REVIEW ARTICLE

The Effectiveness of Self-management Combined Telemonitoring for Patients With Hypertension: An Integrated Review

Eldawati Eldawati[1,2], Faridah Mohd Said[1], Nur Syazana Umar[1]

[1] Faculty of Nursing, Lincoln university College Malaysia, Malaysia
[2] Faculty member, Sekolah Tinggi Ilmu Kesehatan Karawang/Horizon Karawang, Indonesia.

ABSTRACT

Introduction: Digital health intervention and mobile technologies for self-management of chronic health condition is gaining popularity in health care management. The purpose of this review was to assess the efficacy of self-management paired with telemonitoring in hypertensive individuals. **Design:** The review was conducted using integrated reviews. Data Sources: Databases were searched through PubMed, PsycINFO, EMBASE was undertaken using different keyword combination. Searching was conducted on 8 March to 19 July 2020. **Review methods:** For qualitative investigations, McMaster critical analysis was used, while for quantitative studies, the Critical Appraisal Skills Program was used. The review's quantitative and qualitative data were mostly good methodologically. However, the most significant limitations were small sample numbers and the missing of controls, which had a major effect on the study's generalizability. **Results:** The initial search resulted in 703 articles. Following rigorous appraisal, nine final pieces were deleted, leaving six for inclusion in the review. The methodological quality of the majority of the quantitative research included in the review was satisfactory. All studies have reported that self-management combined with telemonitoring could effectively reduce blood pressure and cost-effective. **Conclusion and Impact:** According to this analysis, self-management paired with telemonitoring could be a promising approach to controlling blood pressure in hypertensive patients. The healthcare policy may need to integrated this approach and facilitate for future development to help patient's hypertension could manager their disease and reduce mortality.

Keywords: Self-Management, Telemonitoring, Hypertension, Review

Corresponding Author:
Eldawati Eldawati, M. Kep
Email: eldawati415@gmail.com
Tel: +62267-412480

INTRODUCTION

Hypertension is a major cause of premature death worldwide, and it is a global public health issue. (1,2). Globally, hypertension is anticipated to affect 26 percent of the world's population (972 million people), with the incidence expected to climb to 29 percent by 2025, primarily due to economic development in emerging countries. (3). Men are more likely than women to have high blood pressure (47%) and just roughly one in every four persons (24%) has their condition under control. (2,4). According to research, it is one of the biggest risk factors for mortality and morbidity, with around 69 percent of people suffering from their first heart attack, nearly 77 percent of those suffering from their first stroke, and 74 percent of those suffering from congestive heart failure(2). Therefore, controlling blood pressure becomes essential for reducing the burden of high blood pressure-related disorders.

Self-management of chronic conditions can be described as the measures an individual takes to control his or her own state (5). Self-monitoring is connected with small but significant reductions in blood pressure, but it is also cost-effective and well-liked by patients. (1,5). Self-management involves understanding one's own condition and actively participating in treatment plans, making different lifestyle choices, such as eating habits, exercise options, and living conditions, and monitoring one's own symptoms (4,6). Patients are advised to carefully monitor their blood pressure while on medications, comply with changes in lifestyle, and manage their body mass index (BMI) (maintaining a BMI of 18.5 to 24.9 kg / m2), adoption of healthy eating habits

(consistent with dietary hypertension (DASH) diet), reduction of sodium intake in diet (consuming no more than 6 g of salt per day), at least 30 minutes of regular physical activity per day and periodic physical activity for at least 30 minutes per day and moderate alcohol intake (Most men should limit their alcohol consumption to no more than two drinks per day, while women and those with lower body weights should limit their alcohol consumption to one drink per day) (7). Such treatments are based on evidence and have shown a decrease in blood pressure and regulation of hypertension (8,9). Instructions for medication will give the dosage, length of treatment, and other information on the different drugs. The recommendation is that if the goal of blood pressure is not reached through lifestyle changes, then proper medications should be used and optimized based on the patient's condition (7).

Digital health intervention and mobile technologies for self-management of chronic health condition is gaining popularity in health care management. Mobile health (mHealth) is a way of managing chronic lifestyle diseases such as obesity and diabetes by supporting people's efforts to change their behaviours (5,10). Several studies reported benefits of using mHealth solutions for blood pressure management. An alert that provides medication reminders automatically has been demonstrated to enhance adherence and blood pressure rates in high-risk hypertensive patients. (11). Similarly, another studies reported that mobile phone-based systems can help improve blood pressure (Parati et al., 2008, 2018; Kaplan et al., 2017). There is a growing body of self-telemonitoring intervention research, although it is limited to single illnesses such as diabetes, hypertension, or heart failure (HF) (8,10,16). Various studies and systematic reviews have shown that using self-monitoring treatments to manage chronic illnesses results in improved health outcomes and significant cost savings (16). Furthermore, a study in hypertension found that home telemonitoring can provide reliable and valid data while also being well accepted by patients. (12).

However, self-management support system research has concentrated almost entirely on preventing chronic diseases, like cardiovascular disease (CVD) and heart failure (although some review papers have addressed mental conditions such as schizophrenia and depression as well). Several past studies established that the advantages of integrating mobile healthcare solutions into primary care are equal to, one another, in that they increase the number of patients who can access health care and improve the quality, while also boosting patient involvement. A narrative analysis was used to describe the evidence for using mHealth devices to aid in hypertension self-management. The study concluded that the intervention group's SBP and DBP were lower than those who got standard treatment. Lu et al (17) performed a meta-analysis of 11 randomized controlled trials (RCTs) and concluded that mHealth is an important tool for blood pressure management using only quantitative methods. Another research discovered that mobile health self-management strategies improved blood pressure control, self-management behaviour, and medication adherence (18). Previous research suggests that only a small numbers of apps will be useful and those lacking evidence as well as security measures (19). Others have looked into the intervention's substance, the research population, and the economic assessment (20,21).

We conducted a systematic assessment of the available evidence to assess the efficacy of self-management paired with telemonitoring in hypertensive individuals with the following two goals: (1) To determine whether self-management combined with telemonitoring improves blood pressure control and medication adherence in hypertensive people. (2) To assess the costs of self-management support for the delivery of mHealth therapies for persons with hypertension. (3) To examine user preferences for implementation self-management integrated with telemonitoring, including enabling and barrier elements.

METHODS

Design

The review adhered to the comprehensive review approach proposed by (22). The method was adopted for a comprehensive assessment and critical evaluation of research papers in order to explore the focus of interest both quantitative and qualitative (22).

Search methods

Primary research publications examining the effectiveness of self-management paired with telemonitoring among hypertensive people were identified through a search of databases in December 2020. A PubMed, PsycINFO, and EMBASE search was conducted using combinations of the following terms: hypertension* or hypotension* or hypertensive or "blood pressure" or "elevated blood pressure" or "high blood pressure" AND self-management* or self-monitoring AND telemedicine* or telehealth or eHealth* or "e health" or e-health or mHealth* or "m health" or "m-health" In addition, a thorough review of the reference lists of the included studies was conducted.

Search limits

The search was restricted to the English language only. Unlike the last search, this one was not restricted to certain publication dates.

Inclusion criteria

Articles were considered for inclusion if they reported on primary studies and met the inclusion criteria listed: (1) adults with hypertension as their primary diagnosis; (2) the intervention included both self-management and telemonitoring. (3) As outcomes, clinical data for SBP or DBP, or both, drug adherence-related result, or improvement in self-management behavior were all documented. Research methodologies include observational experiments, intervention studies, qualitative investigations, analysis protocols, and designs.

Exclusion criteria

The following articles were excluded: (1) patients with hypertension who were not the primary participants; (2) hypertension during pregnancy; and (3) papers written in a language other than English were comitted. (4) thorough or extensive literature reviews, as well as analytical or descriptive writings

Search outcomes

The initial search produced 703 results. Other sources have found two more records and removed 40 duplicates. Using the inclusion criterion, the first author (EE) examined the remaining 663 papers for relevance. The outcomes of this step of the process were then shared for discussion with the other writers (FMS, SBU). After evaluating the titles and abstracts, 618 items were discarded, leaving 45 full-text papers to be examined. Thirty people did not match the criteria for inclusion, thus the remaining 15 were scrutinized. After critical examination, the ninth paper was eliminated from consideration, and the remaining six were forwarded on for review. (Figure 1).

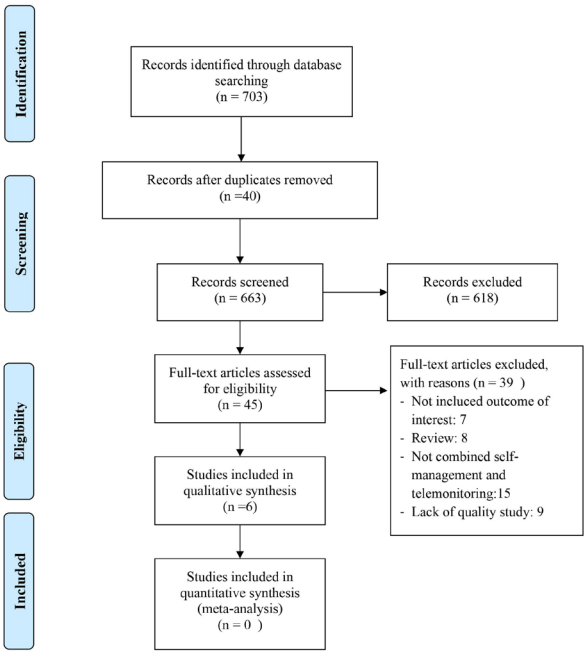

Figure 1 : PRISMA.

Quality appraisal

For qualitative investigations, McMaster critical analysis was used, while for quantitative studies, the Critical Appraisal Skills Program was used. (23) (24). The McMaster rigorous review entails formulating a goal, conducting a review of literature, implementing an investigation, undertaking selected studies evaluating effectiveness of interventions, design of the study, materials, and the findings in which these must be integrated in order to to draw potential sub-questions. In CASP and McMaster's assessment, we utilized a different technique in obtaining the documents. Every component was allocated one score, with a maximum total score of 15. A total of eleven elements are discussed in the CASP tool, such as: the purpose of the study; the method used; the recruitment process used; data collecting; evaluation of the investigator connection; ethical issues; statistical analysis; findings; and overall value. These questions are offered with either a 'Yes' or a 'No' answer option. Each question was graded on a scale of one to ten, with a maximum score of ten points. The review's quantitative and qualitative data were mostly good methodologically. However, the most significant limitations were small sample numbers and the missing of controls, which had a major effect on the study's generalizability.

Data abstraction

Two authors collaborated on data abstraction (EE, FMS). Each study was carefully examined and then read through multiple times, at which point information relevant to it was abstracted and facts were gathered.

Data synthesis

The results were organized and summarized by means of a descriptive coding method. (22). These scripts were initially created by the primary author (or co-editors (EEs) and peer-reviewed) and then validated in real life through observations or experiments (FMS, SBU). This was done in order to increase transparency in the review process, which will help to encourage fairness and uniformity.

Ethical Clearance

This study was approved by Research Ethics Committee, Departement of Nursing, Sekolah Tinggi Ilmu Kesehatan Karawang No. 13/KK25.003.11.20/KEP/2020

RESULTS

Characteristics of included studies

All studies were conducted in the United Kingdom (see Table I). Five of the investigations were quantitative, with one being qualitative. The leading Self-management integrated telemonitoring mobile application was used to transmit blood pressure data

Table I : Methodology characteristics of included studies

Author, years/ Country	Aim	Study design	Sample	Instrument	Quality appraisal
Grant et al., 2019/UK	Evaluation of facilitators and barriers to self- and telemonitoring interventions for hypertension within the Telemonitoring and Self-monitoring in Hypertension (TASMINH4) trial	Mixed method study	- Patients aged >35 years with uncontrolled hypertension, <140/90 mmHg - Purposive sample - n=40 participants, 23 patients and 13 healthcare professionals	-	12/15 (McMaster)
Kaambwa et al., 2014/UK	To assess the long-term cost-effectiveness of self-monitoring and telemonitoring of blood pressure measurements	Prospective RCT	- Patients had to be aged 35–85, have a blood pressure at baseline of over 140/90 mmHg, be receiving treatment for hypertension with two or fewer antihypertensive drugs	Automated sphygmomanometer	13/15 (McMaster)
McManus et al., 2018/UK	To assess the efficacy of self-monitored blood pressure, with or without telemonitoring	Parallel randomized controlled trial	- Hypertensive patients older than 35 years, with blood pressure higher than 140/90 mmHg - Randomly assigned (1:1:1) to telemonitoring group, self-monitoring blood pressure with telemonitoring (telemonitoring group), or to usual care	- Systolic and diastolic - Medication Adherence Rating Scale - EQ-5D-5L	13/15 (McMaster)
McManus et al., 2010/UK	To assess whether self-management by people with poorly controlled hypertension resulted in better blood pressure control compared with usual care	Prospective, randomized open trial	- Hypertensive patients older than 35 years, with blood pressure higher than 140/90 mm Hg. - Randomly assigned (1:1:1) to telemonitoring group, self-monitoring blood pressure with telemonitoring (telemonitoring group), or to usual care. - N=480	- Automated sphygmomanometer - State-Trait Anxiety Inventory	13/15 (McMaster)
Monaha et al., 2019/UK	To assess the cost-effectiveness of self-monitored blood pressure, with or without telemonitoring	Randomized controlled trial with a Markov patient-level simulation model	- Hypertensive, aged >35 years, with a clinic BP >140/90 mm Hg.	- Quality adjusted life years (QALYs) (EQ-5D-5L)	12/15 (McMaster)
Stoddart et al., 2015/UK	To compare the costs and cost-effectiveness of managing patients with uncontrolled blood pressure (BP) using telemonitoring versus usual care from the perspective of the National Health Service (NHS)	Within trial post hoc economic evaluation of data from a pragmatic randomized controlled trial using an intention-to-treat approach	- 401 primary care patients aged 29–95 with uncontrolled daytime ambulatory blood pressure (ABP) (≥135/85, but <210/135 mm Hg) - A convenience samples - n= n=46 (response rate:86%)	- Validated automated sphygmomanometer (Stabil-O-Graph mobile, IEM, Germany). - Morisky medication adherence scale - EuroQol-5D - HADS anxiety and depression score	12/15 (McMaster)

Table II : Summary of findings of included studies

Author, years/ Country	Intervention	Results
Grant et al., 2019/UK	Self-monitoring with telemonitoring (self-monitoring plus sending readings via an SMS text-based telemonitoring service with web-based data entry back up —mHealth solution)	Four key implementation priority areas concerned: acceptability of self- and telemonitoring to patients and HCPs; managing data; communication; and integrating self-monitoring into hypertension management (structured care).
Kaambwa et al., 2014/UK	Participants in the telemonitoring group were trained to send readings via a simple free SMS text-based telemonitoring service with web-based data entry back-up Patients used a color traffic light system to code these readings as green (below target but above safety limit), amber (above target but below safety limits) and red (very high or very low).	Self-monitoring with self-titration of antihypertensives and telemonitoring of blood pressure measurements not only reduces blood pressure, compared with usual care, but also represents a cost-effective use of health care resources
McManus et al., 2018/UK	Participants in the telemonitoring group were trained to send readings via a simple free SMS text-based telemonitoring service with web-based data entry back-up	After 12 months, systolic blood pressure was lower in both intervention groups compared with usual care.
McManus et al., 2010/UK	Participants were trained to monitor their own blood pressure for the first week of each month and to transmit to an automated modern device (i-modem; Netmedical, De Meern, Netherlands). Two self-measurements were made each morning with a 5-min interval A color traffic light system was used by participants to code these readings as green (below target but above safety limit), amber (above target but below safety limits) and red (outside of safety limits).	From baseline to 12 months, systolic blood pressure decreased by 17.6 mm Hg (14.9–20.3) in the self-management group and by 12·2 mm Hg (9.5–14.9) in the control group.
Monaha et al., 2019/UK	Patients in the self-monitoring alone group were trained to self-monitor their own BP by a nurse and asked to post the readings to their practice every month	Self-monitoring plus telemonitoring was the most cost-effective strategy (17 424 per quality-adjusted life year gained) compared with usual care or self-monitoring alone.
Stoddart et al., 2015/UK	Mobile phone technology, consist of: Home BP monitoring Transmission of data Feedback to patient participants (closed loop feedback) Sharing the readings with the healthcare team	Home telemonitoring of BP costs significantly. more than usual care (mean difference per patient 115.32 (95% CI 83.49 to 146.63; p<0.001)). The mean cost of systolic BP reduction was 25.56/mm Hg (95% CI 16.06 to 46.89) per patient.

(n = 6). The duration of the programs varied, ranging from six to twelve months.

The majority of participants in the included trials were hypertensive individuals with BP >140/90 mm Hg (n=4) and uncontrolled daytime ambulatory blood pressure (n=2). The majority of the studies included were secondary data from the TASMINH4 trial of telemonitoring and self-monitoring in hypertension.

Telemonitoring and self-monitoring were accomplished by instructing participants on how to check their own blood pressure and send values via a simple free SMS text-based telemonitoring service with web-based data entry backup. Each morning, two self-measurements were taken at 5-minute intervals. Participants used a color traffic light system to identify these readings as green (below target but above safety limits), amber (above target but below safety limits), and red (below target but above safety limits) (outside of safety limits).

The included papers reported a variety of outcomes, the most common of which were blood pressure and cost-effectiveness, with one qualitative study focusing on the facilitators and barriers to self- and telemonitoring interventions for hypertension as part of the Telemonitoring and Self-monitoring in Hypertension (TASMINH4) trial. Outcomes were measured using an automated sphygmomanometer, Quality adjusted life years (QALYs) (EQ-5D-5L), and the Morisky medication adherence scale.

Main findings

After a 12-month intervention, all studies found that self-management paired with telemonitoring effectively reduced blood pressure. In the self-management group, systolic blood pressure fell by 17.6 mm Hg (14.9–20.3) while in the control group, it fell by 122 mm Hg (9.5–14.9) (12). Furthermore, when compared to normal care or self-monitoring alone, self-monitoring plus telemonitoring was the most cost-effective technique (£17 424 per quality-adjusted life year gained) (25). Home telemonitoring of blood pressure costs much more than standard treatment (mean difference per patient £115.32 (95 percent CI £83.49 to £146.63; p0.001)), with the mean cost of systolic blood pressure reduction being £25.56/mm Hg (95 percent CI £16.06 to £46.89) per patient (26). There were four important implementation priority areas to consider: patient and HCP acceptability of self- and telemonitoring; data management; communication; and incorporating self-monitoring into hypertension therapy (structured care)(27).

DISCUSSION

According to the findings of this study, self-management paired with telemonitoring could be a promising way to controlling blood pressure in hypertensive individuals. Several research on blood pressure monitoring have been undertaken. In an uncomplicated hypertension population, a randomized controlled trial was conducted combining self-monitoring of patient blood pressure with self-titling of antihypertensive medicine based on a pre-defined mediation escalation procedure(8). Other studies showed that Self-monitoring of BP at home, using validated digital is has been widely practice and accepted among hypertension patients as one approach of self-care management (11,28). However, there is still a limitation on the hypertension patients to troubleshoot for example when the BP reading is higher or lower or when problem arise. This is mainly due to there is no interlink/ more information / between patients output with the care giver. Mobile health (mHealth) technology, on the other hand, opens up new possibilities and can be used to support self-management behavior (5,10).

Another study combined self-management with self-monitoring and discovered a considerable improvement in blood pressure control. (8). Overall, a meta-analysis in systematic reviews was difficult due to interfering heterogeneity, but high-strength evidence suggests that systolic blood pressure reductions of 2.1 to 8.3 mmHg are attainable depending on the study design and intervention (16). Patients referred to web-based treatment had only a nonsignificant change in blood pressure control, whereas 25 percent more patients with enhanced prescription services had managed blood pressure at 12 months compared to usual care, which was also associated with a significant increase in the use of antihypertensive drugs and health care touch (25). Other studies, which included behavioral management components, have demonstrated that changes in BP regulation can be recognized when combined with BP self-monitoring. (6).

Engaging patients actively in their care can improve results, save money by avoiding unneeded therapy, and decrease the number of office visits. mHealth can also increase communication between health care providers and patients, promoting self-management. (11). Several studies found that employing mHealth solutions improved blood pressure regulation. An automatic medication alert application installed on a mobile phone, for example, has been demonstrated to greatly increase adherence and blood pressure rates in high-risk hypertensive

patients (11). With current moving society 5.0, there is a call for home-based monitoring to be connected to the health care provider. Recent studied had showed evidence on the effectiveness of telemonitoring in management of patient with hypertension (8), heart failure (11), and diabetes mellitus (11). However, there is limitation of study on the effect of self- management and telemonitoring on blood pressure control, self-care, and adherence to hypertensive therapy in patients with hypertension in Indonesia.

This study will provide additional knowledge on self-management and telemonitoring studies and its effectiveness, thus could be a resource of evidence with strongest level. This study also will provide recommendations for patients with hypertension in Indonesia regarding the self-management and telemonitoring of blood pressure, diet, and medication, thus could be used in their daily practice Self-monitoring (or home monitoring) allows a person to evaluate their own blood pressure outside of the clinic and become more involved in their own care (29). It has the potential to be utilized for screening, diagnosis, and continuous management, and it has greater predictive power than clinic measurements (30). Therefore, the healthcare policy may need to integrated this approach and facilitate for future development to help patient's hypertension could manager their disease and reduce mortality.

Limitations

The very small sample sizes in each of the included studies limit the results' generalizability and representativeness. Furthermore, the demand for independent self-management and telemonitoring practice, which cannot be mandated or regulated, could be a constraint. Finally, the review included only papers published in English, which may have excluded other important studies, particularly those from non-English speaking nations.

CONCLUSION

According to the findings of this study, self-management paired with telemonitoring could be a promising way to controlling blood pressure in hypertensive individuals. Self-monitoring with antihypertensive self-titration and telemonitoring of blood pressure measures not only lowers blood pressure relative to conventional care, but also represents a cost-effective use of health care resources. However, prior to introducing self-management paired with telemonitoring, significant implementation priority areas included: patient and HCP acceptance of self- and telemonitoring; data management; communication; and integrating self-monitoring into hypertension management (structured care). Future research into self-management mixed with telemonitoring is needed to validate the outcomes of the study, which was largely done in the United Kingdom.

ACKNOWLEDGEMENT

This study is part of our dissertation.

REFERENCES

1. Tackling G, Borhade MB. Hypertensive Heart Disease. In Treasure Island (FL); 2020.
2. Dorans KS, Mills KT, Liu Y, He J. Trends in prevalence and control of hypertension according to the 2017 American College of Cardiology/ American Heart Association (ACC/AHA) guideline. J Am Heart Assoc. 2018;7(11):1–11.
3. WHO. Cardiovascular diseases (CVDs). World Health Organization. 2017.
4. Oparil S, Acelajado MC, Bakris GL, Berlowitz DR, Cнfkov6 R, Dominiczak AF, et al. Hypertension. Nat Rev Dis Prim. 2018 Mar;4:18014.
5. Tucker KL, Sheppard JP, Stevens R, Bosworth HB, Bove A, Bray EP, et al. Self-monitoring of blood pressure in hypertension: A systematic review and individual patient data meta-analysis. PLoS Med. 2017 Sep;14(9):e1002389.
6. McCartney DE, McManus RJ. Self-monitoring and self-management: New interventions to improve blood pressure control. Curr Opin Nephrol Hypertens. 2016;25(6):502–7.
7. Chamberlain AM. Heart Disease and Stroke Statistics — 2019 Update A Report From the American Heart Association. 2019.
8. McManus RJ, Mant J, Franssen M, Nickless A, Schwartz C, Hodgkinson J, et al. Efficacy of self-monitored blood pressure, with or without telemonitoring, for titration of antihypertensive medication (TASMINH4): an unmasked randomised controlled trial. Lancet. 2018;391(10124):949–59.
9. Mills KT, Stefanescu A, He J. The global epidemiology of hypertension. Nat Rev Nephrol. 2020;16(4):223–37.
10. Le Bras A. Benefit of BP self-monitoring for hypertension. Nat Rev Cardiol. 2018;15(5):254.
11. Band R, Bradbury K, Morton K, May C, Michie S, Mair FS, et al. Intervention planning for a digital intervention for self-management of hypertension: a theory-, evidence- and person-based approach. Implement Sci. 2017 Feb;12(1):25.
12. Parati G, Dolan E, McManus RJ, Omboni S. Home blood pressure telemonitoring in the 21st century. J Clin Hypertens (Greenwich). 2018 Jul;20(7):1128–32.
13. Bray EP, Jones MI, Banting M, Greenfield S, Hobbs FDR, Little P, et al. Performance and persistence of a blood pressure self-management intervention: Telemonitoring and self-

management in hypertension (TASMINH2) trial. J Hum Hypertens. 2015;29(7):436–41.
14. Parati G, Stergiou GS, Asmar R, Bilo G, De Leeuw P, Imai Y, et al. European society of hypertension guidelines for blood pressure monitoring at home: A summary report of the second international consensus conference on home blood pressure monitoring. J Hypertens. 2008;26(8):1505–26.
15. Kaplan AL, Cohen ER, Zimlichman E. Improving patient engagement in self-measured blood pressure monitoring using a mobile health technology. Heal Inf Sci Syst. 2017;5(1):4.
16. Bashi N, Karunanithi M, Fatehi F, Ding H, Walters D. Remote monitoring of patients with heart failure: An overview of systematic reviews. J Med Internet Res. 2017;19(1):1–14.
17. Lu X, Yang H, Xia X, Lu X, Lin J, Liu F, et al. Interactive mobile health intervention and blood pressure management in adults: a meta-analysis of randomized controlled trials. Hypertension. 2019;74(3):697–704.
18. Li R, Liang N, Bu F, Hesketh T. The Effectiveness of Self-Management of Hypertension in Adults Using Mobile Health: Systematic Review and Meta-Analysis. JMIR mHealth uHealth. 2020;8(3):e17776.
19. Dawson RM, Felder TM, Donevant SB, McDonnell KK, Card III EB, King CC, et al. What makes a good health 'app'? Identifying the strengths and limitations of existing mobile application evaluation tools. Nurs Inq. 2020;27(2):e12333.
20. Chib A, van Velthoven MH, Car J. mHealth adoption in low-resource environments: a review of the use of mobile healthcare in developing countries. J Health Commun. 2015;20(1):4–34.
21. Wang V, Smith VA, Bosworth HB, Oddone EZ, Olsen MK, McCant F, et al. Economic evaluation of telephone self-management interventions for blood pressure control. Am Heart J. 2012;163(6):980–6.
22. Whittemore R, Knafl K. The integrative review: updated methodology. J Adv Nurs. 2005 Dec;52(5):546–53.
23. Law, M., Stewart, D., Pollock, N., Letts, L., Bosch, J., and Westmorland M. Critical review form, quantitative studies. 1998.
24. Critical Appraisal Skills Program. CASP Qualitative checklist. 2017.
25. Monahan M, Jowett S, Nickless A, Franssen M, Grant S, Greenfield S, et al. Cost-effectiveness of telemonitoring and self-monitoring of blood pressure for antihypertensive titration in primary care (TASMINH4). Hypertension. 2019;73(6):1231–9.
26. Stoddart A, Hanley J, Wild S, Pagliari C, Paterson M, Lewis S, et al. Telemonitoring-based service redesign for the management of uncontrolled hypertension (HITS): cost and cost-effectiveness analysis of a randomised controlled trial. BMJ Open. 2013 May;3(5).
27. Grant S, Hodgkinson J, Schwartz C, Bradburn P, Franssen M, Hobbs FDR, et al. Using mHealth for the management of hypertension in UK primary care: an embedded qualitative study of the TASMINH4 randomised controlled trial. Br J Gen Pract. 2019;69(686):e612–20.
28. Parati G, Torlasco C, Omboni S, Pellegrini D. Smartphone applications for hypertension management: a potential game-changer that needs more control. Curr Hypertens Rep. 2017;19(6):48.
29. Joffres M, Falaschetti E, Gillespie C, Robitaille C, Loustalot F, Poulter N, et al. Hypertension prevalence, awareness, treatment and control in national surveys from England, the USA and Canada, and correlation with stroke and ischaemic heart disease mortality: a cross-sectional study. BMJ Open. 2013;3(8).
30. Fleming S, Atherton H, McCartney D, Hodgkinson J, Greenfield S, Hobbs FDR, et al. Self-screening and non-physician screening for hypertension in communities: a systematic review. Am J Hypertens. 2015;28(11):1316–24.