Training Problem
Shock

Learning Objectives:

Knowledge

Subinterns should be able to

*Describe the common causes of shock including

1. Hypovolemic shock
    a. Blood loss due to trauma or gastrointestinal bleeding
    b. Third space loss of plasma volume (pancreatitis, bowel obstruction, infarction, anaphylaxis)
    c. Diarrhea
    d. Burns
2. Cardiogenic shock
    a. Acute myocardial infarction (>40% of LV mass)
    b. Arrhythmia (heart block, Ventricular tachycardia, etc.)
    c. Acute valvular dysfunction
    d. Ventricular septal rupture
3. Obstructive shock
    a. Pericardial tamponade
    b. Inferior/superior vena caval obstruction
    c. Aortic dissection
    d. Massive pulmonary embolism
4. Distributive shock
    a. Venous pooling due to loss of venous tone such as in spinal cord injury
    b. High output shock as seen in sepsis, toxic shock, or anaphylaxis

*Describe the signs and symptoms of each of the above causes of shock.

*Identify the most likely cause of shock in a specific patient.

*Describe the initial and subsequent management of a patient in shock.

Skills

Subinterns should be able to

*Conduct a targeted history:

1. Rapidly evaluate the patient in shock.
2. Ask appropriate questions to determine the reason the patient is in shock.
3. Conduct a focused chart review of the patient when appropriate.

*Conduct a physical examination:

1. Evaluate the patient for clinical stability.
2. Evaluate the patient to determine the reason the patient is in shock.

*Develop a management plan

1. Provide appropriate resuscitative and supportive measures for the patient in shock.
2. Demonstrate the ability to develop a differential diagnosis utilizing the collected data.

3. Order appropriate laboratory and radiologic studies.
4. Use the data collected to determine the reason the patient is in shock.
5. Treat the patient appropriately for the cause of shock.

Attitudes and professional behavior

Subinterns should demonstrate

*A compassionate attitude towards all patients and their family members.
*Professionalism when communicating with colleagues, nursing staff, and consultants.

References:

- Ahuja S, Flood K, Paranjothi S (Eds): Shock. *In:* The Washington Manual of Medical Therapeutics. 30th ed. USA, Lippincott Williams and Wilkins, 2001. p 210-213.

- Dambro M (Ed): Shock, circulatory. *In:* Griffith's 5 Minute Clinical Consult. USA, Lippincott Williams and Wilkins, 2004. p. 1012-1013.

- Dellinger RP, Levy MM, et al: Surviving Sepsis Campaign: International Guidelines for management of severe sepsis and septic shock: 2008. *Critical Care Medicine* 2008; 36: 296-327.

- Freeman B, Natanson C: Hypotension, Shock, and Multiple Organ Failure. *In:* Hospital Medicine. Wachter R, Goldman L, Hollander H (Eds). USA, Lippincott Williams and Wilkins, 2000. p 123-131.

- Holleberg S, Parrillo J: Shock. *In:* Harrison's Principles of Internal Medicine. 14th ed. Braunwald E, Fauci A, Hauser S, Isselbacher K, Kasper D, Longo D, Martin J, Wilson J (Eds). McGraw-Hill, 1998. p 214-222.

Directions:

Begin by reading the references. Use the information from the background article (and other sources as appropriate) to answer the questions following each case. The questions are "open-ended" and therefore there are no right or wrong answers. The three cases described below highlight the clinical findings, management and the critical areas of difference between cardiogenic, distributive and hypovolemic shock.

Case Scenario #1

It is your first night of call during your subinternship month, and you are asked by your resident to evaluate a patient in the emergency room. The patient is an 85 year old female with a history of Alzheimer's dementia and Hypertension who presented to the emergency room via ambulance from a nursing home with decreased mental status. The ambulance team reports that on their arrival, the patient's blood pressure was 80/40mmHg. Her medications at the nursing home include Aricept, Hydrochlorothiazide, and Metoprolol.

A) What additional history would you like from the nursing home staff, patient's chart, and ambulance team?

B) Define shock. What are the main categories of shock?

On physical examination, the patient is lying quietly in bed and somewhat difficult to arouse with sternal rub. Her pulse is 120 beats/min, BP is 80/40, RR is 18, and temperature is 101 degree Fahrenheit. There is no JVD, thyromegaly. Her cardiac exam reveals a normal S1 and S2 without rubs, gallops and murmurs. On pulmonary exam, her lungs were clear to auscultation bilaterally. Her abdominal exam reveals some mild to moderate suprapubic tenderness but is otherwise normal. Her extremities are cool to touch but she has palpable peripheral pulses. There is no peripheral edema. The rest of her physical examination is normal. A Foley catheter is in place and contains dark colored urine with small amounts of pus.

C) Based on the history and physical examination, what is your differential diagnosis and what is the most likely cause of shock in this patient?

D) What is SIRS, severe sepsis, septic shock and refractory septic shock?

E) What laboratory evaluation would you want to obtain in this patient?

A Complete Blood Count reveals and elevated white blood cell count with a left shift, and a urinalysis shows many bacteria with >100 WBCs/hpf and positive nitrite. Urine gram stain revealed gram negative bacilli, and the urine was sent for culture. Blood cultures were drawn and sent to the lab.

F) How would you continue to manage this patient?

Patient was aggressively volume resuscitated and started on intravenous antibiotics. Over the next 24 hours, patient blood pressure increased to 110/60mm Hg, HR 90. Blood culture from the lab was reported as gram negative bacillus, urine culture also revealed gram negative bacillus. Patient's antibiotic was continued.

G) What is your antibiotic of choice in this case? What antibiotic would you consider if the patient's blood culture and urine culture reported gram positive cocci in clusters?

H) How would you management differ if your patient's blood pressure continued to be in the low 80s with fluid resuscitation

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Case Scenario #2

You are on the floor with the intern helping out with floor calls when you receive a call from the cardiac floor about a patient admitted earlier in the day with chest pain. The nurse reports that the patient's blood pressure is currently 80/40mmHg, and he is again complaining of chest pain.

A) What questions would you ask the nurse and how would you proceed?

While walking hurriedly to the cardiac floor, you remember that this particular patient is a 60yo male attorney with Hypertension, Hyperlipidemia, and Diabetes mellitus type II who presented earlier in the day with a complaint of chest pain while questioning a witness in court. His initial EKG on arrival showed nonspecific ST-T segment changes, and the initial cardiac enzymes were mildly elevated. He was admitted to the hospital to rule out a cardiac cause of his chest pain. On arrival to the patient's room, the patient is diaphoretic and sitting on the side of the bed clutching his chest.

B) Identify some key points you need to focus on when you arrive in his room.

C) How would you proceed?

On physical examination, the patient is tachypneic and diaphoretic. His HR is 100beats/min, BP 80/40mmHg, RR 24, temperature 98.8degrees Fahrenheit, and Oxygen saturations of 88% on room air. His cardiac exam reveals a III/VI holosystolic murmur at the left sternal border as well as a S3 gallop. On lung exam, he has crackles bilaterally without wheezing. His extremities are cool to the touch but otherwise his physical examination is normal.

D) What is the differential diagnosis of shock in this hospitalized patient? What is the main difference in pathophysiology between the patients in case 1 and case 2?

E) What do you expect this patient's hemodynamic profile to be?

F) What are the next steps in the evaluation and management of this patient?

As you are waiting on the EKG, chest X-Ray, and labs, you ask the nurse to place the patient on 2L of oxygen. The EKG shows STT segment elevation in leads II, III, and aVF. You immediately page your resident and the cardiology fellow and have the nurse give the patient aspirin, nitroglycerin, and morphine sulfate. The cardiology fellow then arrives and immediately takes the patient to the cardiac catheterization lab.

Case Scenario #3

You are asked by your resident to evaluate a patient in the emergency room. The patient is a 45 year old Indian businessman with no medical problems who just returned from an overseas trip and presents with a one day history of abdominal pain and diarrhea. He is on no medications at home. In triage, the patient's blood pressure is noted to be 80/40, and the patient is immediately taken to an examination room.

A) What further questions do you have for this patient?

On physical examination, the patient is in mild to moderate distress with a HR of 140beats/min, BP of 90/60, RR of 18, and temperature of 99.8degrees Fahrenheit. His mucous membranes are dry. His cardiac exam is normal except for tachycardia, and his lung exam is normal. His abdominal exam reveals diffuse tenderness to palpation with hyperactive bowel sounds. The rest of the exam is normal. Rectal exam reveals a large amount of clear yellow, watery stool that is guaic negative**.**

B) What are some causes of shock and which would be most likely in this patient?

C) How would you proceed with the workup and treatment of this patient?

D) How would you management be different if this patient had a history of melena?