

AntiHypertensive Medications

ACE Inhibitors, ARBs, and DRIs are preferred in diabetes due to their B/P lowering and renal-protection effects. These meds target the Renin-Angiotensin-Aldosterone-System (RAAS), delay progression from microalbuminuria to macroalbuminuria. Diuretics are often added as adjunct therapy.

Monitor B/P, renal function and electrolytes at baseline and on regular basis. Instruct pt to report signs of orthostatic hypotension and get up slowly.

ACE, ARBs, DRI – If B/P not at goal with these agents, add a diuretic or other class. Do not use during pregnancy or in persons w/ renal or hepatic dysfunction. Start w/ low dose, gradually increase.

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Frequency	Considerations
ACE Inhibitors Angiotensin Converting Enzyme Action - Block the conversion of AT-I to AT-II. Also stimulates release of nitric oxide causing vasodilation.	benazepril / Lotensin [†]	10 – 40 mg	1 x a day	Try to take same time each day. Effects seen w/in 1 hr of admin, max effects in 6 hrs. Side effects: Can cause cough (due to increased bradykinin) – can try different med in same class. Also can cause fatigue, dizziness, hypotension. [†] These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide). [‡] These meds are also available as a combo w/ CCB (calcium channel blocker) usually amlodipine
	captopril /Capoten* ^{††}	12.5 - 100 mg	2-3 x a day	
	Enalapril/ Vasotec* ^{††}	2.5 - 40 mg	1-2 x a day	
	Fosinopril / Monopril [†]	10- 40 mg	1 x a day	
	Lisinopril * ^{††} Prinivil Zestril	10 – 40 mg 10 - 40 mg		
	Ramipril / Altace* ^{††}	2.5 – 10 mg		
	Moexipril / Univasc [†]	3.75 - 15 mg		
	Perindopril/Aceon [‡]	2-16 mg		
	Perindopril/ Indapamide combo (Coversyl)	2 - 8 mg 0.625 - 2.5 mg		
	Quinapril /Accupril [†]	5 – 40 mg		
Trandolapril/ Mavik	1.0 – 4 mg			
Trandolapril/ Verapamil combo (TARKA)	1-4 mg 180 to 240 mg			
ARBs -Angiotensin Receptor Blockers Action -Block AT-I receptor which reduces aldosterone secretion and vasoconstriction	Azilsartan/Edarbi	40 - 80 mg	1 x daily	Try to take same time each day Side effects- Can cause dizziness, drowsiness, diarrhea, hyperkalemia, hypotension. [†] These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide). [‡] These meds are also available as a combo w/ CCB (calcium channel blocker) usually amlodipine
	Azilsartan/ Chlorthalidone combo (Edarbyclor)	40 mg 12.5 - 25 mg		
	Candesartan/Atacand [†]	8 – 32 mg		
	Eprosartan/Teveten [†]	400 - 600 mg		
	Irbesartan/ Avapro [†]	75 – 300 mg		
	Losartan / Cozaar* ^{††}	25 – 100 mg		
	Olmesartan / Benicar ^{†‡} Tribenzor (triple combo)	20 – 40 mg		
	Telmisartan / Micardis	20 – 80 mg		
Valsartan / Diovan ^{†‡} Exforge HCT (triple combo)	80 – 320 mg			
Valsartan/ Nebivolol combo (Byvalson)	80 mg 5 mg			

*indicates medication is available in generic form.

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DRIs - Direct Renin Inhibitors -	Aliskiren / Tekturna†	150 – 160 mg	1 x daily	Generally well tolerated. †These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide).

Beta Blockers are commonly prescribed as an add-on to other B/P meds for people with DM. Beta Blockers are beneficial for persons w/ concurrent cardiac problems and prevention of recurrent MI and heart failure. Caution in DM since Beta Blockers can cause hyperglycemia and mask hypoglycemia induced tachycardia (but do not block hypoglycemia related dizziness and sweating). Monitor B/P, heart rate, lipids and glucose.

Beta Blockers <i>β1- Selective</i> Action: Blockade β1 receptors & reduce cardiac output & kidney renin activation.g	Acebutolol / Sectral*	200 – 800 mg	2 x daily	Side Effects: Usually CNS related including sedation, dizziness, lightheaded . Watch for bradycardia, hypotension, depression and sexual dysfunction. Check heart rate each visit, adjust dose if HR <50. Can cause heart block – review package insert for drug-drug interactions. Watch for exercise intolerance. When stopping beta blockers, taper dose gradually. Use cautiously at lowest dose. †These meds are also available as a combo w/ low dose HCTZ (hydrochlorothiazide).
	Atenolol / Tenormin*	25 – 100 mg	1 x daily	
	Atenolol with Chlorthalidone/ Tenoretic	50 -100 mg 25 mg	1 x daily 1 x daily	
	Betaxolol / Kerlone	5 – 10 mg	2 x daily	
	Bisoprolol/ Zebeta†	2.5 – 10 mg	1 x daily	
	Metoprolol tartate/Lopressor*†	25 – 100 mg		
	Metoprolol succinate / Toprol XL	25 - 100 mg		
Beta Blockers <i>Non Selective</i> Action: Blockades β1 & β2	Nebivolol/Bystolic	5 to 40 mg		
	Nebivolol with Valsartan/ Byvalson	5 mg 80 mg		
	Nadolol / Corgard*	40 - 120 mg	1 x daily	
	Nadolol with Bendroflumethiazide	40-80 mg 5 mg		
	Penbutolol / Levatol	10 - 40 mg	1 x daily	
	Pindolol / Visken	10 – 40 mg	2 x daily	
	Propranolol / Inderal* Inderal LA (extended)	40 – 160 mg 60 – 180 mg	2 x daily 1 x daily	
Timolol / Blocadren*	10 – 60 mg	2 x daily		
Combined α- and β- Blockers	Corvedilol / Coreg	6.25 – 50 mg	2 x daily	Same precautions as beta blockers.
	Coreg CR	20 – 80 mg	1 x daily	
	Labetalol / Normodyne*	100 – 2400 mg	2 x daily	

Diuretics are often used as adjunct therapy. Obtain baseline B/P, electrolytes, uric acid, glucose and lipids prior to starting and periodically. May require supplementation w/ magnesium and potassium.

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Considerations
Thiazide Diuretics Action: cause diuresis and decrease vascular resistance. (Many meds combined with this class)	Hydrochlorothiazide (HCTZ)* HydroDIURIL Microzide	12.5 – 25 mg Most frequently prescribed	1 x daily in am with or w/out food Side effects: lyte imbalances; hypokalemia, hypomagnesemia, hyperuricemia, hyperglycemia, hyperlipidemia and hyper/hypocalcemia. S/S include muscle cramps, fatigue, dizziness and cardiac arrhythmias .
	Chlorthalidone / Clorpres*	12.5 – 25 mg	
	Metolazone / Zaroxolyn*	2.5 – 20 mg	
	Indapamide / Lozol*	1.2 – 2.5 mg	

*indicates medication is available in generic form.

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Considerations	
Loop Diuretics (resistant HTN)	Furosemide/Lasix*	20 – 600 mg 2x day	Side Effects as above, but more intense. Need K ⁺ supplement.	
	Torsemide / Demadex*	2.5 – 200 mg 1x day		
	Bumetanide / Bumex*	0.5 – 10 mg 2 x day	Used if GFR < 30 or if greater diuresis is needed	
Potassium Sparing Diuretics	Amiloride / Midamor	5 – 20 mg	1 x day	Usually combined with thiazide diuretic to balance serum potassium. Alone, they do little to lower BP.
	Triamterene / Dyrenium	37.5 – 75 mg	1 x day	
	Spironolactone / Aldactone*	25 – 100 mg	1-2 x day	
	Eplerenone / Inspra	50 - 100 mg	1 -2 x day	

Calcium Channel Blockers are usually second or third line BP med for diabetes, since they have less impact on CVD. They may also be used for those who can't tolerate ACE or ARB Therapy.

Class / Action	Generic / Trade Name	Usual Daily Dose Range	Frequency	Considerations	
Calcium Channel Blocker <i>Nondihydropyridine</i> Relaxes coronary blood vessels to decrease heart rate and cardiac output.	Diltiazem immediate release*	30 – 360 mg	4 x day	Monitor BP, heart rate, liver enzymes and cardiac function a baseline and periodically.	
	Diltiazem extended release*				
	Cardizem CD	120 – 480 mg	1 x day		
		Tiazac	120 – 540 mg	1 x day	Take at the same time each day (with meals if possible).
		Dilacor, Diltia	180 – 540 mg	1 x day	
		Verapamil immediate release*			
		Calan	80 -320 mg	3 x day	
	Verapamil sustained release*			Take in evening if experience drowsiness.	
	Calan SR, Veralan	120 mg – 480 mg	1 -2 x day		
	Verapamil extended release*			Side Effects: Watch for cardiac conduction abnormalities, bradycardia, CHF and edema. Can cause peripheral edema and constipation. Metabolized through CYP3A4, so review package insert for drug and food interactions (ie grapefruit).	
Calcium Channel Blocker – <i>Dihydropyridine</i> Causes vasodilation and decreases peripheral vascular resistance.	Amlodipine/Norvasc	2.5 – 10 mg	1 x day		
	Felodipine / Plendil	2.5 – 10 mg	1 x day		
	Isradipine controlled release DynaCirc CR	2.5 – 10 mg	1 x day		
	Nicardipine sustained release / Cardene SR	30 – 60 mg	2 x day		
	Nifedipine long-acting* Adalat CC /Procardia XL	30 – 120 mg	1 x day		
	Nisoldipine / Sular	10 – 40 mg	1 x day		

α1 – Receptor Blockers - Often used for pts with DM & benign prostatic hypertrophy (BPH).

α1 – Receptor Blockers Vasodilation	Doxazosin/Cardura*	1 – 8 mg	1 x day	Take at hs and low dose to reduce risk of postural hypotension/syncope.
	Prazosin / Minipress*	2 – 20 mg	2 - 3 day	
	Terazosin/ Hytrin*	1 – 10 mg	1 – 2 day	

α2 agonists- Not usually first line due to side effects. Effective in pts w/ renal disease, since does not compromise renal function.

α2 agonists – Centrally act to block influence of norepinephrine on the heart and lower B/P	Clonidine / Catapres*	0.1 to 0.8 mg	2 x day	Administer w/ diuretic. Side effects: sedation, dry mouth, bradycardia orthostatic hypotension, impotence. Do not stop abruptly, can cause hypertensive crisis.
	Methyldopa / Aldomet*	250 – 1000 mg	2-3 x day	

*indicates medication is available in generic form.

Cholesterol Medications

LDL Lowering Medications				
Class / Action	Generic / Trade Name	Usual Daily Dose Range	LDL % Lowering	Considerations
“Statins” HMG- CoA Reductase Inhibitors Inhibits enzyme that converts HMG-CoA to mevalonate - limits cholesterol production	Atorvastatin / Lipitor*	10 – 80 mg	20- 60	Lowers TGs 7-30% Raise HDL 5-15% Take at night. Side effects: weakness, muscle pain, elevated glucose levels. Review package insert for specific dosing adjustments based on drug, food interactions (ie grapefruit).
	Fluvastatin / Lescol* Lescol XL	20 – 80 mg 80 mg	20- 35	
	Lovastatin* Mevacor Altoprev XL	20 - 80 mg 10 - 60 mg	20- 45	
	Pravastatin / Pravachol*	10 - 80 mg	20- 45	
	Rosuvastatin / Crestor	5 – 40 mg	20- 60	
	Simvastatin / Zocor*	20 – 80 mg	20- 55	
	Pitavastatin / Livalo	2 – 4 mg		
Bile Acid Sequestrants Action: Bind to bile acids in intestine, decreasing cholesterol production. Secondary action – raise HDL	Cholestyramine/ Questran*	4 to 16 g per day powder – 1 scoop 4g	Lower LDL by 15-30%	May raise TG levels. Raise HDL 3-5%. Avoid taking in same timeframe w/ other meds – may affect absorption (see package insert). Side effects: GI in nature
	Colesevelam / Welchol Lowers A1c 0.5%	3.75 x 1 daily 1.875 x 2 daily (625mg tablets)		
	Colestipol / Colestid	2 - 16 gms per day tabs Powder – 1 scoop = 5g 5 to 20 gm per day Mix w/ fluid		
Cholesterol Absorption Inhibitors	Ezetimibe / Zetia	10 mg – 1x daily	15-20%	Usually used in combo w/statin. Headache, rash.
Plant Stenols	Benecol	3 servings daily	14%	Well tolerated
Plant Sterols	Take Control	2 servings daily	17%	
Triglyceride Lowering / HDL Raising Medications				
If TG > 500, lower TG first, then reduce LDL.				
Class / Action	Generic / Trade	Usual Daily Dose Range	Lowers TG	Considerations
Fibrates or Fibric Acids Reduces liver lipogenesis	Fenofibrate/ Tricor Multiple brand formulations	48-145 mg 1x daily Please refer to individual package insert for dosing	20-50%	Lowers LDL 5-20% Raise HDL 10-20% GI side effects, myopathy Avoid w/ severe renal or hepatic disease
	Gemfibrozil / Lopid*	600mg 2x daily		
Nicotinic Acid Raise HDL/Lower TG Inhibits mobilization of free fatty acid	Niacin (immediate release)*	1.5- 3 gms	20-50%	Raise HDL 15-35% Flushing, hyperglycemia, hepatotoxicity – monitor liver enzymes. Can take w/aspirin to < flushing
	NiaSpan (extended release) Niacin (sustained release)	1-2 gms		
Omega 3 Fatty Acid	Omega 3 Acid/ Lovaza	4 gm a day	45%	Raise HDL 9% - Primary use for TG > 500
Combination Medications				
Vytorin	Zetia + Simvastatin	Observe precautions of each component drug		
Juvisync	discontinued			

*indicates medication is available in generic form.

Neuropathy Medication for Diabetes

Prevention – Maintain glycemic control; quit smoking, alcohol reduction, exercise.

Pathogenetically Oriented Therapy

- Alpha lipoic acid 600 – 1,800 mg a day

Prescription Therapy:

1st line – Tricyclic Antidepressants (Amitriptyline, Nortriptyline, Desipramine)

- Calcium Channel Modulators (Gabapentin, Pregabalin)
- Serotonin Norepinephrine Reuptake Inhibitors (SNRI – Venlafaxine, Duloxetine)

2nd Line - Topical Capsaicin Cream for localized pain – Apply 2-4 x daily for up to 8 wks

- Opioids (Tramadol, Oxycodone)

Reasons for Treatment Failure

- Dose too low
- Inadequate trial – requires 2-8 weeks of treatment to observe symptom reduction
- Pt expecting elimination of symptoms – only reduces symptoms by about 50%
- Incorrect diagnosis: If in doubt, refer to neurologist
- If patient does not respond or has adverse effects, change medication class
- In patient has some but inadequate relief, raise the dose and consider adding or changing meds.

References: Ziegler, D. Painful diabetic neuropathy. Diabetes Care 2009; 32 (Supp 2): S414-S419

Class	Generic / Trade Name	Usual Daily Dose Range	Comments	Side Effects/ Caution
1st Line Agents Tricyclic Antidepressants TCA Improves neuropathy and depression	Amitriptyline / Elavil	25 – 100 mg* Avg dose 75mg	Usually 1 st choice	Take 1 hour before sleep. Side effects; dry mouth, tiredness, orthostatic hypotension. Caution: not for pts w/ unstable angina (<6 mo), MI, heart failure, conduction system disorder.
	Nortriptyline / Pamelor	25 - 150 mg* (for burning mouth)	Less sedating and anticholinergic	
	Desipramine / Norpramine	25 – 150 mg* *Increase by 25mg weekly till pain relieved		
Calcium Channel Modulators	Gabapentin/ Neurontin	100 - 1,200mg TID	Improves insomnia, fewer drug interactions	Sedation, dizziness, peripheral edema, wt gain Caution; CHF, suicide risk, seizure disorder.
	Pregabalin / Lyrica *FDA approved for neuropathy treatment	50 - 200mg TID		
Serotonin Norepinephrine Reuptake Inhibitor SNRI	Duloxetine / Cymbalta *FDA approved for neuropathy treatment	60 mg daily Start at 30 mg	Improves depression, insomnia	Nausea, sedation, HTN, constipation, dizziness, dry mouth, blurred vision. Caution: adjust dose for renal insufficiency, do not stop abruptly, taper dose.
	Venlafaxine/ Effexor	75 - 225 mg daily		
2nd Line Agents Opioids	Weak opioids Tramadol / Ultram	50 – 400 mg	Sedation, nausea, constipation (always prescribe stool softener) Caution: abuse, suicide risk, short acting opioids not recommended for long term tx, can develop tolerance	
	Strong opioids Oxycodone	10 – 100 mg		
Local Treatment	Capsaicin Cream (0.025%) Apply 2-4 x daily for up to 8 wks			
Other choices	If above medications not effective, contraindicated or intolerable consider: Bupropion/Wellbutrin Paroxetine / Paxil Citalopram / Celexa Topiramate / Topamax Topical Lidocaine (for localized pain).			

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