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## The Development of mWellcare, an mHealth System for the Integrated Management of Hypertension and Diabetes in Primary Care

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### Abstract

This paper describes development of mhealth application “mWellcare” for the integrated management of hypertension and diabetes in public primary health care settings. mWellcare application was developed in four phases: identifying gaps in usual care; identifying components of intervention; developing intervention; evaluating acceptability and feasibility through pilot testing. Final version of mWellcare application is capable of computing personalized evidence-based management plan for hypertension, diabetes and co-morbid conditions (depression and alcohol use disorder).

### Keywords:

Decision Support Systems, Clinical; Primary Health Care; Chronic Disease.

### Introduction

Cardiovascular diseases (CVD) and diabetes are among the leading causes of premature adult deaths in India [1]. Systematic reviews has shown that mHealth based Decision Support System (DSS) improves preventive care and physician’s clinical decision quality in hypertension and diabetes management[2]. The aim of this paper is to describe the steps and processes in the development of mWellcare, a complex intervention based on mHealth technology.

### Methods

We used the framework for the development of ‘complex’ interventions proposed by the Medical Research Council (MRC), United Kingdom[3]. Based on this framework, we followed these steps: 1) Identifying the gaps in usual care; 2) Identifying the components of intervention; 3) Development of intervention components; and 4) Evaluating acceptability and feasibility through pilot testing .

### Results

The mWellcare system platform is built with Python using django web framework, mobile application is driven by an XML application configuration layer with JavaRosa at the core and database is Couch DB. Standards used for its development are ICD 10 for diagnosis, LOINC for lab results ,

UIDAI (Unique Identity Authority of India) Aadhaar for patient identification, HL7 for messaging, CCD for clinical document exchange. It is used by primary care nurses and doctors and has the ability to: store and integrate longitudinal health records electronically; provide automated guideline-recommended treatment plan and life style advices tailored to patient clinical profiles; enables longitudinal patient monitoring and alerts to the need for changes in management; send out automatic short-messaging services (SMS)reminders and alerts to patients ; serves as data collection tool for remote quality assurance of NCD programs; and exports standards compliant healthcare data to relevant receiving healthcare systems. mWellcare system is currently in use in 40 community health centers in two states of India, Haryana in the north and Karnataka in the south.

### Conclusions

We have described the process of development of a mHealth intervention seeking to improve the integrated management of hypertension and diabetes in primary care level. The effectiveness and cost-effectiveness of the intervention is currently being evaluated in a cluster randomized controlled trial in India (trial registration number NCT02480062).

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