# INOTROPES VASOPRESSORS

#### RATIONALE OF CHOICE





# **INOTROPES & VASOPRESSORS**



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# **INOTROPES & VASOPRESSORS**











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COLD SHOCK

**Cool, clammy extremities** 

#### Weak distal pulses

Narrow pulse pressure

# Planning your strategy







#### **Direct inotropic effects**





#### Adrenergic receptors and vasoactive agents







# HOW DO I MAKE MY CHOICE?

# **Rationale of choice**

AGENTS

# EFFECTS

# Rationale of choice





BP does NOT always equate to blood flow

# Rationale of choice

# Inotrope Rx



To determine whether CO is adequate in patients with shock is a thorny problem.



Hypotension – reduced perfusion pressure

Abnormal shunting of blood flow within organs

Cellular alterations – inability to use delivered substrates

Down-regulation of adrenergic receptors





- Restore effective tissue perfusion
- Normalise cellular metabolism

# **Decision making**

- Which one works?
- Sequence?
- Mechanism of action == goals of therapy
- Consider the best available clinical evidence



<sup>co•</sup> 2.7 目 52 <sup>∽scv0</sup> ₂		
CI	sv	SVR
1.4	32	2394
Vmin/m²	d'ltrn	dyne-s/cmª
SVV	SVI	SVRI
13	17	4167
%	ml/b/m²	dyne-s-m∜cm <sup>ε</sup>



Ventricular arrhythmias Contraction- band necrosis Infarct expansion

Compromised myocardial perfusion Elevated LV filling pressures Increased myocardial O<sub>2</sub> requirement Further reduction in CPP







Moderate doses of these agents maximize inotropy and avoid excessive  $\alpha$ 1-adrenergic stimulation that can result in end-organ ischemia.

# Dobutamine



Dobutamine is started at an infusion rate of **3–5 µg/kg/min** (without a loading dose)

Usual dose range is **5–20 µg/kg/min** 

#### Preparation: 250mg/5ml ampoule

# Dobutamine

Dobutamine is started at an infusion rate of **3–5 µg/kg/min** (without a loading dose)

Usual dose range is 5–20 µg/kg/min



# Dopamine



Preparation: 200mg/5ml ampoule

#### Dopamine is started at an infusion rate of ≤3 µg/kg/min

#### Usual dose range is **3–10 µg/kg/min**

# Dopamine

#### Usual dose range is 3–10 µg/kg/min





SBP <70 mmHg; Inadequate response to medium dose DOPAMINE or DOPAMINE/DOBUT



#### **NOREPINEPHRINE-resistant vasodilatory shock**





# Surviving Sepsis ··· Campaign



The Intensive Connection

Society of Critical Care Medicine

Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock. *Intensive Care Med* 2013; 39(2): 165-228 and *Crit Care Med* 2013; 41(2): 580-637





Vasopressor therapy initially to target MAP 65mmHg



First choice vasopressor

# Nor-epinephrine



Usual dose range is **8–10 µg/min** 

Preparation: 1 ampoule of 2 ml contains 4 mg noradrenaline tartrate equivalent to 2 mg noradrenaline base (2:2)

# Nor-Epinephrine

#### Usual dose range is 8–10 µg/min



# Epinephrine

Preparation: 1mg/ml ampoule



# The initial infusion rate is usually **1 – 2 µg/min (or 0.02 µg/kg/min)**

Usual dose range is **5 – 15 µg/min** 

# Epinephrine

#### Usual dose range is 5 – 15 µg/min



# Phenylephrine

Phenylephrine can be given as intermittent IV doses. The initial IV dose is **0.2 mg**, which can be repeated in increments of **0.1 mg** 

Phenylephrine can be infused at an initial dose rate 0.1 – 0.2 mg/min





NOT recommended in the Rx of shock except: NE associated with serious arrhythmias CO is known to be high and BP persistently low As salvage Rx when combined inotrope/ vasopressor drugs and low dose vasopressin have failed to achieve MAP target



- VP 0.03U/min can be added to NE with intent of either raising MAP or decreasing NE dosage
- Low dose VP is NOT recommended as the single initial vasopressor
- VP doses higher than 0.03-0.04U/min should be reserved for salvage Rx



#### **NEUROCRITICAL CARE**

TRAUMATIC BRAIN INJURY

ACUTE NEUROLOGIC INJURY



Vasodilation

# Vasopressin



Usual dose range is 0.01 – 0.04 units/min

Preparation: 20U/ml ampoule

# Vasopressin

#### Usual dose range is 0.01 – 0.04 units/min





Potentially lifesaving

Maintains blood pressure

Drug of choice

Antagonizes the effects of the released mediators

- Hypotension in anaphylaxis is due to a dramatic shift of intravascular volume
- Fundamental treatment intervention after epinephrine is aggressive IV fluid administration
- Vasopressors may also be needed to support blood pressure.
- Intravenous epinephrine (1:10,000 v/v preparation) can be administered as a continuous infusion, especially when the response to intramuscular epinephrine (1:1000 v/v) is poor.
- Dopamine infusion can also be used.

- Beta blocked patients or Refractory shock
- Glucagon
  - both inotropic effects and chronotropic effects on the heart by increasing intracellular levels of cAMP, independent of the betaadrenergic receptors.
  - can also reverse bronchospasm.



Norepinephrine Dobutamine NE +Dobut

- vasodilatory shock
- shock associated with decreased cardiac output
- vasodilatory shock with decreased CO



**Epinephrine** 

- CPR, 2nd line for shock unresponsive to other catecholamines

Vasopressin

- resistant vasodilatory shock.



The use of other catecholamines and modern nonadrenergic vasoactive drugs in shock remains with little evidence.



**Smaller combined doses** of inotropes and vasopressors may be advantageous over a single agent used at higher doses to avoid dose-related adverse effects.











O/E Pallor +++ Diaphoretic HR 128bpm BP 88/54mmHg SpO2- 96%





A 76 old man comes to the ER with sudden onset of chest pain and worsening of dyspnea. He has previous h/o CABG 20 yrs back with triple vessel disease and has noted features of progressive worsening cardiac failure. His medications include: T.Aspirin 75mg OD, T. Telmisartan 40mg OD, T. Spironolactone 25mg OD, T. Atorvastatin 20mg OD.





He was shifted to ICU. During his vitals check, he collapsed and became unresponsive. ROSC achieved after 4 minutes of CPR. 1mg IV epinephrine administered and one shock of 200J was delivered during CPR. His was intubated and mechanical ventilation is initiated.

O/E

Unresponsive, ECG - ST-T Changes, sinus rhythm, HR 64bpm, ABP 80/52mmHg, SpO2- 92%



A 54 yr lady, known hypertensive and diabetic for part 15 yrs, with poor glycemic control (HbA1c 9.2), early CKD on follow-up (previous Creat 2.1, Urea 35mg%), presents with drowsiness and difficulty to breath.

She has cellulitis on her left leg extending upto knee.

She give h/o fever since 2 days.





O/E HR 110bpm, BP 90/50mmHg, SpO2- 90% (room air), Resp rate 20bpm ECG- Sinus tachy.

Labs: Hb 9.2gm%; TC 11,000, N 88, L 10, E 2

B Urea 60; Creat 3.4 Na 135; K 5

Blood sugar 420mg%

