

Effectiveness of disease management program for hypertension: expert evaluation

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ABSTRACT

Background

Hypertension is a risk factor for cardiovascular disease and premature mortality worldwide. Effective management of this condition requires the integration of structured interventions, such as disease management programs, which have proven clinically significant in increasing treatment adherence and improving patient outcomes.

Objective

To evaluate the effectiveness of a disease management program in achieving target blood pressure in primary care.

Materials and methods

A retrospective random sampling method was used to include 200 medical cards (form 025/u) of patients with arterial hypertension registered for dispensary care in 4 city polyclinics of Astana, Kazakhstan, for 2023-2024. Patients were divided into two groups depending on whether they achieved the target BP level (<140/90 mmHg). Clinical and laboratory parameters, including age, lipid profile, glucose level, and systolic/diastolic BP, were analyzed. The completeness of the disease management program implementation was also assessed using a criterion scale.

Results

Of the total number of patients, 170 (85%) successfully achieved the target blood pressure level, and 30 (15%) did not. Individuals with uncontrolled arterial hypertension were characterized by a significantly higher mean age (71.17 ± 10.87 vs. 66.08 ± 10.14 years; $p < 0.05$) and elevated levels of low-density lipoprotein cholesterol (LDL-C) (4.86 ± 1.75 vs. 3.53 ± 1.32 mmol/L; $p < 0.05$). Mean systolic and diastolic BP were also significantly higher in this group ($142.83 \pm 12.98/87.00 \pm 5.63$ mmHg vs $133.34 \pm 12.41/82.43 \pm 6.80$ mmHg; $p < 0.05$). Full compliance with the Disease Management Program was associated with good clinical outcomes, with the group that achieved target blood pressure levels and fully complied with the program scoring significantly higher on the program implementation scores (8.2 ± 0.7 vs 5.6 ± 1.1 ; $p < 0.001$).

Conclusion

Full implementation of the disease management program significantly improves lipid profile and BP control in the primary care. The study also demonstrated the importance of regular follow-up, patient monitoring, and lifestyle interventions as key components of effective hypertension management.

Keywords

hypertension; disease management program; blood pressure control; outpatient treatment, lipid profile.

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INTRODUCTION

Arterial hypertension (AH), or high blood pressure, is one of the most prevalent health issues worldwide, affecting a substantial portion of the global population and contributing significantly to morbidity and premature mortality¹.

More than 1.3 billion people worldwide are living with arterial hypertension, and this number is expected to rise in the coming years². This increase is driven by factors such as population aging and lifestyle choices, with a higher prevalence observed in low- and middle-income countries³. These statistics underscore the urgent need for primary prevention, early detection through screening, and public awareness programs to help mitigate the growing burden of hypertension^{4,5}.

Hypertension is defined as a sustained elevation of blood pressure at or above 140/90 mmHg, in accordance with current international guidelines⁶. It is a major risk factor in the pathogenesis of serious complications such as cardiovascular diseases, chronic kidney disease, and vascular dementia. The damage caused by uncontrolled hypertension affects multiple organ systems and often progresses silently over many years, making early diagnosis and treatment critically important. This highlights the relevance of systematic monitoring and patient education as essential components of hypertension management.^{7,8}

Standard clinical guidelines recommend therapeutic interventions beginning with lifestyle modifications, including reduced salt intake, increased physical activity, smoking cessation, weight management, and moderate alcohol consumption^{9,10}. If these measures are insufficient, pharmacological therapy with antihypertensive agents is introduced, often requiring a combination of medications to achieve optimal blood pressure control¹¹⁻¹³. However, treatment adherence remains low, as many patients either discontinue their medications or fail to implement necessary lifestyle change^{14,15}. Thus, comprehensive disease management programs have become vital tools in addressing chronic conditions such as hypertension^{16,17}.

Disease management programs (DMPs) are structured interventions designed to assist patients in effectively managing their chronic conditions¹⁸.

The core components of an effective chronic disease management program are (10):

1. **Patient registries** – These are carefully maintained databases that collect essential medical and demographic information about people living with chronic illnesses. They help doctors group patients by how well their condition is controlled and serve as a foundation for tracking progress, identifying trends, and tailoring interventions more effectively.
2. **Observation cards** – Simple, one-page forms that summarize the most important details about a patient's health status, current treatment, and recent test results. They act as quick reference tools during clinic visits, ensuring that both the doctor and the patient stay focused on what matters most.
3. **Scheduled visits** – Regularly planned appointments with clear goals in mind. With the help of observation cards, these visits become more structured and consistent, allowing healthcare providers to monitor treatment progress and keep patients moving toward their therapeutic targets.
4. **Telephone follow-ups** – Periodic calls made to patients, with the frequency depending on how well their condition is managed. These check-ins help catch early warning signs, prevent patients from dropping out of care, and re-engage them promptly when needed.
5. **Group sessions** – Meetings where several patients with the same condition come together for education and shared support. These sessions create opportunities for peer learning, encourage active self-care, and allow healthcare teams to reach more patients in a single sitting.
6. **Self-management support** – Helping patients build the confidence and skills to take charge of their own health. This includes encouraging lifestyle changes, strengthening motivation, and reinforcing personal responsibility—all of which are crucial for long-term disease control.

The program is adapted to local needs and includes training for healthcare professionals and patients, involvement of a multidisciplinary team, support for self-management, and the use of digital tools for remote monitoring and follow-up care¹⁹. In the management of hypertension, disease management programs are particularly valuable as they empower patients to take an active role in their health and promote adherence to both pharmacological and non-pharmacological therapies²⁰⁻²². Such programs have been shown to

improve clinical outcomes, reduce hospitalizations, and enhance the quality of life for patients with chronic diseases²³. Importantly, they can also reduce healthcare costs by preventing the progression of hypertension-related complications.

The impact of hypertension on public health is particularly evident in countries undergoing rapid economic and social transitions. Over the past few decades, significant global shifts in lifestyle and dietary habits have contributed to a marked increase in non-communicable diseases, including hypertension. According to available data, hypertension has become a critical public health issue in Kazakhstan, particularly given its high prevalence and the relatively low levels of awareness, treatment, and control among affected individuals⁵.

Studies indicate that a significant proportion of rural residents may not undergo regular medical check-ups or blood pressure screening, often seeking medical assistance only when severe symptoms arise [24]. Such delays in diagnosis can lead to complications that could otherwise have been prevented. Moreover, limited access to healthcare facilities and financial constraints may further hinder effective treatment in rural areas²⁵.

Even in urban centers, where healthcare infrastructure is more developed, hypertension control remains suboptimal²⁶. Although awareness and diagnostic rates have improved in urban settings, only a small proportion of patients achieve adequate blood pressure control²⁶. Contributing factors include limited follow-up care, inconsistent adherence to prescribed treatment regimens, and insufficient patient education on the importance of continuous monitoring²⁸. The current healthcare system in Kazakhstan continues to face challenges in delivering comprehensive, patient-centered care for chronic diseases^{29,30}. Addressing these challenges requires a multifaceted approach, including early detection, patient education, improved treatment adherence, and the implementation of comprehensive disease management programs.

Moreover, public health education campaigns aimed at increasing awareness of the risks associated with hypertension and the importance of regular blood pressure monitoring can significantly improve outcomes^{31,32}. Coordinated efforts at both policy and practice levels can reduce the public health burden of hypertension and improve population health and well-being globally³³.

Objective: To evaluate the effectiveness of a disease management program in achieving target blood pressure in primary care.

MATERIALS AND METHODS

An expert analysis of medical records of patients with arterial hypertension was conducted in four urban outpatient clinics in Astana from January 2023 to December 2024.

The study protocol, titled “*Comprehensive Assessment and Improvement of Outpatient Care Organization for Patients with Arterial Hypertension*,” was approved by the Independent Local Ethics Committee of the Non-Profit Joint-Stock Company “Astana Medical University” (Approval No. 2, dated November 10, 2022).

A total of 200 outpatient medical records (Form 025/u) were selected using random sampling, with 50 records drawn from each of the four primary clinics. The study included records of patients with arterial hypertension who were registered for follow-up care with a general practitioner, aged over 18 years, and receiving treatment within the framework of the disease management program (DMP).

Exclusion criteria included patients with secondary hypertension, those with severe comorbid conditions that could confound the results, newly diagnosed individuals not yet stabilized on therapy, those unwilling to participate in the study, and individuals unable to provide informed consent independently.

The dataset extracted from the medical records included the following variables:

- Demographic characteristics: sex and age;
- Clinical diagnoses: as documented by general practitioners and cardiologists;
- Laboratory test results: including urinalysis and biochemical indicators such as total cholesterol and low-density lipoproteins (LDL);
- Instrumental examination findings: including electrocardiography (ECG), 24-hour ambulatory blood pressure monitoring (ABPM), and echocardiography;
- Treatment plans and lifestyle modification interventions;
- Data on achievement of target blood pressure levels as part of routine outpatient follow-up.

To assess the effectiveness of the disease management program based on the analysis of patients' medical records, the presence or absence of the following criteria was determined: frequency of visits to the general practitioner (GP) and the district nurse under the DMP, whether lifestyle modification recommendations were provided, availability of laboratory data (urinalysis, biochemical blood tests), and instrumental data (ECG, echocardiography, Holter monitoring), prescription of a two-component combination antihypertensive therapy, achievement of target systolic blood pressure (SBP) < 140 mmHg and diastolic blood pressure (DBP) < 90 mmHg within 3 months from the start of treatment, and provided good tolerability achievement of the target level of 130/80 mmHg or lower within 6 months. Each criterion was assigned 1 point if present, and 0 points if absent. Based on these ten criteria, the completeness of DMP implementation was assessed. Depending on the total score, patients were classified as having received the DMP in full scope (8–10 points) or partial scope (≤ 7 points).

Table No 1. Criteria for Assessing the Quality of Disease Management Program Implementation in Hypertension:

N	Quality Assessment Criterion	Performance Assessment No – 0 point Yes – 1 point	
1	Nurse visit once every 3 months	≤ 7 points The disease management program was implemented only partially.	≥ 8 points The disease management program was implemented in full.
2	General practitioner (GP) visit once every 3 months		
3	Cardiologist visit once a year		
4	Urinalysis once a year		
5	Biochemical analysis: total cholesterol (TC), LDL once a year		
6	Electrocardiography once a year		
7	Ambulatory blood pressure monitoring (ABPM, 24-hour) once every 2 years		
8	Echocardiography once every 2 years		
9	Achievement of target blood pressure levels during outpatient follow-up		
10	Lifestyle modification recommendations provided		

Statistical Analysis: To assess differences between groups, the Pearson chi-square test was used, or Fisher's exact test when expected cell counts were five or fewer. A p-value of < 0.05 was considered statistically significant.

Continuous variables were compared using the Mann–Whitney U test, as their non-normal distribution was confirmed by the Shapiro–Wilk and Kruskal–Wallis tests. The analysis was conducted using IBM SPSS version 22 (IBM Corp.)

RESULTS

The study included 200 patients with a confirmed diagnosis of arterial hypertension who were under outpatient follow-up. Among them, 73 were men (36.5%) and 127 were women (63.5%). Based on the achievement of target blood pressure levels (<140/90 mmHg), patients were divided into two groups: those who achieved the target values (n = 170; 85%) and those who did not (n = 30; 15%).

Table 2. Comparative Characteristics of Clinical and Laboratory Parameters in Patients with Hypertension Based on Achievement of Target Blood Pressure Levels

Parameter	Target BP Not Achieved (n = 30)	Target BP Achieved (n = 170)	p-value
Mean age, years	71,17 $\pm$ 10,87	66,08 $\pm$ 10,14	< 0,05
LDL, mmol/L	4,86 $\pm$ 1,75 (n = 14)	3,53 $\pm$ 1,32 (n = 126)	< 0,05
Total cholesterol, mmol/L	5,66 $\pm$ 1,10 (n = 20)	5,69 $\pm$ 1,13 (n = 152)	< 0,05
HDL, mmol/L	1,25 $\pm$ 0,50 (n = 8)	1,30 $\pm$ 0,61 (n = 80)	0,05
Glucose, mmol/L	6,20 $\pm$ 1,61 (n = 20)	5,91 $\pm$ 2,01 (n = 129)	0,05
Systolic blood pressure (SBP), mmHg	142,83 $\pm$ 12,98	133,34 $\pm$ 12,41	< 0,05
Diastolic blood pressure (DBP), mmHg	87,00 $\pm$ 5,63	82,43 $\pm$ 6,80	< 0,05

The mean systolic and diastolic blood pressure values were significantly higher in patients who did not achieve target levels: 142.83 $\pm$ 12.98 mmHg and 87.00 $\pm$ 5.63 mmHg, compared to 133.34 $\pm$ 12.41 mmHg and 82.43 $\pm$ 6.80 mmHg, respectively ($p < 0.05$).

Patients who did not achieve target blood pressure levels were characterized by a higher mean age - 71.17 ± 10.87 years compared to 66.08 ± 10.14 years in the group with controlled hypertension ($p < 0.05$). The mean LDL level was also higher among patients with uncontrolled blood pressure (4.86 ± 1.75 mmol/L vs. 3.53 ± 1.32 mmol/L; $p < 0.05$), whereas total cholesterol, HDL, and glucose levels did not differ significantly between the groups.

The frequency of implementation of key components of the disease management program was significantly higher in the main group: 91.8% of patients underwent ECG within the year compared to 63.7% in the control group; biochemical testing (total cholesterol, LDL) was performed in 87.6% versus 58.4%; echocardiography was conducted in 60.2% versus 31.6%; and lifestyle modification recommendations were documented in 94.5% of patients in the main group compared to 52.0% in the control group.

The total program implementation score, calculated based on nine criteria, averaged 8.2 ± 0.7 in the main group and 5.6 ± 1.1 in the control group ($p < 0.001$). This confirms significant differences in the completeness of DMP implementation between the groups and highlights the positive impact of comprehensive program execution on clinical outcomes.

Differences in lipid profile indicators and blood pressure levels underscore the need for a differentiated approach to hypertension control in older patient populations.

Another important aspect is the use of combination antihypertensive therapy. Of the 200 participants, 169 (84.5%) were receiving combination treatment. Among them, 143 patients (84.6%) achieved effective

blood pressure control. This high success rate supports the clinical rationale for initiating or intensifying treatment with combination therapy, especially when monotherapy fails to achieve target values.

DISCUSSION

Our findings demonstrate that structured disease management plays a key role in improving clinical outcomes in patients with hypertension and are consistent with previous research highlighting the effectiveness of chronic care models and structured interventions in the treatment of noncommunicable diseases^{6,12}. For example, in the Kaiser Permanente Northern California program, implementation of a comprehensive hypertension management strategy resulted in an increase in the proportion of patients with controlled BP from 43.6% in 2001 to 80.4% in 2009. (34) Multidisciplinary care teams, regular monitoring, and patient education significantly improved treatment adherence and outcomes³⁵. In addition to quantitative improvements, the data highlight the importance of patient engagement and continuity of care in the treatment of chronic diseases. Such programmes' not only impact clinical outcomes but also contribute to the wider wellbeing of patients and their families by encouraging active health behavior's³⁶.

The group achieving blood pressure targets are more likely to adhere to key components of the disease management programme, including regular ECG, echocardiography and lifestyle counselling. A systematic review in an Irish population found that 56% of patients achieved blood pressure targets ($<140/90$ mmHg), while adherence to antihypertensive treatment varied widely, from 27% to 92%³⁷. These results support the recommendations of the World Health Organization and international hypertension societies, which advocate multidisciplinary, team-based approaches to hypertension management³⁸ and emphasise the importance of patient engagement and continuity of care.

Older age and elevated LDL-C were also found to be significantly associated with failure to achieve blood pressure control. This is consistent with previous findings suggesting that age-related vascular changes and dyslipidemia contribute to resistance to antihypertensive therapy^{39,40}.

Our findings on the use of combination therapy in patients with hypertension are consistent with international

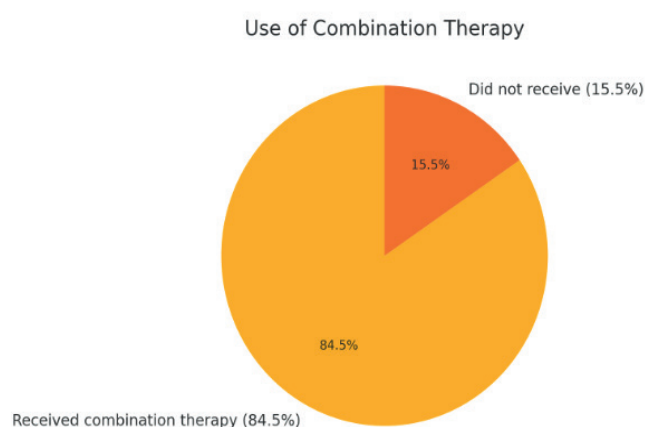


Figure 1. Use of Combination Therapy

guidelines and previously published studies. The 2023 European Society of Cardiology (ESC) and European Society of Hypertension (ESH) guidelines recommend early initiation of combination therapy to achieve rapid and sustained blood pressure control. Fixed-dose combinations of angiotensin-converting enzyme (ACE) inhibitors or angiotensin II receptor blockers (ARBs) with calcium antagonists or thiazide/thiazide-like diuretics have shown the greatest efficacy due to their complementary mechanisms of action and good safety profile [41]. Antihypertensive treatment should be aimed not only at lowering blood pressure, but also at maintaining or improving the patient's quality of life. The results of the ACCOMPLISH trial are consistent with our results, demonstrating that combination therapy provides superior blood pressure control results compared with monotherapy or step-titration strategies.

CONCLUSION

Our study convincingly demonstrates that the Disease Management Program (DMP) is an effective tool for achieving blood pressure targets in patients with hypertension in primary care in Kazakhstan. Patients who completed the program were more likely to achieve blood pressure control. This suggests that scaling up the use of such programs could significantly improve the effectiveness of hypertension treatment in the country.

Conflict of Interest: The authors declare no conflict of interest.

Ethical clearance: This study was conducted in accordance with ethical standards. Ethical approval was obtained from the appropriate institutional review board, and informed consent was secured from all participants prior to data collection.

Authors's contribution

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