

# EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER  
DEPARTMENT OF EMERGENCY MEDICINE



Care Warriors

Author: Kristina T. Gemayel, M.S. | Editor: Benita Chilampath, DO

November 2017 | Vol 4 | Issue 25

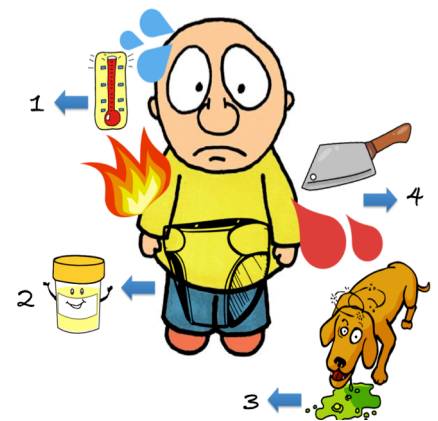
## Hypovolemic Shock

A 76-year old female with a history of atrial fibrillation is brought to the ED by EMS after being found on the floor by her husband. On presentation, she is afebrile, blood pressure is 68/42 mmHg, HR 112, and RR 16, oxygenating 96% on 4L nasal cannula. The patient states she was feeling dizzy and weak, and after standing up from the kitchen table, fell backwards hitting her head on the tile floor. She admits to having bright red blood per rectum for the past 5 days, which has occurred once prior 12 years ago. She denies any recent doctor appointments, but states she is adherent with taking Eliquis (Apixaban) daily. On physical exam, she appears pale with multiple bruises on her arms, is alert and awake, tachycardic and has gross blood per rectum. Examination reveals no obvious injuries due to the fall and neurological exam is normal. The hemoglobin and hematocrit is found to be 5.6/21 and initial EKG strip is shown. Non-contrast CT is pending. Which of the following is the most appropriate initial treatment at this time?



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- A. Establish two 16-gauge IV catheters for fluid resuscitation, type and screen, administer Praxbind (Idarucizumab).
- B. Rapidly transfuse 2 units of O Negative PRBCs.
- C. STAT Cardiology consult to discuss EKG.
- D. Establish two 16-gauge IV catheters for fluid resuscitation, type and screen, administer KCentra (4 factor prothrombin complex concentrate).
- E. Quickly apply local hemostasis measures.



Hypovolemic shock is caused by a critical decrease in intravascular volume through various different mechanisms.

Illustrated above are several conditions that can lead to hypovolemic shock:

- (1) Thermal or Chemical Burns
- (2) Diuresis or Diabetes Insipidus
- (3) Vomiting or Diarrhea
- (4) Blood Loss/Traumatic Injury

*EM Case of the Week is a weekly "pop quiz" for ED staff.*

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

BROWARD HEALTH MEDICAL CENTER

Department of Emergency Medicine  
1625 SE 3rd Avenue  
Fort Lauderdale, FL 33316

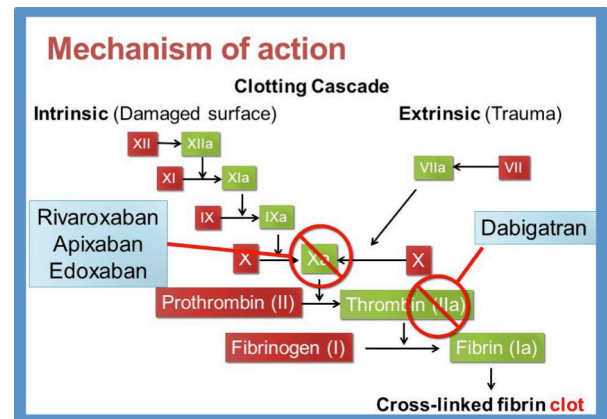
**The correct answer is D.** Establish two 16-gauge IV catheters for fluid resuscitation, type and screen, administer 4 factor prothrombin complex concentrate.

Hypovolemic shock is caused by a critical decrease in intravascular volume. Diminished venous return (preload) results in decreased ventricular filling and reduced stroke volume. Unless compensated for by increased heart rate, as seen in our patient's EKG, cardiac output decreases. Management of hypovolemic shock focuses on fluid and blood replacement, as well as identifying contributing factors and medications that can increase a patient's morbidity and mortality.

### Discussion

Hypovolemic shock refers to a medical or surgical condition in which rapid fluid loss results in multiple organ failure due to inadequate circulating volume and subsequent inadequate perfusion. Most often, hypovolemic shock is secondary to rapid blood loss. With the advent of non-vitamin K antagonist oral anticoagulants (NOACs), it is important that practitioners become familiar with their mechanisms of action (Figure I) and available reversal agents in the setting of major bleeding.

The human body responds to intravascular volume loss by activating multiple pathways to maintain cardiac output and organ perfusion. The cardiovascular system increases the heart rate, myocardial contractility, and constricts peripheral blood vessels secondary to norepinephrine release and decreased tone sensed by baroreceptors secondary to blood loss. Hematogenously, severe blood loss activates the coagulation cascade and



**Figure I** | Harter K., et al. *West J Emer Med.* 2015 16(1). 11-17

platelets in an attempt to clot off the bleeding source. Although NOACs reversibly inhibit coagulation factors and have a shorter half-life than warfarin, discontinuation of the drug and administration of reversal agents in major bleeding is warranted.

### Treatment

Management for all patients with major bleeding includes immediate discontinuation of all anticoagulant and antiplatelet therapy, continuous assessment of hemodynamic status, and placement of large-bore intravenous access for rapid fluid repletion. Rapid volume repletion involves the initial use of one to two liters of isotonic crystalloid in an attempt to restore tissue perfusion. Early correction of the volume deficit is essential in hypovolemic shock to prevent the decline in tissue perfusion from becoming irreversible, potentially leading to multi-organ system failure. Patients with critically low hemoglobin values are transfused when the benefits outweigh the risks.

For a list of educational lectures, grand rounds, workshops, and didactics please visit [BrowardER.com](http://BrowardER.com) and click on the "Conference" link.

*All are welcome to attend!*

# Warriors

Anticoagulant	Reversal Agent	Initial Dose
<b>Dabigatran</b> (Pradaxa)	Idarucizumab (Praxbind)	5 grams
<b>Apixaban</b> (Eliquis)	4 factor PCC (Kcentra, Octaplex)	50 units per kg
<b>Betrixaban</b> (Bevyxxa)	4 factor PCC (Kcentra, Octaplex)	50 units per kg
<b>Edoxaban</b> (Lixiana, Savaysa)	4 factor PCC (Kcentra, Octaplex)	50 units per kg
<b>Rivaroxaban</b> (Xarelto)	4 factor PCC (Kcentra, Octaplex)	50 units per kg

The table above shows the common NOACs, their indicated reversal agent, and the initial dose to be given. Notice that Pradaxa's (Dabigatran) reversal agent is unique from the other anticoagulation reversal agents listed. Praxbind (Idarucizumab) is a dabigatran-specific Fab fragment and has no known activity against direct factor Xa inhibitors or other anticoagulants. The other reversal agent, 4 Factor Prothrombin Complex Concentrate (4 factor PCC) can be utilized in the setting of major bleeding to attenuate risk of death from bleeding associated with direct factor Xa inhibitor anticoagulation. The components of 4 factor PCC are human coagulation factors 2,5,9,10 as well as inhibitor proteins C and S. It is important to note that 4 factor PCC has also been demonstrated to be effective and safe in the reversal of vitamin K antagonists, such as warfarin, in the setting of major bleeding.<sup>1</sup>

## Take Home Points

- Management for all patients with major bleeding includes immediate discontinuation of all anticoagulant and antiplatelet therapy, continuous assessment of hemodynamic status, and placement of large-bore intravenous access for rapid fluid repletion.
- Although NOACs reversibly inhibit coagulation factors and have a shorter half-life than warfarin, discontinuation of the drug and administration of reversal agents in major bleeding is warranted.



This month's case was written by Kristina Gemayel. Kristina is a 4<sup>th</sup> year medical student from NSU-COM. She did her emergency medicine rotation at Broward Health North in November 2017. Kristina plans on pursuing a career in General Surgery after graduation, with hopes of specializing in Breast Oncology.

## REFERENCES

1 Four-factor prothrombin complex concentrate versus plasma for rapid vitamin K antagonist reversal in patients needing urgent surgical or invasive interventions: a phase 3b, open-label, non-inferiority, randomised trial  
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3 Piccini JP, Garg J, Patel MR, et al. Management of major bleeding events in patients treated with rivaroxaban vs. warfarin: results from the ROCKET AF trial. *Eur Heart J* 2014; 35:1873.