Review Article

Mobile health as a viable strategy to enhance stroke risk factor control: A systematic review and meta-analysis

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ABSTRACT

Background: With the rapid growth worldwide in cell-phone use, Internet connectivity, and digital health technology, mobile health (mHealth) technology may offer a promising approach to bridge evidence-treatment gaps in stroke prevention. We aimed to evaluate the effectiveness of mHealth for stroke risk factor control through a systematic review and meta-analysis.
Methods: We searched PubMed from January 1, 2000 to May 17, 2016 using the following keywords: mobile health, mHealth, short message, cellular phone, mobile phone, stroke prevention and control, diabetes mellitus, hypertension, hyperlipidemia and smoking cessation. We performed a meta-analysis of all eligible randomized control clinical trials that assessed a sustained (at least 6 months) effect of mHealth.
Results: Of 78 articles identified, 13 met eligibility criteria (6 for glycemic control and 7 for smoking cessation) and were included for the final meta-analysis. There were no eligible studies for dyslipidemia or hypertension. mHealth resulted in greater Hemoglobin A1c reduction at 6 months (6 studies; 663 subjects; SMD: −0.44; 95% CI: [−0.82, −0.06], P = 0.02; Mean difference of decrease in HbA1c: −0.39%; 95% CI: [−0.74, −0.04], P = 0.03). mHealth also lead to relatively higher smoking abstinence rates at 6 months (7 studies; 9514 subjects; OR: 1.54; 95% CI: [1.24, 1.90], P < 0.0001).
Conclusions: Our meta-analysis supports that use of mHealth improves glycemic control and smoking abstinence rates.

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1. Introduction

Each year nearly 795,000 new or recurrent strokes (ischemic or hemorrhagic) occurred in the US [1]. The data projects that an additional 3.4 million adult people will have a stroke by 2030 [2]. The overwhelming majority of strokes can be prevented via optimal vascular risk factor control. Diabetes mellitus, hypertension, hyperlipidemia, and smoking are all major modifiable risk factors to prevent first-ever strokes as well as recurrent strokes [3,4]. Overall, risk factor control has been improving over the years. However, there is still room for improvement, for example, only 30% recent stroke survivors have blood pressure (BP) controlled ≥ 75% of the time [5]. Lack of medication adherence is a major risk factor for poorly-controlled hypertension [6]. Mobile health (mHealth) involves the use of mobile and wireless devices to improve health outcomes, health care service, and health research. Generally mHealth comprises three categories: Short-Message-Service (SMS) based interventions, smartphone application interventions and social media interventions [7,8]. mHealth has the potential to reach broad populations, including the six billion mobile phone users worldwide [9]. Therefore, mHealth may provide a direct avenue to support recommended therapeutic lifestyle changes and foster improved medication adherence.

In this study, we aim to examine the potential role of mHealth on vascular risk factor control, including diabetes mellitus, hypertension, hyperlipidemia, and smoking, by systematic review and meta-analysis of published randomized-controlled clinical trials on these topics.

2. Methods

This systematic review and meta-analysis is in accordance with the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis: The PRISMA Statement [10].

2.1. Study search

We searched PubMed from January 1, 2000 to May 17, 2016 using keywords: "mobile health," "mHealth," "short message," "cellular phone," "mobile phone" and "stroke prevention and control" to investigate the role of mobile in stroke prevention. Next, we used keywords: "mobile health," "mHealth," "short message," "cellular phone," "mobile phone," "diabetes mellitus," "hypertension," "hyperlipidemia" and "smoking cessation." Then we screened for clinical trials published in English, which investigated the effects of mHealth on vascular risk factor control.

2.2. Study selection

We assessed full-text articles for eligible studies. Inclusion criteria were: (1) adults (≥ 18 years old) being treated for diabetes, hypertension, and hyperlipidemia; age ≥ 16 years old in smoking cessation; (2) a minimum of 6-month follow-up; (3) randomized controlled clinical trials. We expanded the inclusion criteria to age ≥ 16 years old for smoking cessation studies because there have been several large-scale studies including older adolescents. Exclusion criteria were: (1) studies
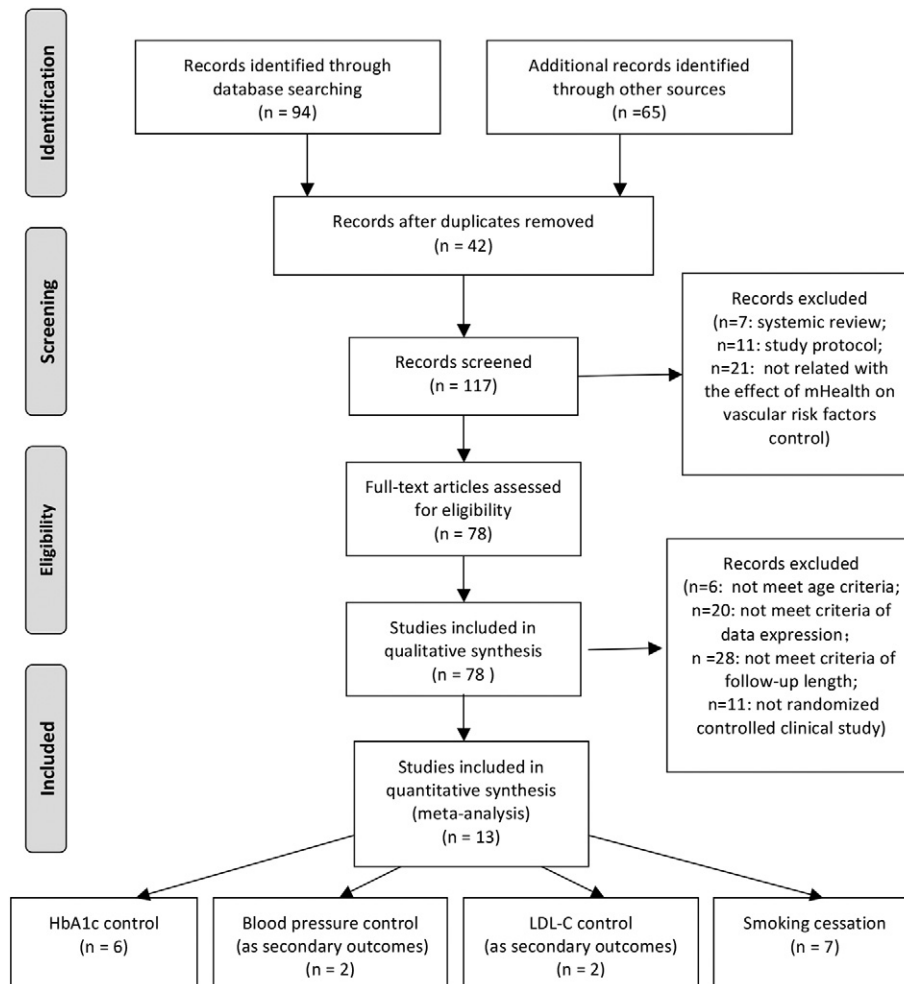

Fig. 1. Data flow of study selection.