ANALYSIS OF INPATIENT TREATMENT FOR HYPERTENSIVE PATIENTS AT TAM DAO HEALTH CENTER IN 2024-2025

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ABSTRACT

Objectives: To conduct an in-depth analysis of inpatient management patterns and clinical characteristics among hypertensive patients admitted to Tam Dao Health Center between 2024 and 2025.

Methods: A retrospective cross-sectional descriptive study was performed, encompassing all hospitalization episodes of patients diagnosed with arterial hypertension at Tam Dao Health Center from June 2024 to June 2025. Data were systematically extracted from electronic health records via the eMRHIS platform. Key variables included the total number of pharmacological agents prescribed, duration of hospitalization, presence of comorbid conditions, and utilization of antihypertensive agents across the five principal therapeutic drug classes.

Results: A total of 333 inpatient episodes involving hypertensive patients were analyzed. Length of stay ranged from 1 to 17 days, with the majority of admissions lasting between 1 and 8 days. Patients received between 1 and 10 pharmacological agents per hospitalization. The prevalence of comorbidities was 37.2%, with cardiovascular diseases accounting for 16.5% and dyslipidemia 13.8% of cases. The most frequently prescribed antihypertensive classes were calcium channel blockers (73.57%), diuretics (69.37%), and angiotensin-converting enzyme inhibitors (34.83%).

Conclusion: This study provides a comprehensive epidemiological and pharmacotherapeutic profile of hypertensive inpatients at a district-level healthcare facility. Findings underscore the clinical complexity of hypertension management in the inpatient setting, highlighting significant rates of polypharmacy and multimorbidity. The results advocate for the implementation of risk-stratified therapeutic approaches and contribute practical evidence to inform guideline-concordant blood pressure management in primary and secondary care settings.

Keywords: Arterial hypertension; inpatient management; pharmacotherapy utilization; comorbidity profile; Tam Dao Health Center.

1. INTRODUCTION

Hypertension is one of the major modifiable risk factors for cardiovascular disease. As defined by the Vietnam Journal of Cardiology, hypertension is diagnosed when systolic blood pressure is ≥140 mmHg and/or diastolic blood pressure is ≥90 mmHg on at least two separate occasions [1].

Elevated blood pressure significantly contributes to cardiovascular and cerebrovascular mortality, particularly through heart disease and stroke. Hypertension is a highly prevalent clinical condition, affecting more than 600 million individuals globally and present across nearly all population groups [2].

According to the 2023 World Health Organization (WHO) report, only 54% of adults with hypertension were diagnosed, 42% received treatment, and merely 21% achieved adequate blood pressure control [3]. WHO estimates that hypertension is responsible for approximately 10.8 million deaths annually, making it the leading cause of mortality among non-communicable diseases [3].

In Vietnam, the prevalence of hypertension is rising rapidly. The 2021 STEPS survey on non-communicable disease risk factors, conducted by the Ministry of Health in collaboration with WHO, reported a national hypertension prevalence of 26.3% among adults. However, only 43.1% of cases were diagnosed, and just 13.6% achieved adequate blood pressure control [4]. These figures highlight a critical challenge in hypertension management at the community level, especially within primary healthcare settings.

Both globally and in Vietnam, numerous studies have investigated the treatment landscape for hypertension, particularly focusing on pharmacological patterns and blood pressure control rates. For instance, a 2022 study in the United States reported that hypertension affects approximately 116 million adults in the U.S. and over 1 billion adults worldwide. First-line antihypertensive therapies include diuretics, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), and calcium channel blockers (CCBs) [5].

In Vietnam, an inpatient study conducted at the Department of Senior Officials, 103 Military Hospital, from December 2022 to October 2024, reported an average hospital stay of 4.96 ± 1.61 days and an average of 10.75 ± 6.09 comorbid conditions per patient [6].

Hypertension treatment outcomes are influenced by a range of factors, including comorbidities (e.g., diabetes mellitus, chronic kidney disease), type of antihypertensive agents administered (e.g., diuretics, ACE inhibitors, beta-blockers, CCBs, ARBs), duration of hospitalization, and accessibility to healthcare services. Moreover, the availability and integration of electronic medical record (EMR) systems, as well as the clinical competency of healthcare providers, play essential roles in monitoring and therapeutic decision-making.

Although various studies have been conducted at central and provincial hospitals, there is a lack of comprehensive investigations on inpatient hypertension management at the grassroots level — a critical tier in the healthcare system responsible for direct and continuous care of chronic conditions in the community. Therefore, it is essential to examine the inpatient treatment practices at Tam Dao Health Center to provide context-specific evidence, inform strategic interventions, improve treatment efficacy, and ultimately reduce the disease burden at the local level.

Based on this practical necessity, we conducted the present study titled:

"Analysis of Inpatient Treatment for Hypertensive Patients at Tam Dao Health Center in 2024-2025."

Study Objective: *To conduct a comprehensive evaluation of inpatient therapeutic approaches, clinical profiles, and pharmacological regimens among hypertensive patients admitted to Tam Dao Health Center.*

2. MATERIALS AND METHODS

2.1. Study Population

A retrospective review was conducted on 333 inpatient treatment episodes for patients diagnosed with hypertension at Tam Dao Health Center, using data extracted from the electronic medical record (EMR) management software.

2.2. Study Setting and Duration

The study was carried out at Tam Dao Health Center from June 2024 to June 2025.

2.3. Study Design

A retrospective cross-sectional descriptive study.

2.4. Sample Size

The sample size was determined based on the total number of inpatient episodes involving hypertensive patients, retrieved from electronic medical records within the specified timeframe. A total of 333 treatment episodes were included in the analysis.

2.5. Sampling Method

Treatment episodes were selected based on the presence of a primary diagnosis of hypertension, coded as I10 according to the International Classification of Diseases, 10th Revision (ICD-10), as defined by the World Health Organization.

- *Inclusion Criteria:* Inpatient medical records of patients diagnosed with hypertension and treated at Tam Dao Health Center between June 2024 and

June 2025.

- Exclusion Criteria: Medical records lacking essential data required for evaluating the treatment episode characteristics.

2.6. Study Variables

Patients were characterized based on the number of medications prescribed, duration of hospitalization, presence or absence of comorbidities, and the type and number of comorbid conditions associated with hypertension (including dyslipidemia, cardiovascular disease, type 2 diabetes mellitus, and chronic kidney disease).

Prescribed medications were classified into five major antihypertensive drug classes currently recommended in treatment guidelines: angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), calcium channel blockers (CCBs), diuretics, and beta-blockers.

2.7. Data Collection Method

Data were retrospectively extracted from the emrHIS electronic health record system.

2.8. Data Processing and Statistical Analysis

Data were cleaned and entered using Microsoft Excel, followed by statistical analysis using STATA version 17.

2.9. Ethical Considerations

This retrospective study was conducted using data extracted from the emrHIS system with the approval of the health center's administration.

All patient information was anonymized, and confidentiality was strictly maintained throughout the research process.

3. RESULTS

3.1. Characteristics of the Study Sample

3.1.1. General Treatment Characteristics of the Study Sample

A total of 333 inpatient treatment episodes involving patients with a primary diagnosis of hypertension were included in the analysis. The number of medications used and the duration of hospitalization varied significantly depending on the patient's clinical condition.

The length of hospital stay ranged from 1 to 17 days, with 250 episodes (accounting for 75%) having a

length of stay of 1 to 8 days.

The number of medications used per treatment episode ranged from 1 to 29 types, with the majority of episodes involving the use of 1 to 10 types of medication. (Chart 1)
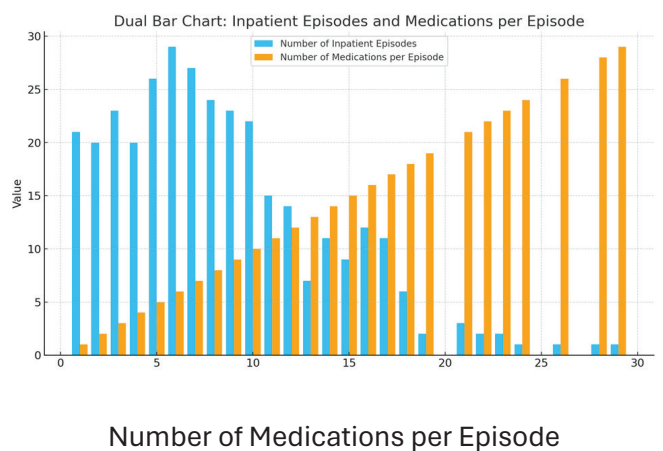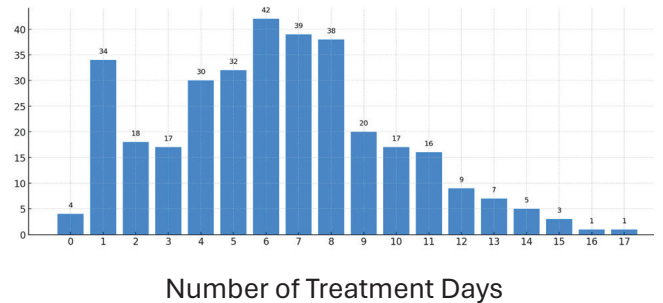

Number of Treatment Days

Number of Medications per Episode

Diagram 1. Number of Drugs Used and Days of Inpatient Treatment in the Study Sample

3.1.2. Comorbidity Characteristics of the Study Sample

The study identified 124 inpatient treatment episodes with comorbidities, accounting for 37.2% of the total number of episodes. The two most common comorbid groups were cardiovascular diseases (16.5%) and dyslipidemia (13.8%) (Chart 2). Patients could present with multiple comorbid conditions. Specifically, among the four commonly observed comorbidities in the study sample, 0.9% of inpatient treatment episodes involved patients concurrently diagnosed with hypertension, dys-lipidemia, cardiovascular disease, type 2 diabetes mellitus, and chronic kidney disease. Additionally, 30.6% of hypertensive cases had two coexisting conditions among the following four: dyslipidemia, cardiovascular disease, type 2 diabetes mellitus, and chronic kidney disease (Table 1).

Table 1. General Characteristics of the Study Sample in Terms of Treatment

Hypertension and Comorbidities	Inpatient Episodes	Days of Hospitalization (min - median - max)	Number of Drugs per Episode (min - median - max)
Hypertension only	209 (62.8%)	0 - 6 - 16	1 - 3 - 7
2 comorbidities	102 (30.6%)	1 - 7 - 17	1 - 3 - 4
3 comorbidities	19 (5.7%)	2 - 7 - 13	1 - 2 - 2
4 comorbidities	3 (0.9%)	5 - 6 - 9	1 - 2 - 7
Total	333 (100%)	0 - 6 - 17	1 - 3 - 7

[1]*Identified Comorbidities: Dyslipidemia, cardiovascular disease, type 2 diabetes mellitus, and chronic kidney disease.*
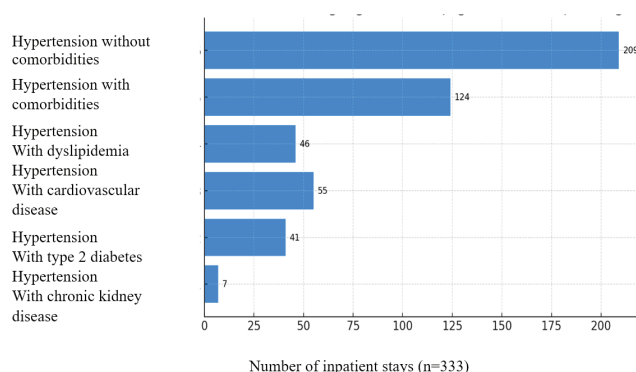

Number of inpatient stays (n=333)

Diagram 2. Characteristics of Comorbidities per Hypertensive Patient per Hospitalization Episode in the Study Sample

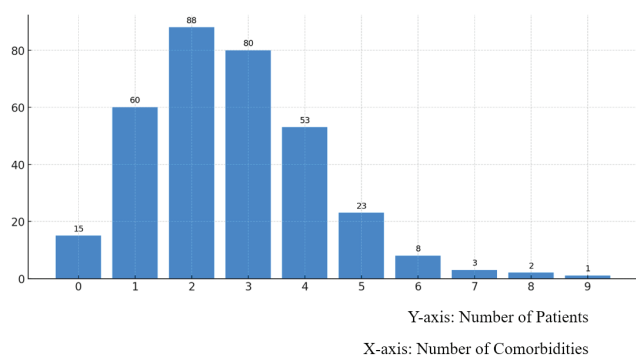Y-axis: Number of Patients

X-axis: Number of Comorbidities

Diagram 3. Number of Comorbidities in Hypertensive Patients

Chart 3 illustrates the number of comorbid conditions accompanying hypertensive patients, including four common diseases (dyslipidemia, cardiovascular disease, type 2 diabetes mellitus, and chronic kidney disease), along with other conditions per treatment episode. The majority of cases involved between 1 and 4 comorbidities, accounting for 84.4%.

3.2. Antihypertensive Medication Utilization

Characteristics of antihypertensive drug use: Among the 333 inpatient treatment episodes for hypertension in the study sample, the utilization rates of calcium channel blockers, diuretics, and angiotensin-converting enzyme (ACE) inhibitors were 73.57%, 69.37%, and 34.83%, respectively. A total of 9 active pharmaceutical ingredients from the five guideline-recommended antihypertensive drug classes were used in the study. Of these, Indapamide was prescribed in 60.36% of treatment episodes, while Amlodipine was used in 57.96% of cases. Notably, three active ingredients-Perindopril, Furosemide, and Nifedipine—were prescribed in more than 77% of treatment episodes (Table 2). Information describing the classes of drugs used and the number of comorbidities is presented in Table 3, in which the number of treatment episodes involving only hypertension (no comorbidities) treated with calcium channel blockers and beta-blockers was 143 and 141, respectively.

Table 2. Frequency of Drug Use

Drug Class / Common Active Substances	Frequency	Percentage
Calcium channel blockers	245	73,57%
Amlodipin	193	57,96%
Nicardipin	57	17,12%
Nifedipin	71	21,32%
Angiotensin II receptor blockers	4	1,20%
Losartan	4	1,20%
Beta-blockers	19	5,71%

Drug Class / Common Active Substances	Frequency	Percentage
Metoprolol	18	5,41%
Bisoprolol	1	0,30%
Diuretics	231	69,37%
Indapamid	201	60,36%
Furosemid	72	21,62%
ACE inhibitors (Angiotensin-converting enzyme)	116	34,83%
Perindopril	116	34,83%

Table 3. Usage of Antihypertensive Drug Classes by Number of Comorbidities in the Study Sample

Number of Comorbidities[2]/ Drug Class			
Only Hypertension	2 Conditions	3 Conditions	4-5 Conditions
Angiotensin II receptor blockers			
1 (25,00%)	3 (75,00%)	0 (0,00%)	0 (0,00%)
ACE inhibitors			
69 (59,48%)	36 (31,03%)	11 (9,48%)	0 (0,00%)
Diuretics			
8 (42,11%)	9 (47,37%)	2 (10,53%)	0 (0,00%)
Calcium channel blockers			
143 (58,37%)	84 (34,29%)	15 (6,12%)	3 (1,22%)
Beta-blockers			
141 (61,04%)	75 (32,47%)	13 (5,63%)	2 (0,87%)
Total			
362 (100%)	207 (100%)	41 (100%)	5 (100%)

[2] *Comorbidities include: hypertension, dyslipidemia, cardiovascular disease, type 2 diabetes, and chronic kidney disease.*

4. DISCUSSION

The analysis results show that the length of hospital stay among hypertensive inpatients ranged from 1 to 17 days, with the majority (75%) staying between 1 and 8 days. This is mainly dependent on blood pressure control, coexisting conditions, and individual treatment responses. Compared to previous studies in Vietnam, the average duration of hospitalization for hypertensive patients may be influenced by multiple factors such as comorbidity patterns, pre-admission blood pressure control, and the effectiveness of multidisciplinary collaboration during treatment.

This study revealed a relatively high prevalence of comorbidities among hypertensive inpatients at Tam Dao Health Center, accounting for 37.2%, with at least one coexisting condition recorded in each relevant case. Cardiovascular disease (16.5%) and dyslipidemia (13.8%) were the two most common comorbidities, both of which are closely linked to hypertension in terms of pathophysiology and may exacerbate clinical status if not correctly managed. Notably, approximately 0.9% of cases had all four common comorbidities concurrently with hypertension. This finding underscores the need to develop appropriate treatment regimens that integrate multiple specialties to optimize blood pressure control in the increasingly prevalent context of multimorbidity.

Regarding pharmacological management, the results indicate that current clinical practice aligns with both national and international guidelines from cardiology societies [7]. The utilization rates of calcium channel blockers, diuretics, and angiotensin-converting enzyme (ACE) inhibitors were 73.57%, 69.37%, and 34.83%, respectively. These three drug classes are foundational in hypertension treatment due to their stable efficacy, good tolerability, and protective properties for target organs. Commonly prescribed active ingredients include Amlodipine and Nifedipine (calcium channel blockers), Indapamide and Furosemide (diuretics), and Perindopril (ACE inhibitor). The use of beta-blockers (5.71%) was relatively low and primarily indicated in cases with heart failure, myocardial infarction, or angina, with Metoprolol and Bisoprolol being the most common choices. Angiotensin II receptor blockers (ARBs) accounted for the lowest proportion (1.20%) and were mainly prescribed to address vascular resistance and promote vasodilation, particularly with Losartan.

When compared with previous studies conducted in Vietnam, several similarities and differences are noteworthy. At Thu Duc City Hospital in 2024, Hoang Thy Nhac Vu and colleagues reported a comorbidity rate of 94.2%, with dyslipidemia (63.7%) and cardiovascular disease (60.1%) being the most prevalent [8]. With a sample size of 359 treatment episodes—comparable to our sample of 333—the significantly higher comorbidity rate at an urban hospital compared to a mountainous district facility (94.2% vs. 37.2%) reflects the elevated risk burden and disease complexity in urban

populations. Nevertheless, both studies identified dyslipidemia and cardiovascular disease as the two most common comorbidities. The survey by Vu et al. also demonstrated broader variability in disease severity, length of hospital stay, and number of medications prescribed per treatment episode compared to our findings.

In terms of medication use patterns, the study conducted at 108 Military Central Hospital recorded a predominance of renin-angiotensin-aldosterone system (RAAS) inhibitors (65.8%) and calcium channel blockers (37.1%), with 58.5% of patients receiving combination therapy. The most common regimen was a combination of an RAAS inhibitor and a calcium channel blocker (17.6%) [9]. Similarly, in our study, the RAAS-related group (including calcium channel blockers) accounted for a total of 73.57%, while diuretics were the second most commonly used class (69.37%).

Another study conducted at Bac Lieu General Hospital by Luu Hong Lien and colleagues also showed a high rate of ARB use (69.52%), followed by beta-blockers (50.52%) and calcium channel blockers (50.45%), with combination therapy applied in 76.45% of cases [10]. These data reflect the modern treatment trend, in which most hypertensive patients are managed using multidrug regimens to maximize the effectiveness of blood pressure control.

5. CONCLUSIONS

This study successfully fulfilled its objective of comprehensively describing hypertensive inpatients at Tam Dao Health Center, clarifying the length of hospitalization, patterns of multimorbidity, and trends in medication use. The findings reflect the clinical complexity of hypertension management and highlight the urgent need to develop risk-based management strategies. Furthermore, the study provides practical evidence to support the optimization of blood pressure control across healthcare facilities.

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