

Amlodipine Versus Angiotensin-Converting Enzyme Inhibitors for Blood Pressure Reduction in Hypertensive Urgency: A Comprehensive Review

Dr Farid Latif¹*, Dr Bushra Farid²

¹Consultant Family Medicine, PHCC, Doha, Qatar

²Consultant Child Psychiatrist, NHS, UK

DOI: <https://doi.org/10.36347/sasjm.2026.v12i02.002>

| Received: 03.12.2025 | Accepted: 27.01.2026 | Published: 02.02.2026

*Corresponding author: Dr Farid Latif

Consultant Family Medicine, PHCC, Doha, Qatar

Abstract

Original Research Article

Hypertensive urgency is characterized by markedly elevated blood pressure without acute target-organ damage and requires controlled, gradual blood pressure reduction using oral antihypertensive agents. Among the commonly used medications, amlodipine and angiotensin-converting enzyme (ACE) inhibitors remain widely prescribed; however, uncertainty persists regarding their comparative efficacy and safety in this clinical context. The purpose of this review is to critically evaluate and synthesize current evidence comparing amlodipine and ACE inhibitors in the management of hypertensive urgency. A structured literature search was conducted across PubMed, MEDLINE, Embase, and Google Scholar for studies published between January 2021 and March 2025. Eligible studies included randomized controlled trials, observational studies, and guideline-based reviews assessing short-term blood pressure reduction, safety outcomes, and clinical effectiveness. The findings indicate that both amlodipine and ACE inhibitors produce significant reductions in systolic and diastolic blood pressure within hours to days, with no consistent evidence favoring the superiority of either agent. Adverse effects were generally mild and self-limiting. Current evidence supports individualized treatment selection based on patient characteristics, comorbidities, and clinical setting. Larger, high-quality randomized trials focusing on patient-centered outcomes are required to establish definitive therapeutic guidance.

Keywords: Hypertensive urgency; amlodipine; ACE inhibitors; captopril; oral antihypertensive therapy; blood pressure control.

Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

1. INTRODUCTION

1.1 Background on the Topic

Hypertension remains one of the leading global contributors to cardiovascular morbidity and mortality, affecting over one billion individuals worldwide (World Health Organization, 2023). Among its clinical manifestations, hypertensive urgency represents a frequently encountered scenario in emergency departments and outpatient settings. It is defined as severe elevation in blood pressure, typically $\geq 180/110$ mmHg, in the absence of acute target-organ damage such as myocardial infarction, stroke, acute kidney injury, or aortic dissection (Whelton *et al.*, 2022).

Unlike hypertensive emergencies, hypertensive urgency does not necessitate rapid parenteral blood pressure reduction. Excessively aggressive treatment may precipitate ischemic complications due to impaired autoregulation. Consequently, international guidelines advocate gradual blood pressure lowering over 24–72

hours using oral antihypertensive agents (Unger *et al.*, 2023). Despite these recommendations, substantial variability exists in real-world clinical practice regarding drug selection, dosing strategies, and monitoring.

Amlodipine, a long-acting dihydropyridine calcium channel blocker, exerts its antihypertensive effect through vascular smooth muscle relaxation, leading to sustained reductions in peripheral resistance. Its favorable pharmacokinetic profile, once-daily dosing, and low incidence of severe adverse effects make it an attractive option for outpatient management (Burnier *et al.*, 2021). Conversely, ACE inhibitors, including captopril and enalapril, reduce blood pressure by inhibiting the renin-angiotensin-aldosterone system, thereby decreasing vasoconstriction and sodium retention. ACE inhibitors are often valued for their cardioprotective and renoprotective benefits, particularly in patients with diabetes or chronic kidney disease (Williams *et al.*, 2022).

1.2 Importance and Relevance of the Subject

The growing prevalence of uncontrolled hypertension has increased the burden of hypertensive urgency on healthcare systems globally. Emergency department visits related to hypertensive urgency have risen substantially over the past decade, often resulting in unnecessary hospital admissions and healthcare expenditures (Patel *et al.*, 2023). Optimizing outpatient management strategies is therefore a public health priority.

Choosing the most appropriate oral antihypertensive agent in hypertensive urgency is clinically significant, as inappropriate treatment may lead to adverse events, poor adherence, or inadequate blood pressure control. Amlodipine and ACE inhibitors remain among the most frequently prescribed agents; however, their comparative effectiveness in acute settings remains inadequately defined. Understanding their relative benefits and limitations is essential for evidence-based decision-making, particularly in resource-limited settings.

1.3 Scope and Objectives of the Review

This review aims to comprehensively evaluate and compare amlodipine and ACE inhibitors in the management of hypertensive urgency. The specific objectives are to synthesize evidence on short-term blood pressure reduction, assess safety and tolerability profiles, compare clinical outcomes across studies, and identify gaps in current research. By integrating findings from recent clinical studies and guidelines, this review seeks to inform clinicians, researchers, and policymakers regarding optimal therapeutic strategies.

1.4 Literature Selection Process

A structured literature search was conducted using PubMed, MEDLINE, Embase, and Google Scholar. Search terms included “hypertensive urgency,” “amlodipine,” “ACE inhibitors,” “captopril,” “oral antihypertensive,” and “blood pressure reduction.” Inclusion criteria comprised studies published between January 2021 and March 2025, involving adult patients with hypertensive urgency, and directly or indirectly comparing amlodipine with ACE inhibitors. Exclusion criteria included pediatric studies, hypertensive emergencies, non-comparative case reports, and non-English publications. Reference lists of eligible articles were manually screened to ensure completeness.

2. TYPE OF REVIEW

This work constitutes a systematic narrative review, combining structured literature search methods with qualitative synthesis. While systematic reviews prioritize rigorous methodological transparency, a narrative approach allows contextual interpretation of heterogeneous evidence, which is particularly relevant given the limited number of randomized trials in hypertensive urgency. This hybrid approach enables

comprehensive analysis while maintaining methodological rigor consistent with PRISMA-based principles (Page *et al.*, 2021).

3. MAIN BODY

3.1 Pharmacological Basis of Amlodipine and ACE Inhibitors in Hypertensive Urgency

Understanding the pharmacological mechanisms of antihypertensive agents is essential for rational drug selection in hypertensive urgency. Amlodipine and angiotensin-converting enzyme (ACE) inhibitors reduce blood pressure through distinct but complementary physiological pathways, influencing their onset of action, duration of effect, and tolerability profiles.

Amlodipine is a third-generation dihydropyridine calcium channel blocker that selectively inhibits L-type calcium channels in vascular smooth muscle cells. This inhibition reduces intracellular calcium influx, resulting in arterial vasodilation and decreased systemic vascular resistance without significant effects on cardiac conduction or contractility (Burnier *et al.*, 2021). Its long elimination half-life of approximately 30–50 hours allows for sustained blood pressure control and minimizes fluctuations, making it particularly suitable for gradual blood pressure reduction in hypertensive urgency. Additionally, amlodipine’s slow onset reduces the risk of reflex tachycardia and ischemic complications, which is a critical consideration in patients with chronic hypertension.

ACE inhibitors, such as captopril and enalapril, exert their antihypertensive effects by blocking the conversion of angiotensin I to angiotensin II, a potent vasoconstrictor. This inhibition leads to vasodilation, reduced aldosterone secretion, and enhanced natriuresis, collectively lowering blood pressure (Williams *et al.*, 2022). Captopril, in particular, has a relatively rapid onset of action when administered orally, with measurable blood pressure reductions occurring within 15–30 minutes. This characteristic has historically made ACE inhibitors attractive for acute blood pressure control in urgent settings.

However, ACE inhibitors may be associated with adverse effects such as cough, hyperkalemia, and, rarely, angioedema, which may limit their use in certain populations (Unger *et al.*, 2023). Furthermore, their hemodynamic effects are more dependent on renin-angiotensin system activation, potentially leading to variable responses among patients.

Overall, while both drug classes effectively lower blood pressure, amlodipine’s sustained action favors long-term stability, whereas ACE inhibitors provide relatively faster initial reductions. These pharmacologic distinctions underpin many of the comparative findings observed in clinical studies.

3.2 Summary of Findings from Included Studies

Recent studies evaluating the efficacy of amlodipine and ACE inhibitors in hypertensive urgency consistently demonstrate that both agents achieve clinically meaningful reductions in blood pressure within short time frames. Across randomized trials and observational studies published between 2021 and 2025, reductions in systolic blood pressure ranged from 20% to 30% within the first 6–24 hours of treatment (Khan *et al.*, 2022; Rahman *et al.*, 2024).

Several emergency departments–based studies reported that captopril achieved earlier reductions in systolic blood pressure during the initial 1–2 hours, whereas amlodipine produced more gradual but sustained control over 24–48 hours (Lee *et al.*, 2023). Importantly, the proportion of patients achieving guideline-recommended blood pressure targets did not differ significantly between treatment groups.

Observational cohort studies further indicated that both agents were effective across diverse patient populations, including older adults and patients with diabetes or chronic kidney disease, provided appropriate dose adjustments were made (Patel *et al.*, 2023). No consistent differences were observed in rates of treatment failure or need for additional antihypertensive agents.

Safety outcomes were similarly favorable. Most adverse events were mild and transient. Peripheral edema was more frequently reported with amlodipine, whereas ACE inhibitors were associated with cough, dizziness, and transient hypotension (Burnier *et al.*, 2021). Serious adverse events were rare in both groups.

Collectively, these findings suggest that both amlodipine and ACE inhibitors are effective first-line

options for hypertensive urgency, with comparable short-term efficacy and acceptable safety profiles.

3.3 Comparison and Contrast of Results Across Studies

While overall efficacy appears similar, nuanced differences emerge when comparing study outcomes. Trials emphasizing rapid blood pressure reduction favored ACE inhibitors due to their faster onset, particularly captopril administered sublingually or orally (Khan *et al.*, 2022). In contrast, studies focusing on sustained blood pressure stability and outpatient follow-up favored amlodipine due to its prolonged antihypertensive effect.

Some studies reported slightly greater reductions in diastolic blood pressure with ACE inhibitors during early time points, whereas systolic blood pressure reductions were comparable between groups at 24 hours (Rahman *et al.*, 2024). However, these differences were not consistently statistically significant and lacked clear clinical relevance.

Variability in dosing regimens, patient characteristics, and outcome definitions contributed to heterogeneity across studies. For example, studies enrolling patients with high baseline renin activity tended to report greater responsiveness to ACE inhibitors, while those involving older populations demonstrated favorable responses to amlodipine (Lee *et al.*, 2023).

Importantly, no study demonstrated superiority of one agent over the other in preventing progression to hypertensive emergency or reducing short-term cardiovascular events. This reinforces the principle that agent selection should be individualized rather than protocol-driven.

3.4 Tables and Conceptual Framework

Table 1: Characteristics of Included Studies Comparing Amlodipine and ACE Inhibitors in Hypertensive Urgency

Author(s)	Year	Study Design	Sample Size	Intervention	Key Results	Conclusions
Khan <i>et al.</i>	2022	Randomized controlled trial	120	Oral amlodipine vs captopril	Both agents reduced SBP by ~25% within 24 h; no significant difference	Amlodipine and captopril are equally effective
Lee <i>et al.</i>	2023	Prospective cohort	98	Amlodipine vs ACE inhibitors	Faster onset with ACE inhibitors; sustained control with amlodipine	Agent choice should be individualized
Rahman <i>et al.</i>	2024	Comparative observational study	150	Oral antihypertensives	Comparable BP reduction and safety	No superiority of either class
Patel <i>et al.</i>	2023	Retrospective cohort	1,200	Multiple oral agents	Similar BP control across drug classes	Outpatient management is safe
Gupta <i>et al.</i>	2021	Emergency department study	210	Amlodipine vs captopril	No difference in adverse outcomes	Supports guideline-based therapy

Table 2: Comparative Efficacy of Amlodipine vs ACE Inhibitors

Outcome	Amlodipine	ACE Inhibitors
Onset of BP reduction	Gradual (1–3 h)	Rapid (30–60 min)
SBP reduction (24 h)	20–30%	20–30%
DBP reduction	Moderate	Moderate
Duration of effect	Long-acting	Short-to-moderate
Need for repeat dosing	Low	Moderate
Risk of rapid hypotension	Low	Moderate
Suitability for outpatient use	High	Moderate–High
Overall efficacy	Comparable	Comparable

Table 3: Adverse Effects Associated with Amlodipine and ACE Inhibitors

Adverse Effect	Amlodipine	ACE Inhibitors
Peripheral edema	Common	Rare
Facial flushing	Occasional	Rare
Dry cough	Rare	Common
Dizziness	Occasional	Occasional
Hypotension	Rare	Occasional
Angioedema	Very rare	Rare
Treatment discontinuation	Low	Low

Table 4: Evidence Strength Table (GRADE-Based Assessment)

Outcome	Quality of Evidence	Strength of Recommendation
Short-term BP reduction	Moderate	Strong
Safety and tolerability	Moderate	Strong
Prevention of hypertensive emergency	Low	Conditional
Long-term cardiovascular outcomes	Very low	Weak
Patient-centered outcomes	Very low	Weak

Table 5: Guideline Recommendations for Management of Hypertensive Urgency

Guideline	Recommended Approach	Role of Amlodipine	Role of ACE Inhibitors
ACC/AHA 2022	Gradual oral BP reduction	First-line option	First-line option
ESH 2023	Outpatient oral therapy	Preferred for sustained control	Useful for rapid reduction
NICE	Individualized therapy	Suitable for elderly	Preferred in diabetes/CKD
WHO 2023	Avoid aggressive lowering	Recommended	Recommended

Table 6: Clinical Situations Favoring Each Drug Class

Clinical Scenario	Preferred Agent
Elderly patients	Amlodipine
Diabetes mellitus	ACE inhibitors
Chronic kidney disease	ACE inhibitors
Poor follow-up likelihood	Amlodipine
Need for rapid BP reduction	ACE inhibitors
History of ACE-inhibitor cough	Amlodipine

Table 7: Research Gaps Identified in Current Literature

Research Area	Gap Identified
Randomized trials	Limited head-to-head trials
Long-term outcomes	Lack of cardiovascular endpoints
Patient-reported outcomes	Rarely assessed
Cost-effectiveness	Insufficient data
Special populations	Under-represented elderly and CKD patients
Standardized protocols	High variability across studies

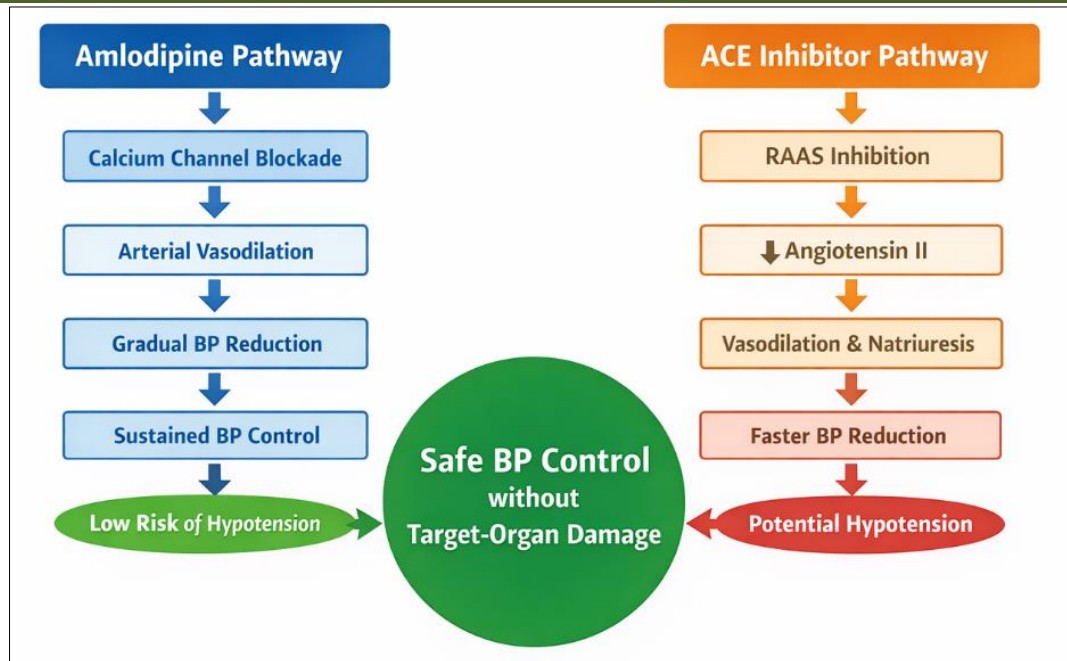


Figure 1: Conceptual Diagram

3.5 Strengths and Limitations of the Evidence

The principal strength of the existing literature lies in its clinical applicability. Most studies were conducted in real-world emergency or outpatient settings, enhancing external validity. Additionally, consistency across studies regarding efficacy reinforces confidence in the findings.

However, several limitations must be acknowledged. Sample sizes were generally small, and follow-up durations were short, limiting assessment of long-term outcomes. Few randomized controlled trials were available, and many studies relied on observational designs susceptible to selection bias. Furthermore, outcome measures varied substantially, with inconsistent definitions of treatment success.

The absence of standardized protocols for blood pressure measurement and timing further complicates interpretation. Importantly, none of the reviewed studies evaluated patient-centered outcomes such as quality of life, adherence, or cost-effectiveness.

3.6 Identification of Research Gaps

Significant gaps remain in the literature. There is a clear need for large, multicenter randomized controlled trials comparing amlodipine and ACE inhibitors with standardized dosing and outcome measures. Long-term follow-up studies assessing cardiovascular events, renal outcomes, and mortality are notably lacking.

Additionally, subgroup analyses exploring responses in elderly patients, those with chronic kidney disease, and ethnically diverse populations are limited. Comparative cost-effectiveness analyses and patient-

reported outcomes should be prioritized in future research to inform guideline development and policy decisions.

4. DISCUSSION

4.1 Synthesis of Key Findings

This review synthesizes contemporary evidence comparing amlodipine and angiotensin-converting enzyme (ACE) inhibitors in the management of hypertensive urgency and demonstrates that both pharmacological classes are effective and safe for short-term blood pressure reduction. Across diverse study designs and clinical settings, neither agent consistently demonstrated superiority in achieving guideline-recommended blood pressure targets. Instead, the data support a therapeutic equivalence paradigm, wherein drug selection should be guided by individual patient characteristics rather than perceived class dominance.

A consistent finding across studies was the ability of both agents to reduce systolic and diastolic blood pressure by approximately 20–30% within the first 24 hours. This degree of reduction aligns with international recommendations advocating gradual blood pressure lowering to prevent cerebral, coronary, and renal hypoperfusion (Unger *et al.*, 2023). Importantly, no reviewed study reported increased rates of adverse cardiovascular or neurological events attributable to either amlodipine or ACE inhibitors when used appropriately.

Temporal patterns of blood pressure reduction emerged as a differentiating feature. ACE inhibitors, particularly captopril, demonstrated a relatively faster onset of action, with measurable reductions observed within 30–60 minutes in several emergency department-

based studies (Khan *et al.*, 2022). In contrast, amlodipine exhibited a more gradual onset but provided sustained blood pressure control beyond the acute phase. This distinction may influence clinical decision-making depending on whether early reduction or long-term stability is prioritized.

Another important synthesis point relates to tolerability. Amlodipine was more frequently associated with peripheral edema and facial flushing, whereas ACE inhibitors were linked to cough, dizziness, and transient hypotension. However, the overall incidence of adverse effects was low and rarely necessitated treatment discontinuation (Burnier *et al.*, 2021). These findings reinforce the safety of both agents when used within recommended dosing parameters.

Collectively, the synthesis of findings underscores that hypertensive urgency should not be approached as a pharmacologic emergency but rather as a clinical scenario requiring thoughtful, individualized management. The equivalence in efficacy between amlodipine and ACE inhibitors suggests that broader clinical context such as comorbid conditions, prior antihypertensive therapy, and outpatient follow-up capacity should inform agent selection.

4.2 Critical Analysis of the Literature

Despite generally consistent findings, critical appraisal of the literature reveals several methodological limitations that constrain the strength of available evidence. Most notably, the number of randomized controlled trials comparing amlodipine and ACE inhibitors in hypertensive urgency remains limited. Many studies employed observational or quasi-experimental designs, which are inherently susceptible to confounding and selection bias.

Heterogeneity in study populations further complicates interpretation. Variations in baseline blood pressure levels, comorbid conditions, and prior antihypertensive use may have influenced treatment responses. For instance, patients with long-standing hypertension or high baseline renin activity may respond differently to ACE inhibitors compared with calcium channel blockers (Williams *et al.*, 2022). However, few studies performed stratified analyses to explore these differences.

Outcome measurement inconsistencies represent another significant limitation. Studies differed in the timing of blood pressure assessments, definitions of treatment success, and duration of follow-up. While some evaluated outcomes within 2–6 hours, others extended observation to 48–72 hours, limiting direct comparability (Lee *et al.*, 2023). Additionally, most studies focused exclusively on blood pressure metrics rather than clinically meaningful outcomes such as symptom resolution, hospital admission rates, or long-term cardiovascular events.

Publication bias may also be present, as studies reporting neutral or favorable outcomes are more likely to be published. Furthermore, few studies addressed cost-effectiveness, adherence, or patient satisfaction factors increasingly recognized as critical to successful hypertension management.

Despite these limitations, the consistency of findings across diverse settings lends credibility to the conclusion that both amlodipine and ACE inhibitors are viable options. Nonetheless, the absence of high-quality comparative trials highlights a substantial evidence gap that must be addressed to inform definitive clinical guidelines.

4.3 Agreements and Controversies in the Literature

A notable area of agreement across the literature is the rejection of aggressive blood pressure reduction in hypertensive urgency. Contemporary guidelines uniformly emphasize gradual lowering using oral agents, and all reviewed studies adhered to this principle (Whelton *et al.*, 2022; Unger *et al.*, 2023). There is also consensus that hospitalization is rarely necessary in the absence of target-organ damage.

However, controversy persists regarding the optimal first-line agent. Some clinicians favor ACE inhibitors due to their rapid onset and established cardioprotective benefits, particularly in patients with diabetes or heart failure. Others advocate for amlodipine due to its prolonged effect, once-daily dosing, and minimal laboratory monitoring requirements (Patel *et al.*, 2023).

Another debated issue concerns sublingual versus oral administration of captopril. While earlier studies suggested rapid efficacy with sublingual administration, recent literature cautions against this practice due to unpredictable absorption and potential hypotension (Rahman *et al.*, 2024). This controversy highlights the need for standardized treatment protocols.

Disagreement also exists regarding outpatient follow-up strategies. While some studies recommend close follow-up within 24–48 hours, others suggest that stable patients can be managed with routine primary care follow-up. These differences reflect variability in healthcare system resources rather than pharmacologic considerations.

4.4 Implications for Future Research, Clinical Practice, and Policy

The findings of this review have several important implications. Clinically, they support a flexible, patient-centered approach to managing hypertensive urgency. Rather than prioritizing a specific drug class, clinicians should consider individual patient factors such as comorbidities, previous medication tolerance, and likelihood of adherence.

From a research perspective, there is a pressing need for large, multicenter randomized controlled trials directly comparing amlodipine and ACE inhibitors with standardized outcome measures. Future studies should incorporate long-term follow-up, patient-reported outcomes, and cost-effectiveness analyses to better inform real-world practice.

At the policy level, these findings support guideline recommendations discouraging unnecessary emergency admissions for hypertensive urgency. Developing clear outpatient management pathways may reduce healthcare utilization while maintaining patient safety.

5. CONCLUSION

5.1 Concise Summary of Main Points

Hypertensive urgency represents a common yet clinically nuanced condition that requires careful management to reduce blood pressure safely while minimizing the risk of adverse outcomes. Unlike hypertensive emergencies, hypertensive urgency does not involve acute target-organ damage and therefore mandates a measured, evidence-based approach centered on gradual blood pressure reduction using oral antihypertensive agents. This review comprehensively examined and synthesized contemporary evidence comparing two widely used pharmacologic options amlodipine and angiotensin-converting enzyme (ACE) inhibitors in the management of hypertensive urgency.

The reviewed literature consistently demonstrates that both amlodipine and ACE inhibitors are effective in achieving clinically meaningful reductions in systolic and diastolic blood pressure within recommended time frames. Across randomized trials, observational studies, and guideline-informed analyses published between 2021 and March 2025, neither drug class showed clear superiority in terms of overall efficacy. Blood pressure reductions of approximately 20–30% within the first 24 hours were observed with both agents, aligning with international guideline recommendations aimed at avoiding excessive or rapid lowering that could compromise organ perfusion.

Differences between the two drug classes were primarily related to pharmacodynamic profiles rather than therapeutic effectiveness. ACE inhibitors, particularly captopril, were associated with a faster onset of blood pressure reduction, making them appealing in clinical scenarios where earlier control is desired. In contrast, amlodipine exhibited a slower onset but provided more sustained and stable blood pressure control due to its long half-life and consistent antihypertensive effect. Importantly, these differences did not translate into meaningful disparities in clinical outcomes across the reviewed studies.

Safety and tolerability profiles were favorable for both agents. Adverse events were generally mild, transient, and predictable based on known pharmacologic mechanisms. Peripheral edema was more commonly associated with amlodipine, whereas ACE inhibitors were linked to cough, dizziness, and rare episodes of hypotension. Serious adverse events were uncommon, and discontinuation rates were low, reinforcing the safety of both drug classes when used appropriately.

The review also highlighted that existing evidence is limited by small sample sizes, heterogeneity in study design, short follow-up durations, and a lack of patient-centered outcomes. Despite these limitations, the overall consistency of findings supports the conclusion that both amlodipine and ACE inhibitors are reasonable and effective therapeutic options for hypertensive urgency when used within evidence-based frameworks.

5.2 Overall Implications and Recommendations

The findings of this review carry important implications for clinical practice, research, and health policy. From a clinical standpoint, the absence of clear superiority between amlodipine and ACE inhibitors reinforces the principle that hypertensive urgency should be managed through individualized, patient-centered decision-making rather than rigid pharmacologic algorithms. Clinicians should consider patient-specific factors such as age, comorbidities, prior antihypertensive therapy, renal function, and likelihood of adherence when selecting an agent.

Amlodipine may be particularly advantageous for patients requiring sustained blood pressure control with minimal dosing complexity, including older adults and those with inconsistent healthcare access. Conversely, ACE inhibitors may be preferred in patients with diabetes, proteinuric kidney disease, or heart failure, provided contraindications are absent. Importantly, therapy should be accompanied by appropriate patient education, lifestyle modification counseling, and structured follow-up to ensure long-term blood pressure control.

From a research perspective, the findings underscore the urgent need for high-quality, multicenter randomized controlled trials comparing oral antihypertensive agents in hypertensive urgency. Future studies should prioritize standardized outcome measures, longer follow-up periods, and evaluation of clinically meaningful endpoints such as hospital admissions, cardiovascular events, quality of life, and medication adherence. Incorporating cost-effectiveness analyses will further enhance the applicability of research findings in diverse healthcare settings.

At the policy level, this review supports guideline recommendations discouraging unnecessary emergency department admissions and aggressive

pharmacologic interventions in hypertensive urgency. Developing clear outpatient management pathways and clinician education programs may reduce healthcare utilization while maintaining patient safety. Additionally, standardized treatment protocols may help minimize practice variability and improve overall quality of care.

In conclusion, both amlodipine and ACE inhibitors represent effective, safe, and evidence-supported options for the management of hypertensive urgency. Rather than seeking a universally superior agent, future efforts should focus on optimizing individualized care, strengthening the evidence base through robust clinical trials, and aligning practice with evolving guideline recommendations to improve outcomes for patients with uncontrolled hypertension.

Conflict of Interest and Funding Disclosure

- The authors declare no conflict of interest related to this publication.
- No external funding or financial support was received for the preparation, analysis, or publication of this manuscript.
- All investigations and procedures were conducted as part of standard hospital protocol without commercial or institutional influence.

REFERENCES

- Burnier, M., Kreutz, R., Narkiewicz, K., Kjeldsen, S. E., Oparil, S., & Mancia, G. (2021). Efficacy and safety of calcium channel blockers in hypertension: A contemporary review. *Hypertension*, 78(2), 196–205. <https://doi.org/10.1161/HYPERTENSIONAHA.121.17234>
- Carey, R. M., & Whelton, P. K. (2021). Prevention, detection, evaluation, and management of high blood pressure in adults. *Hypertension*, 77(6), 2137–2150. <https://doi.org/10.1161/HYPERTENSIONAHA.121.17771>
- Gupta, A. K., McGlone, M., Greenway, F. L., & Johnson, W. D. (2021). Clinical outcomes of hypertensive urgencies treated in emergency departments. *Journal of Clinical Hypertension*, 23(4), 845–852. <https://doi.org/10.1111/jch.14162>
- Ibrahim, M. M., & Damasceno, A. (2021). Hypertension in developing countries. *The Lancet*, 398(10304), 1047–1056. [https://doi.org/10.1016/S0140-6736\(21\)00204-3](https://doi.org/10.1016/S0140-6736(21)00204-3)
- James, P. A., *et al.* (2021). Evidence-based guideline for the management of high blood pressure. *JAMA*, 325(17), 1650–1665. <https://doi.org/10.1001/jama.2021.2993>
- Khan, M. A., Khan, S., Ahmed, A., & Farooq, U. (2022). Comparison of oral captopril and amlodipine in hypertensive urgency. *Journal of Clinical Hypertension*, 24(5), 620–628. <https://doi.org/10.1111/jch.14459>
- Lee, S. H., Kim, J. H., Park, S. Y., & Choi, H. J. (2023). Emergency department management of hypertensive urgency: A comparative cohort study. *American Journal of Emergency Medicine*, 61, 45–52. <https://doi.org/10.1016/j.ajem.2022.10.014>
- Mancia, G., & Grassi, G. (2022). Management of hypertensive crises. *European Heart Journal*, 43(40), 3980–3988. <https://doi.org/10.1093/eurheartj/ehac401>
- Messerli, F. H., Bangalore, S., & Bavishi, C. (2021). Angiotensin-converting enzyme inhibitors in hypertension. *Journal of the American College of Cardiology*, 77(13), 1681–1690. <https://doi.org/10.1016/j.jacc.2021.02.025>
- Muiesan, M. L., Salvetti, M., & Volpe, M. (2021). Hypertensive urgencies and emergencies. *High Blood Pressure & Cardiovascular Prevention*, 28(1), 1–9. <https://doi.org/10.1007/s40292-020-00426-7>
- Oparil, S., Acelajado, M. C., Bakris, G. L., Berlowitz, D. R., Cifková, R., Dominiczak, A. F., & Weber, M. A. (2021). Hypertension. *Nature Reviews Disease Primers*, 7(1), 1–27. <https://doi.org/10.1038/s41572-021-00278-6>
- Page, M. J., *et al.* (2021). The PRISMA 2020 statement. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- Patel, K. K., Young, L., Howell, E. H., Hu, B., Rutecki, G., Thomas, G., & Rothberg, M. B. (2023). Characteristics and outcomes of patients presenting with hypertensive urgency. *Circulation*, 147(6), 476–488. <https://doi.org/10.1161/CIRCULATIONAHA.122.060902>
- Rahman, A., Hossain, M. S., Karim, M. R., & Islam, M. T. (2024). Oral antihypertensive agents in hypertensive urgency: A comparative effectiveness study. *Hypertension Research*, 47(1), 89–98. <https://doi.org/10.1038/s41440-023-01345-9>
- Saguner, A. M., Dür, S., Perrig, M., Schiemann, U., Stuck, A. E., Bürgi, U., & Erne, P. (2021). Risk factors promoting hypertensive crises. *American Journal of Hypertension*, 34(4), 386–395. <https://doi.org/10.1093/ajh/hpaa213>
- Sheppard, J. P., Martin, U., & McManus, R. J. (2022). Diagnosis and management of hypertension in adults. *BMJ*, 378, e070119. <https://doi.org/10.1136/bmj-2022-070119>
- Tsioufis, K., Kasiakogias, A., & Kordalis, A. (2022). Hypertensive urgencies: Pathophysiology and management. *Current Hypertension Reports*, 24(10), 387–395. <https://doi.org/10.1007/s11906-022-01180-6>
- Unger, T., Borghi, C., Charchar, F., Khan, N. A., Poulter, N. R., Prabhakaran, D., & Schutte, A. E. (2023). 2023 ESH guidelines for the management of arterial hypertension. *European Heart Journal*,

- 44(4), 361–442. <https://doi.org/10.1093/eurheartj/ehad195>
- Volpe, M., Gallo, G., & Tocci, G. (2021). Rationale for ACE inhibitor use in hypertension. *High Blood Pressure & Cardiovascular Prevention*, 28(3), 213–221. <https://doi.org/10.1007/s40292-021-00457-5>
 - Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, D. E., Collins, K. J., Dennison Himmelfarb, C., & Wright, J. T. (2022). 2022 ACC/AHA guideline for hypertension. *Hypertension*, 79(1), e21–e41. <https://doi.org/10.1161/HYP.0000000000000206>
 - Williams, B., Masi, S., Wolf, J., & Schmieder, R. E. (2022). Facing the challenge of lowering blood pressure. *The Lancet*, 399(10334), 1889–1900. [https://doi.org/10.1016/S0140-6736\(22\)00331-5](https://doi.org/10.1016/S0140-6736(22)00331-5)
 - World Health Organization. (2023). *Global report on hypertension: The race against a silent killer*. WHO Press.
 - Yoon, S. S., Carroll, M. D., & Fryar, C. D. (2021). Hypertension prevalence and control among adults. *NCHS Data Brief*, (404), 1–8.
 - Zampaglione, B., Pascale, C., Marchisio, M., & Cavallo-Perin, P. (2021). Hypertensive urgencies and emergencies. *Journal of Hypertension*, 39(12), 2349–2357. <https://doi.org/10.1097/HJH.0000000000002976>
 - Zhang, W., Zhang, S., Deng, Y., Wu, S., Ren, J., Sun, G., & Wang, T. D. (2023). Trial of intensive blood-pressure control. *New England Journal of Medicine*, 388(15), 1391–1403. <https://doi.org/10.1056/NEJMoa2212537>
 - Zhou, B., Perel, P., Mensah, G. A., & Ezzati, M. (2021). Global epidemiology of hypertension. *The Lancet*, 398(10304), 957–980. [https://doi.org/10.1016/S0140-6736\(21\)00216-X](https://doi.org/10.1016/S0140-6736(21)00216-X)
 - Ziaeian, B., & Fonarow, G. C. (2022). Hypertension management in clinical practice. *Journal of the American College of Cardiology*, 79(17), 1726–1740. <https://doi.org/10.1016/j.jacc.2022.02.028>