

20 Questions: Shock

1. You are called for a stab wound to the chest. The patient is a 23yo M who has a radial pulse, but no obtainable blood pressure. He is anxious and gasping for air. What are three life-threatening causes of shock that this patient might have?
2. How might you differentiate these on exam?
3. What is the definition of shock?
4. What are some basic signs of shock?
5. What are the three (or four, depending on how you look at them) basic categories of shock?
6. A 45yof is stung by a bee on the golf course and collapses. Her skin is warm and flushed, her systolic blood pressure (SBP) is 60. What treatment can you offer her and how does each work?
7. What are some other causes of vasogenic (distributive) shock?
8. An elderly nursing home resident has a fever and a systolic BP of 70. What is the most common cause of sepsis in the elderly?
9. Due to a long transport, and with permission of the receiving MD, you administer 3 liters of normal saline without a significant change in BP. Why might this be?
10. Why should septic shock **not** be thought of as just a problem with vascular tone?
11. Hooking up a 54yom to your Zoll you note ST elevation in leads II, III, and aVF consistent with an inferior MI. The patient's SBP is 70. His lungs are clear. What is the best therapy for this patient?
12. The brother of this patient is now having chest pain. His ECG shows ST elevation in V1-V3. His lungs have coarse crackles throughout. His SBP is 70 also. Should you offer him the same treatment?
13. What are some clues auscultating the heart may provide in these patients?
14. Because the patient seems to be in pulmonary edema and shock, should you give NTG or IV fluids?
15. A 24yo F who takes oral contraceptives is out for a smoke break, leaning on her crutches she's using for her broken leg when she has a syncopal event. On your arrival she is hyperventilating, with an O2 sat of 88%, clear lungs, and a BP of 80/60. What treatments should you start immediately?
16. Extricating a 20yo M from a Mini Cooper that was hit by a road grader, you note a tender abdomen and a SBP of 80. Enroute to the stab room the patient's SBP is 120 after 500cc of fluid. Should you continue to run an additional bag wide open?
17. Responding to a possible pediatric arrest, you find an obtunded two year old who has been vomiting and having diarrhea for several days. Only femoral and carotid pulses are present, the skin is cool. You place an IO line. How much fluid should be given initially?
18. Should this be run in the standard way, from a hanging IV bag?
19. For the pediatric patients in shock, which one of your routine tests should never be missed?
20. The child goes into cardiac arrest enroute to the hospital. Initial rhythm is PEA. Besides continuing the fluid push and giving an initial dose of 0.1ml/kg of 1:10,000 epi, what drug (and dose) should you request from medical control?

20 Answers: Shock

1. Tension pneumothorax, cardiac tamponade, and hemorrhagic shock from laceration of a major vessel. Remember the patient can bleed into body compartments, so hemorrhage may not be obvious.
2. **Tension pneumothorax:** look for crepitus ("rice crispy" sensation when palpating the skin that indicates subcutaneous air), absent breath sounds on one side, you may or may not find a narrow pulse pressure (small difference between systolic and diastolic), distended neck veins, & tracheal deviation – *treatment:* IV fluids and request decompression. Also, if you can ultrasound absent sliding signs is a very sensitive, quick and easy test for pneumothorax. **Cardiac tamponade:** location of wound suggests possible cardiac involvement, possible muffled heart tones, distended neck veins, narrow pulse pressure. The presence of distended neck veins with shock is a sign that obstruction of blood flow to the R side of the heart is occurring because of tamponade, tension PTX, PE, or MI with R ventricle

involvement. Any patient in shock showing this sign should, oddly enough, get IV fluids as their initial resuscitation! **Hemorrhagic shock:** wide pulse pressure, tachycardia, pale skin, tachypnea – *treatment:* IV fluids.

3. Shock is a state of inadequate perfusion, that is inadequate supply of oxygen to the tissues.
4. Remember that hypotension is a relatively late sign of shock and may never occur in some patients before cardiac arrest ensues. **The general order that progressive shock changes vitals: HR increase à hypotension à signs of end organ perfusion issues (most obviously AMS).** Restlessness and anxiety are generally present, thirst frequent, and diaphoresis with cool skin is common with traumatic causes of shock. Tachycardia occurs frequently, but relative bradycardia (that is, a normal pulse rate in the face of a huge blood loss) has been described in several large series of trauma and ectopic pregnancy patients. Rely on your clinical judgement and remember that even VS aren't a perfect indicator.
5. It is easiest to think of three major systems that give problems – the heart, the vessels, and the blood volume. These respectively are associated with cardiogenic, vasogenic, and hypovolemic shock. Some authors (and I think this is a good idea, because it prompts you to look for correctable causes) add obstructive shock to these three (tension PTX, tamponade, PE, etc.).
6. Anaphylaxis is primarily a vasogenic problem, though there is some evidence of direct myocardial depression during these events. Basically, the vessels all dilate in an overcompensatory allergic response to a stimulus, which leads to the warm skin (via dilation of the skin capillaries)... Fluids will help to fill the relative volume deficit, epinephrine acts to directly increase cardiac output and induce vasoconstriction, and diphenhydramine acts to block the continued release of histamine, which is one of the primary vasodilating culprits. **Epinephrine is the most important drug in these people because of the vasodilation.**
7. Sepsis and neurogenic shock are also relatively specific vasogenic shock states. Sepsis is shock due to a flood of toxins and inflammatory markers. The effects are widespread. Neurogenic shock can occur with high spinal cord injuries and other CNS issues – lack of innervation causes the vessels to lose their tone and dilate.
8. Urinary tract infection, with pneumonia closely behind. Not all hypotensive, febrile patients are in septic shock, as this definition is only met when the patient remains hypotensive despite adequate volume resuscitation, and most ill NH residents aren't exactly guzzling that refreshing Chippewa spring water...
9. In sepsis, and often other shock states the vessels not only may dilate inappropriately, but they may become leaky, such that HUGE amounts of volume are required to obtain a normal venous pressure. The fluid goes into the interstitial space (i.e. the space between the cells) and isn't always readily apparent on initial exam. This is referred to as third spacing, which is also the term that can be used when you're really out of it on your third shift in a row...
10. Septic patients generally have direct myocardial depression from the bacterial toxins in addition to the vasogenic shock. So it's a combined vasogenic/cardiogenic shock state which usually requires pressor agents for both the heart and vessels (as discussed with anaphylaxis). Also, MI and cardiac ischemia can occur due to the low blood pressure and the stress of the event. It's a good idea to assess all medical shock patients for cardiac ischemia.
11. **FLUID.** This patient probably has an inferior MI with R ventricle involvement and may need quite a bit of fluid (many liters, in some cases) to help him fill the R side of the heart. **Do not give nitroglycerin to these patients. Nitro acts to directly dilate the veins, causing decreased R-sided cardiac perfusion and worsening shock.**
12. NO. The main thing to assess with cardiogenic shock is the lungs. If they are clear, a fluid challenge is probably warranted, especially with inferior MI. If pulmonary edema is present, additional fluid is NOT generally indicated.
13. A new murmur may indicate that the patient has either had a valve fail (usually caused by tearing of one of the papillary muscles that support the valve) or had valve dysfunction due to ischemia of the heart muscle in that area (unable to contract/control the valve properly). Either of these can cause sudden pulmonary edema and often sudden death.
14. This can be a difficult dilemma. In a patient with pulmonary edema and high or normal BP, NTG helps to dilate the vessels and create more space for the fluid. The side effect is that the BP will fall. When a patient is in cardiogenic shock, the lungs collect fluid because the left ventricle is too sick to pump. Therefore, we should treat the shock with gentle IV fluids. This

can be a difficult situation but in this instance we fall outside the general pulmonary edema protocols due to the hypotension. The mortality from cardiogenic shock is very high (60%).

15. Oxygen and IV fluids. Once again, here is a case of obstructive shock in which the initial resuscitation is volume (usually a few liters) to try to get the R ventricle the optimum amount of fluid to work with. This is a massive PE.
16. No. This is an area of some controversy but it is probably safe to say that we do not need to be giving these patients IV fluids above that needed to get the patient normotensive (generally agreed upon as a SBP of 90mmHg or greater). The purported reason for this is that give more fluid to these patients may cause them to bleed more internally.
17. 20cc/kg of normal saline is the initial bolus.
18. No. You will either need pressure on the bag or will need to give flushes with a syringe (best method). These may be given quite rapidly. Gravity flow basically does not work with IO lines! **Keep a close eye on the site and surrounding soft tissues for growing edema and signs of extravasation.**
19. Glucose. A recent series from St. Paul Children's showed that nearly 20% of their critically ill patients were hypoglycemic. This child is highly likely to be hypoglycemic due to the nature of his illness (poor intake and high metabolic demand). 2mL/kg of D25 (D50 cut 1:1 with NS) should be given if the glucose is low – check with medical control if unsure.
20. Sodium bicarbonate 1ml/kg. Pediatric patients become severely acidotic when very dehydrated (mainly due to lactic acidosis from poor perfusion to the tissues). This is usually corrected with fluids but in critically ill or arrest states bicarb should be given to more rapidly normalize the pH (and thus improve cardiac function).