Bolus Doz Vasopressorler

Dr. Öğr. Üyesi Ali DUMAN

Adnan Menderes Üniversitesi

Tıp Fakültesi

Acil Servis

Bolus Doz Vasopressor

- Hipotansiyon ve bradikardiye bağlı perfüzyon bozukluğu olan hastalara düşük dozda vasopresör verilmesi şeklinde tanımlanmaktadır.
- Bu müdahale, geçici hipotansiyon için geçici bir önlem veya daha kesin bir tedaviye köprü olarak kabul edilir.
- Kalp, beyin ve böbrekler gibi kritik organların perfüzyonuna geçici olarak yardım etme potansiyeli sunar.
- Weingart tarafından tanımlanan bir terim olan push-doz presör (PDP) tedavisi de denir.

Hemodynamic management during anesthesia in adults

Author: Martin J London, MD
Section Editors: Girish P Joshi, MB, BS, MD, FFARCSI, Jonathan B Mark, MD
Deputy Editor: Nancy A Nussmeier, MD, FAHA

All topics are updated as new evidence becomes available and our peer review process is complete.

Literature review current through: Mar 2019. | **This topic last updated:** Mar 27, 2019.

- Epinefrin, fenilefrin ve efedrin gibi ajanlar ameliyathanelerde anestezistler tarafından yıllardır kullanılmaktadır.

Vasopressor and positive inotropic agents — Vasopressor bolus doses and/or continuous infusions are administered to treat hypotension that does not immediately respond to decreasing anesthetic depth and/or fluid administration (table 2) [9]. Vasopressors raise BP by increasing systemic vascular resistance (SVR), whereas inotropic (and positive chronotropic) agents typically increase CO through effects on heart rate (HR) and contractility. However, the

- Ephedrine – Ephedrine is often selected to treat acute decreases in BP, particularly in patients with bradycardia since this agent stimulates alpha, $beta_1$, and $beta_2$ receptors. It is administered as 5 to 10 mg bolus doses. Ephedrine has

- Phenylephrine – Phenylephrine is often selected to treat hypotension if normal or elevated HR is present, and is the most commonly selected intraoperative vasopressor in the United States. Phenylephrine exclusively stimulates $alpha_1$

- **Epinephrine** – Epinephrine administration as a first-line agent to treat intraoperative hypotension is typically reserved for treatment of anaphylaxis or cardiac arrest (table 3 and algorithm 1) (see "Perioperative anaphylaxis: Clinical

Endikasyonları

- Post-entübasyon hipotansiyonu
  - % 28.6-42
  - mortalitesi 1.9-2.1 kat artar
  - kardiyak arrest gelişimi % 2-3
  - *Solunum yetmezliği nedeniyle entübe olan hastaların hipotansiyon ve kollaps gelişim riski yüksektir.*
  - Acil serviste solunum yetmezliği en sık entübasyon nedenlerinden biri
- Kardiyak arrest sonrası spontan dönüş
- Sedasyon sonrası hipotansiyon
- Travmatik beyin hasarı
- Hipotansiyonun muhtemelen sürekli olduğu hastalarda (sepsik şok) geleneksel tedavi yöntemlerine bir köprü olarak kullanılabilir.

Table. Pharmacology and dosing of common bolus-dose vasopressors.

Pharmacology	Epinephrine	Phenylephrine	Ephedrine
Pharmacologic effect	Inotrope and vasopressor	Vasopressor	Inotrope
Target receptor	β1, β2, α	Pure α	β1 (indirect α)
Onset, min	1	1	1
Duration, min	5–10	10–20	60
Desired concentration/mL	10 μg	40–100 μg	5 mg
Recommended dosing/2–5 min	5–20 μg	40–200 μg	5–10 mg
Rate, mL/min	0.5–2	0.5–2	0.5–2
Patient selection	Low cardiac output associated with shock; anaphylaxis	Tachycardia and low mean arterial pressure predominately caused by vasodilation	Not recommended in the ED because of extended duration
Adverse events	Tachycardia, rebound hypertension	Rebound hypertension, bradycardia	Tachycardia

- Epinefrin ve fenilefrin, hızlı etki başlangıcı ve kısa etki süresi
- Efedrin, daha yavaş başlangıcı ve daha uzun etki süresi
- *Epinefrin*, **vazokonstriksiyon+inotropik+kronotropik**
- *Fenilefrin*, ***kalp hızını etkilemeden kan basıncını artırır***

The Journal of Emergency Medicine, Vol. 49, No. 4, pp. 488–494, 2015

0736-4679/$ - see front matter

ELSEVIER

http://dx.doi.org/10.1016/j.jemermed.2015.04.033

Pharmacology in Emergency Medicine

February 2011 to February 2012.

CrossMark

EFFICACY OF BOLUS-DOSE PHENYLEPHRINE FOR PERI-INTUBATION HYPOTENSION

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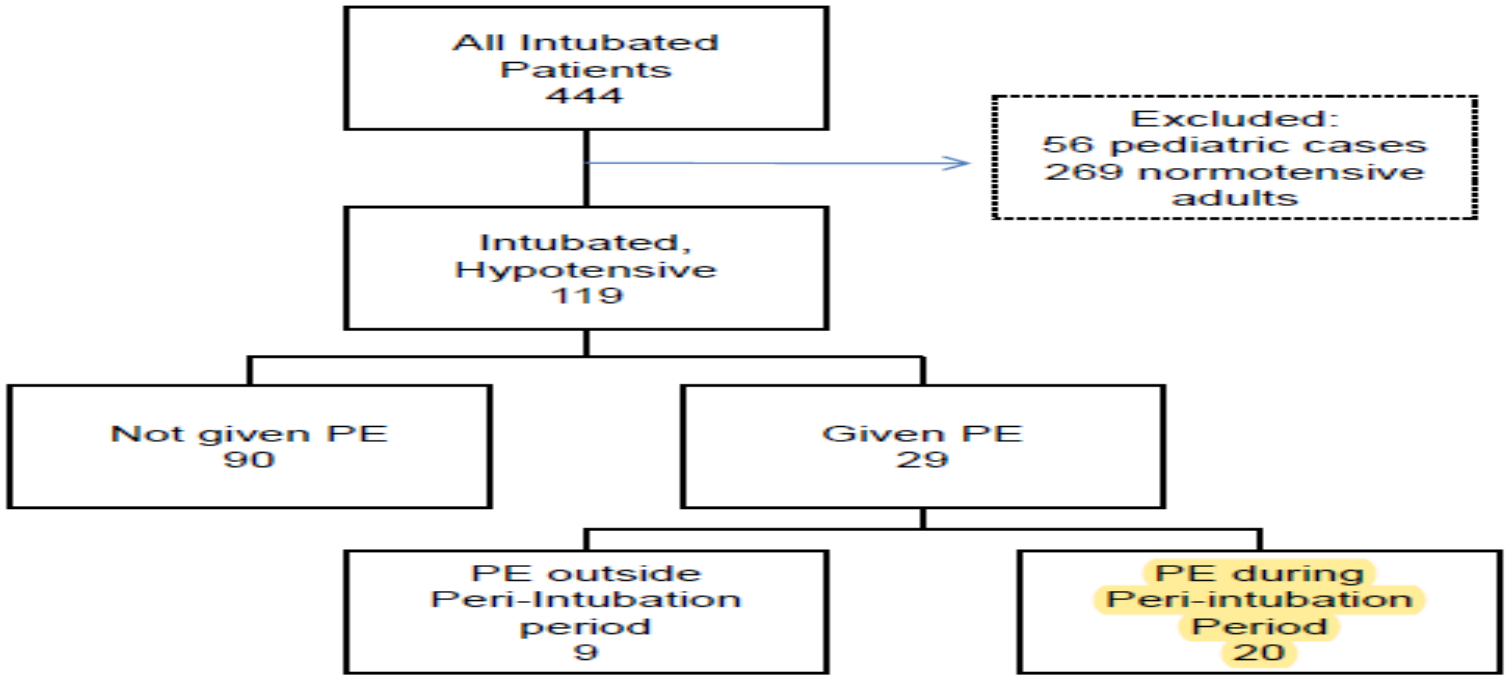

Figure 1. Schematic of patients in study population. PE = phenylephrine.

Table 1. Demographics of Intubated Patients Treated with Phenylephrine (PE) for Hypotension During the Peri-intubation Period

	Frequency (%)
Age (years)*	64 ± 16
Gender (male)	10/20 (50)
Reason for intubation	
Airway management	12/20 (60)
Respiratory failure	8/20 (40)
Sedative given	
Etomidate	14/20 (70)
Ketamine	5/20 (25)
None	1/20 (5)
Paralytic given	
Succinylcholine	5/20 (25)
Rocuronium	14/20 (70)
None	1/20 (5)
Trauma	
Blunt trauma	4/20 (20)
Penetrating trauma	1/20 (5)
Septic shock	11/20 (55)
Admission diagnoses	
Acute respiratory failure (unspecified)	5/20 (25)
Pneumonia	3/20 (15)
Acute respiratory failure/sepsis	2/20 (10)
Cerebrovascular accident	2/20 (10)
Cardiogenic shock	1/20 (5)
Cerebral hemorrhage	1/20 (5)
Diverticulitis	1/20 (5)
GI bleed	1/20 (5)
Myocardial infarction	1/20 (5)
Trauma	1/20 (10)
Other	2/20 (10)

GI = gastrointestinal.
* Mean ± SD.

Table 2. Usage of Phenylephrine (PE) for Patients

	Frequency (%)
Patients treated with PE during peri-intubation period	20
Treated with multiple doses of PE	13/20 (65)
PE given during peri-intubation period	
Time of PE after intubation (min)*	4 ± 13
Median time (min)	2
Range (min)	−18–29
Vasopressors given with PE treatment	14/20 (70)
Time after intubation (min)*	16 ± 36
Median time (min)	9
Range (min)	−30–108
Type of vasopressor given with PE	
Norepinephrine	10/20 (50)
Dopamine	2/20 (10)
Epinephrine	1/20 (5)
Epi and Norepi combined	1/20 (5)
Vasopressor started after PE treatment	9/20 (45)
Time (min)*	34 ± 32
Median time (min)	23
Range (min)	0–108

* Mean ± SD.

Table 3. Effect of Peri-intubation Phenylephrine Treatment on Heart Rate, Systolic Blood Pressure (SBP), and Diastolic Blood Pressure (DBP) (n = 20)

	Heart Rate (beats/min)	SBP (mm Hg)	DBP (mm Hg)
Pre-PE	114 (99–130)	73 (67–78)	42 (35–48)
Post-PE	115 (101–130)	93 (80–105)*	52 (44–58)*

PE = phenylephrine.
Data are presented as mean (95% confidence interval).
* $p < 0.05$.

American Journal of Emergency Medicine 34 (2016) 2419–2422

Contents lists available at ScienceDirect

American Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/ajem

Brief Report

The impact of push-dose phenylephrine use on subsequent preload expansion in the ED setting☆

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fromJanuary 1, 2014 through June 30, 2015.

Table 1
Demographics and patient characteristics (n = 73)

n (%)	
Age (years) – median (IQR)	65 (57–75)[a]
Male	44 (60.3%)
Female	29 (39.7%)
Primary diagnosis	
Septic Shock	33 (45.2%)
Respiratory Failure	14 (19.2%)
Miscellaneous[b]	12 (16.5%)
Stroke (ischemic)	5 (6.8%)
Cardiac Arrest	5 (6.8%)
Pulmonary Embolism	4 (5.5%)

[a] Median.
[b] Includes any diagnosis documented at a frequency of <2.7%.

Table 2
Initiation of CVI following bolus-dose PHE, and the prior volume expansion

Primary end point:	n = 73	Median (IQ1-IQ3)
Patients initiated on CVI infusion within 30 minutes following first PE dose	34 (46.5%)	6.5 (3–13.5) min
Indication for PHE		
Peri-intubation hypotension	52 (71.2%)	
Bridge to continuous vasopressor infusion	11 (15.1%)	
Acute hypotension	10 (13.7%)	
PHE dosing		
Patients receiving multiple doses of PHE	39 (53.4%)	2 (1–3)
Single PE dose		100 (100–200) μg
Cumulative PE dose		200 (100–400) μg
Weight-based Cumulative PE dose		2.39 (1.47–5.2) μg/kg
Number of orders for a single PE dose of 1000 mcg	10 (13.7%)	
Preload expansion		
Weight-based volume of IVF given prior to PHE	49 (67.1%)	30.9 (11.5–35.14) ml/kg
Total volume of IVF given prior to PHE	49 (67.1%)	1000 (0–2000) ml
Type of CVI initiated within 30 minutes (n = 34)		
Norepinephrine	31 (91%)	
Epinephrine	1 (3%)	
Phenylephrine	1 (3%)	
Vasopressin	1 (3%)	

Intravenous Fluids (IVF), Continuous Vasopressor Infusions (CVI), Phenylephrine (PHE).

- **PHE verildikten en az bir saat sonra;**
  - Ortalama **MAP** 56.5 (± 19.9) mmHg'den 79.3 (± 21.0) mmHg'ye yükseldi (P <0.05).
  - Ortalama **HR** 91.4 (± 31.7) bpm'den 91.8'e (±25.2) yükseldi(P = 0.979).

Table 3

Documented serious adverse effects associated with bolus-dose phenylephrine

Adverse effect	Frequency – n (%)
Reactive hypertension	6 (8.2%)
Ventricular tachycardia	2 (2.7%)
Bradycardia	7 (9.6%)
Intracranial bleed/hemorrhage	0 (0%)
Extravasation	0 (0%)

The American Journal of Emergency Medicine
Volume 37, Issue 3, March 2019, Pages 494-498

Brief Report

Push dose pressors: Experience in critically ill patients outside of the operating room

Andrew Rotando DO [a], Lindsey Picard MD [a], Samantha Delibert Pharm.D., [b], Karin Chase MD [a, c], Courtney M.C. Jones PhD, MPH [a], Nicole M. Acquisto Pharm.D. [a, b]

Show more

https://doi.org/10.1016/j.ajem.2018.12.001

Data was collected from November 2015 through March 2017.

Table 1. Demographics (n=146).

Push dose pressor	Phenylephrine (n=104) No. (%)	Ephedrine (n=33) No. (%)	Both (n=9) No. (%)	Total (n=146) No. (%)
Gender				
Male	68 (65.4)	23 (69.7)	6 (66.7)	97 (66.4)
Female	36 (34.6)	10 (30.3)	3 (33.3)	49 (33.6)
Admitting Diagnosis				
Respiratory failure	64 (61.5)	14 (42.4)	2 (22.2)	80 (39.8)
Other[a]	38 (36.5)	10 (30.3)	2 (22.2)	50 (24.9)
Sepsis	24 (23.1)	10 (30.3)	3 (33.3)	37 (18.4)
Altered mental status	13 (12.5)	3 (9.1)	1 (11.1)	17 (8.5)
ICH, stroke, or TBI	10 (9.6)	2 (6.1)	–	12 (6.0)
Trauma	1 (1.0)	1 (3.0)	1 (11.1)	3 (1.5)
Cardiac	2 (1.9)	–	–	2 (1.0)
Treatment Indication				
Peri-intubation	62 (59.6)	23 (69.7)	5 (55.6)	90 (61.6)
Transient hypotension	45 (43.3)	11 (33.3)	4 (44.4)	60 (41.0)
Fluid administration at the time of PDP	29 (27.9)	10 (30.3)	–	39 (26.7)

Table 2. Efficacy of push dose pressors[a].

	Pre	Post	Mean change from baseline (%)	95% confidence interval	*p* value
SBP (n=82), mean mmHg (SD)	80 (15.4)	106 (24.8)	+25.6 (32.5)	−31.1 to −20.2	<0.001
DBP (n=81), mean mmHg (SD)	48 (12.1)	61 (19.1)	+13.4 (27.2)	−17.1 to −9.7	<0.001
HR (n=77), mean bpm (SD)	93 (24.1)	99 (23.2)	−5.8 (6.4)	−10.4 to −1.3	0.013

SBP=systolic blood pressure, DBP=diastolic blood pressure, HR=heart rate, SD=standard deviation, bpm=beats per minute.

a

Sample size for each group differs based on available dose and vital sign data pre- and post-push dose pressor administration.

Table 3. Adverse events and medication errors.

Push dose pressor	Phenylephrine (n=104) No. (%)	Ephedrine (n=33) No. (%)	Both (n=9) No. (%)	Total (n=146) No. (%)
Adverse event[a] (n=146)	13 (12.5)	2 (6.1)	2 (22.2)	17 (11.6)
SBP increase>100%	6 (5.8)	–	1 (11.1)	7 (4.8)
HR increase>30%	6 (5.8)	2 (6.1)	1 (11.1)	9 (6.2)
Push dose pressor	Phenylephrine (n=104) No. (%)	Ephedrine (n=33) No. (%)	Both (n=9) No. (%)	Total (n=146) No. (%)
Dysrhythmia	1 (1.0)	–	–	1 (0.7)
Medication errors[c] (n=116)				13 (11.2)
Phenylephrine dose >200 µg	12[b] (10.3)	–	–	12 (10.3)
Ephedrine dose >25 mg	–	1 (8.6)	–	1 (8.6)

SBP=systolic blood pressure, HR=heart rate, bpm=beats per minute.

Bolus dose of epinephrine for refractory post-arrest hypotension

Michael Gottlieb, MD, RDMS*

ABSTRACT

Post-cardiac arrest hypotension is associated with worse outcomes. However, a significant proportion of patients may not be responsive to intravenous (IV) fluids, and vasopressor infusions require significant time to initiate. This case series describes the successful use of a bolus dose of epinephrine to rapidly treat IV fluid refractory hypotension among three patients in the post-arrest period. A bolus dose of epinephrine may be considered as a treatment for post-arrest hypotension that does not respond to IV fluids, but further studies should be performed prior to routine use.

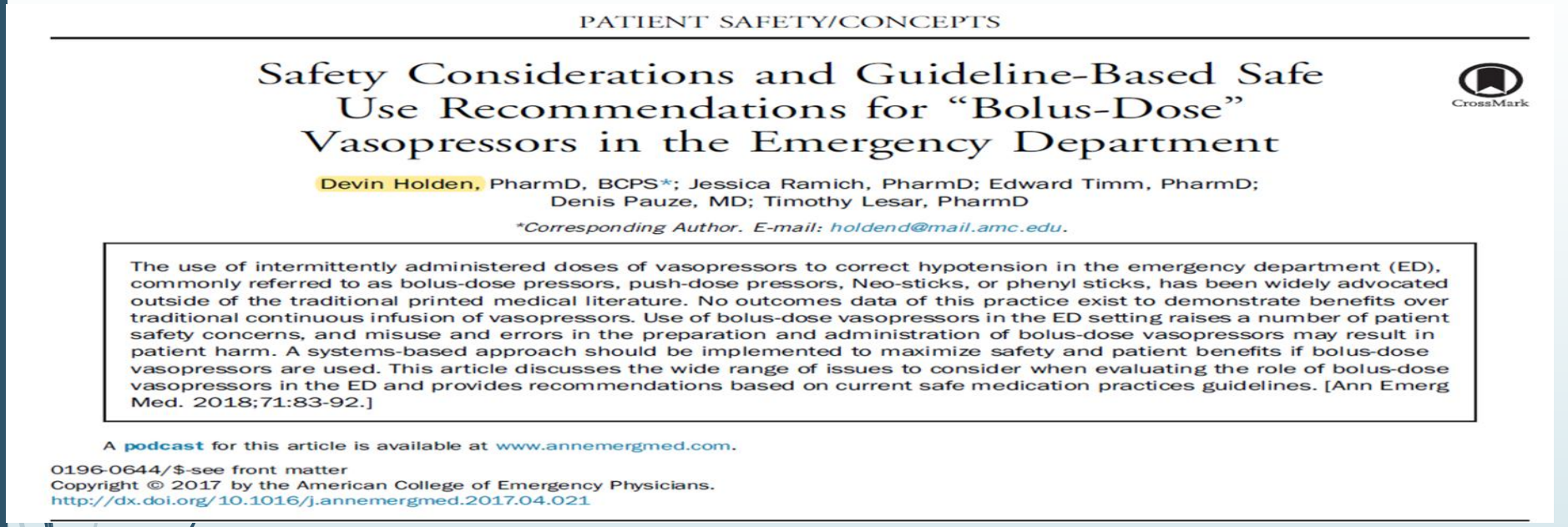
describes the use of a bolus dose of epinephrine as a bridge to vasopressor therapy among three patients with significant hypotension after cardiac arrest.

RÉSUMÉ

L'hypotension artérielle suivant un arrêt cardiaque est associée à des résultats cliniques défavorables.

- Kardiyak arrest sonrası belirgin hipotansiyonu olan üç hastada bolus dozda *epinefrinin* vasopressor tedavisine köprü olarak kullanılabileceğini açıklamıştır.

Güvenli Kullanım



PATIENT SAFETY/CONCEPTS

Safety Considerations and Guideline-Based Safe Use Recommendations for "Bolus-Dose" Vasopressors in the Emergency Department

Devin Holden, PharmD, BCPS*; Jessica Ramich, PharmD; Edward Timm, PharmD; Denis Pauze, MD; Timothy Lesar, PharmD

*Corresponding Author. E-mail: holdend@mail.amc.edu.

The use of intermittently administered doses of vasopressors to correct hypotension in the emergency department (ED), commonly referred to as bolus-dose pressors, push-dose pressors, Neo-sticks, or phenyl sticks, has been widely advocated outside of the traditional printed medical literature. No outcomes data of this practice exist to demonstrate benefits over traditional continuous infusion of vasopressors. Use of bolus-dose vasopressors in the ED setting raises a number of patient safety concerns, and misuse and errors in the preparation and administration of bolus-dose vasopressors may result in patient harm. A systems-based approach should be implemented to maximize safety and patient benefits if bolus-dose vasopressors are used. This article discusses the wide range of issues to consider when evaluating the role of bolus-dose vasopressors in the ED and provides recommendations based on current safe medication practices guidelines. [Ann Emerg Med. 2018;71:83-92.]

A **podcast** for this article is available at www.annemergmed.com.

0196-0644/$-see front matter

http://dx.doi.org/10.1016/j.annemergmed.2017.04.021

- Bolus doz vasopressorlerle ilgili ana güvenlik kaygılarından biri, dozaj uygulama hataları riskinin yüksek olmasıdır.
- Holden ve arkadaşları;
  - Güvenli ilaç kullanım klavuzu geliştirilmesi
  - PDP kullanımından önce hastane tarafından fikir birliği sağlamalı
  - Karışıklığı önlemek ve ortak bir dil oluşturmak için sağlık ekibinin eğitilmesi

ED ONLY ADULT PUSH DOSE PRESSOR IV Administration Guidelines

Form Provided	Phenylephrine 40mcg/ml 10ml syringes (ED only)
Starting Dose	**Titration / Incremental Dose**
40-80mcg (1-2ml) slow IV push	Repeat dose per direction of LIP every 1-5min as needed Increase dose per direction of LIP to 40-200mcg based on response
Important Information	• Syringe provides dose to be given incrementally (eg 1-2ml (40-80mcg) with additional doses, or dose increase based on response every 1-5 minutes • **MUST BE GIVEN BY LIP, OR MAY BE GIVEN BY RN PER DIRECTION OF LIP PRESENT AT BEDSIDE.** • Extravasation risk- use CVL or large vein when available • Used as temporizing measure for hypotension. • Phenylephrine has solely α-adrenergic activity and therefore has no effect on the heart. Use when patient is tachycardic. May cause reflex increase in parasympathetic tone and therefore cause a decrease in heart rate.
Minimum Monitoring	• ED use only • Monitor HR and BP at least every 5min while administering / titrating, and if appropriate, q5min x3 after administration.

ED ONLY ADULT PUSH DOSE PRESSOR IV Administration Guidelines

Form Provided	Epinephrine 10mcg/ml 10ml syringes (ED Only)
Starting Dose	**Titration / Incremental Dose**
5-20mcg (0.5-1ml) slow IV push	Repeat dose per direction of LIP every 1-5minutes as needed. Increase dose per direction of LIP to 10-20mcg based on response
Important Information	• Syringe provides dose to be given incrementally (eg 0.5-1ml (5-10mcg) with additional doses, or dose increase based on response every 1-5 minutes • **MUST BE GIVEN BY LIP, OR MAY BE GIVEN BY RN PER DIRECTION OF LIP PRESENT AT BEDSIDE.** • Extravasation risk- use CVL or large vein when available • Used as temporizing measure for hypotension. • Epinephrine has both α- and β-adrenergic activity – may cause tachycardia in addition vasoconstriction. Consider phenylephrine in significant tachycardia or any tachyarrhythmia.
Minimum Monitoring	• ED use only • Monitor HR and BP at least every 5min while administering / titrating, and if appropriate, q5min x3 after administration.

EPINEPHephrine 10 mcg/mL Syringe Preparation:

1. Draw up 9 mL of normal saline into a 10 mL syringe (DO NOT use 10ml IV line "flush" syringes)
2. Into this syringe, draw up 1 mL of EPINEPHphrine 0.1 mg/mL (1 mg/10ml) from a cardiac syringe
3. Label syringe

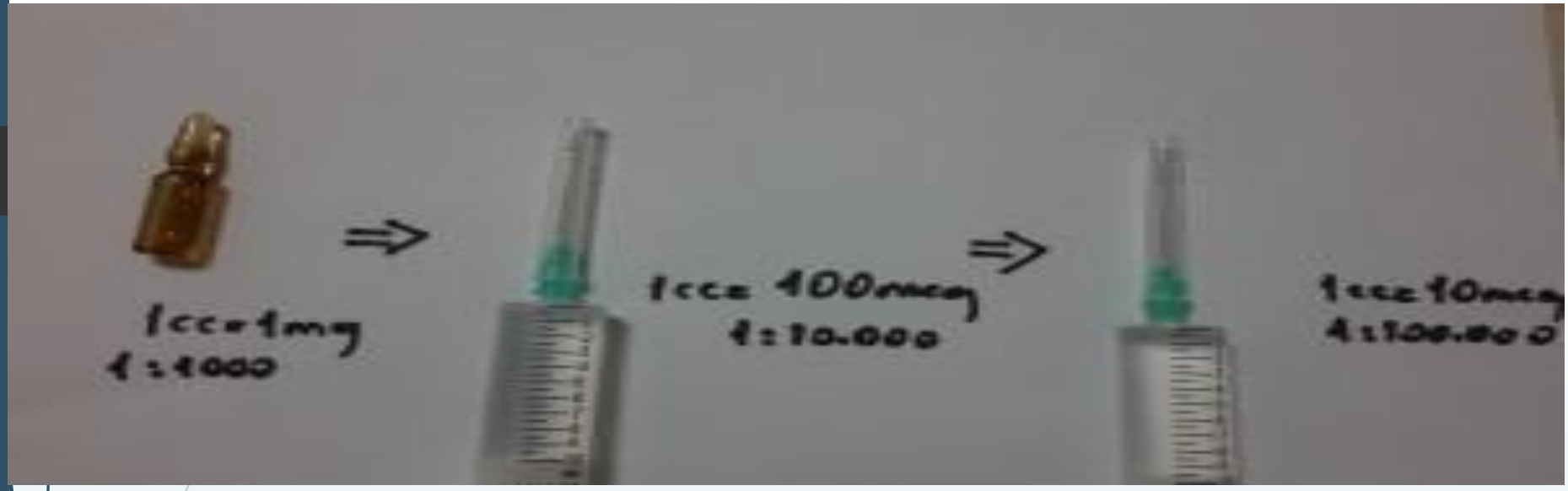
Phenylephrine 100 mcg/mL Syringe Preparation:

1. Draw up 1 mL of phenylephrine from a 10 mg/mL vial into a 3 mL syringe
2. Inject this into a 100 mL bag of normal saline. Label bag; safely discard when finished
3. Draw up 10 mL into a 10 mL syringe
4. Label syringe
5.

ePHEDrine 5 mg/mL Syringe Preparation:

1. Draw up 9 mL of normal saline into a 10 mL syringe (DO NOT use 10ml IV line "flush" syringes)
2. Into this syringe, draw up 1 mL of ePHEDrine from a 50 mg/mL vial
3. Label syringe

Figure 2. Instructions for ad hoc preparation of bolus-dose vasopressors (adapted from Weingart[6] and Cocchio[9]).



- Arrest ya da anaflaksi dozu değil.
- ABD'de kardiyak adrenalin olarak bilinen formu 1:10.000'lik olarak hazır ülkemizde yok.
  - İlk olarak **1 mg** adrenalini **9 cc SF** ile sulandırın (1cc=0.1mg)
  - Bu enjektörden 1 cc çekip ve tekrar 9cc SF ile sulandırın (1cc=0.01mg=10µg)
  - 0.5-2 mL (2-5dk)

Featured Clinical Topic: Push-Dose Pressor Utilization in the Emergency Department

Authors: Michael Scott, PharmD Candidate 2019: UMKC School of Pharmacy and Jeremy Hampton, PharmD, BCPS: UMKC School of Pharmacy

- Alternatif vazopresör seçenekleriyle karşılaştırıldığında, fenilefrin ve epinefrin ile daha az lokal doku hasarı riski ve ekstravazasyon riski olduğunu göstermektedir.
- Uygulama bölgesi antekubital veya popliteal fossa ve proksimal geniş damaryolu seçilmesi ile risk azalmaktadır.
- Vasopresör infüzyon süresi artıkça ekstravazasyon riski artmaktadır.

The Use of Bolus-Dose Vasopressors in the Emergency Department

Sabrina Weigand, MD; J. Nate Hedrick, PharmD; William J. Brady, MD

EMERGENCY MEDICINE I MARCH 2018

While bolus-dose vasopressors are commonly used in critical care medicine and anesthesiology to treat patients with hypoperfusion, its application in emergency medicine is minimal with little penetration into daily care.

- Doğru ve uygun şekilde kullanıldığında, PDP'ler, acil serviste şokun yönetiminde önemli araç olarak kullanılabilir.

Bolus-Dose Vasopressors in the Emergency Department: First, Do No Harm; Second, More Evidence Is Needed

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0196-0644/$-see front matter

http://dx.doi.org/10.1016/j.annemergmed.2017.05.039

- Acil tıpta hem nöromüsküler bloker hem de propofol kullanımı başlangıçta sert eleştirilerle karşılandı.
- Zamanla, kanıtlar bu ilaçların acil serviste kullanımının güvenli olduğunu ve yüksek kaliteli araştırmalardan elde edilen klinik olarak anlamlı sonuçlara göre, önceki yaklaşımlarda iyileşme sağladığını ortaya koydu.
- Acil serviste PDP'lerin kullanılması, benzer pratik araştırmalara ilham vermelidir.

Teşekkürler