

## Hypertension

### DRUGS FOR THE TREATMENT OF HYPERTENSIVE URGENCIES AND EMERGENCIES

#### PARENTERAL DRUGS FOR THE TREATMENT OF HYPERTENSIVE EMERGENCIES

(See UHN Nursing Intravenous Drug Lists on Intranet for further details)

#### VASODILATORS

<b>Drug</b>	<b>Enalaprilat</b>	<b>Hydralazine</b>	<b>Nitroglycerin</b>	<b>Nitroprusside</b>
<b>Trade/Alternate Name</b>	VASOTEC	APRESOLINE	glyceryl trinitrate	NIPRIDE
<b>Dose</b>	<b>Suggested initial dose:</b> 1.25 mg IV q6h (0.625 mg if volume depleted or in renal failure) <b>Dose range:</b> 0.625 to 5 mg IV q6h	<b>Suggested initial dose:</b> 10 mg IV q6h <b>Dose range:</b> 2.5 to 40 mg IV q4h to q12h	<b>Suggested initial dose:</b> 5 to 10 mcg/min IV infusion <b>Dose range:</b> 5 to 100 mcg/min IV infusion <b>Titrate:</b> Every 3 to 5 min in 5 to 10 mcg/min increments	<b>Suggested initial dose:</b> 0.25 mcg/kg/min IV infusion <b>Dose range:</b> 0.25 to 10 mcg/kg/min <b>Titrate:</b> Every 5 min in 0.5 mcg/kg/min increments.
<b>Onset of Action</b>	Less than 15 min Peak: 1 to 4 h	10 to 30 min	1 to 5 min	Immediate
<b>Duration of Action</b>	4 to 12 hours	3 to 6 hours	3 to 5 min	1 to 2 min
<b>Adverse Effects</b>	Renal failure, unpredictable abrupt hypotension in high-renin states, angioedema	Flushing, headache, tachycardia, worsening angina	Headache, nausea, vomiting, tachycardia, tachyphylaxis with prolonged use, raised ICP	Thiocyanate or cyanide toxicity, raised ICP
<b>Considerations</b>	Unpredictable and not readily titrated to target BP	Unpredictable and not readily titrated to target BP. First dose and any IV push doses to be administered by physician only. Give q12h if CrCl less than 30 mL/min. Max infusion rate: 0.5 mg/min for	Greater effect on SBP; larger doses are required to decrease DBP. Requires ECG monitoring. <b>Restricted:</b> see restricted nursing intravenous drug list for approved areas.	Monitor methemoglobin. Monitor thiocyanate/cyanide levels in patients with renal dysfunction, on prolonged therapy (greater than 7 days), or on high doses (greater than 4 mcg/kg/min). May be started in non-ICU setting for hypertensive crisis but patient must be

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		intermittent infusion. <b>Restricted:</b> see restricted nursing intravenous drug list for approved areas		transferred to ICU when bed available.
<b>Unit Cost</b>	1.25 mg/mL 2 mL vial \$34.29	20 mg/mL 1 mL vial \$12.29	5 mg/mL 10 mL vial \$11.08	25 mg/mL 2 mL vial \$114.67

**Note:** Hypotension can occur with all the listed drugs.

#### ADRENERGIC INHIBITORS

<i>Drug</i>	<b>Esmolol</b>	<b>Metoprolol</b>	<b>Labetalol</b>	<b>Phentolamine</b>
<b>Trade Name</b>	BREVIBLOC	BETALOC	TRANDATE	ROGITINE
<b>Dose</b>	<b>Suggested initial dose:</b> 0.5 to 1.5 mg/kg bolus over 1 min followed by 50 mcg/kg/min IV infusion <b>Dose range:</b> 50 to 200 mcg/kg/min <b>Bolus dose:</b> may give 0.5 mg/kg bolus over 1 minute prior to every rate increase	<b>Suggested initial dose:</b> 2.5 mg IV q6h <b>Dose range:</b> 2.5 mg to 15 mg IV q4h to 8h	<b>Suggested initial dose:</b> 0.5 mg/min IV infusion <b>Dose range:</b> 0.5 to 3 mg/min IV infusion <b>Bolus Dose (for MD administration):</b> 5 to 10 mg IV over 1 to 2 min	<b>Suggested initial dose:</b> 5 mg IV once or 1 mg/min IV infusion <b>Dose range:</b> 5 to 10 mg IV with repeats every 30 min or 1 to 5 mg/min IV infusion
<b>Onset of Action</b>	1 to 2 min Peak: 30 min	20 min	Less than 5 min	1 to 2 min
<b>Duration of Action</b>	10 to 20 min	5 to 8 hours	4 to 6 hours	10 to 30 min
<b>Adverse Effects</b>	Bradycardia, bronchospasm	Bradycardia, bronchospasm	Nasal congestion, dyspnea, bradycardia, heart block, bronchospasm	Flushing, headache, weakness, cardiac arrhythmia

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Drug	Esmolol	Metoprolol	Labetalol	Phentolamine
<b>Considerations</b>	<p>Physician must administer all boluses. If no bolus given, peak effect of rate increase may be delayed up to 30 minutes.</p> <p>Physician must order every rate increase (no titration by RN) no more frequently than every 4 minutes.</p> <p>Morphine increases esmolol concentrations by 50% → reduce dose. Delayed onset (30 min) of peak action after dose titration if no boluses given.</p> <p>ECG monitoring required.</p> <p><b>Restricted:</b> see restricted nursing intravenous drug list for approved areas</p>	<p>ECG monitoring required.</p> <p><b>Restricted:</b> see restricted nursing intravenous drug list for approved areas</p>	<p>Combined alpha and beta-adrenergic blockade. ECG monitoring required.</p> <p><i>For patients receiving thrombolysis:</i> If BP greater than 185/110 mmHg, give labetalol bolus. May repeat one time.</p> <p><i>During or after thrombolysis:</i> If BP greater than 180/105 mmHg, give labetalol bolus. May repeat every 10 to 20 minutes up to 300 mg or switch to infusion.</p> <p><b>Restricted:</b> see restricted nursing intravenous drug list for approved areas</p>	<p>For catecholamine excess states.</p> <p>May require additional alpha-adrenergic blockade for BP control or the use of nitroprusside.</p>
<b>Cost</b>	<p>10 mg/mL 250 mL bag \$114.68</p> <p>10 mg/mL 10 mL vial \$12.36</p>	<p>1 mg/mL 5 mL vial \$7.21</p>	<p>5 mg/mL 20 mL vial \$27.80</p>	<p>10 mg/mL 1 mL \$38.29</p>

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#### CALCIUM CHANNEL BLOCKERS

<b>Drug</b>	<b>Diltiazem</b>
<b>Trade Name</b>	CARDIZEM
<b>Dose</b>	<b>Suggested initial dose:</b> 0.25 mg/kg IV loading dose over 2 minutes followed by 5 mg/hr IV infusion <b>Dose range:</b> 5 to 15 mg/hr IV infusion
<b>Onset of Action</b>	3 min
<b>Duration of Action</b>	0.5 to 10 hours
<b>Adverse Effects</b>	Bradycardia, hypotension
<b>Considerations</b>	Dosing over 15 mg/hr or infusions longer than 24 hrs are not recommended due to non-linear kinetics 2 <sup>nd</sup> line when beta blockers cannot be used due to bronchospasm ECG monitoring required <b>Restricted:</b> see restricted nursing intravenous drug list for approved areas
<b>Cost</b>	5 mg/mL 5 mL \$12.65

**Note:** Hypotension can occur with all the listed drugs.

#### ORAL DRUGS FOR THE TREATMENT OF HYPERTENSIVE URGENCIES

<b>Drug</b>	<b>Captopril</b>	<b>Clonidine</b>	<b>Labetalol</b>
<b>Trade/Alternate Name</b>	CAPOTEN	CATAPRES	TRANDATE
<b>Dose</b>	Initial 12.5 to 25 mg PO. May repeat as needed, then q8h. Dose range: 6.25 to 50 mg PO q8h	0.1 to 0.2 mg PO once then 0.05 to 0.1 mg q1h to a maximum of 0.7 mg Then 0.1 mg PO q12h up to 0.8 mg/day	200 mg PO once then may repeat every hour to a max of 1200 mg. Then 200 to 400 mg PO q6h to q8h.
<b>Onset of Action</b>	5 to 15 min Peak: 1 hour	30 to 60 min Peak: 2 to 4 hours	30 to 120 min Peak: 2 hours
<b>Duration of Action</b>	6 to 12 hours	6 to 10 hours	4 to 12 hours

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### DRUGS FOR THE TREATMENT OF HYPERTENSIVE URGENCIES AND EMERGENCIES

Drug	Captopril	Clonidine	Labetalol
<b>Adverse Effects</b>	Abrupt hypotension in high renin states, acute renal failure, angioedema, hyperkalemia	Drowsiness, sedation, dry mouth, orthostatic hypotension, rebound hypertension with withdrawal	Dizziness, scalp tingling, headache, nasal congestion, dyspnea, bradycardia, heart block, precipitates asthma
<b>Special Considerations</b>			Often chosen after using IV labetalol. Avoid in patients with second or third degree heart block, severe bradycardia, severe bronchospastic disease or decompensated heart failure
<b>Unit Cost*</b>	\$0.12/ 6.25 mg \$0.21/ 12.5 mg \$0.30/ 25 mg \$56/ 50 mg	\$0.26/ 0.025 mg \$0.16/ 0.1 mg \$0.29/ 0.2 mg	\$0.33/ 100 mg \$0.58/ 200 mg
<b>30 Day Patient cost#</b>	\$11.66 (6.25 mg tid) \$20.40 (12.5 mg tid) \$29.20 (25 mg tid) \$54.40 (50 mg tid)	For 0.1 mg bid \$67.40 (0.025 mg tabs) \$10.40 (0.1 mg tabs) \$9.40 (0.2 mg tab)	\$21.40 (100 mg bid) \$37.60 (200 mg bid)

**Note:** Nifedipine *regular release* should NOT be used, as it is associated with fatal cerebral, renal and myocardial ischemic events.

\* List prices from the Ontario Drug Benefit (ODB) Formulary, Ontario Ministry of Health. Last Updated: 01/04/2011 Version 2.2. All prices represent the generic medication option. IV prices come from distributor database.

# 30 day patient costs represented by ODB generic price + 8% markup. These prices do not include a dispensing fee, which can range from 4.99 – 11.99. Pricing is based on a typical dosing regimen.

#### REFERENCES

1. Compendium of Pharmaceuticals and Specialties online version (e-CPS)
2. Lexicomp Online Lexi-Drugs
3. Hardy YM, Jenkins AT. Hypertensive Crises: Urgencies and Emergencies. US Pharm. 2011;36(3):Epub.
4. Adams HP, del Zoppo G, Alberts MJ, et al. AHA/ASA Guidelines for the early management of adults with ischemic stroke. Circulation. 2007;115:e478-e534.

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# DRUGS FOR THE TREATMENT OF HYPERTENSIVE URGENCIES AND EMERGENCIES

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Due to the rapidly changing nature of cardiovascular treatments and therapies, users are advised to recheck the information contained herein with the original source before applying it to patient care.

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