Potential Use of Personal Health Records in Managing Hypertension: A Systematic Review

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Abstract

Hypertension is a major problem in both developed and developing countries. In 2015, worldwide cases of hypertension reached 1.13 billion people, and in 2025, it is expected to increase to 1.5 billion people. Every year, 9.4 million people die from hypertension and complications, but hypertension could be prevented by risk control. This literature study aims to assess the potential use of personal health records to manage hypertension. The method used in this research was the systematic literature review following the PRISMA protocol. Scientific articles were obtained from five electronic databases, namely PubMed, JSTOR, EBSCOhost, ProQuest, and Google Scholar, with publication dates between 2009 and 2019. Initially, we obtained 103 articles, but after screening there were only four articles that met the requirements for this study. The articles, which come from the USA, Canada and France, show the potential use of PHRs to manage hypertension because of their ability to keep a record of complete health data. There was a decrease of 5.25 diastolic BP points from 25.7% of active users. Based on this data, the tool can assess user level of hypertension risk. A further benefit of the PHR as a mobile application tool is the potential to increase awareness of and encouragement to engage in healthy behaviors so the risk of hypertension can be managed. The PHR is a tool to monitor physical exercise, diet, weight and the extent to which hypertension has been controlled based on blood pressure readings, examination results and related laboratory results.

Keywords: *Hypertension; personal health record; risk prevention; hypertension management*

Introduction

Hypertension is a major medical problem in developed and developing countries. It is the most common risk factor for cardiovascular disease, which is the number one cause of death in the world[1]. Hypertension is known as the silent killer because the symptoms are usually undetectable. People often do not know they have hypertension and only discover it when complications occur. A person is said to suffer from hypertension if systolic blood pressure is equal to or above 140 mmHg and diastolic pressure is equal to or above 90 mmHg[2].

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Hypertension cases continue to increase, and every year approximately 9.4 million people in the world die from hypertension and its complications[3]. World Health Organization (WHO) data in 2015 showed that approximately 1.13 billion people worldwide suffer from hypertension, and it is estimated that this will increase to 1.5 billion people by 2025[4]. In Southeast Asia, there are as many as 1.5 million deaths per year due to hypertension, and one-third of the population suffers from hypertension requiring treatment, which can lead to increased health costs[5].

Hypertension is a major challenge in Indonesia, where the prevalence increased from 25.8% in 2013 to 34.1% in 2018[6]. Based on this data, only one-third of hypertension cases were detected. Hypertension is often found in patients 15 years or older, and the finding is closely related to lifestyle. As many as 36.3% of people with hypertension are smokers, 93.5% consume a decreased amount of fruits and vegetables, 52.7%

consume more than 2000 mg/day of salt, 15.4% suffer from obesity, and 26.1% are not physically active[7].

In Indonesia, especially in big cities, there has been a shift in eating patterns, which has led to an increased use of fast food and preservatives, which are known to have a high salt and saturated fat content and a lower fiber content. By knowing the symptoms and risk factors of hypertension, patients can be expected to participate in prevention and management with a modified diet and lifestyle or medication so complications can be avoided[8]. Risk factors of hypertension that cannot be changed/ controlled are age, gender, family history and genetic factors. Risk factors that can be personally controlled are smoking habits, salt consumption, saturated fat consumption, alcohol use, obesity, lack of physical activity, stress and estrogen use[9].

Because of the large numbers of people affected, researchers are interested in building a PHR prototype design, which will be an instrument for personalized health care and help to prevent the risks of hypertension. The latest technological developments have been very supportive for developing application of PHR that reside on mobile device. Using PHRs could improve medication compliance and provide increased availability of patient information related to hypertension. Hypertension sufferers who use PHRs may then be able to control their diets, increase physical activity and participate in various other prevention efforts.[10]

This study aims, first, to assess the benefits of using a PHR to prevent hypertension risks and overcome the condition. The second aim of the study is to learn what requirements must be fulfilled by a PHR application so users can enjoy the benefits.

Method

The method used in this research was a systematic literature review, in which several search strategies were used to identify relevant studies. A systematic search among databases was performed to identify articles that met the inclusion requirements.

Eligibility Criteria

In order to be included, the articles had to meet six criteria: 1) Included in academic journals found in online databases PubMed, JSTOR, EBSCOhost, ProQuest, or Google Scholar, 2) Published in English, 3) Appropriately published as journals, articles, original studies, theses, systematic dissertations or reviews, 4) Available without charge, 5) Published between 2009–2019, and 6) Topic was hypertension management using PHRs and was published in the field of health informatics.

Search Strategy

A total of 103 articles were identified in PubMed, JSTOR, EBSCOhost, ProQuest, and Google Scholar. A duplicate check using Mendeley identified that 100 articles were free of duplications. After the inclusion criteria were applied and any articles that could not be accessed because of a payment requirement were eliminated, four articles were chosen for further analysis.

In searching for articles about PHRs used for hypertension management, the population was "patients with hypertension." To find related articles according to inclusion criteria, this study used several PICO keywords, namely "hypertension" AND "PHR" OR "Personal Health Record" AND "Prevention and Risk of Hypertension." From this process, there are articles matched: 11 PubMed articles, 38 JSTOR articles, 32 EBSCOhost articles, 19 ProQuest articles and 3 Google Scholar articles.

Below are details of the search strategies carried out in five online databases.

Details of the search strategy carried out in PubMed: "hypertension" AND "PHR" OR "Personal Health Record" AND "Prevention and Risk of Hypertension," published between 01/01/2009 and 04/13/2019.

Details of the search strategy carried out in JSTOR: "hypertension" AND "PHR" OR "Personal Health Record" AND "Prevention and Risk of Hypertension," published between 2009 and 2019.

Details of the search strategy carried out in EBSCOhost: "hypertension" AND "PHR" OR "Personal Health Record" AND "Prevention and Risk of Hypertension," published between 2009 and 2019, published in English and publication area of health informatics.

Details of the search strategy carried out in ProQuest: "hypertension" AND "PHR" OR "Personal Health

Record" AND "Prevention and Risk of Hypertension)," published between 2009 and 2019, published in English and publication area of information technology.

Details of the search strategy carried out in Google Scholar: "hypertension" AND "PHR" OR "Personal Health Record," published between 2009 and 2019, research articles.

Results

This study revealed four articles published in the US, Canada and France that met the requirements for analysis. The research designs used in these articles included qualitative, descriptive analysis, randomized trials, random effectiveness trials, and interventions. In general, the purposes of these four articles were almost the same namely to improve self-care in hypertensive patients by encouraging medication compliance, observing changes in biological outcomes, empowering patients, monitoring the quality of care and tracking prescribed care schedules.

The articles reviewed demonstrate benefits to managing hypertension by using a PHR. One article showed that positive health outcomes result from using a PHR application. Current technological advances are useful for developing flexible platforms that contribute to improved patient self-care. The following are the detail information about the studies.

The first article was entitled 'Using Electronic Personal Health Records to Empower Patients with Hypertension', published in 2011 in the US using qualitative methods and randomized group trials. The aim of this study is to increase PHR by including patient suggestions and examining their impact on patients. The results of this study reveal that using PHR affects patient's blood pressure, empowerment, satisfaction with care and use of health services, and available information indicates a decrease in diastolic blood pressure. This result is related to the frequency of using PHR, which is influenced by a younger age with greater computer skills and a more positive provider communication rating. The conclusion of this article is that access to web portals and PHR is very meaningful if providers and facilities can integrate PHR into individual clinical practice settings and services so that doctors and patients can collaborate to improve health information.

The second article, titled 'Personal health records and hypertension control: randomized trials', was published in 2012 in the US using the effectiveness of randomized trials. The purpose of this study was to examine the impact of PHR on patients with hypertension, measured by changes in biological outcomes, patient empowerment, and patient perceptions of the quality of care because PHR user levels are still low. The results of this study are the involvement of patients in controlling personal health, increasing patient activity for healthy living behaviors, and making it easy to obtain health information. With a decrease of 5.25 diastolic BP points from 25.7% of active PHR users, it was determined by observing the patient's activity, medical utilization, and how the patient felt. The conclusion of this article is that patients are given access to the empowerment of PHR experience and clinical interventions designed to encourage the use of PHR for the treatment of hypertension.

The third article entitled 'Changing the management of hypertension using mobile health technology for remote monitoring and self-care support', published in 2013 in Canada using the intervention method. The aim of this study is to improve patient self-care and to encourage interventions that depend on the patient's continued adherence to the prescribed monitoring and treatment schedule. The constraints of this study are that PHR voice messages for patients are limited, do not adhere to blood pressure measurement schedules at home, and remote monitoring of blood pressure has not been done. The results of this study are that eHealth helps by setting treatment goals, assessing response to patient therapy, monitoring deviations from health control, and motivating patients to adhere to treatment. This application undergoes rigorous and precise usability testing. Advances in mHealth technology can improve patient self-care. For successful interventions, the mHealth application depends on patient compliance with prescribed monitoring and treatment schedules. The conclusion of this article is that for hypertensive patients, self-care is very important in controlling blood pressure properly. It is important to make the right lifestyle choices and adhere to the prescribed treatments.

The fourth article is titled Patient Port Portal Electronic Health Record in CKD and Hypertension Management: Meaningful to Use? 'Which was

published in 2015 in France using a descriptive analysis method. The aim of this study is to facilitate patient involvement in establishing PHR for various chronic conditions. The obstacle of this research is that PHR has limited educational material about health and there is no interactive feature that allows patients to enter monitoring and development information from time to time. The results of this study showed that of the participants studied, 39% accessed the portal, and 0.80% used it to schedule meetings or review laboratory test results. Drug information was reviewed by 77%, and 65% requested refills. Less than a third of participants use the portal to communicate with nephrologists regarding medical advice. The conclusion of this article is that various forms of technology have been used to increase outreach to patients with complex medical problems. The most successful interventions have been shown to improve patient communication with providers, patient satisfaction and clinical outcomes.

Discussions

Why is the Use of PHRs Especially Beneficial for Hypertensive Patients?

Hypertension is a health problem commonly found in Indonesia, where about one in four people are estimated to suffer from this disease. Efforts to prevent and overcome hypertension problems in the community still have many obstacles[11]. With the advancement of information technology, PHRs can be an alternative solution for the community to manage this chronic disease. PHRs are mobile applications, so they are very user-friendly and flexible in that they can be used anywhere and anytime.

Patient data obtained through the mobile application can be received in real time by health workers, so hypertension management can be more effective. Mobile-based PHR applications will support the compliance of users in managing chronic diseases[12]. Mobile applications can also greatly help hypertensive patients in increasing medication compliance[13].

The main functions of a mobile application in chronic disease management include: 1) Secure message services, 2) User access to health education, 3) Examination of drug interactions, 4) Monitoring of patient health behaviors, 5) Electronic medical record functions, and 6) Daily records of activities. Patients can use the data recorded in a PHR to communicate with doctors or nurses.[14]

In the PHR usage test, patients who registered were given a unique username and password and were trained in the function of the PHR, including access, entering data and finding clinical information.

What Requirements Must be met by the Personal Health Record Application so Users Can Benefit?

The four articles reviewed outlined the requirements that must exist in the PHR application so patients can easily track and send health information, and so it is easier for patients to get involved in accessing health records. The application must be associated with information that comes from outside the medical record and have storage so data is more concise and can be displayed quickly according to patient needs. This will facilitate patient health reporting and work automatically with data quality and information standards. In that way, data can be controlled and integrated with supporting software in PHR applications.[15]

The design of Android-based PHR applications for hypertension management is dependent on hardware, namely Android phones, laptops or PCs. These applications can be used by health workers in health services, on servers and internet networks, through modems and local area networks (LANs)[16]. Software can be designed using programming languages Java or Python and be connected to databases with access to general data, medical histories, physical examinations, laboratory data and other information[17].

Conclusions

PHRs as mobile applications can be auxiliary tools for patients managing hypertension. Based on the articles reviewed, PHRs can encourage users to participate in carrying out healthy living behaviors. PHRs can be tools to monitor physical exercise, eating behaviors, weight control, and the extent to which hypertension has been controlled based on measures such as blood pressure and related laboratory results. This research should be continued to develop more PHR prototypes, and the use of PHRs should be tested to determine how they can be used to control hypertension.

Ethical Clearance: No ethical approval was required since this is literature study and there is no impact on humans.

Conflict of Interest : The authors declare that there is no conflict of interest.

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