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Medication Adherence with Smart Phones: Pharmacists Focused Apps

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Medication Adherence with Smart Phones: Pharmacists Focused Apps

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Introduction

Medication adherence relates to the concept of compliance to a medicine regimen and is defined as 'the extent to which a patient acts in accordance with the prescribed interval and dose of a dosing regimen' (Cramer et al., 2008). Often desired health outcomes are not achieved due to patients, not taking their prescribed medication or taking them incompletely or inconsistently (Miller et al., 1997). This results in higher negative health outcomes and increasing cost of care and is therefore a growing global concern.

Tackling the problem of non-adherence requires a collaborative, patient-centric approach and can be guided by modern technologies that offer efficient ways to managing healthcare (Williams et al., 2014). Over the last two decades, the internet has revamped the way information is accessed and mobile devices have taken this a step further by allowing users to access any and every information they want at their fingertips. The availability of over one and a half million applications or apps for download endorses the growing interest in the technology (Bexley et al., 2010). Mobile apps can provide an opportunity for both the healthcare professional and the patient to access user-friendly ways of accessing important medical information quickly, for improving patient health and advancing support and care (Choi et al. 2015; Miller et al., 1997).

According to the eMarketer¹, 2014, about 58.2% of the global population was using mobile phones in 2012; this percentage increased to 61.1% in 2013 and is further expected to increase to 69.4% of the world's population by 2017. As of April 2014, 62% of smartphone users have searched for health information using their devices. Evidently, mobile is rapidly becoming the preferred consumer channel for communication including health services. Mobile-HealthNews.com² highlights that the Apple App Store already has about 6,000 mobile health related apps, indicating consumers' interest in a more active role in their own health management.

Choi et al., (2015) emphasise that with the increasing demand for applications, the desire to have effective features and easier-to-follow instructions in applications has also

¹<http://dazeinfo.com/2014/01/23/smartphone-users-growth-mobile-internet-2014-2017/>

²<http://mobihealthnews.com/6908/3-million-downloads-for-android-health-apps>

increased. There is a requirement for more advanced medication-related applications with distinct functions. For pharmacies in particular, mobile applications can advance their connection with patients and improve the overall customer experience (Kony-Whitepaper). Most importantly, they present an opportunity to tackle the medication non adherence problem by avoidable hospitalizations that results in heavy costs for the healthcare industry each year. While it is easy to use mobile apps, getting patients to remain compliant with their medications by using them, to improve their healthcare results and thereby lowering costs, can be very challenging (Kony-Whitepaper). Therefore, in this whitepaper, we will discuss medication adherence with smart phone apps with a particular emphasis on pharmacy driven apps, how these are perceived by patients for their benefits, barriers and desired features.

Medication adherence with smart phones

Mobile apps for medication adherence are regarded as the novel innovative and non-invasive approach to evaluating and improving nonadherence rates in patients (Gauthier and Cardot, 2012). Using smartphone apps for medication adherence is fast gaining prominence and the number of medication adherence apps available in the market has significantly increased over the last few years (Dayer et al., 2013). These can potentially consolidate all the medication-specific information creating a repository for patients; are constantly accessible and provide a systematic and efficient process to coach the patients about their disease condition and care. Dayer et al., (2013) also emphasise that they are available for little or no cost, and while the smartphone medication adherence-oriented app can benefit anyone taking prescription medications these are particularly beneficial for patients with complex medication regimens.

Currently across the dominant smartphone platforms there is an upsurge of apps aimed at supporting patients for organizing and adhering to their medications. As outlined in Table 1, features of the apps that are presently available in the market include reminders for taking and refilling medicines, calendar-based alarm reminders with specific dosages and facilities for data logging that can be accessed by both patients and healthcare providers. Integration of medication lists with pharmacy contact information and prescription drug discount cards are all

immediately accessible by way of these apps. Additionally these also include medication information likes dosages, side effects, toxicities, etc.

The potential benefits of the medication adherence app are many, and efforts are currently under way to advance their usage by integrating smartphones with health-monitoring devices that transmit the output data directly to patients or physicians. It is noteworthy however that their efficacy in terms of improving the effectiveness and decreasing the costs of traditional medication adherence has not been empirically tested to a large degree.

Currently available medication adherence apps

A variety of medication adherence apps are currently available on multiple smart phone operating systems. The prominent features that most of these apps offer are listed in Table 1 below while Table 2 lists some of the most common medication adherence apps on the Google Android and Apple iOS platforms.

Table 1: Features and description of medication adherence apps

Features	Description
Online data entry	App has companion website(s) that allow data and medication regimen entry from a computer
Complex medication instructions	App has the capability to schedule medication instructions including dose administrations that occur non-daily, monthly, every X days; or medications with stop dates
Cloud data storage	App has the capability to back up and retrieve a medication regimen from a cloud storage system
Database of medications	A medication database is available that allows the user to enter, search, and select medications using features such as auto population
Sync/export/print data	App has the capability to transmit, print, or export medication regimens and/or medication-taking behaviours for use by the patient or health care providers
Tracks missed and taken doses	App has the capability to remind patients to take their medication and to record taken and missed doses that could potentially be used to calculate adherence rates

Provider data input capable	App allows providers to input and maintain the patient's medication regimen and "push" the regimen to the patient's device
Multiple platform app	App is available on more than one platform
Free-only apps	App is completely free (i.e., no fees for pro upgrades or charges to unlock additional features)
Generates reminders with no connectivity	App has the capability to generate medication reminders without the use of cellular (3G/4G/LTE) or wireless (Wi-Fi) connectivity
Statement of HIPAA* compliance	App has a statement from their manufacturer claiming HIPAA compliance
Multiple profile capable	App has the capability to generate medication reminders for multiple individuals on different medications (i.e., enabled family use)
Multilingual	App is available in English plus any other language

Source: Dayer et al., 2013; * Health Insurance Portability and Accountability Act

Table 2: Some smartphone apps for medication adherence on the Google Android and Apple iOS platforms

Application	Compatibility	Cost	Availability	Features
Dosecast	Android	Free	Worldwide	Offers customizable dose amounts and instructions for multiple patients Allows reminder postponing and "Smart Silencing" feature Tracks dose history and adherence, provides refill alerts, shares information with provider and pharmacy
Mango Health	Android	Free	USA, UK and Canada	Records timing and dosing for medications and supplements with personal health journal Offers reminder alerts, including notifications of potential interactions with medications, food, or drink

Application	Compatibility	Cost	Availability	Features
				Allows users to earn points for real-world rewards (e.g., from Target)
MedCoach	Both	Free	USA	<p>Shares medication history and refill times with pharmacist and primary provider</p> <p>Presents visual reminders (alerts are triggered one time only, not continuously)</p> <p>Offers immediate access to customer service agents and ability to emergency number</p>
MediSafe	Both	Free	Worldwide	<p>Synchronizes information to a “family pillbox”</p> <p>Shares information with caretakers who can be notified if patient has not checked into the app</p> <p>Shows daily medication list that can be checked off throughout the day</p>
Medi-Prompt	iOS	\$1.99	Worldwide	<p>Offers dynamic scheduling with maximum or minimum daily doses</p> <p>Works with multiple patients and multiple medications; includes password protection</p> <p>Offers scheduled or ad-hoc doses, calculated doses, regular intervals, or combinations</p>
MedMory	iOS	Free	Worldwide	<p>Sets visual and audio reminders for individual medications, including as-needed or unscheduled</p> <p>Tracks medication quantities, refill reminders, and adherence history</p> <p>Alarm may continue after taking medications; alerts may sound at wrong times</p>

Application	Compatibility	Cost	Availability	Features
MyMedSchedule	Both	Free	Worldwide	Records pictures and notes for medications with daily reminders
MyMeds	Both	Free	Worldwide	Tracks medication history, allergies, and immunizations for entire family with customizable reminders Shares information with pharmacist and primary provider and locates nearby pharmacies Requires registration at www.my-meds.com for use
PillMonitor	iOS	Free	Worldwide	Schedules reminder time, repeat date, and dosage with photos, notes, and history for each medication Shares medication list and history to primary care provider via e-mail
RxCase Minder	Android	Free	Worldwide	Stores information about multiple patients, caregivers, pharmacists, and primary care providers Available in multiple languages
RxmindMe	iOS	Free	Worldwide	Nine types of alerts that recur until dismissed Tracks remaining quantity, time to refill, and adherence history with password protection Exports data and history, saves medication pictures, and accesses FDA medication database

Source: American Pharmacists Association

Adherence management: role of pharmacists

Pharmacists play an essential role as the medication expert and are well-positioned to improve medication use in patients through individualized recommendations. Being trained in the pharmacology and pharmacokinetics of medication, pharmacists can proficiently guide patients and are capable of managing patients' medication therapy of chronic health conditions by virtue of their advanced clinical training in the preparation and suitable use of medications.

While designing and rolling out pharmacy focused programs that are personalised toward patients' requirements can provide significant professional, economic, and therapeutic rewards, implementation of these by pharmacies may seem daunting. However, (Kony-Whitepaper) outlines that with the advancement of technologies and the advent of mobile applications whether a pharmacy is small and independent, or has an expansive national network, a positive return on investment in a relatively short period of time can be realised by venturing into the medication adherence regime. The immediate benefits include:

- Patients when given regular reminders and refill notifications are less likely to neglect filling a prescription; this helps the pharmacy providing the alerts in retaining patients and getting reimbursements
- Patients who when engage with their pharmacists regularly are more likely to have additional prescriptions filled from the same place and they may engage in doing additional shopping at the store too.
- Regular interactions between pharmacists and patients with a chronic disease are more likely to develop a sense of patient responsibility, encouraging patients to visit the pharmacy more often.

Thus with the use of technology like smart phone apps independent, community-based pharmacies or retail pharmacies with established networks can reap significant benefits by engaging with their patients in their self-care and encourage greater patient loyalty.

Pharmacy driven apps

DiDonato et al., (2015) define a pharmacist-driven app as ‘the mobile technology set up by the pharmacist to ensure accuracy of patient information, to facilitate sharing of patient-centred health information and to allow open communication directly with the pharmacist.’ While prior studies like Dayer et al., (2013) and Bailey et al., (2014) have evaluated medication adherence apps for their features, usefulness and ability to support medication self-management. DiDonato et al., (2015) emphasises that it is particularly important to understand patients’ perception of these medication adherence mobile apps in terms of their benefits, barriers and desired features (Table 3).

Benefits of using a pharmacist-driven mobile app

Based on their empirical analysis, DiDonato et al., (2015) suggest that patient’s perceptions about the benefits of a pharmacy driven apps can be categorised into four main factors - accessibility, privacy, pros of appearance and beneficiaries.

Accessibility includes patients being able to communicate directly with their pharmacists by way of email or messaging features. Patients prefer the apps being set up for them by pharmacists and do not feel the apps are invasive of their privacy. The study also shows that while patients find the portability of health information beneficial they are willing to be educated and counselled by way of videos on medication administration. They perceive the benefits of pharmacy driven apps in terms of refilling of medications, reminder alarms, recording dosages and the ability to views statistics that tracks their adherence. In terms of the appearance, patients like photographs of the medications, a systematic outline of medications and statistics or graphs displaying their adherence. Moreover, the patient’s perception is that an integrated account that can be used by their family member or caregiver is another beneficial aspect that the apps can offer.

Barriers to using a pharmacist-driven mobile app

Along with outlining patients' perception about the benefits of pharmacists driven apps, DiDonato et al., (2015) also detail patient's concerns and the potential barriers in using pharmacist-driven mobile apps. While complexity of use of the apps is the most prominent of the patients concern, they are also anxious about the appearance, background, font size and colour of the apps. The app being hard to download, being bothered by advertisements and rearrangement of app features upon updates are also perceived by patients as barriers to using the apps. Additional usage concerns involved patients needing to manually upload their medications into the app; the displayed pictures of the medications may not match with their actual medicines.

Another barrier is cost, as patients are inclined to download only free apps or apps with minimal cost and are not keen to pay a recurrent fee. Privacy and security in terms of their mobile phone being stolen and their prescription information being accessed by others was another barrier. Similarly reliability in terms of connectivity or cellular coverage; breakage or malfunction of the app; phone battery being drained due to app usage are other barriers. Finally motivation is also perceived as a barrier by patients as they feel that the use of the apps may be time-consuming, there is a fear of technology usage, and some patients may have an attitudinal barrier and not want help with managing medications.

Table 3: Patients perceptions about the benefits and barriers of a pharmacist-driven mobile app

Benefits	Description	Barriers	Description
Accessibility	Being able to discuss things with the pharmacist without having to take up phone time	Complexity of using the apps	Using the app may be difficult
Information	Getting educated and counselled by way of videos on medication administration	Reliability	Breakage or malfunction of the app
Performance	Being reminded about refilling of	Cost	Having to pay a fee for downloading the app

	medications, set up of alarms, recording dosages		
Appearance	Ability to view statistics that tracks their adherence	Motivation	Not wanting to use something complex and time consuming
Beneficiaries	Providing integrated account that can be used by family member or caregiver	Privacy	Prescription information being accessed by others

Desired features of a pharmacist-driven mobile app

Prior research has also explored features patients look for when using mobile apps, these range from the appearance of the app to its customizability and functionalities (DiDonato et al., 2015). In terms of the apps' appearance, patients prefer being able to change the apps font size, colour and contrast. The ability to enlarge pictures of medications, setting alarms specific to certain medications and selecting a reminder ring tone of their choice are other preferences of the patients. While patients prefer having a step by step guide for the app usage, they also want to be able to print or email information from the app. Having provision to switch off part functionality of the app or have the app run in the background so it doesn't drain their phone battery and having a checklist to be able to refill all medicines at once, are some of the other desired features for a pharmacist-driven mobile app.

Mobile applications framework for pharmacies

With respect to the practice of pharmacies, mobile apps may be viewed as an efficient tool to achieve patient education and provide patient support, act as a communication aid and even facilitate informed decision making by healthcare providers. We put forward a framework of the potential interventions of a pharmacy based mobile app (Figure 1).

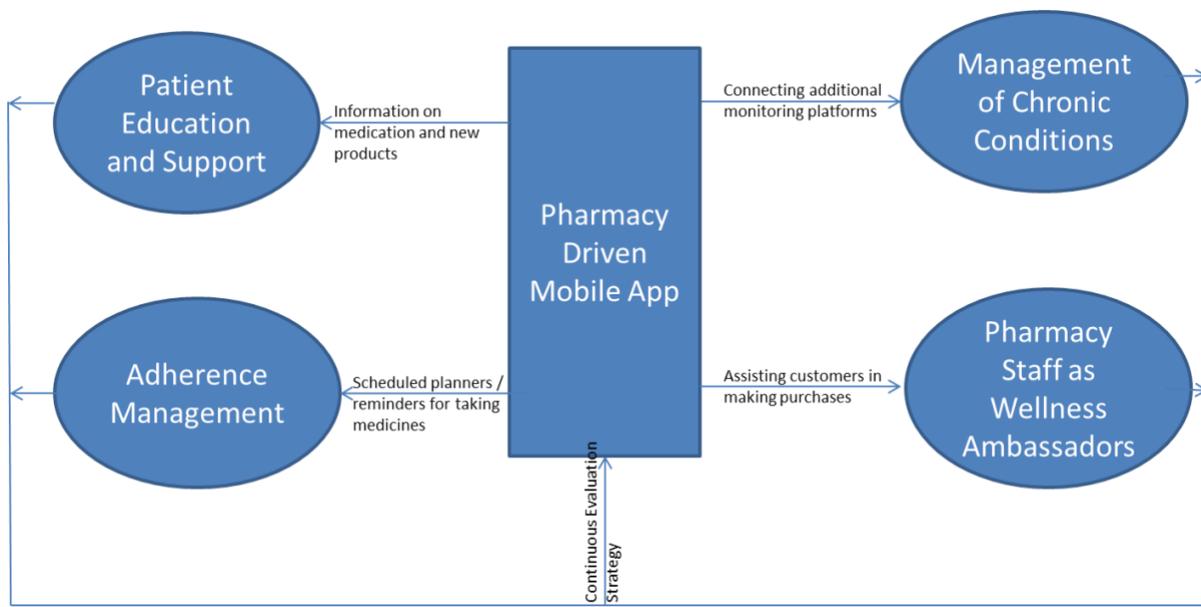


Figure 1: Mobile applications framework for pharmacies

As indicated in Figure 1, in the current scenario of increasing ongoing pressure on the health system and pharmacists assume extended roles, pharmacists based mobile apps have a potential role for improving and maintaining medication adherence, along with the measurement and advancement of health outcomes.

Implications

Adherence apps are economical, scalable, and accessible to anyone with smartphones and are be easily implementable as no separate devices or packaging is required. These present a potential strategy for pharmacists to recommend to non-adherent patients (Davies et al., 2014) Kony Whitepaper highlights their positive implications for both patients and the pharmacies themselves.

Key benefits to patients

- Medication reminders – These can help patients manage their medications. Alternatively pharmacists can enter medication information accurately on their behalf and send out reminders to ensure patients buy and adhere to their medication regime.

- Adherence reports – Reports can be generated within the app and pharmacists can send these on to the patients or their care givers informing about the patients adherence to medications or a lack thereof
- Automatic or one-tap refill requests – This solution provides patients the convenience of having an automated message sent to their pharmacists to initiate a refill procedure and thereby adhere to their medicines without a gap.
- Prescription plans and discounts – Patients can avail of cost-saving opportunities by way of alerts about discounts on drug purchases available on their medication adherence apps.
- Medication reference and education – Patient can access web-based guides for prescription medications using their apps. These also improve medication adherence by encouraging patients to proactively look for answers to their queries.
- Email the pharmacist – Patients can directly get in touch with their pharmacist electronically. By way of such communication tools patients can quickly clarify their queries without overburdening the on-site personnel.

Key benefits to pharmacists

- Drug ordering — periodic and ad-hoc – Pharmacists can benefit by time saving through the automatic and precise ordering capabilities of the mobile phone apps. Getting their patients to only scan the bar codes of their medications for purchases and only a click to order refills can result in customer satisfaction and a significant rise in repeat customers.
- Portable drug reference – Pharmacists can create educational leaflets/ pamphlets for patients according to their specific prescriptions, providing customised support to patients. The reference guide can also be cross-linked to the select wholesalers so that inventory of the required drugs can be maintained at the right price and quantity.
- Dosage calculator – Pharmacist can provide patients/ caregivers with a quick dosage calculator in the app to avoid potential medication prescription errors
- Secure patient communications – By communicating with patients through ‘email the pharmacist’ feature or secure messaging tools, pharmacists can establish a strong

relationship with their patients. Such rapport ensures ongoing refills and even new business through their patient's friends and family.

- Refill request management – Additional to the request refill feature for the patients, pharmacists can also have a simple reminder for themselves to contact the patients for refilling their prescription or for reminding that their prescription is due to be refilled.

Thus, as detailed above medication adherence apps have the potential to not only result in clinical benefits for the patients but can have increasing economic benefits for the entire healthcare system.

Conclusion

In conclusion, it can be asserted that medication adherence is one of the exceptional areas of health care policy regarded as a win-win for patients, providers, and payers alike. It signifies a remarkable opportunity for return on investment in an era of economic austerities and spiralling health care costs. Therefore positioning of strategies for medication adherence optimization is rapidly burgeoning and reporting effective outcomes and cost-savings. While future use of health related mobile applications is expected to increase in various healthcare settings, pharmacists are uniquely positioned in this scenario to leverage new technology to drive effective adherence strategies. Mobile applications are a valuable tool for patients, caregivers, and healthcare professionals and represent a key strategy that pharmacists can suggest to non-adherent patients and incorporate into their practice.

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