# POCUS to FOCUS

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## Introduction

Point of care ultrasound (POCUS) plays an important role in the Emergency Department or in any Critical Care Unit. In our case, we present how a POCUS mnemonic guided us in diagnosing two fatal conditions in a single case.

## Case presentation

An 82-year-old male patient presented to our emergency with a syncopal attack; triage vital signs were BP 112/67 mmHg, HR 167 beats per minute (irregularly irregular), RR 18/min, SPO2 97%, temperature 36.3°C. The patient was transferred to a resuscitation room. ECG showed rapid atrial fibrillation (AF, online Figure S1). As the onset of AF was uncertain, rate control therapy was initiated. The patient was asymptomatic except for mild abdominal pain. The patient's laboratory results revealed: D-dimer 3.89 mg/L (normal level <0.5 mg/L), serum Lactate 7.3 mmol/L (0.5 - 2.2 mmol/L), troponin T 0.21 ng/ml (between 0.1-2.0 ng/mL is high risk for this lab suggesting myocardial damage), cardiac Pro-BNP 8290 pg/ml (< 125). These lab results were sugested a critical underlying pathology. With the onset of AF and elevated D-dimer, the differential included pulmonary embolism. However, the patient denied having any breathing difficulty or chest pain, and had no clinical signs of deep vein thrombosis (DVT). The patient maintained oxygen saturation at room air (> 95%). Differential included mesenteric ischemia from an acute embolic event given the high lactate and abdominal pain.

We utilized the ACUTE mnemonic [1] to help us in the evaluation of patients presenting with an acute abdomen (Table 1). Using a curvilinear probe we scanned the Abdominal Aorta, Inferior vena cava, and assessed for per-

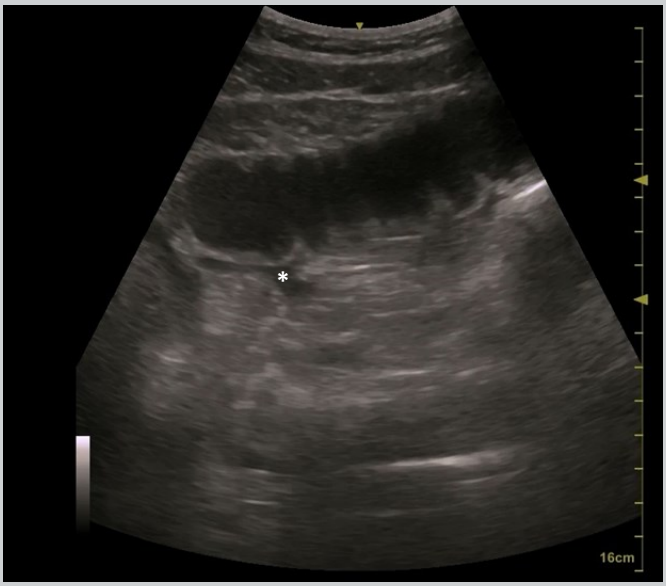


Figure 1. Dilated small bowel loop 3 cm, thickened bowel loops 3 mm wall thickness with free fluid. * free fluid

*Table 1. ACUTE ABDOMEN mnemonic (Part A) for critical causes of acute abdomen.*

| | | |
|---|---|---|
| **A** | **Abdominal Aorta aneurism** | **Abdominal Aortic > 3cm?** |
| **C** | **Collapsed IVC** | **IVC collapsing > 50%?** |
| **U** | **Ulcer (perforated viscus)** | **Pneumoperitoneum? [3, 4]**<br>**Direct sign:**<br>Increased echogenicity of peritoneal stripe<br>Present of A lines<br>**Indirect sign :**<br>Intraperitoneal free fluid<br>Air bubbles in ascetic fluid<br>Thickened bowel loop<br>Bowel or gallbladder thickened wall with ileus |
| **T** | **Trauma : FAST** | **Intraperitoneal hypoechoic fluid?** |
| **E** | **Ectopic pregnancy** | **Intraperitoneal hypoechoic fluid, empty uterus or extra-uterine gestational sac?** |

*Table 2. LOW BP mnemonic for undifferentiated shock evaluation.*

| | | |
|---|---|---|
| **L** | **Lung** | **Pneumothorax:**<br>absent lung sliding?<br>**Pulmonary edema:**<br>>2 B-lines in 3 or more lung zones? |
| **o** | **Cardiac Output** | **Pulmonary embolism:**<br>RV strain. Abnormal RV is equal or more in size to LV<br>**Cardiogenic shock:**<br>Reduce LV contractility or Poor EF<br>**Pericardial tamponade:**<br>hypoechoic fluid collection around the heart.<br>**Hypovolemia:**<br>collapsed chamber, hyper dynamic LV |
| **w** | **Water ( IVC )** | **Hypovolemic and distributive shocks:**<br>IVC < 1.5cm, collapsing >50% on inspiration<br>**Obstructive and cardiogenic shocks:**<br>IVC > 2.5cm, collapsing less than 50% |
| **B** | **Blood in cavity (FAST,AAA and pleural space )** | **Leaking AAA?**<br>Intraperitoneal hypoechoic fluid. Aortic aneurysm > 3cm.<br>**Intraperitoneal free fluid?**<br>**Pleural effusion?**<br>loss of mirror image of liver/spleen at Rt/Lt diaphragmatic areas |
| **P** | **Ectopic pregnancy and Pipes** | **Ectopic pregnancy:**<br>intraperitoneal hypoechoic fluid, empty uterus or extra-uterine gestational sac<br>**DVT:**<br>non compressible veins, direct clot visualization |

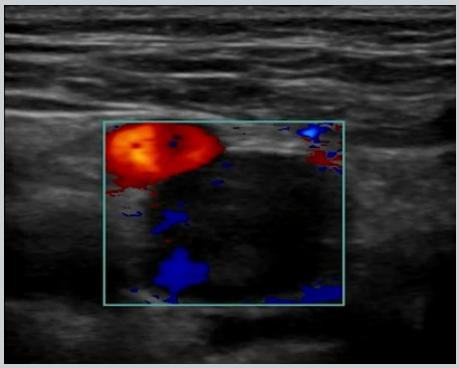

Figure 2. Right femoral vein incompressible, with absent Doppler flow in femoral vein confirmed DVT.

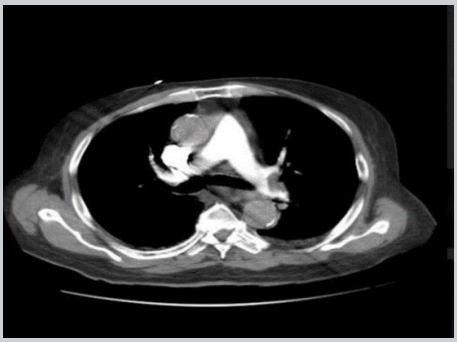

Figure 3. CT pulmonary angiogram showed left side pulmonary embolism.

forated viscus, free fluid in the abdomen, and ectopic pregnancy using the **ACUTE** mnemonic. The only positive finding in our patient was free fluid in right upper quadrant and pelvic area with a dilated small bowel loop 3 cm, thickened bowel loops 3 mm wall thickness (Figure 1). Therefore, the next plan of action was to perform a CT abdomen with contrast to evaluate for mesenteric ischemia.

Meanwhile, the patient became hypotensive with a blood pressure of 75/45mmHg, sinus tachycardia (spontaneously converted) and hypoxia. Resuscitation was initiated in our patient while we went back to POCUS to look for causes of hypotension by using the **LOW BP** mnemonic [2] (Table 2). A curvilinear probe was used for this scan for lung, cardiac, IVC, AA, and free fluid; and a linear probe was used for the DVT scan. The scan was negative except for free fluid in the abdomen (previous finding) and positive for DVT in the right femoral vein (Figure 2). We then planned to include a pulmonary angiogram to rule out pulmonary embolism.

The CT scan showed left side pulmonary embolism at the level of the bifurcation of the left main pulmonary artery extending into the lower lobe segmental branches (Figure 3), perforated viscus (Figure 4), and prostate mass (Figure 5). The patient was referred to surgical, medical, urology, and the cardiology teams. The patient was transferred to the operating room for exploratory laparotomy with intra-operative findings of perforation of the 2nd part of the duodenum. The patient was admitted to the surgical ICU and his condition improved gradually; enoxaparin was started. After 15 days, the patient was discharged from hospital.

**Discussion**

The use of POCUS is becoming widely established as a standard of care within Emergency and Intensive Care Departments. It is a safe, non-invasive tool, used as an extension of our clinical examinations; which can help answer focused questions and rule in or rule out life-threatening diagnoses rapidly. LOW BP and ACUTE ABDOMEN both are new mnemonics, specially designed to

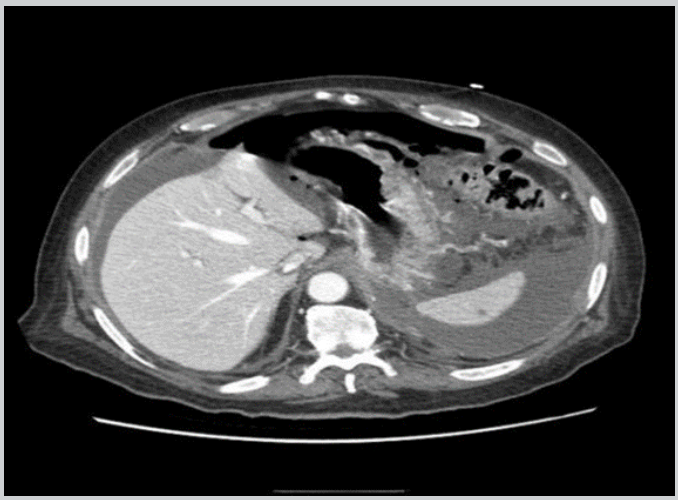

Figure 4. CT abdomen with IV contrast showed pneumoperitoneum, free fluid suggestive of perforated viscus.

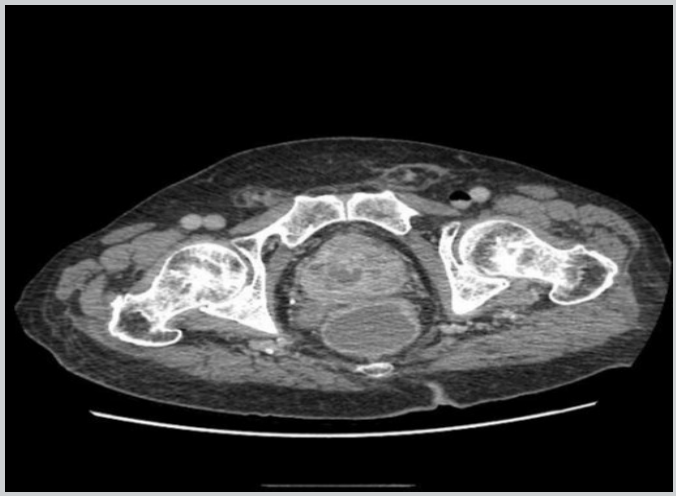

Figure 5. CT abdomen with IV contrast showed prostate mass.

*Table 3. ACUTE ABDOMEN mnemonic (Part B) for other surgical causes of acute abdomen.*

| | | |
|---|---|---|
| **A** | **Appendicitis** | • **Non-compressible blind loop, with diameter of > 6 mm, with or without appendicolith.** |
| **B** | **Biliary tract** | • **Gallbladder stone, sonographic murphy, dilated common bile duct, thickened anterior wall of gallbladder, pericholecystric fluid.** |
| **D** | **Distended bowel loop** | • **Dilated small bowel loop > 3 cm**<br>• **Decrease bowel peristalsis** |
| **O** | **Obstructive uropathy** | • **Hydronephrosis, absent ureteral jet.** |
| **M**<br>**E**<br>**N** | **Men: testicular torsion**<br><br>**Women: ovarian torsion.** | • **Hypoechoic testis compare to normal, Reduce or no perfusion.**<br>• **Adnexal mass >4cm, Pelvic free fluid or Reduced blood flow on Doppler.** |

address critical emergency approach of ABC (Airway, Breathing then Circulation). In the LOW BP mnemonic (Figure 5), it starts with causes of shock attributed to the 'Breathing' part of ABC, with letter L symbolizing Lung consisting of Pneumothorax and Pulmonary Edema. This is followed by the 'Circulatory' causes of shock composed of Cardiac output, IVC, Free fluid, AAA, pregnancy, DVT and PE. On the other hand, ACUTE ABDOMEN (Table 3) begins with the most critical cause: Abdominal Aortic Aneurysm. Other surgical causes of acute abdomen are listed in "ABDOMEN" as part of the mnemonic (Table 3): Appendicitis, biliary tract disease, distended bowel loop, obstructive uropathy, Men: testicular torsion, and Women: ovarian torsion. Moreover, our mnemonics exhibit certain characteristics that make them easy to remember, such as they follow an anatomical approach and each mnemonic title represents the problem it is designed to address.

## Conclusion

POCUS played a prominent role in the management and decision making process for this patient and a lot of other patients. Having an algorithmic approach with the ACUTE ABDOMEN, and LOW BP mnemonics will help Emergency Physicians or any Critical Care Physician rule out serious conditions that can be easily missed.

**References:**

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