Treatment of Hypertension in the Prevention and Management of IHD: 
AHA Scientific Statement 
Rosendorff et al Circulation 2007;115:2761-2788 2770

This scientific statement has several sections
  a. General Recommendations (Know these and table)
  b. Management of HTN in Pts. With ACS-UA and NSTEMI
  c. Management of HTN in Pts. With ACS- STEMI
  d. Management of HTN in Pts. With HF of Ischemic Origin

There are themes that are based in evidence and/or practical pharmacologic or pathophysiologic principles
Recommendations follow the AHA/ACC classification scheme

AHA Format for Classification of Recommendations and Levels of Evidence

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- Intervention is useful and effective
- Evidence conflicts/opinions differ but leans towards efficacy
- Evidence conflicts/opinions differ but leans against efficacy
- Intervention is not useful/effective and may be harmful

•A- Data derived from large multiple randomized clinical trials or meta-analysis
•B- Single randomized trial or nonrandomized studies
•C- Expert Opinion, Consensus based on case studies or standard of care
1) For the primary prevention of CAD in hypertension, aggressive BP lowering is appropriate, with a target BP of <130/80 mm Hg in individuals with any of the following: DM; chronic renal disease; CAD; CAD risk equivalents; carotid artery disease; peripheral arterial disease; AAA; and for high-risk patients, defined as those with a 10-year Framingham risk score of >10%; and
- a target BP of <140/90 mm Hg in individuals with none of the above
- (Class Ila; Level of Evidence B)

2) In patients with an elevated DBP and CAD with evidence of myocardial ischemia, the BP should be lowered slowly, and caution is advised in inducing falls of DBP below 60 mm Hg if the patient has DM or is over 60 years.
- In older hypertensive individuals with wide pulse pressures, lowering SBP may cause very low DBP values (<60 mm Hg). The clinician should carefully assess for any untoward signs or symptoms, especially those due to myocardial ischemia.
- In the very old, (> 80), antihypertensive therapy is effective in reducing stroke risk, but evidence for a reduction in coronary events is less certain (Class Ila; Level of Evidence C).
Treatment of Hypertension in the Prevention and Management of IHD: General Recommendations
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3) The choice of drugs remains controversial. There is a general consensus that the amount of BP reduction, rather than the choice of antihypertensive drug, is the major determinant of reduction of cardiovascular risk; however, there is sufficient evidence in the comparative clinical trials to support the use of an ACE inhibitor (or ARB), CCB, or thiazide diuretic as first-line therapy, supplemented by a second drug if BP control is not achieved by monotherapy.

- Most patients will require >2 drugs to reach goal, and when the BP is >20/10 mm Hg above goal, 2 drugs should usually be used from the outset.
- In the asymptomatic post-MI patient, a beta-blocker is a more appropriate choice for secondary prevention for at least 6 months after the infarction and is the drug of first choice if the patient has angina pectoris.
  - (Class I; Level of Evidence A).

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<tr>
<th>Area of Concern</th>
<th>BP Target, mm Hg</th>
<th>Specific Drug Indications (Lifestyle Modifications for all)</th>
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<tbody>
<tr>
<td>General CAD prevention</td>
<td>&lt;140/90</td>
<td>Any effective antihypertensive drug or combination</td>
<td>If SBP &gt;160 mm Hg or DBP &gt; 100 mm Hg, then start with 2 drugs</td>
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<tr>
<td>High CAD risk*</td>
<td>&lt;130/80</td>
<td>ACEI or ARB or CCB or thiazide diuretic or combination</td>
<td>If SBP &gt; 160 mm Hg or DBP &gt; 100 mm Hg, then start with 2 drugs *DM, CKD, known CAD or CAD equiv., or &gt;10% Framingham score</td>
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<tr>
<td>Stable angina</td>
<td>&lt;130/80</td>
<td>β-Blocker and ACEI or ARB</td>
<td>If β-blocker contraindicated, or if side effects occur, can substitute diltiazem or verapamil (but not if bradycardia or LVD is present) • Can add dihydropyridine CCB (not diltiazem or verapamil) to β-blocker • A thiazide diuretic can be added for BP control</td>
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<td>UA/NSTEMI</td>
<td>&lt;130/80</td>
<td>β-Blocker (if patient is hemodynamically stable) and ACEI or ARB</td>
<td>If β-blocker contraindicated, or if side effects occur, can substitute diltiazem or verapamil (but not if bradycardia or LVD is present) • Can add dihydropyridine CCB (not diltiazem or verapamil) to β-blocker • A thiazide diuretic can be added for BP control</td>
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<td>LVD</td>
<td>&lt;120/80</td>
<td>ACEI or ARB and β-blocker and aldosterone antagonist¶ and thiazide or loop diuretic and hydralazine/ISDN (blacks)</td>
<td>Contraindicated: verapamil, diltiazem, clonidine, moxonidine, - blockers ¶ severe HF(NYHA III or IV, or LV&lt;40% and clinical HF)</td>
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### Simplified: (Simplified for Confirmed CAD)
#### AHA Statement Rosendorff Circulation 2007

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| Stable angina or UA/NSTEMI or STEMI | <130/80 | ß-Blocker (if patient is hemodynamically stable) and ACEI or ARB | -If ß-blocker contraindicated, or if side effects occur, can substitute diltiazem or verapamil (but not if bradycardia or LVD is present) 
-Can add dihydropyridine CCB (not diltiazem or verapamil) to ß-blocker 
-A thiazide diuretic can be added for BP control |
| LVD | <120/80 | ACEI or ARB and ß-blocker and aldosterone antagonist and thiazide or loop diuretic and hydralazine/ISDN (blacks) | Contraindicated: verapamil, diltiazem, clonidine, moxonidine, -blockers 
¶ severe HF(NYHA III or IV, or LV<40% and clinical HF) |

### Further Simplified: (No LVD)
#### AHA Statement Rosendorff Circulation 2007

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-Can add dihydropyridine CCB (not diltiazem or verapamil) to ß-blocker 
-A thiazide diuretic can be added for BP control |
Management of HTN in Patients with CAD and Stable Angina
Rosendorff et al Circulation 2007;115:2761-2788 2770

1. Patients with hypertension and chronic stable angina should be treated with a regimen that includes a beta-blocker in patients with a history of prior MI, an ACE inhibitor or ARB if there is diabetes mellitus and/or LV systolic dysfunction, and a thiazide diuretic (Class I; Level of Evidence A). The combination of a beta-blocker, ACE inhibitor or ARB, and a thiazide diuretic should also be considered in the absence of a prior MI, diabetes mellitus, or LV systolic dysfunction (Class IIa; Level of Evidence B).

2. If beta-blockers are contraindicated or produce intolerable side effects, a nondihydropyridine CCB (such as diltiazem or verapamil) can be substituted, but not if there is LV dysfunction (Class IIa; Level of Evidence B).

3. If either the angina or the hypertension remains uncontrolled, a long-acting dihydropyridine CCB can be added to the basic regimen of beta-blocker, ACE inhibitor, and thiazide diuretic. The combination of a beta-blocker and either of the nondihydropyridine CCBs (diltiazem or verapamil) should be used with caution in patients with symptomatic CAD and hypertension because of the increased risk of significant bradyarrhythmias and HF (Class IIa; Level of Evidence B).

4. The target BP is <130/80 mm Hg. If ventricular dysfunction is present, consideration should be given to lowering the BP even further, to <120/80 mm Hg. In patients with CAD, the BP should be lowered slowly, and caution is advised in inducing falls of DBP below 60 mm Hg. In older hypertensive individuals with wide pulse pressures, lowering SBP may cause very low DBP values (<60 mm Hg). This should alert the clinician to assess carefully any untoward signs or symptoms, especially those due to myocardial ischemia (Class IIa; Level of Evidence B).

5. There are no special contraindications in hypertensive patients to the use of nitrates, antiplatelet or anticoagulant drugs, or lipid-lowering agents for the management of angina and the prevention of coronary events, except that in uncontrolled severe hypertension in patients who are taking antiplatelet or anticoagulant drugs, BP should be lowered without delay to reduce the risk of hemorrhagic stroke (Class IIa; Level of Evidence C).
Management of HTN in Patients with ACS, Unstable Angina and NSTEMI
Rosendorff et al Circulation 2007;115:2761-2788 2770

1. In unstable angina or NSTEMI, the initial therapy of hypertension should include short-acting beta-1-selective -blockers without ISA, usually IV, in addition to nitrates for symptom control. Oral beta-blockers can be substituted at a later stage of the hospital stay (Class IIa; Level of Evidence B)

   • Alternatively, oral beta-blockers may be started promptly without prior use of intravenous -blockers (Class I; Level of Evidence A)

   • If the patient is hemodynamically unstable, the initiation of beta-blocker therapy should be delayed until stabilization of HF or shock has been achieved. Diuretics can be added for BP control and for the management of HF (Class I; Level of Evidence A).

2. If there is a contraindication to the use of a beta-blocker, or if the patient develops intolerable side effects of a beta-blocker, then a nondihydropyridine CCB, such as verapamil or diltiazem, may be substituted, but not if there is LV dysfunction. If the angina or the hypertension is not controlled with a beta-blocker alone, then a longer-acting dihydropyridine CCB may be added. A thiazide diuretic can also be added for BP control (Class I; Level of Evidence B).

3. If the patient is hemodynamically stable, an ACE inhibitor (Class I; Level of Evidence A) or ARB (Class I; Level of Evidence B) should be added if the patient has an anterior MI, if hypertension persists, if the patient has evidence of LV dysfunction or HF, or if the patient has diabetes mellitus.
Management of HTN in Patients with ACS, Unstable Angina and NSTEMI
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4. The target BP is <130/80 mm Hg. However, in patients with an elevated DBP and acute coronary syndrome, the BP should be lowered slowly, and caution is advised in inducing falls of DBP below 60 mm Hg. In older hypertensive individuals with wide pulse pressures, lowering SBP may cause very low DBP values (<60 mm Hg). This should alert the clinician to assess carefully any untoward signs or symptoms, especially those due to worsening myocardial ischemia (Class IIa; Level of Evidence B).

5. There are no special contraindications in hypertensive patients to the use of nitrates, anticoagulants, antiplatelet drugs, or lipid-lowering agents for the management of acute coronary syndromes. For the same reason, BP should be lowered without delay in patients with uncontrolled hypertension who are taking antiplatelet or anticoagulant drugs (Class IIa; Level of Evidence C).

Management of HTN in Patients with ACS-STEMI
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1. In STEMI, the principles for HTN are similar to those for UA and NSTEMI, with some exceptions. Initial therapy can include short acting Beta1-selective -blockers without ISA, usually IV, in addition to nitrates for symptom control (Class IIa; Level of Evidence B).
   - However, if the patient is hemodynamically unstable, the initiation of beta-blocker therapy should be delayed until stabilization of HF or shock has been achieved. Oral beta-blockers can be substituted at a later stage of the hospital stay. Alternatively, oral -blockers may be started promptly without prior intravenous beta-blockers (Class I; Level of Evidence A).
   - Diuretics can be added for BP control and for management of HF
   - (Class I; Level of Evidence A).
Management of HTN in Patients with ACS-STEMI
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2. An ACE inhibitor (Class I; Level of Evidence A) or ARB (Class I; Level of Evidence B) should be administered early in patients with STEMI and hypertension, particularly in anterior MI, or if hypertension persists or there is LV dysfunction, HF, or diabetes mellitus. ACE inhibition has been found to be particularly beneficial in patients in whom the infarct is large and/or there is a history of previous infarction, HF, and tachycardia. ACE inhibitors and ARBs should not be given together because there is an increase in the incidence of adverse events without improving survival.

Management of HTN in Patients with ACS-STEMI
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3. Aldosterone antagonists may be useful in the management of STEMI with LV dysfunction and HF and may have an additive BP-lowering effect. Serum potassium levels must be monitored. These agents should be avoided in patients with elevated serum creatinine levels (2.5 mg/dL in men, 2.0 mg/dL in women) or elevated potassium levels (5.0 mEq/L) (Class I; Level of Evidence A).

4. CCBs do not reduce mortality rates in the setting of acute STEMI and can increase mortality if there is depressed LV function and/or pulmonary edema. Long-acting dihydropyridine CCBs can be used when beta-blockers are contraindicated or inadequate to control angina, or as adjunct therapy for BP control.
   • Nondihydropyridine CCBs may be used for the treatment of patients with supraventricular tachycardia but should not be used in patients with bradyarrhythmias or impaired LV function
   • (Class IIa; Level of Evidence B).
5. With UA/NSTEMI, the target BP in patients with STEMI is <130/80 mm Hg; however, in patients with an elevated DBP and STEMI, the BP should be lowered slowly, and caution is advised in inducing falls of DBP below 60 mm Hg.

- In older hypertensive individuals with wide pulse pressures, lowering SBP may cause very low DBP values (<60 mm Hg). This should alert the clinician to assess carefully any untoward signs or symptoms, especially those due to worsening myocardial ischemia

- (Class IIa; Level of Evidence B).

6. There are no special contraindications in hypertensive patients to the use of nitrates, anticoagulant and antiplatelet drugs, or lipid-lowering agents for the management of STEMI. Uncontrolled hypertension is a contraindication to fibrinolytic therapy because of the risk of intracranial hemorrhage. For the same reason, BP should be lowered without delay in patients with uncontrolled hypertension who are taking antiplatelet or anticoagulant drugs

- (Class IIa; Level of Evidence C).
Management of HTN in Patients with HF of Ischemic Origin
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1. The treatment of hypertension in patients with HF should include behavioral modification, such as sodium restriction, and a closely monitored exercise program
   • (Class I; Level of Evidence C). Other nonpharmacological approaches are the same as for patients without HF.

2. Drugs that have been shown to improve outcomes for patients with HF generally also lower BP. Patients should be treated with diuretics, ACE inhibitors (or ARBs), -blockers, and aldosterone receptor antagonists
   • (Class I; Level of Evidence A).

3. Thiazide diuretics should be used for BP control and to reverse volume overload and associated symptoms. In severe HF, or in patients with severe renal impairment, loop diuretics should be used for volume control, but these are less effective than thiazide diuretics in lowering BP. Diuretics should be used together with an ACE inhibitor or ARB and a -blocker
   • (Class I; Level of Evidence C).

4. Studies have shown equivalence of benefit of ACE inhibitors and the ARBs candesartan or valsartan in HF. Either class of agents is effective in lowering BP. Drugs from each class can be used together, provided that the patient is hemodynamically stable and not in the immediate post-MI period
   • (Class I; Level of Evidence A).
5. Among the -blockers, carvedilol, metoprolol succinate, and bisoprolol have been shown to improve outcomes in HF and are effective in lowering BP (Class I; Level of Evidence A).

6. The aldosterone receptor antagonists spironolactone and eplerenone have been shown to be beneficial in HF and should be included in the regimen if there is severe HF (New York Heart Association class III or IV, or LVEF <40% and clinical HF). One or the other may be substituted for a thiazide diuretic in patients requiring a potassium-sparing agent.
   • If an aldosterone receptor antagonist is administered with an ACE inhibitor or an ARB or in the presence of renal insufficiency, the serum potassium should be monitored frequently.
   • These drugs should not be used, however, if the serum creatinine level is 2.5 mg/dL in men or 2.0 mg/dL in women, or if the serum potassium level is 5.0 mEq/L. Spironolactone or eplerenone may be used together with a thiazide diuretic, particularly in patients with refractory hypertension
   • (Class I; Level of Evidence A).
Management of HTN in Patients with HF of Ischemic Origin
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7. Consider the addition of hydralazine/isosorbide dinitrate to the regimen of diuretic, ACE inhibitor or ARB, and beta-blocker in black patients with NYHA class III or IV heart failure (Class I; Level of Evidence B). Others may benefit similarly, but this has not yet been tested.

8. Drugs to avoid in patients with HF and hypertension are nondihydropyridine CCBs (such as verapamil and diltiazem), clonidine, and moxonidine
   • (Class III; Level of Evidence B).
   • Adrenergic blockers, such as doxazosin, should be used only if other drugs for the management of hypertension and HF are inadequate to achieve BP control at maximum tolerated doses (Class IIA; Level of Evidence B).

Management of HTN in Patients with HF of Ischemic Origin
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9. The target BP is <130/80 mm Hg, but consideration should be given to lowering the BP even further, to <120/80 mm Hg. In patients with an elevated DBP who have CAD and HF with evidence of myocardial ischemia, the BP should be lowered slowly, and caution is advised in inducing falls of DBP below 60 mm Hg if the patient has diabetes mellitus or is over the age of 60 years. In older hypertensive individuals with wide pulse pressures, lowering SBP may cause very low DBP values (<60 mm Hg). This should alert the clinician to assess carefully any untoward signs or symptoms, especially those due to myocardial ischemia and worsening HF (Class IIA; Level of Evidence B).