Research Article

Apps in Transplantation

Makanjuola JK* and Olsburgh J

Department of Transplantation, Guys and St Thomas NHS Foundation Trust, London, United Kingdom

Abstract

There is an expansion in the amount of surgery particular applications accessible to download and the field of transplantation has begun to grasp this rising innovation. Requisitions (applications) are downloaded things of programming onto an Internet-Enabled Mobile Device (iEMDs) which fulfil a particular function or role. The worldwide business sector for iEMDs provisions has grown enormously in recent years. Apps provide an opportunity for transplantation surgeons to engage with patients and offer a reference tool to have the latest evidence to aid practice that can be accessed anywhere at any time on a smart phone. With this emerging market and increasing creation of medical apps there will be an increase in patient information content in apps.

Keywords: Transplantation; Apps

Introduction

There is an increase in the number of surgery specific apps available to download and the field of transplantation has started to embrace this emerging technology [1]. Applications (apps) are downloaded items of software onto an Internet-Enabled Mobile Device (iEMDs) which fulfil a specific function or role [2]. The worldwide market for iEMDs applications has grown enormously in recent years. Revenues from applications in the first half of 2010 were estimated at £1.4 billion ($2.2 billion). In January 2012, Apple announced the twenty fifth billionth download from its app library 'App Store' which utilised the iOS platform [3]. 'The Android Market' is the alternative to 'App Store' developed by Google for Android OS devices [4]. Once downloaded, users can rate any app (from 1 to 5 stars) on the app page so other potential users can rate the usefulness of the app. Raters can also leave comment for prospective users to read.

Emerging use of iEMDs apps in transplantation

Smart phones have the potential to improve diagnostic skills and education of surgeons [5,6]. Transplantation apps that are available to download on the Apple App Store and Google Android Market have a number of uses.

We have identified types of transplantation apps and have classified them it to the following:

Reference apps-for use by physicians for references purposes, for example apps that provide the user the most recently published randomised control trials.

Risk calculators-apps that are described as a research tool to assess the relative impact of specific risk factors and to identify patients at greater risk of developing Delayed Graft Function (DGF).

Conference app-these apps are used by conference delegates to schedule plenary sessions to attend, view submitted abstracts or view latest breaking news form the conference.

Patient information apps-these apps can be used for patient information regarding procedure or treatment and help facilitate the consent process with simplified surgical diagrams.
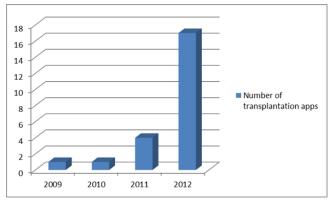
Methods

We conducted a key word search of the term 'Transplant' and 'Transplantation', to the search tab in App Store and The Android Market. Included were all apps for solid organ transplantation for health professionals and patients. Excluded were apps with a focus on nephrology, bone marrow, skin or hair transplants.

Results

We found 23 apps following our keyword search and inclusion criteria (Table 1). The earliest posted app at the time of our search was on 15th September 2009. This was an app called 'Transplants and Cancer'. This app helps users learn about various organ transplant options for eligible cancer patients. There was a more than doubling of the number of transplantation apps found on the app sites between 2011 and 2012 (Figure 1). All but one of the transplantation apps (Mini Atlas Transplantation: $1.85) were available to download for free. There were 15 apps produced by companies specialising in app development.

Type of app	Number
Reference	13
Conference	4
Risk Calculators	4
Patient information	2

Table 1: The types of Transplantation apps in the App Store and The Android Market.

Figure 1: The number of Transplantation apps in the App Store and The Android Market per year.

*Corresponding author: Jonathan K Makanjuola, Department of Transplantation, Guy's and St Thomas' NHS Foundation Hospital, Great Maze Pond, London, SE1 9RT, UK, Tel: +44 (0)7939 512 119; E-mail: jonathan.makanjuola@nhs.net

13 apps were for reference, 4 for conference use. The types of applications are detailed in Table 2. We found that 65% of the apps found were aimed at physicians.

Discussion

This is the first analysis of transplantation apps. We have shown that there is a steep increase in the number of transplantation apps produced each year since the 1st transplant app in 2009. The use of these transplant specific apps by transplant surgeons for patients is difficult to determine using the Apple or Android rating systems. This is because when the apps are being downloaded the user ratings are infrequently being recorded to no direct feedback is left for potential new users to access. At present there is no mechanism to access the credibility of the app and validity of the information. App ratings are infrequently left and there is no way of knowing if the user is a true user of the app or if the comment is false. If mistakes are found in the app the user can contact apple to investigate or the app designer directly. At present the only way to access app credibility is to see who created the app. If it was created by a trusted source such as transplantation journal or national transplantation association then this adds some credibility to information supplied.

As iEMDs become an ever increasing part of modern life, healthcare is embracing this technological revolution. Potential organ donors and transplant recipients with access to transplant apps just the recent practise of patients accessing healthcare websites. Transplantation apps are mainly developed for reference purposes. Apps like 'Transplantation Trial Watch' provide a monthly overview of recently published Randomised Controlled Trials (RCTs) in solid organ transplantation providing a summary of the trial and trial information. 'Mini Atlas Transplantation' is an app designed to facilitate the patient consent process by showing simplified images of the anatomy of the transplantation surgery. There are transplantation conference apps like the American Transplant Congress (ATC) 2012, created for attendees at the ATC conference where users can access the latest conference news, share contacts among the delegates and create a unique program for the conference based on the user's interests.

The increasing number of risk calculator apps like the 'Pancreas Transplant Donor Risk Index' or 'Delayed graft Function Risk Calculator', 'The app is designed to estimate graft survival based on the donor risk index [7]. These apps are described as a research tool to assess the relative impact of specific risk factors and to identify patients at greater risk of developing Delayed Graft Function (DGF). Some transplantation journals like the American Journal of Transplantation and Transplantation have followed the trend of producing a tablet version of their journals for their readership.

There have been historically no direct regulation of theses apps and caution was to be excised when using these apps to make clinical decisions as there is no verification of the medical content. However, in September 2013 an attempt was made to regulate medical apps when the Food and Drug Administration (FDA) issued guidance. The FDA intended to apply its regulatory oversight to only those mobile apps that are classed as medical devices and whose functionality could pose a risk to a patient's safety if the mobile app were to not function as intended [8]. These include apps that:

- Are extensions of medical devices by connecting to such device(s) for purposes of controlling the device(s) or displaying, storing, analysing, or transmitting patient-specific medical device data.

- Transform the mobile platform into a regulated medical device by using attachments, display screens, or sensors.

- Become a regulated medical device (software) by performing patient-specific analysis and providing patient-specific diagnosis, or treatment recommendations.

The 2nd subset of Apps for which FDA intends to exercise enforcement discretion (this means that the FDA does not intend to enforce requirements) they include apps that:

Help users self-manage their disease or conditions without providing specific treatment or treatment suggestions;

Provide patients with tools to organise and track their health information;

Provide easy access to information related to patients' health conditions or treatments;

Help patients document, show, or communicate potential medical conditions to health care providers;

Automate simple tasks for health care providers (e.g. medical calculators) or enable patients or providers to interact with Personal Health Record (PHR) or Electronic Health Record (EHR) systems.

Apps that are not classified as medical devises by the FDA include:

- Mobile apps that are intended to provide access to electronic books of medical textbooks or other reference materials.

- Apps that are intended for health care providers to use as educational tools for medical training.

- Apps that are intended for general patient education and facilitate patient access to commonly used reference information.

- Apps that automate general office operations in a health care setting and are not intended for use in the diagnosis of disease or other conditions.

None of the transplant apps reviewed fall in to the FDA regulation for regulation as they do not meet the criteria as a medical device. However, the transplant risk calculator apps fall in to the enforcement discretion category. The other apps including transplant reference material and conference apps do not need regulation.

There are no transplantation apps designed for patient usage to store medical data. The FDA guidelines would cover these types of transplantation apps if they existed as confidentiality laws can be extend to these apps that facilitate the FDA's definition of a medical device.

7 of the transplant apps are written by medical professionals. 3 by professional bodies, 3 by publishers with the remaining 10 created by app companies for medical conferences and patient information. There were no apps that were endorsed by established patient groups. 3 of the transplant apps were created for conference use and were commissioned by professional societies (American society of Transplantation, American society of Transplant surgeons, and the international liver transplantation society). There is potential of patient exploitation or

Organ	Number
Kidney	13
Pancreas	4
Liver	4
Heart and Lung	2

Table 2: The types of Transplantation apps in the App Store and The Android Market.

influence by pharmaceuticals or insurance companies within these apps but to date this is not an issue. The app 'Care after Kidney transplant' is a patient information app intended to help transplant recipients manage their heath after kidney transplantation. It is supported by the National Kidney Foundation and a drug company Novartis that is active in the production of anti-rejection drugs. There is potential conflict of interest however this app does not discuss individual drugs or recommend any specific products.

Conclusion

Apps provide an opportunity for transplantation surgeons to engage with patients and offer a reference tool to have the latest evidence to aid practice that can be accessed anywhere at any time on a smart phone. With this emerging market and increasing creation of medical apps there will be an increase in patient information content in apps. Caution has to be excised as the regulation of the apps is lacking but this provides an opportunity for the transplantation community to ensure standards are being met with the clinical information being provided in future apps. This can be achieved by creating their own individual apps or engaging with the companies that make apps.

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