Hypertension in Older Adults

Takeaways

- Since age is a risk factor for CV disease, many older adults receive **large benefit** from antihypertensives. However, older adults are also **more sensitive** to antihypertensive side effects such as dizziness and falls, and so treatment should be judicious.
- Guidelines disagree on ideal blood pressure **targets** in older adults. The right target therefore depends on the patient in front of you.
- Diuretics, ACEI/ARBs, and calcium channel blockers are the workhorses of pharmacotherapy – just as in younger adults. Pages XX describe how comorbidities influence therapy selection.
- Monitor for orthostatic hypotension (see page X) to help ↓ the risk of falls.

Approach to Hypertension in Older Adults

Hypertension is a common diagnosis in adults >70 years. The benefits of treatment are well established but must be balanced with potential harms (e.g. dizziness, falls), and polypharmacy. Consider time-to-benefit, quality of life, & individual preferences/values.

General principles for initiating antihypertensive drug therapy in older adults[1]

- ***Start low*** … Use lower initial doses (e.g. ≤½ dose of a younger adult). Assess tolerability of a new drug/dose within 3 to 7+ days (e.g. any falls?).
- ***…And go slow!!!*** Individuals ≥65 years may have sluggish baroreceptors[blood pressure sensors], sympathetic neural responses[fight-or-flight], ± impaired cerebral autoregulation[brain blood flow]. In the absence of a hypertensive emergency/urgency, **gradually** ↓ BP over weeks to months to minimize the risk of ischemic symptoms. A good rule of thumb is to ↑ the dose by ≤50 to 100% every 4 weeks to desired effect. Monitor BP & other parameters (e.g. for ACEI/ARB, diuretics: SCr, Na^+ & K^+ at baseline), after 1 to 2 weeks, with any dose change, & periodically (e.g. 6 to 12 months) thereafter.
- There is benefit from treating hypertension in relatively fit adults ≥65 yrs, but **caution should be applied for frail individuals**. Withhold or adjust treatment if symptomatic orthostatic hypotension is a factor, or harm outweighs benefit.

Diagnosis and Assessment

❑ **Use standardized measurement techniques for accurate BP & validated equipment.[2]** (Automated BP monitor preferred)[HTN CAN 2018]

To monitor sitting BP:

- 5 min rest, seated position, back support
- Arm supported at heart level
- Avoid caffeine, exercise, smoking 30 to 60 minutes before BP measurement
- Feet flat on floor & legs uncrossed
- Appropriate size BP cuff
- Ensure bladder has been emptied
- No talking (both patient and observer)

❑ **Measure lying ± sitting & standing BP to assess for orthostatic hypotension (OH).[3]**

Monitor OH in all older adults, especially if symptomatic (e.g. dizziness, feeling faint, light headedness, blurred vision, disorientation, confusion, weakness, fatigue, falling, chest pain).

1. Have the person lie down for 5 minutes, then measure BP, HR; and/or
2. Have the person sit for 1 to 2 minutes, then measure BP, HR; and
3. Have the person stand. Repeat BP & HR after standing for 1 minute & 3 minutes.

A decline of >20 mmHg in SBP or >10 mmHg in DBP within 3 minutes of standing is OH.[4]

White Coat Hypertension

When white coat hypertension is suspected, confirmation can be made by repeat home BP monitoring or ambulatory BP monitoring before treatment decisions are made.

Home BP Measurement[CAN 2018]

1. Home BP monitoring can be used in the diagnosis of hypertension, white coat hypertension and masked hypertension.
2. Home SBP ≥135 mmHg or DBP ≥85 mmHg should be considered elevated & associated with an ↑ overall mortality risk.

   Home BP monitoring for assessing white coat hypertension or sustained hypertension should be based on 2 measurements before breakfast and two measurements 2 hours after supper, for 7 days. Measurements should be performed before taking medication, no caffeine or tobacco in the hour prior, and no exercise 30 minutes preceding the measurement. First-day home BP values should not be considered.
3. HCPs should encourage the use of devices with data recording capabilities or automatic data transmission to ↑ the reliability of reported home BP monitoring. Refer to Hypertension Canada's Blood Pressure Measurement Device Recommendation Program - https://hypertension.ca/hypertension-and-you/managing-hypertension/measuring-blood-pressure/devices. Look for the following on the box and/or in material supplied with the device:

   

   

4. HCPs should ensure that patients who measure their BP at home have adequate training and, if necessary, repeat training in measuring their BP. Patients should be observed to determine that they measure BP correctly and should be given adequate information about interpreting these readings. Patient handout: https://hypertension.ca/wp-content/uploads/2017/11/HTC_BloodPressureLog_ENG_PREVIEW-1.pdf

Ambulatory BP Monitors[CAN 2018]

1. Ambulatory BP monitoring can be used in the diagnosis of hypertension. Ambulatory BP monitoring should be considered when an office-induced increase in BP is suspected in treated individuals with: BP that is not below target despite receiving appropriate chronic antihypertensive therapy; symptoms suggestive of hypotension; or fluctuating office BP readings.
2. Therapy adjustments should be considered in individuals with a mean 24-hour ambulatory BP monitoring of SBP ≥130 mmHg or DBP of ≥80 mmHg, or a mean awake BP of ≥135 mmHg and/or DBP of ≥85 mmHg.
3. Consider the magnitude of changes in nocturnal BP in any decision to prescribe or withhold drug therapy based on ambulatory BP monitoring. Individuals who fail to exhibit nocturnal BP <10% ("non-dippers") are at ↑ risk of cardiovascular events.

Blood Pressure Targets

❑ **Individualize blood pressure (BP) targets.**

Guidelines differ on the optimal blood pressure to target in older adults.[5,6,7,8,9,10]

Guideline →	Canada 2020	ISH 2020	Europe 2018	ACC/AHA 2017	NICE 2019	ACP 2017
Population	≥75 years old	≥65 years old	≥65 years old	≥65 years	>80 years	≥60 years old
Target	<**120** mmHg systolic	<**130**/80 to <**140**/90 mmHg depending on risk factors / frailty	<**130**/80 to <**140**/90 mmHg depending on tolerability	<**130** mmHg systolic	<**150**/90 mmHg unless comorbidities (e.g. more aggressive in CKD)	<**150**/90 mmHg unless comorbidities (e.g. more aggressive if post-stroke)

What does the evidence say?

Evidence	Target and Population	Outcome	Uncertainties
HYVET Trial →**Takeaway**: at minimum, target should be <150mmHg systolic.	Target systolic blood pressure of <**150** mmHg in older adults over 80 years old (mean age 84 years).	**NNT=47**/1.8yrs to ↓ all-cause mortality *(benefit for other outcomes too, e.g. ↓HF)*	• Average blood pressure was reduced from 173mmHg to 144mmHg systolic; would a greater reduction have greater benefit?
SPRINT Trial →**Takeaway**: some populations benefit from a target of <120mmHg systolic. See RxFiles Trial Summary: SPRINT	Target systolic blood pressure of <**120** mmHg in adults over 50 years old (mean age 68 years) at high CV risk.	**NNT=83**/3.3yrs to ↓ all-cause mortality *(benefit for other outcomes too, e.g. ↓HF)* (Mean BP achieved = 121/69mmHg.)	• Is **SPRINT** applicable to frail older adults? e.g. LTC residents excluded. • **SPRINT** adverse effects included hypotension **NNH=100**, syncope **NNH=83**, electrolyte abnormalities **NNH=200**, acute kidney injury **NNH=63**. Are these risks even higher in older adults? • Is nuance lost when applying the results to the real world? e.g. **SPRINT** exclusively measured BP using an automated machine, which may have resulted in lower readings. • Meta-analysis of 6 RCTs **AASK, ACCORD BP, HOT, PAST BP, SPRINT, SPS3** did not find extra benefit from blood pressure ≤135/85mmHg.[6]
Is there a J-shaped curve?[11] →**Takeaway**: dropping blood pressure too low could ↑death	Longitudinal registry data of 22,672 patients examining a range of different blood pressures.	Patients in the blood pressure window of 120/70 to 140/80 mmHg had the lowest risk of CV death, MI, or stroke composite.[12]	• Observational trials are not randomized; were there differences between groups (e.g. comorbidities, frailty) that influenced the results?

So what target is best for my patient?

Consider a more aggressive target (e.g. <**140** mmHg systolic) for …	Consider a less aggressive target (e.g. **140-150** mmHg systolic) for …
• Older adults who are **overall healthy** (e.g. community dwelling, ambulatory, not in LTC, not frail) • Older adults with mild cognitive impairment (**SPRINT-MIND** found **NNT=67**/4.5 years to ↓ dementia.[13]) • Older adults at **higher cardiovascular risk**: → e.g. post-stroke → e.g. chronic kidney disease → e.g. known vascular disease • Target can be achieved with **first-line medications** (i.e. not using medications such as clonidine or hydralazine which have limited outcome data). Note that patients in **SPRINT** on average needed to take 3 medications to achieve their target. • The medications used to reach the more aggressive target are **well tolerated**. • **Shared decision making** leads towards patient preference for a more aggressive approach.	• Older adults who are **frail** (See Geri-RxFiles: Frailty in Older Adults pg XX). • Older adults in **long term care**. • Older adults with **limited life expectancy**. • Older adults at relatively **low cardiovascular risk**. • Older adults with concerns for **cost** or **pill burden**. • Older adults at **risk of adverse effects** (such as falls) or who have trouble tolerating first-line antihypertensives. • **Shared decision making** leads towards patient preference for a less aggressive approach.

Treatment Options[14,15,16,17,18]

Non-Drug Options

❑ **Identify reversible and/or treatable causes:**

- Drug-induced: anabolic steroids, appetite suppressants, antidepressants (MAOIs, SNRIs, SSRIs)[β], caffeine, cocaine & other illicit drugs, corticosteroids[β], cyclosporin, ephedra, erythropoietin, fludrocortisone, licorice root also in chewing tobacco, nasal decongestants, midodrine, nicotine, NSAID/COX-2[β], sympathomimetics, tacrolimus, VEGF inhibitors (e.g. bevacizumab, pazopanib, sorafenib, sunitinib)
- Thyroid disorders & treatment: can affect BP (caution with overtreatment of thyroid)
- Alcohol: recommend ≤2 drinks/day (≤ 14 standard drinks/wk in men, ≤ 9 standard drinks/wk in women)
- Other: hyperaldosteronism, obstructive sleep apnea, poor adherence with CPAP machine, salt

❑ **Assess cardiovascular risk & the role of evidence-based risk reduction strategies** (e.g. vascular protection [statins, antiplatelet therapy] & glycemic control).
Remember: Some healthy older adults with diabetes may be treated to achieve the same glycemic, blood pressure & lipid targets as younger adults with diabetes.

❑ **Optimize lifestyle modification if appropriate & suitable to the individual.**

Diet (Mediterranean diet, salt restriction 2g/d, avoid binge drinking, alcohol in moderation) Exercise / Activity Potassium intake if not at risk of hyperkalemia*	Weight Loss Waist circumference (men<102cm, female<88cm) Smoking Cessation	Education (benefits, lifestyle modification should be ongoing)

⇨ as one moves more toward frailty, quality of life & patient preference often take precedent!

*Hyperkalemia risk factors: Drugs ↑ K^+ (e.g. amiloride, ACEI, ARB, RAS, ARNI, MRA, triamterene, trimethoprim), CKD, eGFR < 45mL/min/1.73m^2, baseline serum K+ > 4.5 mmol/L

ACE Inhibitors (ACEIs) / Angiotensin II Receptor Blockers (ARBs)

Consider an ACEI as 1st-line treatment for older individuals with uncomplicated hypertension (NOT African ancestry), DM, CAD, post-MI, heart failure, renal disease, or LVH. Persons with past CVA/TIA may benefit from ACEI in combination with diuretics.[PROGRESS] ACEI/ARBs are SADMANS medications (see page X), which means they should be held in times of acute illness to avoid kidney injury. Higher doses are required in people with co-existing heart failure; asymptomatic low blood pressure in heart failure treatment may not need a change in therapy. Monitor SCr & K^+ when starting, after a dose change, & after 1 to 2 weeks of stable therapy. ARBs are an alternative when an ACEI is not tolerated, or if there are compelling indications (e.g. isolated systolic hypertension). **Combining an ACEI & ARB is not recommended due to risk of acute kidney injury & ↑K^+.** Some ACEI/ARBs are below:

ACEI	o **Lisinopril** Prinivil, Zestril 2.5 to 5mg daily to start ⇨ up to 40mg daily [ALLHAT]
	o **Perindopril** Coversyl 2mg daily to start ⇨ up to 4 to 8mg daily [HYVET]
	o **Ramipril** Altace 1.25 to 2.5mg daily to start ⇨ up to 10mg daily [HOPE] (ave age ~66 yrs)
ARB	o **Candesartan** Atacand 4mg daily to start ⇨ up to 32mg daily [CHARM]
	o **Valsartan** Diovan 40mg daily to start ⇨ up to 160mg twice daily [VALHEFT]
	o **Losartan** Cozaar 12.5 to 25mg daily to start ⇨ up to 100mg daily [LIFE]
	o **Telmisartan** Micardis 40mg daily to start ⇨ up to 80mg daily [ONTARGET]

Thiazide and Thiazide-like Diuretics

Low-dose thiazide diuretics have been shown to ↓ mortality & cardiovascular morbidity outcomes.[19] Consider a thiazide diuretic 1st-line for most older individuals including those with uncomplicated hypertension, diabetes (DM) with normal albuminuria & eGFR, left ventricular hypertrophy (LVH) **or** isolated systolic hypertension (ISH).[20] Also, consider diuretics as a 1st-line add-on option for hypertension with renal disease & proteinuria.

Which diuretic should be used?

Indapamide, chlorthalidone, and hydrochlorothiazide are all reasonable diuretic options.

- **Chlorthalidone vs Hydrochlorothiazide**: Previously, it was thought that chlorthalidone was superior to hydrochlorothiazide in reducing cardiovascular morbidity and mortality.[SHEP, ALLHAT] However, recent trial evidence showed no difference in CV outcomes between chlorthalidone and hydrochlorothiazide.[DCP,21] Chlorthalidone is more potent (1.5 to 2x) and longer lasting than hydrochlorothiazide. It can lead to a greater risk of electrolyte disturbances such as, hypokalemia or hyponatremia; (in the DCP trial 5% of chlorthalidone patients had hypokalemia vs 3.6% of hydrochlorothiazide patients **NNH=71**).[22,DCP]
- **Hydrochlorothiazide & Squamous Cell Skin Cancer**: Observational data suggests an association with hydrochlorothiazide and squamous cell skin cancer.[23] Five years of hydrochlorothiazide use may increase the risk by 3-4 times; however the baseline risk of squamous cell skin cancer is low, e.g. 0.1% per year.
- **Indapamide:** Has strong outcome evidence [HYVET] and does not have an association with squamous cell skin cancer.[23] However, indapamide is slightly more expensive than the other diuretic options and only comes in one combination product (perindopril/indapamide [COVERSYL PLUS])
- **Monitoring Diuretics**: When initiating diuretics, monitor baseline serum electrolyte (e.g. Na^+, K^+, Mg^{++}, Cl^-, Ca^{++}, PO_4^{3-}), blood glucose, lipids, uric acid, serum creatinine (SCr) & urea. Monitor electrolytes & SCr within 1 to 2 weeks of starting or changing dose; in individuals with renal insufficiency, SCr & urea should be measured more frequently (e.g. every 6 to 12 months).[24] If CrCl <30ml/min, a thiazide diuretic is less effective. The prevalence of gout increases with age, and diuretics should be avoided in gout.

Some diuretics available in Canada:

- o **Indapamide** Lozide 1.25mg [HYVET] (1.5mg) to 2.5mg once daily [PROGRESS] (in combo with an ACEI)
- o **Hydrochlorothiazide** 12.5 to 25mg once daily (BID dosing may be used in HF)
  → 6.25 to 12.5mg often adequate when combined with ACEI or AR
- o **Chlorthalidone** Hygroton 12.5 to 25mg once daily [SHEP, ALLHAT]
  → (50mg tablets; 12.5mg = ¼ of a tablet = not very convenient)

Calcium Channel Blockers (CCB)

All long-acting (LA) CCBs (e.g. amlodipine NORVASC, diltiazem CD CARDIZEM, TIAZAC XC) can be considered for treating uncomplicated hypertension, as well as hypertension in individuals with left ventricular hypertrophy or stable angina. Limiting factors for CCB use in the older adult may include orthostatic hypotension and peripheral edema, which tend to be more common at higher doses. Peripheral edema may be reduced when the CCB is used in combination with an ACEI (or ARB),[25] if CCB dosed at bedtime, or when used at a lower dose.

Dihydropyridine (DHP CCB)	Non-Dihydropyridine (non-DHP CCB)
e.g. **Amlodipine** NORVASC 2.5 to 10mg daily LA-DHP CCBs may also be considered for older adults with isolated systolic hypertension or diabetes without nephropathy. Avoid immediate release nifedipine because of potential hypotension and risk of precipitating myocardial ischemia. Beers See RxFiles Trial Summary: ACCOMPLISH	e.g. **Diltiazem CD** CARDIZEM, TIAZAC XC 120 to 360mg daily NORDIL e.g. **Verapamil** ISOPTIN 120 to 480mg daily CONVINCE (more constipating) May be useful for rate control in atrial fibrillation & in hypertension. Non-DHP CCBs should be avoided in systolic heart failure or reduced ejection fraction. Beers **CAUTION:** Avoid combining a non-DHP CCB with a βB due to risk of ↓ heart rate.

Beta-Blockers (βB)

Beta-blockers should not be used as 1st-line monotherapy in individuals ≥60 years, but may be used in individuals <60 years.[HTN CAN 2018] Adverse outcomes (e.g. death, stroke, MI) that occur when treating hypertension are more likely in adults age ≥65 on a βB, especially atenolol vs other antihypertensives.[26,27,28,29] Beta-blockers should be used in those with compelling indications (e.g. post-MI, heart failure, atrial fibrillation, stable angina &/or acute coronary syndrome), or in those requiring polytherapy to control BP.[30,31] Side effects with all βBs may include fatigue, cognitive impairment and/or confusion in older adults and should be taken into consideration when balancing risk versus benefit.

Which beta-blocker should be used?

Cardioselective beta-blockers are appropriate choices in older adults with **asthma**, **COPD**, diabetes, & for treating high blood pressure in **heart failure**. Bisoprolol and metoprolol are cardioselective beta-blockers also indicated for **angina** or **post-MI** (acebutolol & atenolol also have these indications, but are not first-line options). Higher doses may result in a loss of cardioselectivity.

- **Bisoprolol** MONOCOR 2.5 to 10mg daily
- **Metoprolol** LOPRESOR 12.5 to 200mg BID (**Note:** SR formulation for once daily)

What if a beta-blocker is being used for hypertension in an individual age ≥60 years who is NOT post-MI or diagnosed with heart failure, angina, or atrial fibrillation?

Switch to a more appropriate antihypertensive & taper the beta-blocker slowly to prevent rebound tachycardia/bradycardia. (See Geri-RxFiles: Tapering Medications in Older Adults)

Other Antihypertensives in Older Adults

The antihypertensives listed below are typically avoided or used with caution in older adults.

- **Alpha-1 Blockers** (e.g. doxazosin, prazosin, terazosin) should be avoided as hypertension therapy. The **ALLHAT** trial, which studied doxazosin 2-8mg per day, showed excess heart failure and stroke in doxazosin patients compared to chlorthalidone patients.[47] Alpha-1 blockers can cause syncope, orthostatic hypotension, and in older women worsened urinary incontinence.
- **Central Alpha Agonists** (e.g. clonidine, guanfacine, methyldopa) are not first-line antihypertensives. They are generally less well tolerated by older adults than younger people. They have CNS adverse effects (such as drowsiness with clonidine and depression with methyldopa). They may also cause bradycardia and orthostatic hypotension.
- **Loop diuretics** (e.g. furosemide, ethacrynic acid) are not first-line antihypertensives. They can cause hypotension and electrolyte abnormalities (especially hypokalemia). They may create risk for urinary incontinence, leading to falls. Loop diuretics also do not have adequate evidence for treating dependent ankle edema (in the absence of heart failure, liver failure, renal failure, or nephrotic syndrome). Loop diuretics could be considered in hypertensive chronic kidney disease patients with extracellular fluid volume overload.
- **Potassium-Sparing Diuretics** (e.g. amiloride, triamterene) are not first-line antihypertensives. They should typically be avoided in older adults due to their risk of hyperkalemia. The risk of hyperkalemia increases when these agents are combined with other medications that raise potassium (such as spironolactone, eplerenone, ACEIs, ARBs, or aliskiren) and in patients with reduced renal function (e.g. CrCl <30mL/min). Triamterene may also exacerbate syndrome of inappropriate antidiuretic hormone secretion (SIADH). Patients on these agents should have their potassium monitored at minimum every 6 months.

TREATMENT OPTIONS HTN CANADA 2020	NOTES & CAUTIONS
❑ **Uncomplicated Hypertension (Hypertension without other compelling indications such as HF or AF)**	
Initial therapy: monotherapy or a single pill combination (SPC) **1st line monotherapy:** • **Thiazide**/thiazide-like diuretic (chlorthalidone or indapamide preferred) • ACEI (in non-Black individuals) • Angiotensin receptor blocker (ARB) • CCB→Long Acting (e.g. amlodipine, diltiazem CD) **Single pill combination choices**: ACEI + diuretic or ARB + diuretic (many combinations available) ACEI + CCB (perindopril + amlodipine VIACORAM) ARB + CCB (telmisartan + amlodipine TWYNSTA) **2nd line therapy**: **Combination** of 1st line drugs	• B α-blockers (e.g. doxazosin, terazosin) are not recommended as initial therapy; may be considered for combination therapy or with other compelling conditions (e.g. BPH). • Beta-blockers are not recommended as initial therapy in those who are age > 60 years. • ACEI + ARB combination is not recommended. • Diuretics, including spironolactone, may be useful in "resistant" hypertension. • Dose titration & adverse reaction management more difficult in older adults. • Single pill combination: caution in older adults due to fall risk; add 1 drug at a time. Note: The average BP lowering achieved with a single drug is ~10/5 mmHg.
❑ **Isolated Systolic Hypertension (ISH)**	
1st line therapy (monotherapy): • **Thiazide**/thiazide-like diuretic • Long-acting DHP CCB (e.g. amlodipine) • ARBs **2nd line therapy: Combination** of 1st line drugs	• See comments for uncomplicated hypertension above. • ISH treatments were studied in healthy elderly people. Generalization of recommendations to frail elderly should be cautious and individualized.
❑ **Diabetes mellitus with CV or kidney disease** (including **micro**albuminuria) albumin to creatinine ratio (ACR): ≥ **2**mg/mmol	
1st line therapy: • ACEI or ARB (Renal evidence: **IDNT** irbesartan/**RENAAL** losartan) **2nd line therapy:** • Addition of long-acting DHP CCB (e.g. amlodipine) **3rd line therapy:** • Addition of thiazide/thiazide-like diuretics	• If SCr >150 µmol/L, use a loop diuretic for volume control/edema instead of a thiazide. • If CrCl <30ml/min, then thiazide diuretics are less effective. • ACEI + ARB combination is not recommended. • Evidence for renal benefit with ACEI or ARB is best with macroalbuminuria.
❑ **Diabetes mellitus without CV or kidney disease**	
1st line therapy: • ACEI or ARB • Long-acting DHP CCBs (e.g. amlodipine) • Thiazide/thiazide-like diuretic ALLHAT **2nd line therapy:** Combination of 1st line drugs (ACEI+CCB more effective than ACEI+HCTZ) ACCOMPLISH	• **Low dose thiazides** (e.g. chlorthalidone 12.5mg po od) have evidence for CV outcome benefits in diabetes & minimal effect on glucose; e.g. **ALLHAT** included **>15,000** patients (mean age: 67 yrs) **with diabetes**, the largest antihypertensive trial ever in this population • **ACCORD-BP** (n=4,733/4.7yrs), T2DM patients noted little benefit with SBP target of <120 vs <140mmHg (1°: CV events NS; ↓ stroke NNT=92; ↓ macroalbuminuria NNT=46; ↑ serious AEs NNH=50)
❑ **CAD - Coronary Artery Disease (Ischemic Heart Disease)**	
1st line therapy: • ACEI (or ARB) • If stable angina, beta-blocker or CCB preferred **2nd line therapy:** ACEI + DHP CCB is the preferred combination	• B Avoid short-acting nifedipine. • ACEI + ARB combination is not recommended. • When ↓ SBP to target levels in individuals with established CAD (especially if ISH is present), be cautious when the DBP is ≤60 mmHg because of concerns that MI might be exacerbated, especially in individuals with LVH.
❑ **Recent MI**	
1st line therapy: ACEI (or ARB) and beta-blocker **2nd line therapy:** CCBs (when beta-blockers contraindicated or not effective)	• Non-DHP CCBs (e.g. diltiazem/verapamil) should not be used if concomitant heart failure.

For **diabetes**, combination therapy using two 1st-line agents may be considered as initial treatment if SBP is 20 mmHg greater than target or if DBP is 10 mmHg greater than target. Caution in individuals where a substantial ↓ in BP is more likely or poorly tolerated (e.g. older individuals, autonomic neuropathy).

TREATMENT OPTIONS	NOTES & CAUTIONS
❑ **Heart Failure with reduced ejection fraction (EF ≤40%)…**See Geri-RxFiles: Chronic Heart Failure with Reduced Ejection Fraction pg XX and RxFiles Chart: HFrEF for more info	
1st line therapy: • **ACEI** (or ARB) & **beta-blocker** (e.g. bisoprolol, carvedilol COMET, metoprolol) ± mineralocorticoid receptor agonist (MRA) (e.g. spironolactone, eplerenone) • +/- loop diuretic(s) **2nd line therapy:** • Angiotensive Receptor-Neprilysin Inhibitor (ARNI) (**sacubitril-valsartan** ENTRESTO) {replace ACEI/ARB if EF <40% who remain symptomatic despite appropriate dose}PARADIGM HF • Hydralazine + isosorbide dinitrate A-HEFT [32] if ACEI and ARB contraindicated or not tolerated • Thiazide/thiazide-like diuretic as additive treatment **3rd line therapy:** • Long-acting DHP CCB (e.g. amlodipine)	• Thiazide-like diuretics for BP control; loop diuretics for volume control. • MRA useful for treating heart failure, but often minimal impact on blood pressure. • Watch for ↑ K^+ with MRA.[33] o Watch for combination of ACEI or ARB or ARNI/NSAID (+/- low dose ASA)/MRA-may cause acute kidney injury-monitor K^+ & SCr in first 7days ⇨ 3 to 4wks later then q6-12mos[34] • Avoid NSAIDS in HF; avoid ACEI + ARB → may ↑ SCr & K^+ & ↓ BP. • Caution trimethoprim-sulfamethoxazole with ACEI or ARB & ↓ renal function → ↑ K^+ Beers • Caution CCBs verapamil > diltiazem > nifedipine/felodipine → fluid retention ± exacerbate heart failure Beers • Whenever possible, titrate to HF trial doses with ACEI, ARB, ARNI ENTRESTO or β-blocker. Watch for balance between targeting trial doses and adverse effects in older adults.
❑ **Left Ventricular Hypertrophy**	
1st line therapy: ACEI, ARB, long-acting CCB, thiazide/thiazide-like diuretics **2nd line therapy:** Combinations of first-line agents	• Avoid hydralazine and minoxidil. • Losartan (+HCTZ) ↓ stroke vs atenolol (5% vs 6.7%, NNT=59).LIFE
❑ **Past Cerebrovascular Accident or TIA**	
Acute ischemic stroke (onset to 72 hours): Treatment **not** routine if no thrombolysis. • Thrombolytic: if BP>185/110, ↓ BP to < 185/110 prior to tPA therapy and to below 180/105 for the next 24 hours to ↓ risk of hemorrhagic transformation; • No thrombolytic: if BP>220/120 ↓ BP by ~15% over 24hr (max ↓ 25% in first 24 hours) with gradual reduction thereafter. Avoid excessive lowering of BP because this might exacerbate existing ischemia or might induce ischemia, particularly in the setting of intracranial or extracranial arterial occlusion. **Acute Intracerebral Hemorrhage** (onset 72 hours): avoid SBP<140 in the first 24 hours vs <180 **After acute phase** of non-disabling stroke, ↓ BP may ↓ risk of recurrent CV events. **1st line therapy** (after acute phase)**: ACEI +/- thiazide/thiazide-like diuretic combo** **2nd line therapy: Combination of first-line agents**	• Antihypertensives may ↑ death in **acute** TIA/stroke, but ↓ long-term risk. Evidence supports {chlorthalidone or amlodipine ALLHAT}, {perindopril + indapamide PROGRESS}, {losartan +/- HCTZ LIFE}, {ramipril HOPE} & {diltiazem NORDIL}. • After acute stroke, consider treatment target of BP <140/90.HTN CAN 2018 • In acute cerebral **hemorrhage**, targeting SBP <140 vs. SBP <180 showed no difference in death or stroke-related disability with a trend towards harm in SBP<140.INTERACT-2, ATACH-2 • BP reduction during acute stroke (1st 24 hours) has not shown ↓ death or major disability at 14 days or hospital discharge (RCT, n=4071, mean age 62 yrs, BP ↓ 12.7% within 24 hours). CATIS • **Lacunar** stroke: 2 weeks after stroke, targeting SBP <130 vs. SBP 130 to 149 showed no difference in recurrent stroke or adverse events after 3.7 years.SPS3 • ACEI + ARB combination is not recommended.
❑ **Nondiabetic chronic kidney disease with proteinuria: albumin:creatinine ratio >30mg/mmol or urinary protein >500mg/24hr**	
1st line therapy: • **ACEI** {monitor K^+ and SCr carefully if on ACEI or ARB} • **Thiazide/thiazide-like diuretics as additive; loop diuretics are an alternative** **2nd line therapy:** • ARB (If ACEI intolerant) • Combinations of first-line agents	• AVOID ACEI or ARB if renal artery stenosis (bilateral or solitary). • Consider loop diuretics if volume overload, advanced disease. • Carefully monitor renal function and potassium. • ACEI + ARB combination is not recommended. This combination may ↓ BP, albuminuria & proteinuria, the risks of hypokalemia, hypotension and short-term decrease in GFR pose challenges for use. In addition, the overall long-term clinical benefits of CV or renal morbidity have not been shown in several trials. ALTITUDE, ONTARGET, VA NEPHRON-D
❑ **Other**	
Dyslipidemia: Does not affect initial treatment	See Geri-RxFiles: Dyslipidemia in Older Adults pg XX, Diabetes in Older Adults, pg XX Antiplatelets & Anticoagulants: DAPT, DUAL & Triple Therapy pg XX
Peripheral Arterial Disease (PAD): AVOID β-blockers with severe disease as can trigger unopposed alpha constriction.	Caution: ASA is no longer recommended for primary prevention of CV disease.ASPREE

Hypertensive Urgency (See RxFiles Q&A for more in depth discussion)

Severe hypertension (**systolic blood pressure ≥180 mmHg or diastolic blood pressure ≥110 mmHg**) with no acute signs of end-organ damage, is often called hypertensive urgency. If there are signs or symptoms of acute end-organ damage, the condition is considered a hypertensive emergency and is treated more aggressively.

Optimal management of individuals in hypertensive urgency lacks conclusive evidence. Diagnosis of a **hypertensive emergency requires rapid intervention** to lower BP in the emergency. **Hypertensive urgency is not an emergency and its management is much less aggressive**. There is no proven benefit from rapid reduction of the blood pressure in adults with severe asymptomatic hypertension.

Target an initial goal of reducing the blood pressure by 25% over 24 to 48 hours with conventional oral therapy. Conservative BP lowering reduces the risk of potential adverse effects (e.g. perfusion complications worsening incidence of MI, stroke, and death), which are associated with more aggressive BP lowering.[35,36]

Is it hypertensive urgency OR emergency?

	Urgency	Emergency
Blood pressure (mmHg)	>180 systolic &/or >120 AHA 2017, ESC 2013 to >130 HTN CAN 2018 diastolic	
Target organ damage	No	Yes (e.g. aortic dissection, angina/ACS, stroke, encephalopathy, acute renal failure, pulmonary edema)
Symptoms	Asymptomatic; or severe headache, shortness of breath, nosebleeds, severe anxiety	Shortness of breath, chest pain, numbness/weakness, change in vision, back pain, difficulty speaking

The measured blood pressure was very high (e.g. 190/112). When should I call a physician or send patient to seek medical treatment?

- Provide a quiet room to rest (this can lead to a ↓ in blood pressure of ≥10 to 20 mmHg).
- Verify blood pressure readings & ensure proper technique for measuring BP.
- Obtain medical history and medication history (prescription, OTC, recreational).
- Physical exam - focus on signs of end organ damage (e.g. change in vision, chest pain).
- Lab tests or investigations may be required (e.g. CBC, ECG, urinalysis, renal function).
- If BP **remains elevated & individual is symptomatic** then call physician or refer patient for additional medical care.

Approach to acute hypertension: (See RxFiles Q&A for cautions, risks, & benefits to treatment)

- Treatment depends on whether the individual has already been treated for hypertension or is untreated (e.g. currently not taking any medications for blood pressure).

Hypertensive Urgency - Treated hypertension:

- Restart medications in non-adherent individuals.
- ↑ dose of existing antihypertensive or add agent from a different class. (This option dependent on current treatment & comorbidities; lower doses of 2 medications may be better than the max dose of single medication.)

Hypertensive Urgency - Untreated hypertension:

In the asymptomatic individual, the risk of lowering BP too quickly (cerebrovascular or myocardial ischemia) usually outweighs any benefit. Consider need for starting therapy.

- Reduction of BP over 24 to 48 hours with longer acting agents is usually preferable (e.g. ramipril 10mg, metoprolol SR 50 to 100mg or nifedipine XL 30mg).
- If condition of individual requires temporary BP reduction, the sparing use of fast-acting agents to ↓ BP over several hours may be considered. Reassess BP after a few hours & if ↓ of 20 to 30mmHg, consider starting longer acting agent as indicated previously:
  - **Captopril** Capoten 3.125 to 12.5mg po/SL (may repeat 1 to 2 times at 30 to 60min intervals; max 150mg TID)
  - **Clonidine** Catapres 0.05 to 0.2 mg (may repeat q1-2h; max 0.6 to 0.8mg/day)
  - **Labetalol** Trandate 200 to 400 mg (may repeat q6-12h PRN; max 1200mg/day)

Orthostatic Hypotension [37,38] (See RxFiles Q&A for more in-depth discussion)

Definition: a ↓ in SBP of ≥20mmHg or a ↓ in DBP of ≥10mmHg within 3 minutes of standing when compared with BP from the sitting or supine position[39] & may be associated with ↑ cardiovascular risk[40] & falls. (Physiological changes such as decreased sensitivity of baroreceptors, impaired α1-adrenergic vasoconstriction, decreased thirst response & changes in the kidney's ability to conserve salt & water causing dehydration may lead to drops in BP. May be worse in the morning.)
Symptoms include: dizziness, light-headedness, fatigue, weakness, blurred vision, syncope or falls.
Goals of treatment: symptom improvement, decreasing risk of falls & syncope.

❑ **Review all medications, especially antihypertensive doses. Determine if the BP targets need to be relaxed if they are too aggressive; reduce & stop as necessary.**

Medications of concern: Alcohol, α-blockers (e.g. tamsulosin)[41], antiadrenergics, antiarrhythmics, anticholinergics, antidepressants (e.g. **TCA**, trazodone), antihypertensives, antiparkinson agents (e.g. bromocriptine & levodopa/carbidopa), opioids, neuroleptics, sedatives, SGLT-2 inhibitors (e.g. empagliflozin)

❑ **Consider non-pharmacologic treatment for initial management when appropriate.**

- Rise slowly from lying or sitting: count to 15 at each phase going from lying to sitting to standing.
- Avoid standing motionless for long periods of time. Try crossing legs while standing.
- Regular exercise. Water or recumbent exercise (e.g. rowing, bicycle) may be better options.
- Raise head of bed while sleeping (6 to 9 inches).
- Replace fluids (1.5 to 2.5L/day) or salt (up to 6 to 10g NaCl/day) if needed & appropriate.
- Lower limb compression stockings &/or abdominal binding may be helpful.[42]

Acute symptom management: (May be useful if person exposed to prolonged standing.) Drink 16oz of water in 3 to 4 minutes, ↑ BP may be seen in 5 to 10 minutes & peaks at 30 minutes.[43, 44]

❑ Beers Use medications for orthostatic hypotension with caution due to AE risk.

- **Fludrocortisone** Florinef 0.05 to 0.3mg daily (↑ dose weekly; >0.3mg/day ↑ adverse effects)
- **Midodrine** Amatine 2.5 to 10mg TID every 3 to 4 hours PRN while upright (max 30mg/day)

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45-54 online are deleted compared to online – as they pertained only to the BEERS charts.

Several references deleted as sections retooled – e.g. ref 1-3, 12, 21, 48-54 in old version

New ref 9, 17