Lisinopril (lyse-in-oh-pril)
Prinivil, Zestril

**Classification**
Antihypertensives
ACE inhibitors

**Pregnancy Category**
D

**Indications**

- Alone or with other agents in the management of hypertension.
- Management of heart failure.
- Reduction of risk of death or development of heart failure after myocardial infarction.

**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.

**Therapeutic Effects:**

- Lowering of BP in hypertensive patients.
- Increased survival and decreased symptoms in patients with heart failure.
- Increased survival after myocardial infarction.

**Pharmacokinetics**

- **Absorption:** 25% absorbed following oral administration (much inter-individual variability).
- **Distribution:** Crosses the placenta; may enter breast milk.
- **Metabolism and Excretion:** 100% eliminated by the kidneys.
- **Half-life:** 12 hr (Q in renal impairment).

**Time/Action Profile (effect on BP—single dose†)**

<table>
<thead>
<tr>
<th>ROUTE</th>
<th>ONSET</th>
<th>PEAK</th>
<th>DURATION</th>
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<tbody>
<tr>
<td>PO</td>
<td>1 hr</td>
<td>6 hr</td>
<td>24 hr</td>
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†Full effects may not be noted for several weeks.

**Contraindications/Precautions**

- **Contraindicated in:** Hypersensitivity; History of angioedema with previous use of ACE inhibitors; Concurrent use with aliskiren in patients with diabetes or moderate-to-severe renal impairment (CCr ≤ 60 mL/min); OB: Can cause injury or death of fetus — if pregnancy occurs, discontinue immediately; Lactation: Discontinue drug or use formula.
- **Use Cautiously in:** Patients with renal impairment; Hypoalbuminemia; Concurrent use with aliskiren in patients with diabetes or moderate-to-severe renal impairment (CCr ≤ 60 mL/min); OB: Can cause injury or death of fetus — if pregnancy occurs, discontinue immediately; Lactation: Discontinue drug or use formula.
- **Exercise Extreme Caution in:** Family history of angioedema.

**Adverse Reactions/Side Effects**

- **CNS:** Dizziness, fatigue, headache, weakness.
- **Resp:** Cough.
- **CV:** Hypotension, chest pain.
- **GI:** Abdominal pain, diarrhea, nausea, vomiting.
- **GU:** Erectile dysfunction, impaired renal function.
- **Derm:** Rashes.
- **F and E:** Hyperkalemia.
- **Misc:** ANGIOEDEMA.

**Interactions**

- **Drug-Drug:** Excessive hypotension may occur with concurrent use of diuretics. Additive hypotension with other antihypertensive agents. 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 aliskiren in patients with diabetes or CCr ≤ 60 mL/min. NSAIDs and selective COX-2 inhibitors blunt the anti-hypertensive effect and ↑ the risk of renal dysfunction, ↑ levels and ↑ the risk of lithium toxicity.

**Route/Dosage**

**Hypertension**

- **PO (Adults):** 10 mg once daily, can be ↑ up to 20–40 mg/day (initiate therapy at 5 mg/day in patients receiving diuretics).
- **PO (Children ≤ 6 yr):** 0.07 mg/kg once daily (up to 5 mg/day), may be titrated every 1–2 wk up to 0.6 mg/kg/day (or 40 mg/day).

**Renal Impairment**

- **PO (Adults):** CCr 10–30 mL/min—Initiate therapy at 5 mg daily; may be slowly titrated up to 40 mg/day (or 40 mg/day).
- **PO (Children ≤ 6 yr):** CCr ≤ 10 mL/min—Initiate therapy at 0.5–1 mg/kg once daily (up to 5 mg/day); may be slowly titrated up to 10 mg/day.

**Dosage Formulas**

- **For Oral Administration:**
- **Adults:** 5 mg once daily; can be ↑ up to 20–40 mg/day (initiate therapy at 5 mg/day in patients receiving diuretics).
- **Children ≤ 6 yr:** 0.07 mg/kgonce daily (up to 5 mg/day), may be titrated every 1–2 wk up to 0.6 mg/kg/day (or 40 mg/day).
Renal Impairment
(Children ≤ 6 yr): Ccr ≤ 30 mL/min — Contraindicated.

Heart Failure
PO (Adults): 5 mg once daily, may be titrated every 2 wk up to 40 mg/day; initiate therapy at 2.5 mg once daily in patients with hypotension (serum sodium ≤ 130 mEq/L).

Renal Impairment
(Adults) Ccr < 30 mL/min — Initiate therapy at 2.5 mg once daily.

Acute Myocardial Infarction
PO (Adults): 5 mg once daily for 2 days, then 10 mg daily.

Renal Impairment
PO (Adults): Initiate with caution in patients with serum creatinine ≥ 2 mg/dL.

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 (dyspnea, facial swelling).
● Heart Failure: Monitor weight and assess patient routinely for resolution of fluid overload (peripheral edema, rales/crackles, dyspnea, weight gain, jugular venous distention).

Lab Test Considerations: Monitor renal function. May cause increase in BUN and serum creatinine.
● May cause hyperkalemia.
● May cause slight decrease in Hb and hematocrit and agranulocytosis.
● May cause ↑AST, ALT, alkaline phosphatase, and serum bilirubin.

Potential Nursing Diagnoses
Decreased cardiac output (Side Effects) (Vital Signs)
Noncompliance (Patient/Family Teaching)

Implementation
● Do not confuse Zestril with Zegerid, Zetia, or Zyprexa.

Correct volume depletion, if possible, before initiation of therapy. Precipitous drop in BP during first 1–3 hr following first dose may require volume expansion with normal saline. Discontinuing thiazide therapy or cautiously increasing salt intake 2–3 days prior to initiation may decrease risk. Monitor closely for at least 1 hr after BP has stabilized. Reserve diuretics if BP is not controlled.

PO: For patients with difficulty swallowing tablets, pharmacist can compound an oral suspension, stable at room temperature for 6 wk. Shake suspension before each use.

Patient/Family Teaching
● Instruct patient to take medication as directed at the same time each day, even if feeling well. Take missed doses as soon as remembered but not if 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 risk of hypotension.
● Advise patient to notify health care professional of all Rx or OTC medications, vitamins, or herbal products being taken and to consult with health care professional before taking other medications, especially cough, cold, or allergy remedies.
● May cause dizziness. Caution patient to avoid driving and other activities requiring alertness until response to medication is known.
● Advise patient to inform health care professional of medication regimen before treatment or surgery.
● Instruct patient to notify health care professional if rash; mouth sores; sore throat; fever; swelling of hands or feet; irregular heart beat; chest pain; dry cough; hoarseness; swelling of face, eyes, lips, or tongue; or if difficulty swallowing or breathing occurs. Persistent dry cough may occur and may not subside until medication is discontinued. Consult health care professional if cough becomes bothersome. Also notify health care professional of unusual bleeding or bruising, vision changes, or diarrhea occurs and continues.
● Emphasize the importance of follow-up examinations to evaluate effectiveness of medication.
Advise women of childbearing age to use contraception and notify health care professional if pregnancy is planned or suspected or if breastfeeding.

Hypertension: Encourage patient to comply with additional interventions for hypertension (weight reduction, low sodium diet, discontinuation of smoking, modification of alcohol consumption, regular exercise, and stress management). Medication controls but does not cure hypertension.

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.

Evaluation/Desired Outcomes

- Decrease in BP without appearance of excessive side effects.
- Improvement in survival and reduction of symptoms in heart failure.
- Reduction of risk of death or development of heart failure after myocardial infarction.

Why was this drug prescribed for your patient?