



# Vaccination adherence: Review and proposed model



Asma A. Abahussin<sup>a</sup>, Ahmed I. Albarrak<sup>b,\*</sup>

<sup>a</sup> Biomedical Technology Department, College of Applied Medical Sciences, King Saud University, P.O. Box 10219, Riyadh 11433, Saudi Arabia

<sup>b</sup> Health Informatics, Research Chair of Health Informatics and Health Promotion, College of Medicine, King Saud University, Riyadh, P.O. Box 63709, Riyadh 11526, Saudi Arabia

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## KEYWORDS

Vaccine;  
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Design;  
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## Summary

**Background:** The prevalence of childhood vaccine-preventable diseases can be significantly reduced through adherence to confirmed vaccination schedules. However, many barriers to vaccination compliance exist, including a lack of awareness regarding the importance of vaccines, missing due dates, and fear of complications from vaccinations. The aim of this study is to review the existing tools and publications regarding vaccination adherence, and to propose a design for a vaccination adherence application (app) for smartphones.

**Methods:** Android and iOS apps designed for vaccination reminders have been reviewed to examine six elements: educational factor; customizing features; reminder tools; peer education facilitations; feedback, and the language of apps' interface and content. The literature from PubMed has been reviewed for studies addressing reminder systems or tools including apps.

**Results:** The study has revealed insufficient ( $n=6$ ) technology-based interventions for increasing childhood vaccination rates by reminding parents in comparison to the fast growth in technology, out of which are two publications discussed mobile apps. Ten apps have been found in apps stores; only one out of them was designed for the Saudi vaccination schedule in Arabic language with some weaknesses. The study proposed a design for a vaccination reminder app that includes a number of features in order to overcome the limitations discussed in the studied reminders, apps, and systems. The design supports the Arabic language and the Saudi

\* Corresponding author at: Health Informatics, Chairman, Medical Informatics and E-learning, College of Medicine, King Saud University, P.O. Box 63709, Riyadh 11526, Saudi Arabia. Fax: +966 14690798.

E-mail addresses: [asmabahussin@ksu.edu.sa](mailto:asmabahussin@ksu.edu.sa) (A.A. Abahussin), [albarrak@ksu.edu.sa](mailto:albarrak@ksu.edu.sa) (A.I. Albarrak).

vaccination schedule; parental education including peer education; a variety of reminder methods, and the capability to track vaccinations and refer to the app as a personal health record.

*Conclusion:* The study discussed a design for a vaccination reminder app that satisfies the specific requirements for better compliance to children's immunization schedules based on reviewing the existing apps and publications. The proposed design includes element to educate parents and answer their concerns about vaccines. It involves their peers and can encourage the exchange of experiences and overcome vaccine fears. In addition, it could form a convenient child personal health record.

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## Introduction

Adherence to national immunization schedules for children is essential to protect them from vaccine preventable diseases (VPD). However, the World Health Organization (WHO) has estimated that 1.5 millions of children are dying annually from VPD [1], indicating that compliance to the recommended vaccinations schedule is a challenge for health care systems. The main parental barriers to vaccination include confusion and difficulty in tracking vaccination schedules; lack of awareness regarding the importance of vaccines, missing due dates, and fear of vaccinations' complications and side effects [2–4]. In addition, it has been revealed that 32.9% and 26.6% of the reasons of infants missing vaccinations were due to prior reminders not being given to parents, and parents' forgetfulness respectively [5]. Several proposed solutions to these problems have been discussed in the literature from different aspects in order to increase the immunization coverage rate. For example, it has been found that patient reminders and recall systems are effective in improving immunization rates [6]. Many studies have considered different types of traditional patient reminding approaches, such as mailing and nurse home visits, in addition to discussing some strategies for educating patients about vaccines [2–4,7–13].

Technology and the new media could be effectively utilized to achieve better compliance with children immunization schedules. In fact, it has been found that one in four parents prefer using new technologies for vaccination reminders [14]. However, insufficient evidence is available on the use of social networks, email communication and smartphone applications to support adherence to children vaccination. This has been indicated by a systemic review study published in 2015 that reviewed nineteen interventions applying new media for increasing vaccine uptake and

immunization coverage [15]. The review study covered studies that investigated the role of: text messaging, smart-phone applications, YouTube videos, Facebook, targeted websites and portals, software for physicians and health professionals, and email communication. The included studies were summarized and critically appraised on the effectiveness of the interventions to promote vaccination uptake and increase vaccination coverage. It is evident from the results of this study that text messaging, immunization campaign websites, patient-held web-based portals, and computerized reminders increase immunization rates. On the other hand, not enough evidence was found for using smartphone applications in this field.

The aim of this study is to review the existing tools and publications regarding vaccinations adherence, and to propose a design for vaccinations adherence application (app) for smartphones.

## Methodology

The online app marketplaces for the two most commonly used smartphone operating systems (Android and iOS) were searched using the search terms "vaccine", "vaccination reminder", "vaccine reminder" and "immunization reminder". The search was conducted between the 14th and 20th of October 2015. The apps were included in the present review if they were designed for parents' use to remember and adhere to the children's main vaccination schedule.

PubMed was searched between the 5th and 10th of November 2015 for literature published between 2005 and 2015 using the search terms "vaccination reminder", "immunization coverage rate", "vaccine reminder", "immunization reminder". The search was for publications in the last ten years because the evolution of social media and apps almost started during this period. Articles

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