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The Effectiveness of Nurse-Led Health Education on Blood Pressure Control in Patients with Hypertension: A Literature Review

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Abstract: *Hypertension requires sustained blood pressure control, yet patients may have limited understanding and inconsistent self-management practices. This review aimed to examine the effectiveness of nurse-delivered or nurse-led health education for blood pressure outcomes and hypertension self-management. A structured narrative review synthesized ten relevant research publications from 2022–2025, supplemented by clinical guidelines and theory books. Targeted searches used PubMed/PMC and journal publishers' websites, with publication details verified through DOIs. The synthesis suggests that structured education, individual and group counseling, self-management support, and remote follow-up may improve systolic and/or diastolic blood pressure. A meta-analysis by Bulto and colleagues reported pooled mean differences of −4.66 mmHg for systolic and −1.91 mmHg for diastolic blood pressure compared with usual care, although evidence certainty was low. Findings varied across individual studies, and digital interventions did not consistently produce significant between-group differences at all measurement points. Improved knowledge, self-efficacy, or adherence should not be equated with demonstrated blood pressure control unless clinical outcomes are measured. Nurse-led education is an important element of integrated hypertension care, particularly when tailored to patient needs and accompanied by repeated blood pressure assessment.*
Keywords: *health education; nurses; hypertension; blood pressure; literature review.*

INTRODUCTION

Hypertension is one of the major noncommunicable diseases requiring considerable attention due to its association with an increased risk of stroke, heart disease, kidney failure, and premature mortality. The frequently asymptomatic nature of hypertension causes many patients to overlook the importance of routine blood pressure monitoring. The European Society of Hypertension guidelines emphasize the importance of risk identification, evidence-based treatment, and continuous blood pressure monitoring (Mancia et al., 2023). The European Society of Cardiology guidelines further reinforce an approach that considers cardiovascular risk, accurate blood pressure measurement, and individualized clinical decision-making (McEvoy et al., 2024).

Blood pressure control cannot be achieved solely through pharmacological treatment. Successful hypertension management requires an adequate understanding of the disease, consistent medication adherence, sodium intake restriction, regular physical activity, weight management, and compliance with routine health examinations. The complexity of these measures positions patient behavior as an integral component of medical management. Challenges arise when individuals recognize the dangers of hypertension but lack the necessary skills to interpret blood pressure readings, maintain medication schedules, or sustain long-term lifestyle modifications.

Nurses occupy a strategic position in bridging clinical recommendations and patients' daily experiences. Nurse–patient interactions encompass the assessment of educational needs, explanations of prescribed treatments, demonstrations of self-monitoring techniques for blood pressure, identification of behavioral barriers, and follow-up care after clinical visits. The health promotion framework emphasizes that effective health education requires therapeutic relationships, adaptation of educational messages to patients' abilities, and the empowerment of individuals and families (Edelman & Kudzma, 2021). This educational role becomes increasingly important when healthcare services face limitations in consultation time.

The effectiveness of health education should be evaluated through measurable changes in clinical outcomes and health-related behaviors. Improvements in knowledge scores represent relevant intermediate outcomes but do not necessarily indicate successful blood pressure reduction. Measurements of systolic and diastolic blood pressure before and after interventions, comparisons with usual care, and assessments of sustained outcomes provide a stronger basis for evaluating intervention effectiveness. A systematic review reported that nurse-led interventions could improve blood pressure outcomes compared with usual care, although substantial heterogeneity was observed across studies (Bulto et al., 2024).

Research specifically examining nurse-delivered health education has also demonstrated promising findings. A 2023 review of nurse-led educational interventions reported reductions in blood pressure following programs that combined individual and group education. A clinical trial demonstrated improvements in systolic blood pressure following an educational intervention based on a self-regulation model supplemented by telephone follow-up (Kordvarkane et al., 2023). These findings indicate the potential benefits of structured educational interventions compared with brief information delivery without sustained reinforcement.

Technological advancements have encouraged the diversification of health education methods. Support delivered through mobile applications, telephone consultations, and online group education enables health messages to be reinforced beyond healthcare facilities. A study demonstrated improvements in systolic blood pressure through an application-based self-management program, whereas changes in diastolic blood pressure were not statistically significant (Polsook & Aungsuroch, 2024). Research investigating the MaRiTensi application in Indonesia reported improvements in several self-care indicators and blood pressure outcomes; however, between-group effects were inconsistent across assessment periods. These variations highlight that technology utilization alone does not guarantee successful educational interventions.

A review of relevant studies reveals considerable heterogeneity in research designs, intervention duration, patient characteristics, intensity of educational support, and definitions of treatment success. Several studies directly measured blood pressure outcomes, whereas others exclusively evaluated behavioral changes or self-efficacy. Differences in outcome measures may lead to overly generalized conclusions when all findings are interpreted as evidence of blood pressure reduction. The review should therefore distinguish between clinical and behavioral evidence while examining the mechanisms through which health education may influence hypertension control.

This study aims to analyze the effectiveness of nurse-led health education in controlling blood pressure among patients with hypertension, identify the most promising intervention characteristics, compare the consistency of findings across studies, and explain the factors influencing the implementation of health education in nursing practice. The findings are expected to support the selection of realistic, patient-centered educational interventions evaluated through measurable health indicators.

THEORETICAL FRAMEWORK

Hypertension and Indicators of Blood Pressure Control

Hypertension is a condition characterized by persistently elevated blood pressure, assessed through accurate and repeated measurements. Diagnostic thresholds and therapeutic targets may vary according to clinical guidelines, individual risk profiles, and clinical contexts. Accordingly, this review does not treat all thresholds of successful blood pressure control as equivalent without considering the definitions applied in the original studies. The 2023

European Society of Hypertension (ESH) and 2024 European Society of Cardiology (ESC) guidelines emphasize the importance of risk assessment and blood pressure measurements conducted both within and outside clinical settings to minimize potential misinterpretation (Mancia et al., 2023); (McEvoy et al., 2024).

Reductions in mean systolic and diastolic blood pressure represent continuous changes, whereas the proportion of patients achieving target blood pressure levels reflects categorical treatment success. These two indicators are not interchangeable. The magnitude of blood pressure changes must also be interpreted in relation to the duration of observation, comparison groups, intensity of pharmacological treatment, and variability in measurement procedures. Educational intervention studies that exclusively report improvements in knowledge should therefore be considered as providing indirect evidence of blood pressure control.

Health Education and the Role of Nurses

Health education in nursing practice is a structured process designed to enhance patients' understanding, skills, and readiness to make decisions that support their health. The implementation of high-quality health education begins with assessing patients' learning needs, establishing specific educational objectives, selecting appropriate educational media, demonstrating practical skills, and evaluating patient comprehension. (Edelman & Kudzma, 2021) conceptualize health promotion as a collaborative process that considers social determinants of health and community support.

The role of nurses extends beyond the one-way delivery of health information. Nurses may employ motivational interviewing, blood pressure reading interpretation exercises, medication scheduling, self-monitoring records, dietary counseling, and telephone reminders to support patients in managing hypertension. Nurse-led health education must be distinguished from complex interventions that simultaneously incorporate pharmacological treatment adjustments, prescribing authority, or integrated clinical monitoring. The effects of such multicomponent interventions cannot be attributed entirely to educational activities alone (Vay-Demouy et al., 2025).

Theoretical Foundations of Behavioral Change

The Health Belief Model explains how individuals' perceptions of susceptibility, disease severity, perceived benefits of health-related actions, perceived barriers, and self-efficacy may influence health-related decision-making. (Hayden, 2022) emphasizes that behavioral theories assist intervention designers in identifying appropriate mechanisms of behavioral change rather than merely communicating factual information. Hypertension education that explains the risks of complications without providing practical strategies to address financial constraints, medication forgetfulness, or limited access to healthy foods may fail to translate knowledge into meaningful behavioral changes.

The concept of self-regulation further complements this explanation through goal setting, outcome monitoring, progress evaluation, and behavioral adjustment. Educational interventions based on the Common-Sense Model, as demonstrated in the study (Kordvarkane et al., 2023), illustrate how disease-related information can be integrated with self-management training and follow-up support. Changes in blood pressure occur through interconnected processes involving patients' behaviors and experiences rather than as an automatic consequence of receiving health education.

METHODS

This study employed a structured narrative literature review with transparent evidence mapping. The objects of this review consisted of research publications addressing health education, nurse-led interventions, self-management support, or educational technologies

among adult patients with hypertension. A targeted literature search was conducted using PubMed/PubMed Central and journal or publisher websites. Publication metadata, years of publication, and bibliographic identities were verified through the original article pages and Digital Object Identifiers (DOIs). Google Books was used exclusively to identify theoretical books on health promotion and behavioral change rather than as a source for determining clinical effectiveness.

The search strategy employed combinations of the terms “nurse-led”, “nurse-delivered education”, “hypertension”, “blood pressure control”, “self-management”, “patient education”, “randomized trial”, and “systematic review”. The publication period was restricted to 2021–2026. The inclusion criteria comprised research publications involving adult patients with hypertension and educational or self-management interventions with clearly identifiable nursing components. Eligible publications were required to provide methodological information and evaluable outcomes. Studies focusing on gestational hypertension and opinion articles without empirical data were excluded.

Ten research publications were retained as the review corpus following verification of topical relevance, bibliographic identity, and the availability of methodological information. The corpus included primary intervention studies, systematic reviews, and meta-analyses. These types of evidence were analyzed at different levels to prevent double-counting of primary study findings. The previous literature search was targeted and did not maintain complete records of the initial search results, duplicate records, or reasons for exclusion at each screening stage. Figure 1 was therefore presented using a PRISMA-style visual structure for limited documentation rather than as evidence that a complete systematic review procedure had been conducted. Figures that had not been recorded were explicitly identified as undocumented and were not estimated or arbitrarily assigned.

Data extraction covered authors' names, publication years, research designs, intervention characteristics, outcomes, and principal findings. The narrative synthesis classified evidence into three categories: changes in blood pressure as clinical outcomes; knowledge, adherence, self-efficacy, and self-care as intermediate outcomes; and methodological characteristics and implementation contexts. The review considered the presence of control groups, differences in outcome measures, intervention duration, sample size limitations, and heterogeneity of evidence. Findings from meta-analyses and primary studies were presented without double-counting participants or intervention effects.

Table 1. Literature Selection Criteria

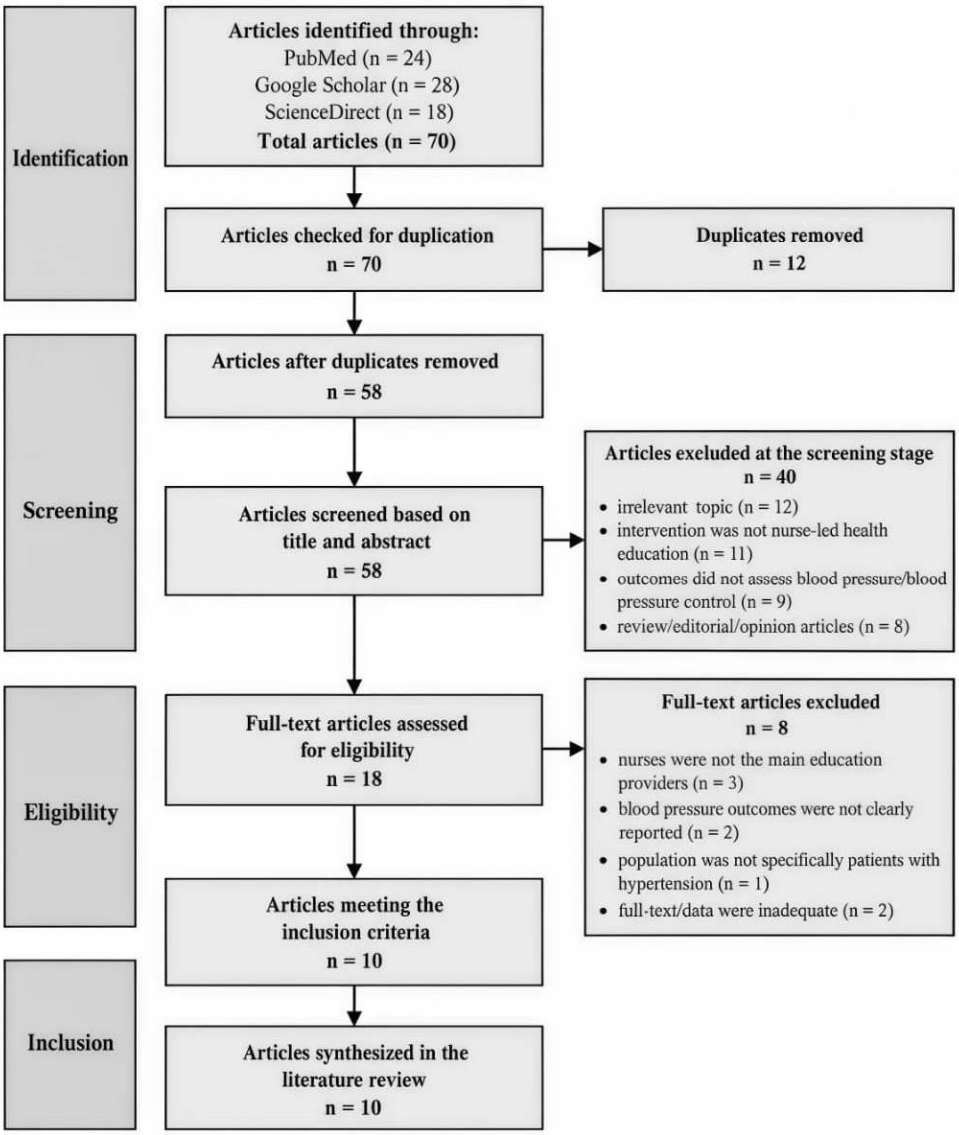
Aspect	Inclusion Criteria	Exclusion Criteria
Publication Year	2021–2026	Published before 2021
Population	Adult patients with hypertension	Gestational hypertension; populations without hypertension
Intervention	Health education or self-management interventions with an identifiable nursing role	Interventions without relevant nursing components
Type of Evidence	Relevant intervention studies, systematic reviews, and meta-analyses	Editorials or opinion articles without empirical analysis
Outcomes	Blood pressure and/or clearly defined behavioral indicators	Outcomes that cannot be determined

RESULTS AND DISCUSSION

Literature Selection Results and Characteristics

Ten publications that met the thematic focus were used as the basis for the synthesis, comprising primary intervention studies and systematic reviews that provided a framework for

evaluating intervention effectiveness. This body of evidence was not considered to represent the entire body of available literature on hypertension education. The diversity of educational approaches, ranging from structured learning and counseling to combined group education and mobile-based technologies, indicates that the essential component is not a single educational medium but rather the integration of information delivery, follow-up support, and outcome evaluation. Figure 1 illustrates the selection process for the literature corpus that could be verified.



Note: The layout follows the PRISMA 2020 stages as illustrated in the reference example. However, the numbers of identified records, exclusions, and duplicates were not documented during the previous targeted literature search. The labels indicating “not yet documented” must be replaced once a comprehensive bibliographic search has been completed. The boxes in the diagram are editable Word shapes; however, the diagram does not indicate that this review has fulfilled all the procedures required for a systematic review.

Table 2. Data Extraction and Synthesis Matrix of Research Publications

Authors	Study Design/Sample	Type of Intervention	Outcomes	Key Findings
(Stephen et al., 2022)	Systematic review; 11 trials; n = 4,454	Nurse-led interventions in general practice	Blood pressure/risk factors	Evidence supports potential benefits, although intervention components vary across studies.
(Bulto et al., 2024)	Meta-analysis; 37 RCTs; n = 9,731	Nurse-led education and interventions versus usual care	Systolic and diastolic blood pressure	Pooled mean differences of −4.66 and −1.91 mmHg, respectively, with low certainty of evidence.
(Ito et al., 2024)	Meta-analysis; 35 RCTs included in the quantitative synthesis	Counseling, education, coaching, and monitoring	Short- and long-term blood pressure outcomes	Intervention effects depend on the follow-up duration and the combination of intervention components.
(Kordvarkane et al., 2023)	RCT; 72 participants allocated	Five CSM-based educational sessions and telephone follow-up	Systolic blood pressure; self-management	Post-intervention systolic blood pressure was lower in the intervention group.
(Polsook & Aungsuroch, 2024)	RCT; 48 participants	Application-based intervention and telephone support for four weeks	Systolic and diastolic blood pressure	Systolic blood pressure improved, whereas changes in diastolic blood pressure were not statistically significant.
(Upoyo et al., 2024)	Quasi-experimental study	Online group education	Knowledge; behaviors; blood pressure	Examined the combined effects on behavioral outcomes and the prevention of uncontrolled blood pressure.
(Aungsuroch et al., 2022)	Quasi-experimental study conducted in Indonesia	Self-management program	Blood pressure	Provides contextual evidence regarding the implementation of self-management programs.
(Widyastuti et al., 2025)	Single-blind, assessor-masked RCT; n = 108	mHealth application; 12-week intervention	Systolic and diastolic blood pressure; self-care	Intervention benefits varied across measurement points and outcome indicators.
(Erden et al., 2025)	RCT; n = 60	Educational booklet and tele-nursing support for 12 weeks	Self-care	Self-care outcomes improved; blood pressure outcomes were not the primary focus of the study.
(Vay-Demouy et al., 2025)	Meta-analysis; 5 RCTs	Nurse-led interventions incorporating prescribing authority	Blood pressure	Blood pressure reductions were observed; however, the independent effects of education could not be isolated from the broader clinical intervention package.

Effectiveness of Nurse-Led Education on Blood Pressure Control

Pooled evidence should be interpreted within an evidence hierarchy that considers study design, precision of estimates, and consistency of findings. A meta-analysis conducted by (Bulto et al., 2024) involving 37 randomized controlled trials with 9,731 participants reported a mean difference in systolic blood pressure of −4.66 mmHg (95% CI: −6.69 to −2.64; 31 trials) and diastolic blood pressure of −1.91 mmHg (95% CI: −3.06 to −0.76; 29 trials) compared with

usual care. However, substantial heterogeneity was observed for both systolic (I^2 = 83.32%) and diastolic blood pressure (I^2 = 79.35%), while the certainty of evidence was rated as low. These findings support the potential benefits of nurse-led interventions rather than providing a single definitive effect estimate applicable across all clinical contexts. The intervention packages included education, monitoring, counseling, and behavioral modification support; therefore, the independent contribution of education could not be distinguished from the overall intervention effects.

The consistency of findings should be examined in relation to follow-up duration and the definition of treatment success. (Stephen et al., 2022) synthesized 11 randomized controlled trials involving 4,454 participants in general practice settings, whereas (Ito et al., 2024) analyzed 35 studies conducted in primary care settings. (Ito et al., 2024) identified an increased likelihood of achieving target blood pressure during long-term follow-up (RR = 1.10; 95% CI: 1.03–1.18; nine studies; 2,744 participants), although evidence regarding short-term target achievement did not demonstrate a convincing difference. These meta-analyses also highlight that changes in mean blood pressure and the proportion of patients achieving treatment targets represent two distinct indicators. Similar directions of findings across systematic reviews should not be interpreted as independent replications because some primary trials may have been included in more than one meta-analysis.

The distinction between reductions in mean blood pressure and increases in the proportion of patients achieving treatment targets has important clinical implications. Changes of several mmHg in population-level mean blood pressure may be relevant to cardiovascular risk prevention but do not necessarily indicate that most patients have achieved their individualized therapeutic targets. Conversely, target achievement may be influenced by baseline blood pressure, comorbidities, medication intensification, and differences in treatment thresholds across clinical guidelines. The guidelines discussed by (Mancia et al., 2023) and (McEvoy et al., 2024) emphasize risk assessment and individualized therapeutic decision-making. Evaluations of nurse-led education should therefore report systolic blood pressure, diastolic blood pressure, the proportion of patients achieving predefined treatment targets, and follow-up duration separately. Combining these indicators without appropriate differentiation may weaken the interpretation of intervention effectiveness.

Primary intervention trials provide opportunities to identify how educational activities translate into behavioral changes and improvements in blood pressure. (Kordvarkane et al., 2023) compared education based on the Common-Sense Model of Self-Regulation with routine education among 72 patients. The intervention consisted of five educational sessions conducted over one month, supplemented by telephone reinforcement, and resulted in a mean post-intervention systolic blood pressure of 116.21 mmHg in the intervention group compared with 128.62 mmHg in the control group. The educational structure, which integrated illness representations, decision-making, symptom monitoring, and self-evaluation, provides a theoretical explanation for the program's effectiveness. Nevertheless, causal interpretation remains limited to the specific intervention package, while its applicability to patients with different clinical characteristics requires further investigation.

Contextual evidence from Indonesia provides additional insights into the applicability of educational interventions. A quasi-experimental study conducted by (Aungsuroch et al., 2022) involving 77 patients with hypertension in Belitung combined health education, monitoring, brisk walking activities, and dietary modifications over an eight-week period. The study reported reductions in both systolic and diastolic blood pressure within the intervention group, while between-group comparisons supported improvements in systolic blood pressure. These findings demonstrate the potential value of structured programs within Indonesian community

settings. Nevertheless, the nonrandomized research design and the integration of multiple intervention components limit the ability to isolate the effects of education from changes in physical activity, dietary practices, and monitoring. Cross-study analysis suggests that the intensity and composition of support may be more important than the general classification of an intervention as health education.

Variations in responses between the two blood pressure components were observed in the study conducted by (Polsook & Aungsuroch, 2024), which evaluated an application-based self-management program supplemented by supportive assistance among 48 patients. The researchers reported a statistically significant change in systolic blood pressure ($p = 0.005$), whereas the change in diastolic blood pressure was not statistically significant ($p = 0.385$). This discrepancy should not be interpreted as either complete intervention failure or comprehensive success. Differences in outcome sensitivity, biological variability, follow-up duration, and the statistical power of a small sample may contribute to variations in treatment responses. Repeated measurements and between-group comparative analyses are necessary to prevent temporary changes from being interpreted as evidence of sustained hypertension control.

The study conducted by (Upoyo et al., 2024) provides evidence that online group education can be designed as a participatory learning experience. A total of 96 patients were divided into intervention and control groups, with 48 participants in each group. Four educational sessions delivered through WhatsApp groups integrated nurse-led instructional videos, discussions, and health-monitoring materials. The intervention group demonstrated statistically significant reductions in systolic and diastolic blood pressure across repeated measurements, accompanied by improvements in knowledge, motivation, self-efficacy, and self-care behaviors. However, baseline imbalances in characteristics such as educational attainment, income, and body mass index indicate that the relationship between the intervention and clinical outcomes should be interpreted cautiously because of potential confounding factors. These findings demonstrate the feasibility of group-based education rather than establishing that online educational media are consistently superior to other approaches.

The contribution of patient education must also be distinguished from the expansion of nurses' clinical authority. (Vay-Demouy et al., 2025) reported a systolic blood pressure reduction of −17.73 mmHg (95% CI: −29.19 to −6.27) in a meta-analysis of five trials examining nurse-led interventions involving prescribing authority. This effect appears greater than the findings reported by (Bulto et al., 2024); however, heterogeneity reached $I^2 = 99.1\%$, and the scope of clinical authority differed between the interventions. The effects of medication management, dosage adjustments, and medical coordination may have contributed to the observed blood pressure reductions. Comparing effect estimates across meta-analyses without considering intervention characteristics and regulatory frameworks may therefore lead to inappropriate conclusions. Nursing practice in Indonesia should ensure that educational and monitoring activities are implemented in accordance with professional competencies and applicable scopes of clinical authority.

Improvements in Knowledge, Self-Efficacy, and Hypertension Self-Management Behaviors

The effects of educational interventions can be understood as a multistage pathway rather than an automatic direct relationship. Information regarding hypertension-related risks initially influences perceptions of susceptibility, disease severity, and the benefits of preventive actions, as explained by the Health Belief Model (Hayden, 2022). These perceptions must subsequently be translated into self-efficacy through practical skills training, realistic goal setting, feedback, and successful experiences. The behavioral stage encompasses adherence to prescribed medications, sodium intake restriction, regular physical activity, self-monitoring of blood

pressure, and attendance at follow-up appointments. Changes in systolic and diastolic blood pressure represent downstream outcomes that are also influenced by pharmacological treatment, physiological conditions, and social barriers. This framework explains why improvements in knowledge scores alone are insufficient to establish the clinical effectiveness of educational programs (Edelman & Kudzma, 2021).

Outcome measurements should distinguish within-group changes from effects attributable to the intervention. Reductions in mean blood pressure following education may result from regression to the mean, concurrent medication adjustments, habituation to blood pressure measurement procedures, or behavioral changes associated with participation in research. Randomized controlled trials involving comparison groups help minimize bias; however, the risks of participant attrition, inconsistent intervention adherence, and the absence of blinding must still be evaluated. This review did not conduct a formal risk-of-bias assessment for each included study. Consequently, study quality should not be presented as though it had been evaluated using established instruments such as RoB 2 or ROBINS-I. Such methodological caution is essential when formulating recommendations for evidence-based nursing practice.

A study conducted by (Erden et al., 2025) involving 60 patients with hypertension evaluated a 12-week tele-nursing program based on the Roper–Logan–Tierney model. Participants in the intervention group received educational booklets, blood pressure measurement training, and remote support twice weekly. The findings demonstrated improvements in self-care management indicators compared with the control group. These results reinforce the argument that repeated educational interventions can enhance patients' capacity to manage chronic conditions. However, the primary outcome of the study was self-care scores, which cannot be interpreted as quantitative evidence of blood pressure reduction. Distinguishing behavioral outcomes from clinical outcomes is a fundamental requirement in evidence synthesis focusing on hypertension control.

A randomized controlled trial conducted by (Widyastuti et al., 2025) examining the MaRiTensi application recruited 108 patients with hypertension in Yogyakarta and analyzed 99 participants who completed the 12-week intervention. Compared with the control group, significant between-group differences in blood pressure changes were observed at the first evaluation for both systolic ($p = 0.039$) and diastolic blood pressure ($p = 0.009$). However, these differences were no longer statistically significant at the second evaluation ($p = 0.429$ and $p = 0.312$, respectively). A significant difference in self-care outcomes remained evident at the second evaluation ($p = 0.024$). This pattern indicates that behavioral and hemodynamic responses do not necessarily develop in parallel. Improvements in health literacy cannot be inferred solely from the statistical significance of clinical changes. Similarly, reductions in blood pressure within individual groups do not establish the superiority of the application across all assessment points.

The integration of technology into health education raises equity concerns that are frequently overlooked in discussions of intervention effectiveness. Mobile applications and online educational programs can only be optimally utilized when patients have access to smartphones, reliable internet connections, adequate reading comprehension, and assistance when difficulties arise. Older adults and individuals with limited digital literacy may require additional support to ensure continued access to healthcare services. A combination of face-to-face education, educational booklets, simple reminders, and follow-up visits may provide a more inclusive approach than exclusively digital strategies. This consideration represents a conceptual implication derived from the heterogeneity of study findings rather than a

comparative result demonstrating the superiority of combined approaches within the reviewed literature.

The online group education program investigated by (Upoyo et al., 2024) incorporated knowledge, motivation, self-efficacy, and self-care behaviors into an approach aimed at preventing uncontrolled blood pressure. The potential benefits of group-based learning extend beyond educational content delivery to include the exchange of experiences, reinforcement of healthy behavioral norms, and opportunities to clarify misconceptions. Nevertheless, barriers related to digital literacy, device availability, and unequal internet connectivity must be considered when implementing these programs beyond healthcare facilities.

Comparison of Educational Methods and Components

Table 3. Comparison of Health Education Strategies That Can Be Implemented by Nurses

Strategy	Active Components	Strengths	Limitations
Individual face-to-face education	Assessment, personalized goals, and teach-back techniques	Educational content tailored to individual patient needs	Requires sufficient consultation time
Group education	Discussions, demonstrations, and peer support	Efficient delivery and strengthens social support	Less personalized for addressing complex individual problems
Telephone follow-up	Reminders, problem-solving, and evaluation	Maintains continuity of interventions	Depends on contact availability and frequency
Mobile applications/mHealth	Blood pressure recording, educational materials, and feedback	Data and educational messages can be accessed repeatedly	Digital literacy requirements and data privacy concerns
Family support	Dietary planning, medication management, and collaborative monitoring	Reinforces health-related behaviors at home	Requires family consent and readiness to participate

The comparison of strategies presented in Table 3 indicates that the selection of educational methods should be based on patient characteristics rather than the attractiveness of particular media. Individual education is effective in addressing specific needs, such as limited understanding of medication regimens or anxiety regarding examination results. Group education provides opportunities to model healthy behaviors and strengthen social support. Follow-up interventions delivered through telephone calls or mobile applications offer opportunities to identify declining treatment adherence at an earlier stage. However, these approaches also increase demands related to healthcare resources, workflow management, and information security.

Determining the appropriate intensity of educational programs requires consideration of educational dosage, implementation fidelity, and continuity of contact. Single-session education often remains limited to information transmission, whereas programs incorporating practical exercises and feedback provide opportunities for patients to correct misunderstandings when encountering everyday challenges. The studies conducted by (Kordvarkane et al., 2023), (Upoyo et al., 2024), and (Widyastuti et al., 2025) incorporated repeated patient contact; however, differences in their research designs do not yet allow the optimal frequency of educational sessions to be quantitatively determined. Healthcare resources, nurses' communication competencies, and documentation workloads should be considered before implementing these programs on a broader scale. Implementation evaluations should document the number of educational sessions actually received by patients rather than merely the number of sessions initially planned.

Components that appear consistently across promising educational programs include repeated contact, clearly defined goals, practical skills training, and feedback based on monitoring results. (Kordvarkane et al., 2023) combined educational sessions with periodic telephone contact, while (Polsook & Aungsuroch, 2024) employed mobile applications and telephone-based support. The MaRiTensi application facilitated mobile-based self-management. These similarities suggest that the intensity of support and patients' ability to apply educational content may represent important mechanisms underlying intervention effectiveness. Determining which components contribute most substantially to improved outcomes nevertheless requires intervention trials that directly compare individual components.

The implementation of nursing interventions can begin with assessing patients' health literacy, establishing individualized treatment targets in collaboration with the clinical team, demonstrating the proper use of blood pressure monitoring devices, developing realistic dietary and physical activity plans, and arranging follow-up visits or contacts. Patients' understanding should be assessed using the teach-back technique, which involves asking patients to explain their care plans in their own words. Evaluations should be conducted using blood pressure records and standardized clinical assessments rather than relying solely on the amount of educational material delivered.

A practical implication of this synthesis is the need for a consistent set of evaluation indicators. Primary indicators should include systolic and diastolic blood pressure measured in mmHg using standardized equipment, procedures, body positions, and measurement times. The proportion of patients achieving their blood pressure targets should be determined according to individual clinical conditions and the guidelines applied. Intermediate indicators should include blood pressure measurement skills, treatment adherence, sodium intake, physical activity, self-efficacy, and the quality of follow-up documentation. Reporting adverse events, medication adjustments, and losses to follow-up would further support the assessment of the net benefits of educational interventions. Without such standards, comparisons of effectiveness across healthcare facilities may reflect differences in measurement procedures rather than differences in the quality of health education.

Table 4. Minimum Indicators for Evaluating Health Education among Patients with Hypertension

Domain	Recommended Measurements	Purpose of Interpretation
Clinical blood pressure	Systolic and diastolic blood pressure (mmHg) measured before and after the program	Primary outcomes; continuous changes that can be compared
Blood pressure control targets	Proportion of patients achieving individualized targets at predefined time points	Distinguishes reductions in mean blood pressure from achievement of clinical targets
Adherence and behaviors	Medication regimens, low-sodium diet, physical activity, and self-monitoring	Examines mechanisms of change at the behavioral level
Patient learning	Knowledge, practical skills, and self-efficacy	Evaluates intermediate outcomes rather than substitutes for clinical measurements
Implementation process and safety	Completed sessions, follow-up activities, medication adjustments, and adverse events	Evaluates implementation fidelity, sustainability, and program safety

Moderating Factors, Limitations of Evidence, and Implications for Nursing Practice

The heterogeneity of intervention benefits does not merely represent a statistical limitation but also reflects variations in healthcare environments and patient needs. Baseline blood pressure levels, age, comorbidities, access to medications, health literacy, socioeconomic

conditions, and family support may moderate the relationship between health education and blood pressure control. Some patients require training to interpret blood pressure measurements, whereas others encounter barriers related to dietary practices, financial constraints, occupational demands, or polypharmacy. Health education messages that fail to address patients' actual challenges may improve knowledge without producing meaningful behavioral changes. A health promotion approach requires nurses to assess individual needs, negotiate realistic goals, and coordinate social support (Edelman & Kudzma, 2021).

The applicability of educational interventions in Indonesian primary healthcare settings requires a clear distinction between the core components of interventions and their methods of delivery. Essential intervention components should include initial assessments, patient-centered communication of health risks, practical skills demonstrations, development of action plans, feedback on blood pressure monitoring results, and periodic evaluations. These components can be delivered through community health center (Puskesmas) visits, family-based support, telephone consultations, or digital platforms, depending on the availability of healthcare resources. Collaborative care models are also essential because effective blood pressure control continues to require clinical assessments and pharmacological treatment adjustments conducted by authorized healthcare professionals. Educational programs implemented without integration into clinical follow-up may improve patients' knowledge without ensuring that blood pressure levels achieve the recommended therapeutic targets.

The limitations of this review must be acknowledged at both the level of the included studies and the review methodology. Heterogeneity in study populations, multicomponent interventions, measurement instruments, follow-up durations, and comparison conditions makes it difficult to attribute observed effects exclusively to health education. Quasi-experimental studies are more susceptible to confounding factors, whereas randomized controlled trials (RCTs) with small sample sizes are associated with greater uncertainty in effect estimates. This review employed a targeted literature selection process without comprehensive search records, independent duplicate screening, or formal risk-of-bias assessment. The PRISMA diagram serves as a limited documentation framework because complete numerical data from the initial identification and screening stages were unavailable. Consequently, this review cannot claim comprehensive coverage of the global evidence base or provide a new pooled effect estimate. Its conclusions are therefore restricted to the consistency and differences observed among findings within the selected body of literature.

Future research should compare standardized nurse-led educational interventions with usual care through adequately powered randomized controlled trials, incorporate repeated blood pressure measurements, report changes in systolic and diastolic blood pressure along with confidence intervals, and examine the sustainability of behavioral improvements after the interventions have ended. Implementation studies in Indonesia should evaluate the integration of hybrid educational approaches, community health center visits, community health volunteers, family involvement, and digital support within real-world resource constraints. The most appropriate practical recommendation is to integrate health education into routine hypertension management, systematically document patients' educational needs and learning objectives, and evaluate changes in blood pressure as the primary clinical indicator of intervention effectiveness.

CONCLUSION

The literature synthesis indicates that nurse-delivered or nurse-led health education has the potential to improve blood pressure control among patients with hypertension, particularly when implemented through structured programs incorporating counseling, self-care skills,

monitoring, and follow-up support. Meta-analyses demonstrate beneficial effects on both systolic and diastolic blood pressure; however, intervention heterogeneity and limitations in the certainty of evidence require caution when generalizing the magnitude of these effects. Individual studies indicate that improvements in systolic blood pressure are not always accompanied by statistically significant changes in diastolic blood pressure. Improvements in knowledge, self-efficacy, and treatment adherence represent important educational outcomes but cannot replace direct blood pressure measurements. Nursing services are therefore encouraged to prioritize educational interventions tailored to patients' individual conditions, evaluate patient understanding through practical skills training, provide continuous support, and maintain consistent documentation of clinical outcomes. More comprehensive reviews incorporating systematic literature searches and formal risk-of-bias assessments are necessary to identify the educational components that contribute most substantially to improved blood pressure control.

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