritis community. To the best of authors' knowledge, this is the first study in Saudi Arabia to design adherence app in collaboration with HCPs and Arthritis society.

5. Conclusions

Medication adherence apps need to be personalized, informative, and motivational to support chronic arthritis patients. Our future research will explore the needs and preferences of arthritis patients for medication adherence apps to inform the design.

References

[1] WHO. Chronic rheumatic conditions. World Health Organization (WHO), 2020.
[2] Van Den Bemt BJ, Zwikker HE, Van Den Ende CH. Medication adherence in patients with rheumatoid arthritis: a critical appraisal of the existing literature. Expert Rev Clin Immunol. 2012 May;8(4):337-51, doi: 10.1586/eci.12.23.
[3] Geuens J, Geurts L, Swinnen TW, Westhovens R, Abeele VV. Mobile health features supporting self-management behavior in patients with chronic arthritis: mixed-methods approach on patient preferences. JMIR mHealth uHealth. 2019 Mar;7(3):e12535, doi: 10.2196/12535.
[4] Azevedo R, Bernardes M, Fonseca J, Lima A. Smartphone application for rheumatoid arthritis self-management: cross-sectional study revealed the usefulness, willingness to use and patients' needs. Rheumatol Int. 2015 Oct;35:1675-85, doi: 10.1007/s00296-015-3270-9.
[5] Mollard E, Michaud K. Self-management of rheumatoid arthritis: mobile applications. Curr Rheumatol Rep. 2020 Nov;23:1-8, doi: 10.1007/s11926-020-00968-7.
[6] Mollard E, Michaud K. A mobile app with optical imaging for the self-management of hand rheumatoid arthritis: pilot study. JMIR mHealth uHealth. 2018 Oct;6(10):e12221, doi: 10.2196/12221.
[7] Grainger R, Townsley H, White B, Langlotz T, Taylor WJ. Apps for people with rheumatoid arthritis to monitor their disease activity: a review of apps for best practice and quality. JMIR mHealth uHealth. 2017 Feb;5(2):e7, doi: 10.2196/mhealth.6956.
[8] Ahmed I, Ahmad NS, Ali S, Ali S, George A, Danish HS, Uppal E, Soo J, Mobasheri MH, King D, Cox B. Medication adherence apps: review and content analysis. JMIR mHealth uHealth. 2018 Mar;6(3):e62, doi: 10.2196/mhealth.6432.
[9] Higgins SA, de Laat M, Geurts EM. Managing product requirements for medical IT products. In: Proceedings IEEE Joint International Conference on Requirements Engineering; 2002 Sep 9; Essen, Germany: IEEE; 2002. p. 341-9, doi: 10.1109/ICRE.2002.1048547.
[10] Norman D. The design of everyday things. NewYork: Doubleday Currency; 1990.