ED Pressors: Tips, Tricks, Pearls, and Pitfalls

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Disclosures

None

Objectives

Review the basics of vasopressors and inotropes

Discuss why norepinephrine is our go-to for almost everything

Discuss how to run multiple pressors (especially with only PIV)

Describe pros and cons of push-dose pressors

Vasopressor	α1	β1	β2	V1
Norepinephrine				
Epinephrine				
Dopamine				
Phenylephrine				
Vasopressin				

Vasopressor	α1	β1	β2	V1
Norepinephrine	+++	+	-	-
Epinephrine	++	+++	++	-
Dopamine	+	++	+	-
Phenylephrine	+++	-	-	-
Vasopressin	-	-	-	+++

Drug	α1	β1	β2
Milrinone	-	++	++
Dobutamine	-	+++	+
Isoproterenol	-	+++	+++
Albuterol	-	-	+++
Levalbuterol	-	-	+++

Why is norepinephrine so popular in sepsis?

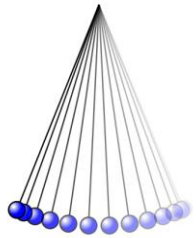
Study	Comparison	Findings	Impact
SOAP II (2010)	NE vs. DA	NE had lower mortality w/cardiogenic shock & fewer arrhythmias	NE replaces DA as first-line
VASST (2008)	NE vs. NE + Vaso	No mortality benefit with vaso	Vaso used only in refractory shock
CATS (2003)	NE vs. Epi	NE better BP control, less tachycardia	Epi reserved for refractory cases
SEPSISPAM (2014)	NE MAP 65 vs. 85	No benefit to higher MAP, more arrhythmia	MAP target set at ≥ 65 mmHg
SSC Guidelines (2021)	NE vs. others	NE is first-line, vasopressin as adjunct	Standardized septic shock management

"Levophed - more like, leave 'em dead!"

N Engl J Med. 2010;362(9):779-89.
N Engl J Med. 2008;358(9):877-87.
Intensive Care Med. 2003;29(10):1616-23.
N Engl J Med. 2014;370(17):1583-93.
Crit Care Med. 2021;49(11):e1063-143.

Fluids or pressors first?

Study	Population	Restrictive Fluids	Liberal Fluids	Primary Outcome
CLOVERS Trial (2023)	Sepsis+HoTN at 60 U.S. centers	782 (50.0%)	781 (50.0%)	Death day 90: 109/782 (14.0%) vs. 116/781 (14.9%)
CLASSIC Trial (2022)	Septic shock at 31 ICUs in Europe/UK	770 (49.6%)	784 (50.4%)	Death day 90: 323/764 (42.3%) vs. 329/781 (42.1%)



N Engl J Med, 2023; 388(6):499-510
N Engl J Med, 2022; 386(26):2459-2470

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General Approach in HoTN in Sepsis/NOS

- Fluid/blood resuscitate PRN
- 1st line - NE*
- 2nd line - vasopressin
- 3rd line - dealer's choice
  - (epinephrine)
- All pressors are compatible in

Drug	DOBUTamine hydrochloride	DOPamine hydrochloride	EPINEPHrine	Norepinephrine Bitartrate	Phenylephrine Hydrochloride
DOBUTamine hydrochloride		Y-Site 13 Results	Y-Site 6 Results	Y-Site 16 Results	Y-Site 4 Results
DOPamine hydrochloride	Y-Site 13 Results		Y-Site 5 Results	Y-Site 9 Results	Y-Site 4 Results
EPINEPHrine	Y-Site 6 Results	Y-Site 5 Results		Y-Site 8 Results	Y-Site 4 Results
Norepinephrine Bitartrate	Y-Site 16 Results	Y-Site 9 Results	Y-Site 8 Results		Y-Site 4 Results
Phenylephrine Hydrochloride	Y-Site 4 Results	Y-Site 4 Results	Y-Site 4 Results	Y-Site 4 Results	
Vasopressin	Y-Site 6 Results	Y-Site 7 Results	Y-Site 6 Results	Y-Site 8 Results	Y-Site

Caution with extravasation

**exceptions: anaphylaxis, bradycardia*

Source: Micromedex

Running Pressors Peripherally?

Study	Drugs	N	>24h	Outcome (O)
Pugliese et al. (2022)	Norepinephrine Phenylephrine Epinephrine	79	7 (8.9%)	Three extravasation events (none requiring treatment); 57% avoided central line placement
Yerke et al. (2024)	Norepinephrine	635	130 (20.5%)	5.5% extravasation rate (all minor, no surgical intervention); 51.6% avoided central line placement
Tian et al. Sys review (2020)	Norepinephrine Phenylephrine Dopamine	1382	Mean 22h	3.4% extravasation rate, no tissue necrosis or limb ischemia

AJHP, 2022 Aug 19;79(Suppl 3):S79-S85
CHEST, 2024; 165(2):348-355
Emerg Med Australas, 2020; 32(2):220-227

Case of missed dialysis

Phentolamine

Alpha-1 blocker

For pressors

Dilute in 10-ml NS and infiltrate around site of extravasation

Hyaluronidase

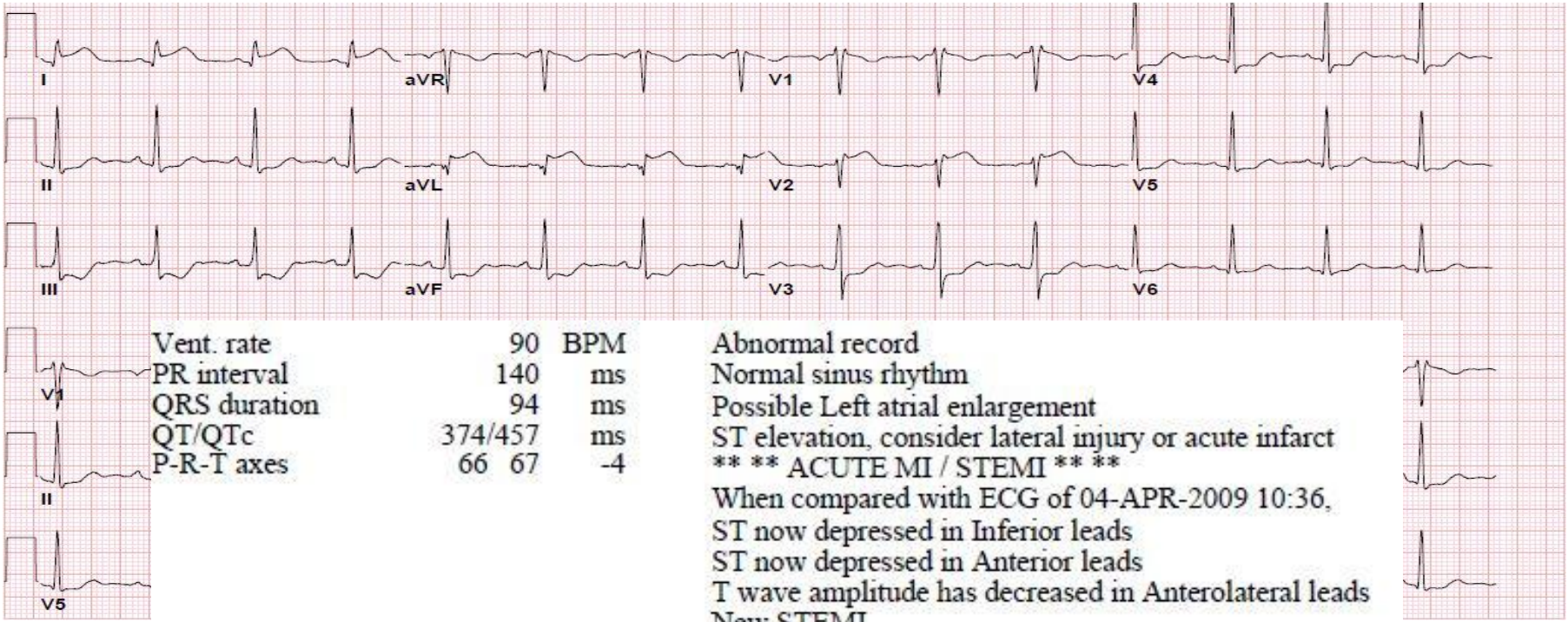
Permeability of cells

For calcium, dextrose, mannitol, Na bicarb, contrast?

Dilute in 10ml NS and infiltrate around site of extravasation

Problems with Epinephrine

- Life-saving drug
- Dangerous when used inappropriately
- Dosing
  - 1:1,000, 1:10,000, 1:100,000
  - mcg/min
  - mcg/kg/min
  - mg/hr



Vent. rate	90	BPM
PR interval	140	ms
QRS duration	94	ms
QT/QTc	374/457	ms
P-R-T axes	66 67	-4

Abnormal record
Normal sinus rhythm
Possible Left atrial enlargement
ST elevation, consider lateral injury or acute infarct
** ** ACUTE MI / STEMI ** **
When compared with ECG of 04-APR-2009 10:36,
ST now depressed in Inferior leads
ST now depressed in Anterior leads
T wave amplitude has decreased in Anterolateral leads
New STEMI. ...

Epinephrine Dosing

- USP standardization
  - 1 mg/ml (for IM only)
  - 1 mg/10 ml (“code cart epi”)
  - *Never give these IV to a patient with a pulse*
- Anaphylaxis
  - Adults: **0.3**-0.5 mg IM
  - Children: **0.15** mg IM
  - May repeat q5-15min PRN
  - No response -> infusion per hospital protocol

“Dirty Epi Drip”

- Injecting 1 mg of epinephrine (regardless of concentration) into 1 L NS
- Final concentration:
  - 1 mcg/ml
- Usual starting dose:
  - 2-10 mcg/min = 2-10 ml/min

J Allergy Clin Immunol. 2020 Apr;145(4):1082-1123
https://www.aliem.com/dirtyepi/


Adrenalin®
1 mg/mL
EPINEPHRINE INJECTION, USP
7833160C/3-16
1 mg
0.1 mg / ml

Temporizing measure

Follow hospital protocols ASAP

Problem with Pressor Drips

- Not immediately available
- May require bedside prep
- IV-line dead space
- Time to look up dosing

Push-Dose Pressors

- Give small quick aliquots for immediate hemodynamic response
- Indication creep from anesthesia
- Pressors used as push-dose in EM
  - **Phenylephrine**
  - **Epinephrine**
- Advocated in EM via social media

	Phenylephrine	Epinephrine
Concentration	100 mcg/ml	10 mcg/ml
Dose*	100-200 mcg	10-20 mcg
Dose volume	1-2 ml	1-2 ml
Duration*	30-60s	30-60s
Repeat	1 min	1 min
Consideration	Reflex bradycardia	Tachyarrhythmias

**Equal to FDA approved dosing when given as a continuous infusion*

Push-Dose Pressors Evidence

Population	Push dose	n	Main Findings
ICU & ED adults	PE, Epi	1727	PE (55.9%) and epi (71.8%) achieved SBP increase. Epi caused more tachycardia.
Prehospital adults	Epi	55	Epi significantly increased SBP, with higher doses yielding greater increases.
ED adults	PE vs Epi	135	Epi caused a greater SBP increase but had more dosing errors than PE
ED/ICU sim	Push-dose vs. infusion	16	Push-dose had faster administration but higher error rates compared to continuous infusion.

Am J Emerg Med. 2022;61:137-142.
Am J Emerg Med. 2022;52:43-49.
Am J Emerg Med. 2019;37(3):494-498.
Am J Emerg Med. 2023;74:135-139.

Push-Dose Pressors Pearls

- Error prone, don't mix at bedside
- Ask Rx to buy RTU products
- Develop policy & procedure
- Train MDs, RNs, AHPs, and pharmacists

Push-Dose Pressors Evidence

- 7 year chart/video review study
- 249 patients receiving push-dose pressors
- Human error:
  - 47 (19%) of patients
  - 7 (3%) with overdoses (2.5-100 fold)

Summary

- Norepinephrine is first line in most cases
- Running PIV pressors is reasonable
- Epinephrine is error-prone, caution with IM/IV dosing
- Push-dose pressors are convenient at the cost of errors