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# Identifying and Validating Requirements of a Mobile-Based Self-Management System for People Living with HIV

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**Abstract.** Background: Due to the widespread use of mobile technology and the low cost of this technology, implementing a mobile-based self-management system can lead to adherence to the medication regimens and promotion of the health of people living with HIV (PLWH). We aimed to identify requirements of a mobile-based self-management system, and validate them from the perspective of infectious diseases specialists. Method: This is a mixed-methods study that carried out in two main phases. In the first phase, we identified requirements of a mobile-based self-management system for PLWH. In the second phase, identified requirements were validated using a researcher made questionnaire. The statistical population was infectious diseases specialists affiliated to Tehran University of Medical Sciences. The collected data were analyzed using SPSS statistical software (version 19), and descriptive statistics. Results: By full-text review of selected studies, we determined requirements of a mobile-based self-management system in four categories: demographic, clinical, strategically and technical capabilities. According to the findings, 6 data elements for demographic category, 11 data elements for clinical category, 10 items for self-management strategies, and 11 features for technical capabilities were selected. Conclusion: Using the identified preferences, it is possible to design and implement a mobile-based self-management system for HIV-positive people. Developing a mobile-based self-management system is expected to progress the skills of self-management PLWH, improve of medication regimen adherence, and facilitate communication with healthcare providers.

**Keywords.** Self-management, Mobile, Data element, HIV/AIDS

## 1. Introduction

HIV-positive people require more support for the management of their condition, including making physical, psychological, and social adjustments because of the chronic condition of the disease [1,2]. Improving the condition of people living with HIV (PLWH) is dependent not only on healthcare services but also on social support and the provision of educational information in several areas such as how to make safe sex behaviors, antiretroviral therapy (ART) and adherence to medication regimens [3-5]. Among these factors, ART is more important that depends on the timely take of prescribed medications, diet and exercise compliance [6,7]. Self-management can

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provide effective solutions to motivation and contribution of patients for continuing in the effective therapeutic goals [8].

Self-management is a set of deliberated, learned, and purposeful activities that carried out by persons with chronic conditions targets reducing disease progression, managing symptoms and the prevention of disabilities [9-11]. Self-management is not a substitute for professional and organizational services, but it is a supplement of healthcare services and as a supportive way to implement specific strategies [12]. In recent years, providing self-management services through mobile technology has been introduced as a new approach to improve health care services and cost savings for HIV-positive people [13,14]. The application of mobile technology in the healthcare industry is widely regarded as a new way of supporting public health services [15-17] and can be used by PLWH to support self-management strategies [18]. According to the widespread use of mobile technology and the low cost of this application, developing a mobile-based self-management system can improve ART, physical, psychosocial, health knowledge, and behavioral outcomes of PLWH [19].

Mobile-based self-management systems with common requirements and technical capabilities to improving HIV-care are expressively required in limited resources countries that are bearing the effect of the HIV epidemic [20]. Unfortunately, in spite of the alarming occurrence and consequences of HIV infection, a self-management system with effective data elements and features are just now being deployed in a few countries [21]. In the same way, there have been limited strategies in developing countries to management of HIV chronic condition [22,23]. As a result, without self-management strategies and technical capabilities to adherence at the HIV care intervention, it is impossible to take an experimental approach to improve HIV care services [24]. However, in Iran, as a developing country, there has not been a mobile-based self-management system for HIV-positive people with the comprehensive data elements and technical capabilities to date [25].The purpose of this study was to 1) identifying requirements of a mobile-based self-management system for PLWH, and 2) validating of identified requirements based on infectious diseases specialists' attitudes.

## 2. Methods

This study was a descriptive cross-sectional one that carried out in two main phases in 2017. In the first phase, we searched documents to identify of requirements and common elements of a mobile-based self-management system for people living with HIV. The combination keywords used to search for resources included in; self-care, self-management, self-monitoring, data elements, minimum data set, requirements, mobile application, smart phone, mobile health, strategy, and HIV/AIDS that have been searched in PubMed, Web of Science, Up To Date, Science direct, Scopus, and Ovid. Studies were included if they reported on common data elements, HIV-care strategies, and technical capabilities of mobile-based HIV/AIDS self-management system. Moreover, full text contents research papers and review articles published between 2000 and 2017 and in English language were selected. We excluded newspapers, abstracts, editorial letters, and reports.

In the second phase, using the identified requirements from the review of related articles [1, 3-15, 18-21, 25, 29, 49], a questionnaire was developed to validate identified requirements. The questionnaire consisted of 4 categories and 47 questions (demographic data elements: 8 questions, clinical data elements: 16 questions, HIV-

**Table 1.** Search result and final reviewed articles

| Elements | Total Reference Retrieved | Total Duplicate References | Total Excluded References | Final Analyzed Articles |
|---|---|---|---|---|
| Demographic | 40 | 16 | 20 | 4 |
| Clinical | 57 | 31 | 20 | 6 |
| Technical | 70 | 35 | 30 | 5 |
| Strategically | 109 | 55 | 41 | 13 |
| Total | 276 | 137 | 111 | 28 |

management strategies: 10 questions, and technical features: 12 questions). Reliability of the questionnaire was calculated 0.87 by Cronbach's alpha and the validity was measured by seven specialists of infectious diseases and health information management experts. The statistical populations were all infectious diseases specialists working at Tehran University of Medical Sciences (N=23). Twenty-one individuals out of 23 statistical population completed the questionnaire. The data were analyzed using descriptive statistics and frequency distribution reports. In this way, the questionnaire options were scored from 1 to 5 (completely agree=5, agree=4, no idea=3, disagree=2, and completely disagree=1). Each of the identified requirements was considered as preference element that had obtained at least a mean of 2.5 or more.

## 3. Results

Using applied research strategies, 276 references were retrieved and finally, 28 related articles that published between 2000 and 2017 were reviewed. Table 1 shows the final analyzed articles, and the resources that did not meet inclusion criteria and excluded from this study. By full text review of selected articles we determined the requirements for a mobile-based self-management system in four categories: demographic (8 data elements), clinical (16 data elements), technical capabilities (12 features) and HIV self-management strategies (10 items).

According to the infectious diseases specialists' attitudes, "height" and "body mass index (BMI)" were not selected as required demographic data elements and only six data elements were selected for this category. In clinical category, mean score for "rash", "sore throat", "fatigue & tiredness", "vital signs", "associated diseases", and "current medication" was less than 2.5 and therefore, 11 data elements were selected for clinical category. According to the findings, all of the identified technical requirements were selected by infectious diseases specialists, except "data collection". Moreover, the mean score for all identified self-management strategies was more than 2.5, and therefore, all of them were selected. The selected data elements for each of categories and mean scores assigned to them by the specialists are shown in Table 2.

As shown in Table 2; 38 data elements and features were selected for different identified categories as requirements of a mobile-based self-management system for PLWH.

## 4. Discussion

People with a chronic condition have a central role in managing their conditions. These individuals can play an important role in improving their health status by benefiting from standard self-management programs [26-28]. A mobile-based self-management system

**Table 2.** The mean of given values and selected elements, features and strategies

| Demographic | | | Technical capabilities | | |
|---|---|---|---|---|---|
| **Data element** | **Mean** | | **Feature** | **Mean** | |
| Gender | 4.6 | √ | Content of text messages | 3.3 | √ |
| Age | 4.4 | √ | Educational messages | 4.9 | √ |
| Marital status | 4.5 | √ | Motivational messages | 4.4 | √ |
| Education level | 2.9 | √ | Drug taking reminder | 5 | √ |
| Occupation | 3.3 | √ | Appointment reminder | 3.9 | √ |
| Height | 2.3 | | Exercise reminder | 4.6 | √ |
| Weight | 4.2 | √ | Diet reminder | 4.9 | √ |
| Body Mass Index (BMI) | 2.4 | | Instructions | 3.3 | √ |
| **Clinical** | | | Data collection | 1.7 | |
| Fever | 4.9 | √ | Internet access | 4.2 | √ |
| Chills | 4.5 | √ | Being user-friendly | 4.5 | √ |
| Night sweats | 2.9 | √ | Security requirements | 4.9 | √ |
| Weight loss | 3.3 | √ | **Self-management strategies** | | |
| Fatigue & Tiredness | 1.8 | | Safe sexual behavior | 3.9 | √ |
| Sore throat | 2.3 | | Education | 4.1 | √ |
| Mouth ulcers | 2.6 | √ | Communication | 2.8 | √ |
| Muscle pain | 4.2 | √ | Motivational messages | 4.3 | √ |
| Skin problems | 3.3 | √ | Physical activity improvement | 2.9 | √ |
| Diarrhea | 4.1 | √ | Nutrition regimen | 3 | √ |
| Pneumonia | 4.6 | √ | Symptom management | 4.2 | √ |
| Swollen lymph nodes | 4.7 | √ | ART and medication adherence | 5 | √ |
| Neurological disorders | 3 | √ | Attend appointments | 3.8 | √ |
| Current medication | 2.3 | | Enhance quality of life | 4 | √ |
| Associated diseases | 2 | | | | |
| Vital signs | 2.3 | | | | |

can serve as a healthcare complement and includes areas such as maintaining health promotion, lifestyle modification, medication adherence, symptom assessment, disease management and rehabilitation [29-31]. In this mixed method study, we aimed to identify requirements of a mobile-based HIV self-management system, and validate them from the perspective of infectious diseases specialists.

The results of this study showed that demographic, clinical, technical, and strategies categories are essential for a mobile-based self-management system for HIV-positive people. Navato et al, in a 2015 developmental study, identified requirements of a mobile messaging system for tracking the care of PLWH and Tuberculosis (TB) in six categories: data acquisition requirements, telecommunications cost, privacy and data security, text message content, communication, and system scalability. The findings of this study showed that using this system could improve self-management and self-care skills of patients and strengthen the relationship between patients and health care providers [32]. Because of the importance of therapeutic objectives of HIV condition, existence of a mobile-based system that is focused on providing self-management services can be an important achievement for healthcare organizations [33]. Organized clinical data elements are a primary requirement for a mobile-based self-management system for information management and providing efficient clinical procedures in healthcare organizations [34]. Furthermore, complete registration of patients' demographic information in a self-management system will help them better identify and manage their prescribed treatment [24]. Demographic data elements of PLWH in a comprehensive HIV/AIDS information management system should be documented in

order to better understand the epidemic of the disease, and to focus on sub-populations and management of treatment [25].

According to the findings, technical capabilities of a mobile-based self-management system for PLWH needs features such as; educational and motivational messages, content of the text messages, drug taking reminder, and security requirements. Technical capabilities such as adherence to medication, drug taking reminder and data security are the important aspects of a mobile-based self-management system [35-38].This important finding was highlighted in most similar studies that, technical capabilities of a mobile-based self-management system can be very helpful by giving reminders and engaging patient in therapeutic activities [39]. For example, a 2016 clinical trial by Garofalo et al., illustrated that a text message-based system in addition to reminders of medication adherence and attend appointments, can also facilitate communication with healthcare providers [40].

Based on the findings of this study, 10 mobile-based self-management strategies were identified and selected for HIV-positive people. Access to health care services and the motivation of HIV-positive people for self-management are two important factors in improving their health status [41-43]. ART is one of the most important self-management strategies and clinical prescriptions for the treatment of HIV, especially in developing countries where the number of PLWH is rising [44,45]. In similar studies, it has been recommended that PLWH should participate in ART strategy and collaborate with healthcare providers to succeed in their clinical treatment [46-50]. Self-management strategies, in addition to ART, should also emphasize on adherence to medication [51]. Adherence to compound medication regimens often leads to a significant aspect of chronic condition management. PLWH are required to start medication regimens that demand a high degree of adherence and attend medical appointments [52]. Furthermore, regarding HIV transmission ways and the social stigma of this disease, it is important to provide educational information on safe sex approaches and how to prevent the transmission of the virus as well as to strengthen the morale of PLWH [53-55].

## 5. Conclusion

In this study, we determined four requirements categories (demographic data elements, clinical data elements, technical capabilities and HIV-care strategies) of mobile-based self-management system for people living with HIV. Using these requirements, it is possible to design and implement a mobile-based self-management system for PLWH. Implementation of this mobile-based system can provide a timely reminder to improve medication adherence, promote the self-management skills, and safe-sex negotiation for HIV-positive people. Complementary studies to address the preferences of an intelligent mobile-based self-management system for PLWH can be an appropriate course for future researches on this topic.

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