Issues and Considerations for Healthcare Consumers Using Mobile Applications

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**Abstract.** There is a large and ever increasing number of mobile phone health, wellness, and medical applications on the market. However, there is little guidance or quality assurance available for consumers. This paper provides a health consumer focused framework for considering a range of issues associated with selecting and using mobile phone applications downloaded from the Internet.

**Keywords.** Mobile phone apps, M-health, data storage issues, software issues

**Introduction**

Internationally we have seen a significant rise in mobile phone use. According to International Telecommunications Union statistics there were over 5.3 billion mobile phone subscribers globally [1]. In 2011 491.4 million smart phones were shipped globally [2]. With the rise in mobile phone (including smart phones) usage rates, there has also been an increase in the development and sale of mobile phone applications across the globe. Many of these applications are healthcare related and consumers are identifying and using mobile phone applications to: (1) support their health decision-making and (2) assist in self-management of their disease or maintain wellness. This paper provides a discussion of some of the considerations surrounding mobile phone software and the data these applications collect to help support consumers decision-making when using mobile phones and their associated software applications. In the literature there are many discussions on the use of health applications by health care professionals or those on formal clinical trials [3], these applications are not specifically under consideration in this paper. This paper provides a consumer health focus on some of the issues for consideration when selecting and using mobile phone health and wellness applications downloaded from the Internet.

1. **Background**

Mobile phone applications are small software programs that provide a specific functionality and can be downloaded onto a phone via the Internet. Most frequently they are associated with smart phones, which use a proprietary operating system (OS)
and allow the user to download specifically designed applications that run only on that
OS, although cross platform mobile apps are now beginning to be developed. Many
mobile phone applications can only be run using the Internet to provide real-time
information and data exchange whilst others are independent from the Internet and
developed as standalone applications, which do not require Internet access. Other apps
can be operated in either mode, with restricted functionality in the offline mode.

It has been postulated that smart phone applications can transform mobile phones
into assistive devices for people with disabilities [4]. As smart phones become more
affordable and the applications remain relatively low cost there is a rapidly increasing
acceptance and use of assistive applications by consumers. Consumer use of mobile
applications is varied. Some consumers use mobile phones to obtain relevant health
information over the World Wide Web (WWW). Other consumers have taken
advantage of the growing availability of mobile applications that are specifically
targeted towards assisting individuals with the promotion of their own health and
wellness as well as the self-management of chronic illnesses such as chronic
obstructive pulmonary disease, diabetes and cardiovascular disease. Other mobile
applications are provide tools that improve communication with health care providers
or facilitate the delivery of patient care, for example: animated videos to educate
patients about the human body, wellness, prevention activities, disorders and diseases.

There are currently more than 13,500 medical, healthcare and fitness applications
in the apple app store alone. The majority of these applications are aimed at consumers
rather than healthcare professionals. Although many are potentially good applications,
researchers and health professionals are increasingly advocating that consumers
consider the types of applications they are downloading or purchasing with some
skepticism, particularly when selecting and using health focused applications [5]. Some
of these considerations form the focus of this paper.

2. Method

The authors of this paper had each independently examined and used a range of mobile
applications for health and wellbeing. This examination had led to considerable
concern regarding the security and quality of mobile phone applications and the data
they collect. In this context we developed a “Consumer Perspective Framework” (see
Table 1) within which we consider the use of mobile applications from a consumer
perspective. The framework emphasizes some key aspects of mobile phones and their
associated applications that need to be assessed by consumers when considering their
use. Key elements of the framework will be discussed in the following section.

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3. Discussion

Two major areas of concern relating to mobile phone software applications and data storage were identified: (1) data issues and (2) software issues.

3.1. Data Issues

There are several data issues that consumers should concern themselves with, including: (1) storage and privacy, (2) ownership, (3) corporate use and (4) location.

Storage and Privacy: One challenge is keeping personally identifiable health information secure. Essentially, mobile health requires the use of strong encryption and authentication processes to ensure the security of these data. However, as patients are increasingly recognising the potential benefits of digitally recording their health information this issue is becoming more discussed in the patient population. Researchers such as Walker et al [6] have identified that patients are less concerned about privacy than health care professionals. However, Gilbert et al [7] emphasise that ensuring privacy is not violated where sensitive information is concerned is a difficult problem to overcome. There is minimal evidence of the use of secure networks or encryption (as in eHealth applications).

Ownership: There is minimal information available about these mobile phone applications at the point of purchase regarding data storage, use (primary and secondary), durability and ownership. These issues need to be considered when entering personal data, including health data, into a mobile phone application. This information may not be available to the consumer via the app store prior to purchase. There is a requirement that all applications cover these issues in their licensing agreement, which the consumer accepts at the time of initial use. However, some users do not understand the importance of these licensing agreements (which by requirement are very long). One application’s licensing agreement, containing standard information, was 26 screen pages long and difficult to read on a mobile phone due to the small screen size. Thus the important elements of the agreement may be difficult to read.

Corporate Use: Some low cost mobile phone applications are sponsored by private enterprises, which can have implications for data privacy and security. One of the key issues is the secondary use of data as application sponsors often provide support to developers in exchange for access to end user personal data. Although, through licensing agreements, this is agreed to by end users it is unlikely that the implications of such agreements have been understood by consumers. Third parties do not have to disclose their actual use of the data and application developers have little or no control over secondary data use. There is limited information about the duration of data storage, or its subsequent use. In the event that the consumer is aware of secondary data transmission, there is the element of consent to the frequency of data transmission. There is concern about the timing of data transmission and to what extent consumers expect their information to be transmitted automatically, and what information is transmitted?

Location: The applications available through the Apple iTunes store are required to meet certification requirements regarding the content and development of the application [8]. This certification does not extend to when and where personal information may be sent once the application’s disclaimer has been accepted by the user. No certification process is required for apps available through the android market [8] and so there is little evidence of where the data is processed or stored. The location
of data storage or transfer can be important, particularly if users are anticipating personalised responses to data inputs. If data are only stored locally, on the mobile phone, then it is necessary that users be aware of this so they do not anticipate others will be ‘monitoring’ them. The reverse is also important where users may consider that they are undertaking a personal venture and then discover their information is being reviewed by others. Consumers need to understand the importance of these issues in a computerised world.

3.2. Software Issues

There are several software issues that also need to be considered: (1) accessibility, (2) clinical effectiveness, (3) credibility, (4) information quality, and (5) consumer usage.

Accessibility: One of the first issues confronting consumers of health and wellbeing applications is the issue of how to locate them. Each of the different phone operating systems (e.g. android) has its own proprietary application stores (app stores) where applications can be purchased and downloaded. The sheer number of applications currently available has the potential to make the search and selection of a useful health or wellness app overwhelming. The majority of app stores have relatively unsophisticated search mechanisms and so for individuals who are uncertain of what they want may find identifying and selecting an app time consuming and cumbersome.

Clinical Effectiveness: There are a large number of medical, health and wellbeing applications. Most of these applications have a limited description of the application’s purpose and few reviews documenting the application’s clinical quality (thereby making selection of mobile applications on the basis of clinical effectiveness more difficult for consumers). Thus, mobile applications may or may not even function as expected, let alone be of use to the individual in supporting a wellness behaviour or helping with the self-management of a consumers’ disease. Where applications are calculating health or wellbeing measures from data inputs it is important to know and understand the means, or algorithms, by which these calculations are being made. Inaccurate calculations, or non-standard ones, may be in conflict with current medical trends and advice and may lead to medical error [10]. It is also possible that results may be ambiguous or misinterpreted by consumers with low health literacy.

Credibility: Anyone can create an application so it is difficult to differentiate credible, safe applications from those which are not. There is little information available in an app store to indicate credibility and if there are reviews these can also be biased or based on unhelpful metrics. As a result of this, there is a need for understanding of the possible issues for both consumers and health care practitioners. There is potentially a role for policy development which will assist people in classifying these applications. For example in the USA the Food and Drug Administration recently released draft guidelines for Mobile Medical Applications [9].

Information Quality: As with health related websites, there is concern about the quality and accuracy of information and advice provided through mobile phone apps. For the scope of this paper the concept of information quality is made up of several elements: (1) quality of the information in the application program incorporated by developers, (2) quality of the information entered into the application by consumers, and (3) quality of information received by the user through their interaction with the application.

Consumer Usage: The motivations behind the use of mobile apps have the potential to impact on the quality of the information recorded. Is the health consumer
after real behavioural change or are they after information to show a healthcare provider to illustrate compliance with a care program? Information quality has the potential to impact on healthcare consumers overall program of care, depending on the credibility that the application holds with the healthcare provider and the methods by which it is used by the consumer.

Having devised and described this framework the authors are intending to move to the next stage and conduct research with consumers to test the reliability of the framework. This work is intended to provide a consumer focused understanding of the most appropriate method by which the framework can be implemented for use by individual consumers to assist them in selecting the most reliable applications. This work will include a comprehensive exploration of literature relating to the framework.

4. Conclusion

There are many facets to consider when selecting a mobile app for use with health and wellbeing in mind. Consumers are encouraged to consider the security and secondary use of the data prior to engaging with these applications. App stores and developers should be encouraged to provide more reputable information about the privacy and security of the data as well as the efficacy and source of the programs. Healthcare professionals as well as consumers, providers and developers have a role to play in ensuring that only high quality efficacious apps are developed into the future. In this paper we describe a framework that can be used by consumers and health professionals when considering mobile application for healthcare use.

References