Brief report

# Development and release of a national immunization app for Canada (ImmunizeCA)

Kumanan Wilson [a,b,*], Katherine M. Atkinson [b], Greg Penney [c]

[a] Departments of Medicine and of Epidemiology and Community Medicine, University of Ottawa, Ottawa, ON, Canada
[b] Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, ON, Canada
[c] Canadian Public Health Association, Ottawa, ON, Canada

## ABSTRACT

Digital technology has created an opportunity to reenvision the traditional immunization paper record. We describe our experience developing a government endorsed mobile immunization record in Canada. The smartphone app, ImmunizeCA is designed to assist individuals in managing their own health information. It allows individuals to store their and their family's immunization records on their smartphone. The app, which is populated by data provided by the user, contains all 13 provincial and territorial schedules, immunization information and outbreak alerts on vaccine preventable diseases. Our experience suggests mobile apps can serve as a mechanism to empower users, increase participation in the process of immunization, potentially improve immunization rates and address jurisdictional obstacles. Key measures of success will include long term uptake, acceptability as an official record, enabling data flow permitting integration with immunization information systems and the ability to rapidly iterate to address changes to both immunization practice and mobile technology.

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Recently the Gates Foundation offered a challenge to reenvision the yellow card as many current formats fail to meet their intended purpose (Table 1) [1]. This call was prompted by the recognition of the importance of records to immunization coverage and public health efforts as well as serving as an important resource to inform health care providers and individuals of immunization status. They sought entries which improved the record, strengthened information systems and empowered workers and families to protect children from vaccine preventable diseases (VPD). This initiative attracted submissions from over 300 teams in 41 countries. Proposals of various formats were submitted to the competition including paper-based solutions, integrated platforms which featured digital technologies as well as mobile and SMS platforms for adaptability in both developed and developing worlds.

In Canada, we recognized a disconnect with parents living in a digital age while their child's vaccine information still resided on a paper record. We saw an opportunity to leverage mobile technologies to create a virtual immunization record which is managed via your smartphone. In response, the Ottawa Hospital Research Institute and Canadian Public Health Association (CPHA) launched one of the first government endorsed immunization apps which enables individuals to track their and their families' immunizations. We describe our experience as well as opportunities presented by this and similar apps to improve immunization programs in Canada and worldwide.

## 1. Genesis

The first version of the immunization app was designed solely for residents of the province of Ontario, Canada. "ImmunizeON" was released in November of 2012 for iPhone. The app created a custom profile for each child where immunization events could be recorded, thereby enabling parents to track and carry their children's immunizations on their mobile device. Interest in the app from both parents and public health officials eventually led to funding from the Public Health Agency of Canada (PHAC) to create a national version. As a requirement, this version had to be compatible with iOS as well as Android devices and contain all 13 provincial and territorial schedules and vaccine information from each jurisdiction in both Canadian official languages (French and English). To best serve a diverse population, the information contained in the app had to undergo plain language review for a Canadian grade 7–8 reading level. On March 20th, 2014 ImmunizeCA, the national version of the app, was released accompanied by a press release by the federal Minister of Health.

* Corresponding author. The Ottawa Hospital, Civic Campus, 1053 Carling Avenue, Administrative Services Building, Room 1009, Box 684, Ottawa, ON K1Y 4E9.
E-mail address: kwilson@ohri.ca (K. Wilson).

**Table 1**
Purpose of immunization records and how mobile solutions components can address them.

| Purpose of immunization records | Mobile solution component |
| --- | --- |
| A unique identifier that is intimately connected to the child | Potential to contain child photo, maternal name and birthday, as well as health card number or other unique identifiers |
| A source of critical information for health workers about the child's health and vaccination status, and what the child needs at each point of contact with the health system | Bidirectional data flow between vaccine recipient and provider either directly or via immunization information system |
| A source of critical information for families, such as date of next visit for vaccination | Immunization status page and calendar reminders can provide alerts when visits are scheduled and approaching |
| A source of critical information for household surveys, which many countries and policymakers rely on to validate coverage levels obtained from administrative data systems | Data flow from mobile platform to immunization information system. Survey administration or reminders can be delivered through the app |
| An educational tool for families to learn more about health interventions | Core content of the app and the possibility to augment in real-time |

## 2. Record keeping

The primary purpose of ImmunizeCA is to serve as an immunization record-keeping tool where individuals can digitally store their own as well as other individuals' immunization records. Upon opening the app, the user is presented with rotating banners on top of four quadrants which access different features of the app. The banners can be changed in real-time and could be used as a mechanism for public health officials to provide information rapidly to the public.

When creating a new profile, the app requests information on the individual's birthdate, sex and province/territory of residence. Based on this information and the currently recommended pediatric and adult vaccination schedules, a customized set of chronological immunization visits is created for that individual (Fig. 1a). For each visit, for example pediatric 2 month visit, the list of recommended, publically funded vaccines is displayed (Fig. 1b). The user indicates whether the vaccine was received and the date of vaccine receipt. Under each vaccine there is information on the diseases it protects against, the official public health fact sheet and quick plain language facts (Fig. 1c). Users can also flip their device to landscape orientation and a virtual immunization record is presented on the device. Users can elect to share this record through print or email functions.

## 3. Additional functionality

The app syncs with the users device's calendar for scheduling of upcoming vaccine visits and generate reminders as the next visit approaches. Under vaccination status, users can view when their next scheduled vaccine is, whether they have received their annual influenza vaccine, as well as when their last tetanus shot was received. Status is also available by vaccine preventable disease (VPD).

Users can identify outbreaks of VPDs in their vicinity through an embedded outbreak alert feature. The information, provided by HealthMap creates a map of the users' location and the location of the report of the VPD (Fig. 2) [2]. The user can then determine if the individuals whose records they track in the app are protected against the condition and access information on the VPD of interest. Furthermore, the app contains FAQs providing accurate answers to common questions about vaccination in an effort to combat misinformation on the Internet [3]. Basic security features were included such as backup to iCloud/Google drive as well as a recommended password protection option.

## 4. Potential advantages

The increasing fragmentation of vaccination provision, with an individual potentially receiving vaccination from several sources,
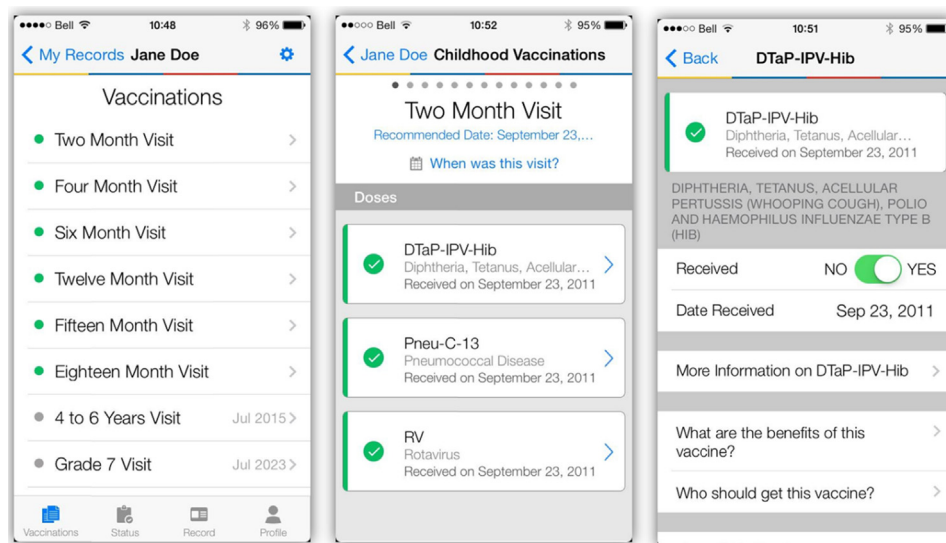


**Fig. 1.** ImmunizeCA presentation of pediatric schedules and recommended vaccinations. (A) An Ontario female schedule, broken down by chronological visits. (B) The two-month Ontario visit with each recommended vaccination. (C) The two-month DTaP–IPV–Hib vaccination page.
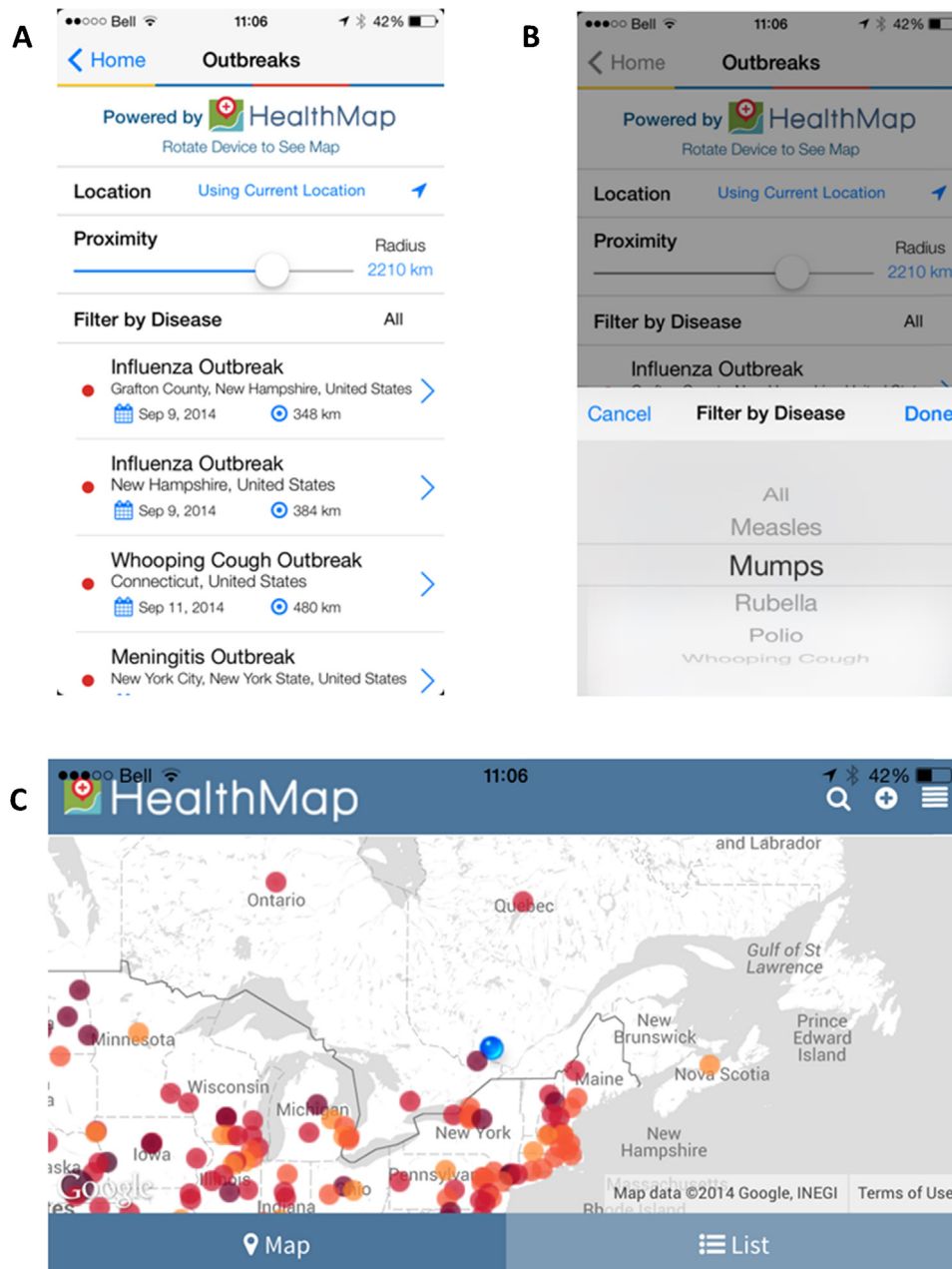
**Fig. 2.** The ImmunizeCA Vaccine Preventable Disease Outbreak Alert Feature, Powered by HealthMap. (A) All Outbreaks within a selected radius of user's location. (B) Feature which allows results to be filtered by disease of interest.

means that individuals' own record-keeping may provide the most accurate representation of their immunization status. Thus, empowering individuals to track their own immunizations digitally could complement and address gaps in provider driven record keeping. The use of mobile technologies also provides an opportunity to overcome jurisdictional challenges presented by increasingly mobile individuals [4]. Canada has 13 unique immunization schedules, most of which also have their own vaccine information sheets. The app guides individuals through the migration of their vaccine record when they move provinces. GPS location services, or the creation of province or city profiles could permit a form of "geo-fencing", where messaging could be tailored for the geographic region [5].

There is also a possibility that the app could assist in the measurement of vaccination coverage. Self-report has been found to be a sensitive and relatively specific indicator of vaccination status, particularly for immunizations given outside of traditional providers [6,7]. The app may also have an impact on vaccination rates through a variety of mechanisms. Providing accessible, accurate information on vaccination could encourage individuals to bypass other less reliable sources, such as the Internet, when searching for information on immunization. The app can also provide notifications and reminders, which have been shown to improve immunization rates [8–11]. Notifying individuals of VPDs in their vicinity can also help remind people of the importance of vaccination [12]. However, it is possible that the individuals that choose to use the app are mostly supportive of vaccination so its ability to influence the vaccine hesitant may be limited.

The current version of the app is designed to assist individuals to manage their own health information. Moving forward we envision data flow from the app to immunization information systems to be a critical component to its ongoing value and success. We

are currently piloting functionality that will permit individuals to send data from ImmunizeCA to public health authorities as well as report adverse events following immunization. We have developed proof-of-concept bar-code scanning using smart phones which will permit lot and global trade identification numbers to be linked to specific vaccinations when they are being transmitted to public health officials. Together, these features have the potential to improve the quality and comprehensiveness of the vaccine data [13].

## 5. Experience from app release

In the first ten months following release ImmunizeCA had 67,203 new users, 236,515 sessions and over 1.2 million screen views. Along the way, we have learned several lessons that may be valuable to other jurisdictions interested in a mobile solution for tracking vaccination records. First, we believe there is considerable value in releasing a product and rapidly iterating based on user feedback in a modified rapid application development methodology. Second, dissemination and uptake of an app is critical to its success, but can be a challenge. We have primarily relied on media stories, public health communication, as well as direct to consumer marketing strategies. We believe that effective dissemination will require the app serving as an official record and front line providers of immunization including physicians advocating its use. Another potential obstacle for uptake is low socio-economic status. We believe this is best addressed by creating an SMS based version for standard cell phones or a complimentary web based solution.

Ongoing evaluation will be focused on (1) identifying the most effective mechanism to raise awareness of the app (2) identifying individual predictors of app download/usage [14] (3) determining if the app can integrate with immunization information systems (IISs) and electronic medical records and (4) determining if the app can influence attitudes towards vaccination.

## 6. Conclusion

The advent of mobile technologies has created new opportunities for public health officials. One such opportunity is the creation of immunization apps (Table 1). Ultimately, success will be determined by long-term uptake data, its acceptability as an official record, ability to link with immunization information systems, and our ability to rapidly iterate to address new challenges while adapting to evolving mobile technology. As the World Health Organization has recently released customizable code that enables countries to create their own vaccination app [15], we hope our experience is of value to those who utilize this opportunity. We believe that some version of a mobile solution will be the future of immunization records both empowering individuals and improving immunization information systems.

## Conflict of interest statement

Both KW and KA are cofounders of Sigvaria Mobile Technologies Inc., the company which developed the ImmunizeCA app in partnership with the OHRI and CPHA.

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