HELPFUL? SAFE?
PUSH DOSE PRESSOR IN THE ED

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University of California, Irvine
Assistant Professor of Emergency Medicine
OBJECTIVES

• At the end of this lecture, learners will be able to:
  • Discuss the mechanism of action of various vasopressors
  • Discuss the risks/benefits of push dose pressor
  • Make and use one type of push dose pressor
• Vasopressors are well known to the critical care and emergency medicine community
• Used to raise blood pressure and cardiac contractility, with the goal to improve cardiac output and tissue perfusion
Obstructive:
Extra-cardiac mechanical causes
Tension pneumothorax
Pericardial tamponade
Pulmonary embolus
SHOCK

Obstructive: Extra-cardiac mechanical causes
- Tension pneumothorax
- Pericardial tamponade
- Pulmonary embolus
- Pulmonary hypertension

Hypovolemic: Insufficient intravascular volume
- Hemorrhagic
- Extreme dehydration
- Metabolic derangement

Pulmonary embolus
Pulmonary hypertension
Pericardial tamponade
Tension pneumothorax
Extra-cardiac mechanical causes
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Insufficient intravascular volume
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Cardiogenic:
Inability of heart to adequately pump blood forward
Valvular dysfunction
Arrhythmia

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Distributive:
Excessive vasodilation
Sepsis
Systemic Inflammatory Response Syndrome (SIRS)
Anaphylaxis
Neurogenic
Endocrine
SHOCK

Hypovolemic: Insufficient intravascular volume
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VASOPRESSORS
Vasopressors work by changes in $\text{CO}$ + change in $\text{SVR}$ = \text{change in perfusion}
Vasopressors work by changes in CO + change in SVR = Change in perfusion
VASOPRESSORS

work by changes in \( CO \) + change in \( SVR \)

\[ \text{Change in perfusion} = \text{Alpha-1} \times \text{Beta-1} \times \text{Beta-2} \times \text{Dopamine} \]
**VASOPRESSORS**

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**ARTERIES CONSTRICIT**

INCREASE SVR/BP

work by changes in **CO** + change in **SVR**

= **CHANGE IN PERFUSION**
**VASOPRESSORS**

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work by changes in **CO** + change in **SVR**

= **CHANGE IN PERFUSION**
Vasopressors work by changes in $CO$ and change in $SVR$:

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Vasopressors work by changes in $CO + \text{change in } SVR = \text{change in perfusion}$
VASOPRESSORS

Alpha-1    Beta-1    Beta-2    Dopamine

BRONCHIOLES
SKELETAL MUSCLES ARTERIES
DILATE BRONCHIOLES
DILATE SKELETAL MUSCLE ARTERIES

work by changes in \( CO \) + change in \( SVR \)

\[ \text{CHANGE IN PERFUSION} \]
Vasopressors work by changes in $CO$ + change in $SVR = \text{change in perfusion}$

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**VASOPRESSORS**

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Cardiac & Renal Relax Smooth Muscles Increase Cardiac Contractility
# Vasopressors

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Vasopressors are a group of drugs that work on the blood vessels to increase blood pressure. They are used in situations where the blood pressure is too low, such as hemorrhage or shock.
# Vasopressors

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<td>➤+++</td>
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<td>Vasodilator, may result in increased, no change, or decreased BP ↑HR, CC</td>
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BOLUS DOSE PRESSORS
PUSH DOSE PRESSORS
PUSH DOSE PRESSORS

• Long history of use in Anesthesia
• Anesthesia has a TON literature behind push dose/bolus dose pressor

• Primarily ephedrine and phenylephrine
• Used during spinal surgery, c-sections
PUSH DOSE PRESSORS

• As of 2014 there were NO studies that show the benefit of push does pressors in the ED
• As of 2017 only 2 studies that look at bolus-dose pressors in the ED
PUSH DOSE PRESSORS

FOAM-ED
Today, an update on Push-Dose Pressors. I coined the name Push-Dose Pressors (PDPs) way back on episode 6. The idea was not new, anesthesiologists and resus docs have been using...

...and administer push dose pressors mostly due to it being a "newer practice" and high risk drug. We would like to have nurses to start to push the actually drug...
WHY?

PUSH DOSE PRESSORS
WHY?
PUSH DOSE PRESSORS

• Transient hypotension that is expected to improve (such as during a sedation, intubation, a-fib with RVR)
• Temporizing measure until a central line is placed, infusion vasopressors can be used
• Temporizing measure until patient is adequately resuscitated with crystalloid fluids
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WHY?
PUSH DOSE PRESSORS
WHY NOT?

PUSH DOSE PRESSORS

• Should not replace fluid resuscitation or transfusion
• Patient safety concerns—issues with mixing, pushing appropriate doses
• Not standard of care in EM...yet
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The American Journal of Emergency Medicine

Medication errors with push dose pressors in the emergency department and intensive care units

Dear Reader,

Utilization of push dose pressors (PDP, low doses of phenylephrine or epinephrine administered IV push) during care of emergency medicine (EM) patients is increasingly popular in EM free open access medical education (FOAMed) [1,2] with resultant increased use in emergency department (ED) and intensive care unit (ICU) settings for peri-/post-intubation hypotension [3]. Due to prominence of this topic in FOAMed, indications are expanding to include bridge to continuous infusion vasopressors, medication related hypotension during procedural sedation and anaphylaxis.

This indication creep has potential detrimental effects, which are rarely discussed. Concerns we have identified are:

1. Differences in patient populations regarding cause of hypotension
2. Decreased considerations for usual management of disease, hypotension and expected medication related adverse effects
3. PDP preparation during acute patient management and dose errors
• Should not replace fluid resuscitation or transfusion
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THE MIXERS

PHENYLEPHRINE

EPINEPHRINE
## Phenylephrine

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**Arteries Constrict**

**Increase SVR/BP**
Phenylephrine

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*ARTERIES CONSTRUCT INCREASE SVR/BP*

Onset <1 min
Duration ~5 mins
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**Phenylephrine**

**Agent:** Phenylephrine

**Alpha-1:***

**Beta-1:**

**Beta-2:**

**Dopamine:**

**Comments:** SVR, BP

**Onset:** <1 min

**Duration:** ~5 mins

**ARteries Constrict**

**INCREASE SVR/BP**
PHENYLEPHRINE
Phenylephrine

• Draw up **1 mL** of phenylephrine from a vial (contains 10 mg/mL)

• Inject this into a **100 mL bag of normal saline**; bag now contains 100 mcg/mL of phenylephrine

• Draw up **10 mLs of this solution** into **10 mL syringe**
Phenylephrine

Dose: 0.5-2 mL every 2-5 minutes (50-200 mcg)

This is equivalent to dose of phenylephrine given via infusion (50-200 mcg/min).
# Epinephrine

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- **Onset**: <1 min
- **Duration**: ~10-20 mins

- **ARteries**: Constrict
- **Cardiac Muscle**: Increase HR, CO
- **Bronchioles**: Dilate
- **Skeletal Muscle Arteries**: Dilate
• Obtain a 10 mL flush waste 1ml = 9 mL of sterile normal saline

• Into the syringe, draw up 1 mL of epinephrine 1:10,000 (from a cardiac arrest amp)
• Concentration of epinephrine 1:10,000 is 100 mcg/mL (or 1 mg in 10 mLs, which is one amp)

• The concentration of epinephrine in the syringe is now 1:100,000, or 10 mcg/mL
Dose: 0.5-2 mL every 2-5 minutes (5-20 mcg).

This is equivalent to dose of epinephrine given via infusion (5-20 mcg/min).
**BOTTOM LINE**

- No great EM evidence on the use of PDP in the ED
- Phenylephrine and epinephrine are the most appropriate for PDP in emergency medicine
- If you are going to adopt PDP know how to mix them appropriately, know their indications, know the doses
FINAL POINT

1980’s RSI

1990’s

Propofol
QUESTIONS?


6. Selde w. Push Dose Epinephrine as a Temporizing Measure for Drugs Causing Hypotension. JEMS 9/15/14
