

SIMULATION CASE TITLE: Aortic Dissection
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PATIENT NAME: James Marshall
PATIENT AGE: 58
CHIEF COMPLAINT: Leg pain and numbness

Brief narrative description of case
Include the presenting patient chief complaint and overall learner goals for this case

A 58 year old male presents to the emergency room for severe leg pain x 2 hours. He is severely hypertensive and has no right femoral pulse on exam. He describes a severe episode of chest pain after using cocaine the previous night which is mostly resolved now. Bedside US reveals a dissection flap in the aortic root prompting a CTA, confirming proximal dissection. The goals of this case include:

- 1) Demonstrate teamwork
- 2) Elicit subtle history and physical exam findings
- 3) Generate a broad differential diagnosis
- 4) Prioritize essential testing and interventions

Primary Learning Objectives
What should the learners gain in terms of knowledge and skill from this case? Use action verbs and utilize Bloom's Taxonomy as a conceptual guide

- 1) Goal: Demonstrate teamwork - a) identify a clear team leader b) use closed loop communication c) direct communication toward a single individual by calling their name or identifying them d) ask for drugs using name, amount, and route of administration (not just name)
- 2) Goal: Elicit subtle history and physical exam findings - a) elicit a thorough history in a patient with non specific complaints b) perform appropriate examinations based on patients chief complaint, history, and your differential diagnosis.
- 3) Goal: Generate a broad differential diagnosis - a) consider emergent diagnosis first and ask historical questions and perform physical exam maneuvers that would confirm/deny these diagnosis b) consider non emergent diagnoses second
- 4) Goal: Prioritize essential testing and interventions - a) Manage ABC's and reassess them frequently as the patient's status changes b) perform testing to rule out emergent diagnosis first

Critical Actions
List which steps the participants should take to successfully manage the simulated patient. These should be listed as concrete actions that are distinct from the overall learning objectives of the case.

1. Place patient on monitor.
2. Obtain IV Access.
3. Check bilateral blood pressures and bilateral pulses in both upper and lower extremities, centrally and peripherally (carotids, radials, femorals, DP).
4. Perform a full neurologic examination and GU examination.
5. Use POCUS to narrow differential (DVT, arterial clot, dissection flap, AAA)
6. Administer antihypertensive medications to lower blood pressure.
7. Consult a CV surgeon for definitive management of proximal aortic dissection.

Learner Preparation <i>What information should the learners be given prior to initiation of the case?</i>	<ol style="list-style-type: none"> 1. Welcome learners, introduce yourself. 2. Ask learners to be respectful, courteous, and curious. 3. Introduce goals and objectives of simulation. 4. Allow learners to orient themselves to environment. 5. Discuss confidentiality, assessment, and learner expectations. 6. Fiction contract.
Required Equipment <i>What equipment is necessary for the case?</i>	<ol style="list-style-type: none"> 1) Vital Signs Monitor (with telemetry leads, bp cuff, O2 sat sensor) 2) Peripheral IV supplies (angiocath, saline flushes, disinfectant, saline lock, gauze, tourniquet, sharps container, gloves) 3) Central line supplies (central line kit) 4) Arterial line supplies (arterial line, tape, sterile gloves) 5) Intubation supplies (et tube, calorimeter, end tidal cO2, 10 cc syringe, suction, mac/miller blade, stylet, bougie) 6) Ultrasound machine (with linear and abd/phased array probe, probe covers, gel)

INITIAL PRESENTATION	
Initial vital signs	HR: 89/min BP: 211/110 RR: 28/min O ₂ SAT: 99 % T: 98.2 °F
Overall Appearance <i>What do learners see when they first enter the room?</i>	A gentleman in his 60's, clutching his right leg in pain.
Actors and roles in the room at case start <i>Who is present at the beginning and what is their role? Who may play them?</i>	Patient will provide history.
HPI <i>Please specify what info here and below must be asked vs what is volunteered by patient or other participants</i>	58 year old gentleman presenting with right groin and right leg pain, onset during s 2 hours PTA. Also complains of severe chest pain last night after using cocaine, mild now, and b/l lower extremity numbness. No recent travel, leg swelling, hx of DVT or PE. (asked) No trauma to back or leg. (asked) No hx of cancer. (asked). Severe chest pain after doing cocaine. (asked x 2 because initially he does not remember) No headache, dizziness, shortness of breath (asked)
ROS	+ nausea/vomiting (NB NB) x 3
Past Medical History	Hypertension
Past Surgical History	None
Family History	None

Medications	Lisinopril 20 mg daily (noncompliant)
Allergies	NKDA
PHYSICAL EXAMINATION	
General	In moderate distress, clutching right thigh.
HEENT	NCAT; Pupils equally reactive to light; no intra oral lesions.
Neck	Supple; 3+ equal carotid pulses.
Respiratory	lungs CTA b/l, no acc muscle use, mild tachypnea
Cardiovascular	RRR no murmurs
Abdomen	Soft, nt, nd
Neurological	A&Ox3; CN 2-12 intact. 5/5 strength in upper extremities. 4/5 strength in RLE. 5/5 strength in LLE. No dysmetria. Decreased sensation in b/l lower extremities.
Skin	No diaphoresis, rash, erythema.
GU	Circumcised; No erythema, induration, or wounds of scrotum noted; No ttp of b/l testes or perineum; No penile lesions; Sensation intact throughout perineum and inner thighs; Good rectal tone;
Extremities	Radial pulses 3+ bilaterally (normal). No right femoral pulse detected. Left femoral pulse 3+
Psychiatric	Normal affect.

SCENARIO STATES, MODIFIERS AND TRIGGERS

- 1. The learners should attempt to lower the blood pressure. If any oral medication to lower blood pressure is given, there will be no response. If an IV push is given, there will be temporary response. If a drip is initiated, there will be a small response which will require increasing the drip rate.*
- 2. The learners should treat the patient's severe leg pain and administer an anti-emetic concomitantly. If no anti-emetic is given the patient will vomit. If no pain medication is administered the patient will complain of increasing pain and numbness and will state that his right leg appears a different color than his left.*
- 3. The learners should obtain some imaging querying for AD expeditiously (XR chest, portable XR chest, CTA, bedside POCUS)*

PATIENT STATUS	LEARNER ACTIONS, MODIFIERS & TRIGGERS TO MOVE TO THE NEXT STATE
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<p>1. Baseline</p> <p>Rhythm: SR HR: 89/min BP: 211/110 RR: 28/min O₂SAT: 99% T: 98.2°F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> Place patient on monitor Obtain IV access Assess ABC's Administer anti-hypertensive medication Administer pain medication full H&P 	<p><u>Modifiers:</u></p> <p><i>Changes to patient condition based on learner action</i></p> <ul style="list-style-type: none"> anti-hypertensive medication: (none or oral = no response - status 2; IV push - temporary response - status 3; drip - minimal response but will respond if drip increased - status 3) pain medication - no response to oral pain medications, minimal response to toradol; moderate response to appropriate weight based morphine/opiates; will vomit if opiates administered w/out ondansetron; <p><u>Triggers:</u></p> <p><i>For progression to next state</i></p> <ul style="list-style-type: none"> administration of pain and or anti-hypertensive medication completion of history and physical exam
<p>2. No Anti-HTN or Pain medication given</p> <p>Rhythm: SR HR: 90/min BP: 220/110 RR: 28/min O₂SAT: 99% T: 98.2°F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> Obtain portable XR chest or 2 view chest Perform POCUS for DVT, arterial clot, and AAA, dissection (echo, abdominal aorta studies) Order CTA pain or anti-HTN medication 	<p><u>Modifiers:</u></p> <ul style="list-style-type: none"> anti-hypertensive medication: (none or oral = no response - status 4; IV push - temporary response - status 4; anti-HTN drip - status 5) pain medication - no response to oral pain medications, minimal response to toradol; moderate response to appropriate weight based morphine; will vomit if morphine administered w/out ondansetron; <p><u>Triggers:</u></p> <ul style="list-style-type: none"> administration of pain and or anti-hypertensive medication recognition of dissection with appropriate treatment (anti-HTN drip) 3 min
<p>3. Some Anti-HTN or Pain medication given</p> <p>Rhythm: SR HR: 90/min BP: 200/100 RR: 26/min O₂SAT: 99% T: 98.2°F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> Obtain portable XR chest or 2 view chest Perform POCUS for DVT, arterial clot, and AAA, dissection (echo, abdominal aorta studies) Order CTA additional anti-HTN medication 	<p><u>Modifiers:</u></p> <ul style="list-style-type: none"> anti-hypertensive medication: additional oral or IV push - temporary response - status 4; increase anti-htn medication by adding drip or increasing drip - status 5 pain medication - no response to oral pain medications, minimal response to toradol; moderate response to appropriate weight based morphine; will vomit if morphine administered w/out ondansetron <p><u>Triggers:</u></p>

<p>4. AMS; patient lethargic, difficult to arouse,</p> <p>Rhythm: SR HR: 100/min BP: 230/120 RR: 26/min O₂SAT: 99% T: 98.2°F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> • intubation • bedside imaging (portable XR chest or POCUS) • CTA 	<p><u>Modifiers:</u></p> <ul style="list-style-type: none"> • no intubation → status 6 • intubation → status 5 <p><u>Triggers:</u></p> <ul style="list-style-type: none"> •
<p>5. Anti-htn drip administered at appropriate rate</p> <p>Rhythm: SR HR: 80/min BP: 160/80 RR: 20/min O₂SAT: 99% T: 98.2°F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> • CTA • vascular/CV surgery consultation 	<p><u>Modifiers:</u></p> <ul style="list-style-type: none"> • surgery called and/or CTA obtained - end case • no surgery OR CTA performed - status 4 <p><u>Triggers:</u></p> <ul style="list-style-type: none"> • as above
<p>6. deteriorating AMS - patient non arousable</p> <p>Rhythm: SR HR: 100/min BP: 230/120 RR: 32/min O₂SAT: 99% T: 98.2°F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> • intubation 	<p><u>Modifiers:</u></p> <ul style="list-style-type: none"> • no intubation - end case • intubation - status 5 <p><u>Triggers:</u></p> <ul style="list-style-type: none"> • as above

SUPPORTING DOCUMENTS, LAB RESULTS AND MULTIMEDIA	
Lab Results	lactic acid 8.9 mmol/l
EKG	sinus tachycardia

CXR CT imaging	widened mediastinum
Ultrasound Video Files	

SAMPLE QUESTIONS FOR DEBRIEFING
<ol style="list-style-type: none"> 1. What are your thoughts on your team's communication? 2. Are there any other questions on history or maneuvers on physical exam that you would have wanted to elicit? 3. What was on your differential? 4. What testing did you perform and why? 5. How is aortic dissection treated in the ER? 6. What is the definitive treatment for aortic dissection?

Ideal Scenario Flow

The learners enter the room to find a patient clutching their right leg in pain, complaining of leg and groin pain and numbness in the lower extremities. They place the patient on bedside monitors and recognize that the patient is severely hypertensive. Airway and breathing are intact but circulation reveals and absent R femoral pulse and normal left femoral pulse (if femoral pulses are checked). Anti-hypertensive medications and/or pain medications may be administered by the team. After completing a physical examination and obtaining an appropriate history, the providers note that the patient's blood pressure continues to climb and the patient complains of increasing pain. On examination, a slight color change is noted in the right leg compared to left. An imaging study should be ordered or performed from which the learners recognize the patient is having an aortic dissection. (XR chest - widened mediastinum, POCUS - aortic root flap and AA flap, CTA - dissection from x to y). The learners should initiate an anti-HTN drip, treat the patient's pain, and obtain cardiovascular surgery consultation. If the learners do not recognize the pathology and initiate an antihypertensive medication, the dissection continues to progress proximally (it is already quite distal) until the carotids are affected and the patient's mental status deteriorates. Intubation will be required. If recognition still does not occur, the patient will deteriorate into cardiac arrest and expire regardless of all interventions.

Anticipated Management Mistakes

1. Failure to elicit a thorough history: We found when using this case that many of our learners did not ask about chest pain, abdominal pain, back pain, or flank pain due to the fact that the patient had pain in an extremity on initial presentation only.
2. Failure to perform a thorough exam: Some of our learners did not check femoral pulses.
3. Failure to expeditiously perform an imaging study: Many of our learners did not order an imaging study in an expeditious manner, all of which would have shown evidence of an aortic dissection.