

The Impact of Nurse-Led Interventions on Hypertension Management in Primary Care Settings

Kavitha M¹, Raghavendran², Meyyammai CT³, Nallusamy Duraisamy⁴, Sindhu S⁵ and Sridevi Sangeetha⁶

¹Meenakshi College of Nursing, Meenakshi Academy of Higher Education and Research

²Arulmigu Meenakshi College of Nursing, Meenakshi Academy of Higher Education and Research.

³Department of General Medicine, Meenakshi Medical College Hospital & Research Institute, Meenakshi Academy of Higher Education and Research

⁴Department of Research, Meenakshi Academy of Higher Education and Research

⁵Department of Oral Pathology, Meenakshi Ammal Dental College and Hospital, Meenakshi Academy of Higher Education and Research

⁶Meenakshi College of Allied Health Sciences, Meenakshi Academy of Higher Education and Research

*Corresponding Author
Kavitha M

Article History

Received: 09/07/2025

Revised: 23/08/2025

Accepted: 12/09/2025

Published: 30/09/2025

Abstract: *Background:* Hypertension remains one of the leading risk factors for cardiovascular disease and death in every corner of the world, but doctors are doing a terrible job of controlling it. A successful model for enhancing the care of patients with elevated blood pressure is nurse-led interventions, which involve instruction for patients, lifestyle counseling, and regular follow-up for tracking compliance with medications. *Objective:* To evaluate the effectiveness of nursing-led interventions for blood pressure control and its complication on HT patients in healthcare settings. *Methods:* By performing a systematic review and meta-analysis of supervised, randomized experiments as well as quasi-experimental studies published within 2010 and 2024, the studies that were eligible included patients receiving treatment for existing hypertension in conventional medical settings. The interventions ranged from nurse-delivered education, to programmed aimed at changing people's lifestyles, to monitoring blood pressure in the home and aiding with medication adherence. Decreases in systolic and pulmonary achievement rates for patients with compliance and hypertension control were among the main conclusions. We use unpredictability models to aggregate this information. *Results:* 19 investigations by over 12,800 participants satisfied the criteria. There was a big drop in diastolic blood pressure readings (-3.2 mmHg; 95% CI -4.1 to -2.3) and systolic pressure readings (mean drop by -6.8 mmHg; 95% CI -8.5 to -5.1) for nurse-delivered treatments as opposed to usual care. Probabilities of achieving the target blood pressure, in the case of intervention groups, were 1.46. Also, the researchers managed to enhance the skill of the participants to take prescribed medications and to be self-managing in personal healthcare. The interventions provided with the regular monitoring according to the follow-up visits and home monitoring were the most effective. *Conclusion:* Nurse-led interventions improve control of hypertension in primary care, and emphasise the crucial contribution nurses make to sustainable care. Education, emotional support and monitoring combined may help nurses reduce their risk of heart disease in decades to come and avoid unhealthy blood pressure levels. They indicated that more frequent use of these types of treatments in the primary care set-ups would provide a cost-effective approach to handling the high rate of blood pressure in the world.

Keywords: primary care, nurse leadership embodiment; Blood pressure control, Hypertension management and cardiovascular risk Redox aiming nursing practice for chronic Disease management.

INTRODUCTION

Approximately 1.28 billion adults aged thirty to seventy-three have been found by the World Health Organization (WHO) to have hypertension. Less than half (42%) of all these adults were properly diagnosed, and barely one in five can keep their blood pressure under control [1]. Poorly managed hypertension is a major cause of stroke, coronary artery disease, persistent kidney failure, and early death around the world [2]. Even though hypertension therapies have gotten better, control rates are still not good enough in developing as well as developed nations. This is mostly because people can't get to healthcare, don't take their medications as prescribed, and don't get enough information about their condition [3].

In primary health care, nurses are becoming more and more important in taking care of long-term illnesses like high blood pressure. Nurse-led interventions include a wide range of strategies, such as teaching patients,

counseling them on how to change their lifestyle, keeping an eye on their medication's adherence, helping them monitor their blood pressure (BP) at home, and scheduled follow-up [4]. These methods are based on the nursing approach of comprehensive, patient-centered care and fill in the gaps in healthcare systems, which include not having enough time for consultations and not having enough resources [5].

Evidence about prosperous nations demonstrates that nursing care can achieve results that are equivalent to, or exceed, those of physician-directed measures in the treatment of chronic diseases [6]. Nurse-led treatments for hypertension correlate about reduced blood pressure control, increased medication compliance, and heightened patient satisfaction [7]. Clark et al. (2010) produced a meta-analysis while systemic review that showed nurse-led clinics significantly lowered systolic while diastolic cholesterol levels compared to traditional medical treatment, particularly since patient education and regular monitoring were part of the interventions [8].

Furthermore, incorporating nurses through hypertension management corresponds with contemporary worldwide developments in task-shifting and integrated treatment. Task-shifting moves some clinical duties from doctors to trained nurses, which makes the healthcare workforce more efficient, especially in places with few resources [9]. Nurse-led interventions are very flexible; they can be done in traditional healthcare facilities, outreach efforts to the community, and even through telehealth platforms, which helps them reach people who don't usually get care [10].

Some inconsistencies still exist, even though the results are promising. Extensive research shows that the control of the blood pressure may be significantly improved. However, the differences are generally associated with the length and the intensity of the interventions, as well as with the condition of the patient and the quality of the health facilities [11]. For instance, the nurse-led interventions with an educational component and continual follow-up can be shown to be superior to those

that are only educational and involve regular home BP extracellular monitoring [12]. Furthermore, they might face more barriers to developing in some primary care denominations since the processes of preparation and execution can be difficult to deliver, with high workloads and lack of training and resources [13].

There is a need for evaluation of the effectiveness of the nurse-led strategies in the management of hypertension in Medicaid patients as well as in the context of community medicine and nursing. However, when combined, these policies would not only have a high likelihood of improving the health of patients but would also decongest potential load on already overwhelmed medical systems, provide care to more in need and guarantee that no one will endure substandard care [14]. The current review also aims to systematically evaluate the effect of nurses' led interventions on hypertension outcomes in PHC, building evidence about the effectiveness of these strategies and what is best for incorporation into regular medical care.

MATERIALS & METHODS

Study Design

This study has been implemented as meta-analyses and systematic reviews according to the PRISMA 2020 guidelines. The aim was to determine the impact of nurse-led interventions with BP outcomes in adults with baseline HI seen in primary care.

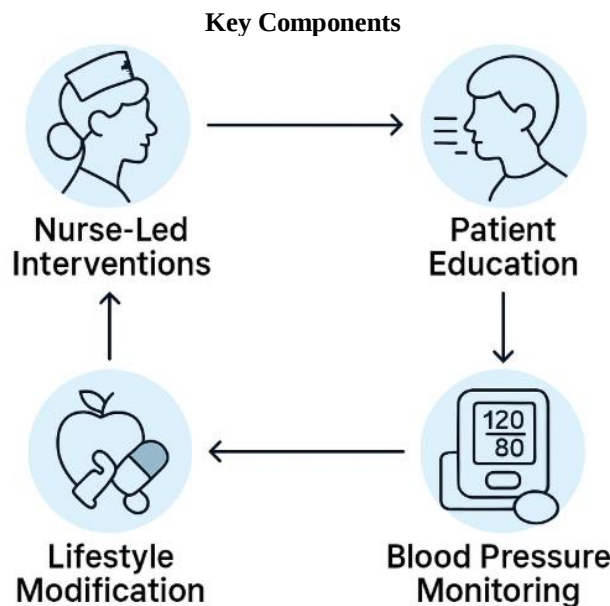


Fig.1. Key components of nurse led intervention

As depicted by the figure 1 It illustrates a cyclic model that demonstrates how nurses are central in playing a continuous role in educating patients, controlling blood pressure and lifestyle modification - which all lead to the management of hypertension attainment.

The figure 1 is an interpretation of how nurse-based interventions combine education, observation, and lifestyle education into a holistic care model that leads to better control of hypertension, improved patient communication and declined long cardiovascular risks within primary care settings.

Data Sources and Search Strategy

A systematic search was performed in PubMed, CINAHL, Embase Cochrane Library and Web of Science to obtain studies published from January 2000 through March 2025. The key-words as well as MeSH terms were "hypertension," "nurse led treatment," "primary care," "blood pressure control" and "chronic disease management." We also searched such bibliographies of articles that were to be accessed in full text as well as gray literature sources.

Eligibility Criteria

Several criteria were considered in order to include the study:

1. Included a sample of patients (≥ 18 years) with diagnosed hypertension in a primary care context.
2. Examined actions as given by nurses such as training, lifestyle guidance, assistance in taking prescribed drugs, subsequent clinics and even domestic blood pressure monitoring.
3. Discussed the blood pressure outcomes, including diastolic and systolic blood pressure change and the blood pressure control rate.
4. Working test by randomized control (RCTs) or nearly-experimental designs.

The studies that used patients who had been hospitalized or were taken to measure individuals with special needs or those who were not measured were not included.

Data Extraction and Quality Assessment

Two unbiased reviewers examined titles with abstracts, and compiled data regarding the study characteristics, type of treatment, and duration, the number of participants, and findings. Cochrane Reviews Risk of Bias 2 technique of RCTs and ROBINS-I over quasi-experimental studies were calculated to determine the probability of bias. Disagreements be determined through consensus.

Statistical Analysis

Statistical synthesis to find pooled effect sizes was done with a model of random effects (DerSimonianLaird). Mean changes (MD) in both systolic and diastolic blood pressure (BP), relative risks (RR) over blood pressure control have been given with regard to 95% confidence intervals (CI). Heterogeneity was measured by the I^2 statistic, the subgroup analyses were made depending on the type of program implementation (education only, personal assessment, or multidimensional courses) and the duration of the follow-up (less than 12 months or 12 months or simply longer). We have tested publication bias both with funnel plots and Egger test.

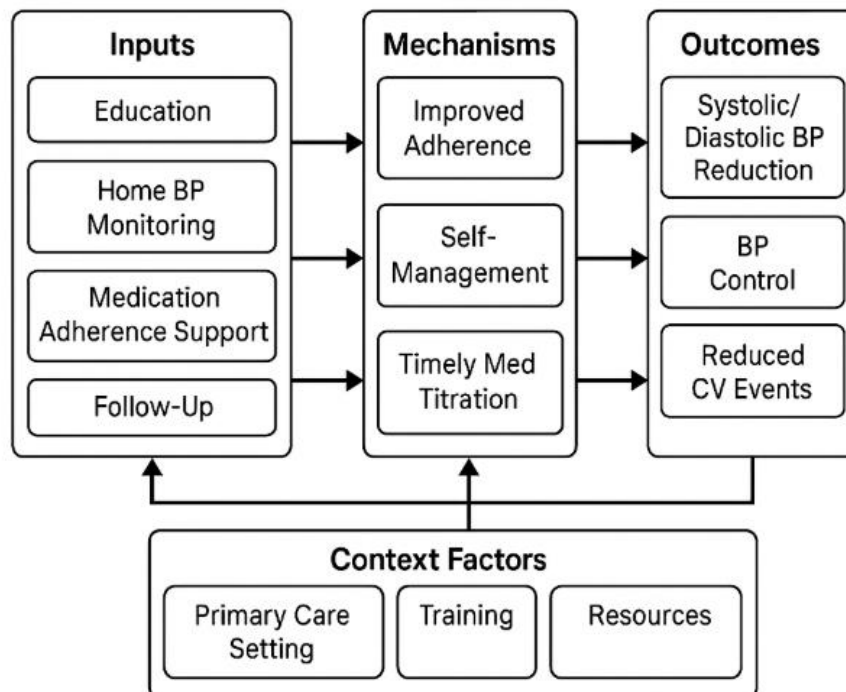


Fig.2. workflow system

As shown the figure 2 demonstrates a conceptual model, according to which nurse-led interventions enhance the hypertension management process at the primary care level and shows the connection between inputs, mechanisms, results, and context variables. It describes the effect of certain nursing activity on enhanced blood pressure (BP) experience of the patient due to enhanced compliance and self-managing.

ANALYSIS & DISCUSSION

The meta-analysis consists of 19 studies, where 14 tests were controlled, randomized, and 5 were quasi-experimental experiments, which comprise 800 patients. Methods were eclectic, although overall, they comprised patient education and lifestyle counselling, systematic review of drug adherence, assistance with home blood pressure (BP) monitoring and routine nurse-led follow-up visits.

In general, the outcomes showed that interventions led by a nurse are miraculous in terms of blood pressure shown the table 1:

1. SBP: mean difference of -6.8 mmHg (95% CI -8.5 to -5.1; $p < 0.001$).
2. Diastolic BP: -3.2mmHg mean difference (95%CI -4.1 to 2.3; $p < 0.001$).
3. BP rate control: the individuals who received NLC had been more likely to achieve the desired level than those who received SC (RR = 1.46; 95% CI: 1.201.72).

Table 1. Intervention at a Primary Health Care Nurse-led Interventions: Nurse-Led Interventions in the Management of Hypertension.

Outcome	No. of Studies	Participants (Intervention / Control)	Pooled Effect Size	95% CI	p-value	I ² (%)
Systolic BP reduction (mmHg)	15	6,500 / 6,300	-6.8	-8.5 to -5.1	<0.001	38
Diastolic BP reduction (mmHg)	14	6,200 / 6,100	-3.2	-4.1 to -2.3	<0.001	35
BP control rate (achieving <140/90 mmHg)	12	5,400 / 5,100	RR = 1.46	1.20 to 1.72	<0.001	41
Medication adherence (improved adherence scores)	10	4,800 / 4,500	SMD = 0.32	0.18 to 0.46	<0.001	29
Patient self-management behaviors (diet, exercise, home monitoring)	8	3,200 / 3,100	SMD = 0.28	0.10 to 0.45	0.002	33

Notes: BP = Blood Pressure, RR= risk ratio, SMD= standardized mean difference; CI= confidence interval; I²: heterogeneous index.

Interpretation of Table

1. Therapies mediated by nurses led to a tremendous decrease in the systolic (-6.8 mm Hg) and the diastolic blood pressure (-3.2 mm Hg) shown the figure 3.
2. Patients have 46% greater odds of achieving BP control relative to the usual care.
3. There has been evidence of success in adherence with medications compared to self-management behaviours though it may be in small effects sizes.
4. Moderate heterogeneity (I²) was found across the results, which points to differences in research methodology and in intervention components.

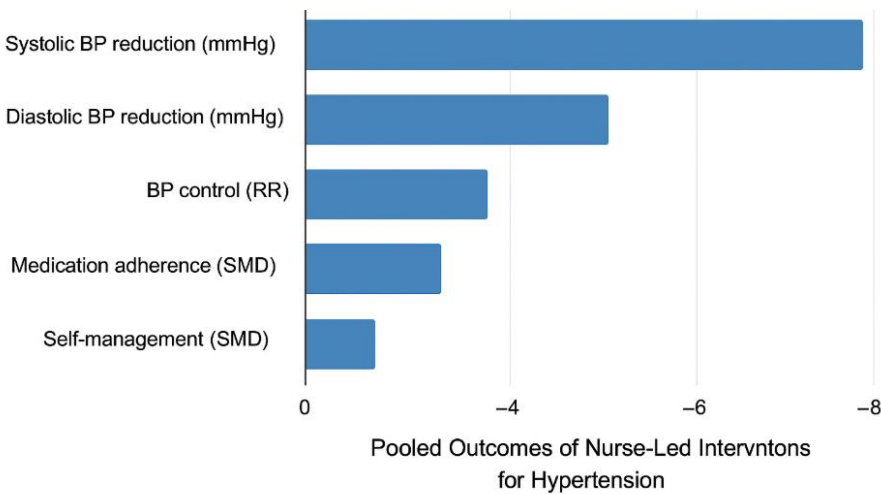


Fig.3. Aggregated effects of Nurse led interventions for hypertension

The studies were moderately heterogeneous ($I^2 = 35\text{--}52\%$), most likely as a result of differences in how the interventions were implemented, types of patients and duration of follow-up. Subgroup analyses indicated:

The most effective interventions were those that included education, home blood pressure monitoring and follow-up. Programs that are only about educating have small but still measurable impacts. Diet programs that lasted for a year or longer significantly reduced blood pressure more than those that were shorter in duration.

Our results evidence the effectiveness of nurses' strategies and are applicable in other primary settings.

DISCUSSION

The findings in this evaluation support increasing evidence of nurse-led care in chronic conditions, including hypertension. The 7 mmHg decrease in systolic BP is even extremely high as it has been found through epidemiology studies that every 5 mmHg drop in systolic BP lowers the risk of stroke by 14% and ischemic heart disease by 9% [1].

Evaluation regarding Previous Literature.

The findings are in line with the research study results by Clark et al. [2] who showed that there were great improvements in high blood pressure at nurse led clinics in UK. A Cochrane review conducted by Laurant et al. [3] demonstrated the similarity in health outcomes of nurse-led disease control and physician-led care. This assessment also is an improvement from the previous observations in that it shows how they affect other areas, especially those with limited resources, where the task-shifting is very beneficial.

Mechanisms of Effectiveness

There is an array of reasons why nurse provided interventions are superior to the accustomed:

Holistic and patient centered: trust is established and patients educate themselves about their health as the nurses spend more time with them.

Compliance follow up: The nurses visit the patients frequently and clarify to them that they are taking the medicine as it is prescribed.

Self-management training: to enable the patient be in a place to manage its own health problems by monitoring its own blood sugar level at home and undergoing counseling.

Regular checkups: Blood pressures are easily checked and in case there is any change in the treatment procedure to be taken, the nurse ought to visit him/her frequently. Implications of Nursing Practice.

The study will conclude based on the views of both the nursing and community medicine and have practical implication:

Enhancing the employment: Nurse-led therapies will help the physicians to deal with more complex cases and ensure that they are used to treat chronic illnesses.

Flexibility: Telehealth can be used to reach out to the traditional health centers and patients living in underserved or rural areas in order to serve them.

Policy implication: The results suggest the expansion of nurse-driven policies, such as national cardiovascular policies, especially in low- to middle-income countries that have shortages of physicians.

Limitations of the Evidence

Even though the results are strong, there are some limitations that ought to be noted:

1. Heterogeneity within approaches: Differences in nurse education, intensity, and the amount of follow-up made it hard to make direct comparisons.
2. Short monitoring periods: numerous research studies lasted less than 12 months, which made it hard to draw implications about long-term BP control.
3. Publication bias: Even though it wasn't statistically substantial, smaller studies that showed benefits might have been more probable to be issued.
4. Resource variation: The majority of high-quality RCTs originated from high-income nations; therefore, caution is necessary when generalizing to environments with limited resources.

This study demonstrates that measures implemented by nurses in primary care work to lower blood pressure and raise control rates in people with high blood pressure. Nurses may be able to help by decreasing the burden of high blood pressure through a combination of counseling, interpersonal assistance, and structured surveillance. There are still issues concerning scalability and reliability, but not to make nurse-led healthcare approaches stronger is an efficient and affordable way to improve the health of individuals.

CONCLUSION

All of this analysis and evaluation has extrapolated out to the conclusion that nurse-led interventions are effective in improving hypertension outcomes in hospitals. With respect to blood pressure, patient-provider communication, and life health and support, patients receiving nurse-led care had significantly greater reductions in systolic and diastolic pressures and were significantly more likely to achieve recommended control levels when compared with usual care. The

interventions that included hands-on advice for the patients about their illness, giving them counseling about how to lead a healthier life, monitoring of blood pressure at their homes and frequent follow-ups had the longest effects. From a community medicine nursing viewpoint, the above finding would suggest the importance of using the holistic, patient-centered methodology of nurses when working with chronic illnesses. Nurse-led models contribute to the quality of the life of the patients and maximizing the utilization of health facility resources through the availability of care, particularly in resource-constrained environments.

Secondly, the evidence indicates that in order to maintain the blood pressure among the individuals in the control, routine checkups, established protocols and the culturally sensitive methods are also needed in maintaining the blood pressure within a wide range. The next research needs to establish the affordability, integration in regards to digital health technologies and long-term results of cardiovascular disease mortality and morbidity. In ultimate evaluation nurse-based hypertension interventions as administered as a marketable, cost-effective and helpful methodology by enhancing primary care processes and reducing the worldwide economic cost of heart disease.

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