Miller Vasopressors and Inotropes

Vasopressors

DRUG/ ADRENERGIC RECEPTOR STIMULATION	INITIALb DOSE /	VASCULAR Alpha	VASCULAR B2	HEART, B1
Methoxamine (Vasoxyl)c /	2–100 mg	+++	0	0
Phenylephrine (Neo-Synephrine)/	50–100 ?g	++	0	±
Metaraminol (Aramine)/	100 ?g	++	±	+
Ephedrine/	5–25 mg	+	±	+
Norepinephrine (Levophed)/	1–4 ?g	+++	0	+++

0, no effect; ±, may or may not have an effect; +, weakest effect; ++, moderate effect; +++, strongest effect
aAlso see Chapter 14.
bGeometric (1,2,4,8 x) or logarithmic (1,3,10,30 x) increases in dose may be required to achieve desired degree of response. An infusion may be required to sustain the effect.
cMethoxamine is rarely used because of its long duration of action.
dEphedrine doses above 50 mg are seldom used because of its limited efficacy; infusions are not used.

• TABLE 49–24. Inotropic Therapy

DRUG	INTRAVENOUS BOLUS	INFUSION	LIMITATIONS
Amrinone (Inocor)	1.5–3 mg/kg a	5–10 mcg/kg/min	Hypotension (? TPR)
Milrinone (Primacor)	50–75 mcg /kg	0.4–0.8 mcg /kg/min	Hypotension (? TPR)
Dobutamine (Dobutrex)	—	2–20 mcg /kg/min	Tachycardia Dysrhythmias
Dopamine (Intropin)	—	2–15 mcg /kg/min	Tachycardia Dysrhythmias Vasoconstriction
Epinephrine (Adrenalin)	2–50 mcg a	2–60 mcg /min	Tachycardia Vasoconstriction
Norepinephrine (Levophed)	1–10 mcg b	1–60 mcg /min	Vasoconstriction Tachycardia
Isoproterenol (Isuprel)	1–5 mcg b	0.5–5 mcg /min	Hypotension Tachycardia Dysrhythmias

A Higher dose than recommended in package insert is necessary to achieve effective drug concentrations.223
B Per 70-kg individual

• Other Inotropic Drugs

DRUG	DOSEa	LIMITATIONS
Calcium chloride	0.25–1 g	Dysrhythmias, AV block
Digoxin		
Initial	1–1.5 mg	Dysrhythmias
Maintenance (daily)	0.125–0.5 mg	Bradycardia
Ouabain	0.3–0.5 mg	AV block
Glucagon	3–10 mg	Tachycardia Decreased AV block (increased ventricular rate) Hyperglycemia

a - Per 70-kg individual
b - Inotropic effect is weak and superseded by vasoconstriction, which is a more prominent effect. Intravenous bolus dose is useful to increase systemic blood pressure transiently without increasing heart rate.

•. Relative Efficacy of Intravenous Vasodilators on Hemodynamic Variables

VASODILATOR / (DILATION) VENOUS / PULMONARY ARTERIAL/	SYSTEMIC ARTERIAL/	CARDIAC OUTPUT
Nitric oxide/ 0/+++/0/ ±		
Nitroglycerin IV (Tridil)/ +++/	+/	+/ +/- a
Nitroprusside (Nipride)/ +++/	+++/	+++/ +/- a
Phentolamine (Regitine)/ +/	+/	+++/ +
Hydralazine (Apresoline)/ 0/	?/	+++/ +
Nicardipine (Cardene)/ 0/	?/	+++/ +
Amrinoneb (Inocor) / +/	+/	+/ +
Milrinoneb (Primacor)/ +/	+/	+/ +
Prostaglandin E1c / +/	+++/	+++/ +/- a

aEffect on cardiac output depends on net balance of effects on preload, afterload, and myocardial oxygenation.
bInodilators have inotropic plus vasodilating effects
cAlmost always requires left atrial infusion of norepinephrine to sustain adequate systemic blood pressure.
0, none; ± small, variable; + mild; +++ strongest effect of that particular drug.

• Dosage of Vasodilators

DRUG DOSING REGIMENa INITIAL / MAXIMUM		
-Administered as infusion:		
Nitroglycerin (Tridil) b	50 mcg/min	500 mcg /minc
Nitroprusside (Nipride)d	10–25 mcg /min	8 mcg /kg/min
Nicardipine	100–300 mcg	3–5 mg/h
Trimethaphan (Arfonad)	0.3 mg/min	6 mg/min
Phentolamine	10–100 mcg /min	7 mcg /kg/min
Prostaglandin E1	0.05 mcg /kg/min	0.5 mcg /kg/min
-Administered as intravenous bolus:		
Chlorpromazine (Thorazine)	1 mg	5–25 mg/24 hr e
Droperidol (Inapsine)	2.5 mg	10–20 mg/24 hr e
Hydralazine (Apresoline)	5 mg	40 mg over 1 hr f
Phentolamine (Regitine)	1 mg	0.5 mg/min g

aPer 70-kg individual
bIV bolus doses of 25–100 ?g may be useful to produce transient effect rapidly.
cHighest dose rate reported; no maximum yet defined in terms of toxicity or efficacy.
dIV bolus doses of 20–200 ?g (geometric or logarithmic progression) are useful for rapid reduction of systemic blood pressure lasting 2–3 minutes, with more or less complete recovery depending on degree of reduced venous return.
eLimits are suggested because higher doses are probably no more effective in controlling hypertension and may lead to marked and prolonged CNS effects.

fPeak effects may not occur until 30 to 60 minutes after injection; seldom will more than 40 mg be needed to produce effects lasting several hours. Temporarily withdrawn from market by manufacturer, who is trying to develop a more economical formulation.
gIntravenous bolus doses of 5 to 10 mg may be used, depending on the situation; a maximum infusion rate has not been defined in terms of efficacy or toxicity but rarely is more than 0.5 mg/min.