enalapril, enalaprilat (e-nal-a-pril, e-nal-a-pril-at)

| Epaned, Vasotec, Vasotec IV |

**Classification**

Therapeutic: antihypertensives  
Pharmacologic: ACE inhibitors

**Pregnancy Category D**

<table>
<thead>
<tr>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alone or with other agents in the management of hypertension. Management of symptomatic heart failure. Slowed progression of asymptomatic left ventricular dysfunction to overt heart failure. Unlabeled Use: Treatment of proteinuria in steroid-resistant nephrotic syndrome patients.</td>
</tr>
</tbody>
</table>

**Action**

Angiotensin-converting enzyme (ACE) inhibitors block the conversion of angiotensin I to the vasoconstrictor angiotensin II. ACE inhibitors also prevent the degradation of bradykinin and other vasodilatory prostaglandins. ACE inhibitors also lower plasma renin levels and aldosterone levels. Net result is systemic vasodilation.

**Pharmacokinetics**

**Absorption:** Enalapril: 55–75% absorbed following oral administration. Enalaprilat: IV administration results in complete bioavailability.

**Distribution:** Crosses the placenta; small amounts enter breast milk.

**Metabolism and Excretion:** Converted by the liver to enalaprilat, the active metabolite; primarily eliminated by kidneys.

**Half-life:** Enalapril: Adults: 2 hr; Adults with HF: 3.4–5.8 hr; Children and infants with HF: 2.7 hr; Neonates with HF: 11.9 hr. Enalaprilat: Adults: 35–38 hr; Children and infants with HF: 11.1 hr; Infants 6 wks–8 mo: 6–10 hr; Neonates with HF: 11.9 hr.

<table>
<thead>
<tr>
<th>TIME/ACTION PROFILE (effect on BP—single dose†)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ROUTE</strong></td>
</tr>
<tr>
<td>Enalapril PO</td>
</tr>
<tr>
<td>Enalaprilat IV</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contraindications/Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contraindicated in: Hypersensitivity; History of angioedema (either idiopathic or with previous use of ACE inhibitors); Concurrent use with aliskiren in patients with diabetes or moderate-to-severe renal impairment (CCr &lt; 60 mL/min). Can cause anaphylaxis or death of fetus – if pregnancy occurs, discontinue immediately.</td>
</tr>
</tbody>
</table>
Use Cautiously in: Patients with renal impairment, hypovolemia, hyponatremia, and concurrent diuretic therapy; Black patients (monotherapy of hypertension less effective, may require additional therapy; higher risk of angioedema); Surgery/anaesthesia (hypotension may be exaggerated). Women of childbearing potential; Pedi: Injectable product contains benzyl alcohol which is associated with gasping syndrome in neonates; Geri: Initial dose recommended. |

**Adverse Reactions/Side Effects**


**Interactions**

**Drug-Drug:** Excessive hypotension may occur with concurrent use of diuretics. Additive hypotension with other antihypertensives. Risk of hyperkalemia with concurrent use of potassium supplements, potassium-sparing diuretics, or potassium-containing salt substitutes. Risk of hyperkalemia, renal dysfunction, hypotension, and syncope with concurrent use of angiotensin II receptor antagonists or aliskiren. Avoid concurrent use with thiazide diuretics or GFR < 40 mL/min. NSAIDs and selective COX-2 inhibitors may blunt the antihypertensive effect and the risk of hyperkalemia.

**Drug-Natural Products:** Avoid licorice; causes sodium and water retention and potassium loss.
Route/Dosage
Hypertension
PO (Adults): 2.5–5 mg once daily, then increased up to 40 mg/day in 1–2 divided doses (initiate therapy at 2.5 mg once daily in patients receiving diuretics).
PO (Children and Neonates): 0.1 mg/kg/day in 1–2 divided doses (max 24 hr dose 5 mg/kg/day).
IV (Adults): 0.125–1.25 mg (0.125 mg/min in continuous infusion) every 6 hr, can be titrated up to 4 mg every 12 hr.
IV (Children and Neonates): 5–10 mcg/kg/min given q8–24 hr.
Renal Impairment
PO, IV (Adults): CCr 10–50 mL/min—75% of dose; CCr <10 mL/min—50% of dose.
Renal Impairment
PO, IV (Children and Neonates): CCr <30 mL/min—Contraindicated.
Heart Failure
PO (Adults): 2.5 mg 1–2 times daily, titrated up to a target dose of 10 mg twice daily; initiate therapy at 2.5 mg once daily in patients with hypokalemia (serum sodium <130 mEq/L).

NURSING IMPLICATIONS
Assessment
- Hypertension: Monitor BP and pulse frequently during initial dose adjustment and periodically during therapy. Notify health-care professional of significant changes.
- Monitor frequency of prescription refills to determine compliance.
- Assess patient for signs of angioedema (swelling of face, extremities, eyes, lips, or tongue, or difficulty in swallowing or breathing).
- Heart Failure: Monitor weight and assess patient routinely for resolution of fluid overload (peripheral edema, rales/crackles, dyspnea, weight gain, jugular venous distention).
enalapril, enalaprilat

azem, diphenhydramine, dobutamine, docetaxel, dolasetron, dopamine, doripenem, doxacurium, doxorubicin hydrochloride, doxorubicin liposome, doxycycline, ephedrine, epinephrine, epirubicin, epoetin, epoetin alfa, esomeprazole, fentanyl, filgrastim, fluconazole, fludarabine, fluorouracil, folic acid, folic acid, foscarnet, furosemide, ganciclovir, gemcitabine, gentamicin, glycopyrrolate, granisetron, heparin, hetastarch, hydrocortisone sodium succinate, hydrochlorothiazide, hydroxyzine, inhaled corticosteroids, ibuprofen, idarubicin, ifosfamide, imipenem/cilastatin, indomethacin, insulin, irinotecan, isoproterenol, ketorolac, labetalol, leucovorin, levofloxacin, lidocaine, linezolid, lorazepam, magnesium sulfate, mannitol, melphalan, meropenem, metaraminol, methotrexate, methylprednisolone sodium succinate, metoclopramide, metoprolol, metronidazole, micafungin, nimodipine, nimodipine, nitrofurantoin, nitroglycerin, nitroprusside, norepinephrine, octreotide, ondansetron, oxacillin, oxaliplatin, oxytocin, paclitaxel, palonosetron, pamidronate, pentamidine, pentazocine, pento- barbital, phenobarbital, phentolamine, phenylephrine, phytonadione, piperacillin/tazobactam, potassium acetate, potassium chloride, potassium phosphates, procainamide, prochlorperazine, promethazine, propofol, propranolol, promethazine, promethazine, quinidine, quinupristin/dalfopristin, ranitidine, remifentanil, rituximab, rocuronium, sodium acetate, sodium bicarbonate, streptokinase, succinylcholine, sufentanil, tacrolimus, teniposide, tetracycline, theophylline, thiamine, thiotepa, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, tolazoline, trastuzumab, vancomycin, vasopressin, vecuronium, verapamil, vinblastine, vincristine, vinorelbine, voriconazole, zoledronic acid.

● Y-Site Incompatibility:
  amphotericin B cholesteryl, amphotericin B colloidal, caspofungin, cefepime, dantrolene, diazepam, diazoxide, phenytoin.

Patient/Family Teaching

● Emphasize the importance of continuing to take medication as directed at the same time each day, even if feeling well. Take missed doses as soon as remembered but not at almost time for next dose. Do not double doses. Warn patient not to discontinue ACE inhibitor therapy unless directed by health care professional.

● Caution patient to avoid salt substitutes containing potassium or foods containing high levels of potassium or sodium unless directed by health care professional.

● Caution patient to change positions slowly to minimize orthostatic hypotension.

● Use of alcohol, standing for long periods, exercising, and hot weather may increase orthostatic hypotension.

● Instruct patient to refer health care professional of all Rx or OTC medications, vitamins, or herbal products being taken and consult health care professional before taking any new medications, especially cough, cold, or allergy remedies.

● May cause dizziness, especially during first few days of therapy. Caution patient to avoid driving and other activities requiring alertness until response to medication is known.

● Advise patient to refer health care professional of medication regimen before treatment or surgery.

● Instruct patient to notify health care professional if rash, sore throat, fever, swelling of hands or feet, irregular heart beat, shortness of breath occurs.

● Advise women of childbearing age to use contraception and notify health care professional of pregnancy is planned or suspected. If pregnancy is detected, discontinue medication as soon as possible.

● Emphasize the importance of follow-up examinations to evaluate effectiveness of medication.

● Hypertension: Encourage patient to comply with additional interventions for hypertension (weight reduction, low sodium diet, discontinuation of smoking, moderation of alcohol consumption, regular exercise, and stress management).

● Instruct patient and family on correct technique for monitoring BP. Advise them to check BP at least weekly and to report significant changes to health care professional.

● May cause dizziness, especially during first few days of therapy. Caution patient to avoid driving and other activities requiring alertness until response to medication is known.

● Use of alcohol, standing for long periods, exercising, and hot weather may increase orthostatic hypotension.

● Instruct patient to refer health care professional of all Rx or OTC medications, vitamins, or herbal products being taken and consult health care professional before taking any new medications, especially cough, cold, or allergy remedies.

● May cause dizziness, especially during first few days of therapy. Caution patient to avoid driving and other activities requiring alertness until response to medication is known.

● Advise patient to refer health care professional of medication regimen before treatment or surgery.

● Instruct patient to notify health care professional if rash, sore throat, fever, swelling of hands or feet, irregular heart beat, shortness of breath occurs.

● Advise women of childbearing age to use contraception and notify health care professional of pregnancy is planned or suspected. If pregnancy is detected, discontinue medication as soon as possible.

● Emphasize the importance of follow-up examinations to evaluate effectiveness of medication.

● Hypertension: Encourage patient to comply with additional interventions for hypertension (weight reduction, low sodium diet, discontinuation of smoking, moderation of alcohol consumption, regular exercise, and stress management).

● Instruct patient and family on correct technique for monitoring BP. Advise them to check BP at least weekly and to report significant changes to health care professional.

● May cause dizziness, especially during first few days of therapy. Caution patient to avoid driving and other activities requiring alertness until response to medication is known.
Evaluation/Desired Outcomes

- Decrease in BP without appearance of excessive side effects.
- Improvement in survival and reduction of symptoms in heart failure.
- Decrease in development of overt heart failure.

Why was this drug prescribed for your patient?