Infusion Reaction Scenario

SIMULATION CASE TITLE: Infusion Reaction: Anaphylaxis

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LEARNER AUDIENCE: Internal Medicine Interns

PATIENT NAME: Ana Smith

PATIENT AGE: 65

CHIEF COMPLAINT: Pruritis soon after the initiation of infusion

PHYSICAL SETTING: Hospital; general medicine ward

Brief narrative description of case	Ms. Smith is a 65-year-old woman, admitted to the hospital with recurrent ANCA-associated vasculitis, has been initiated on rituximab infusion. About 15 minutes after the infusion starts, she develops pruritis of her extremities and mouth, followed by urticaria, nausea, abdominal cramps, facial and oropharyngeal edema, shortness of breath, and respiratory failure. Improves after administration of intramuscular (IM) epinephrine.
Primary Learning Objectives	By the end of this simulation case, learners will be able to: 1. Evaluate a patient with an acute infusion reaction 2. Formulate a differential for severity of infusion reactions 3. Manage a patient with anaphylaxis and anaphylactic shock
Critical Actions	1. Obtain vital signs (from RN or performs) 2. Obtain focused history (onset of pruritis, lip/tongue swelling, dyspnea, dysphagia, prior infusions/drug reactions, allergies, pre-medications given, infusion rate, any interventions already started?) 3. Performs focused physical exam (mental status, examine mucosa, limited skin exam, respiratory, cardiovascular, abdominal) 4. Slow down infusion/continue at the same rate but repeat vital signs at regular intervals 5. When urticaria and dyspnea develop, stop infusion, check vitals, call RRT/code, examine mucosa/lungs/heart, administer

	epinephrine IM, place patient on oxygen, administer IV fluids and diphenhydramine +/- methylprednisolone, +/- H-2 blocker 6. Place pads on patient 7. Quickly administer of IM epinephrine when urticaria, mucosal swelling, and abdominal cramping occur 8. Place rituximab on the allergy list
Learner Preparation or Prework	The learner will be provided with the brief history of present illness from the care nurse upon entering the room. The learner will also have a printed handoff sheet from the primary team, from which they may obtain additional information about the patient.

INITIAL PRESENTATION	
Initial vital signs	T 37.5C (99.5F), BP 135/80, HR 90, RR 14/min, SpO2 98% on room air
Overall Setting and Appearance	The patient, represented by a manikin, is upright in the hospital bed. The care nurse is at the bedside providing reassurance to the patient and greets the house officer upon arrival. Rituximab is infusing through the patient's single IV-line, patient is in mild distress.
Confederates (e.g., standardized participants) and their roles in the room at case start	**Primary learner(s):** Internal Medicine interns who will direct the care of the patient in the scenario. Two interns share this role. They are providing cross-cover care to the patient. **The patient:** Represented by a manikin – the Sim Man – which is enabled with both a microphone and a speaker. The patient's voice is provided by a simulation staff member in an adjacent room, who watches the simulation case through a window and can hear the questions and comments from the learners and nurses via a microphone. The patient complains of itchiness, feels dizzy and clammy. She has never had these symptoms before. This is her third time receiving rituximab. Her first two infusions, 14 days apart, were administered 7 months ago.

	The care nurse (confederate): The patient's primary nurse, who is played by a simulation faculty member. The nurse pages the primary learner to report the patient's development of pruritis, dizziness, diaphoresis. The nurse reports that the patient developed symptoms 15 minutes after the initiation of infusion. **Observer (confederate):** A simulation faculty member who will observe the simulation, track critical actions to help guide the debrief, and end the scenario.		
HPI	Mrs. Smith is a 65-year-old woman admitted overnight for a pulmonary flare of previously diagnosed ANCA-associated vasculitis, for which the rituximab infusion was initiated. 15 minutes after the start of the infusion, she complains of itchiness in her arms, dizziness, sweating, and calls the nurse. **Additional information if asked:** Mrs. Smith complains of tingling around her mouth but there is no visible rash. No shortness of breath. She is starting to feel some abdominal cramping. She initially presented with hemoptysis, which is unchanged in frequency and volume. No diarrhea, constipation, dysuria, hematuria. No fevers or chills currently. This is her third infusion of rituximab. Last infusions were two weeks apart, administered 7 months ago. She did not have any side effects associated with prior infusions of rituximab. **Infusion information:** Started 15 min ago Dose – 1000 mg Rate – 100 mg/hr Premedication: Diphenhydramine 25 mg po, acetaminophen 650 mg po, methylprednisolone 100 mg IV RN has not stopped or changed the rate of the infusion		
Past Medical/Surgical/Social History	**Inpatient Medications**	**Allergies**	**Family History**
ANCA-associated vasculitis Essential hypertension Hyperlipidemia GERD Does not smoke or drink alcohol; no illegal drug use	Aspirin 81 mg daily Losartan 50 mg daily Atorvastatin 40 mg daily Prednisone 60 mg daily Rituximab 1000 mg every 6 months	None	Mother – hypothyroidism Father – heart disease

Physical Examination	
General	Mildly anxious, no acute distress; sitting up in bed
HEENT	Eyes open, pupils round and reactive, no lip/tongue/uvular edema
Lungs	Clear bilaterally
Cardiovascular	Normal rate, regular rhythm, no murmurs, 2+ pulses equal in all extremities
Abdomen	Soft, nontender, nondistended, normal bowel sounds
Neurological	Alert, oriented to self, location, year and circumstance; cranial nerves II-XII intact; no focal motor or sensory deficits
Skin	Warm, dry, no rashes at first; *develops urticarial rash on extremities and trunk a few minutes after the initial exam*

INSTRUCTOR NOTES - CHANGES AND CASE BRANCH POINTS		
Intervention / Time point	**Change in Case**	**Additional Information**
Slow down infusion/keep the same rate	In about 15 minutes the patient states "I am about to die", complains of chest tightness, shortness of breath, hives on arms and legs, crampy abdominal pain, nausea, and sensation of tongue swelling Exam: acute distress, diaphoresis, swelling of tongue and lips, wheezing with stridor, tachycardia, abdominal tenderness diffusely, urticarial rash diffusely	BP 110/40 HR 125 T 100.5 F (38^{o}C) RR 25 98% on RA If EKG ordered: sinus tachycardia If CXR ordered: known cavitary lesion above diaphragm and several nodules throughout, unchanged from admission X-ray
If IM epinephrine given	Patient's breathing improves and she feels much less anxious She still has urticaria	BP 115/75 HR 132 T 100 RR 16 98% on RA
If fluids and diphenhydramine given after IM epinephrine	Urticaria resolves, patient now feels comfortable	Vitals return to baseline

IF something other IM epinephrine given (IV solumedrol, IV Diphenhydramine, etc.)	Respiratory distress worsens, patient is no longer able to speak, RN asks if the provider thinks epinephrine may be useful in this case, as she has seen it done before in a similar situation	BP continues to decrease HR increases Respiratory rate increases → until IM epinephrine is given and then as above
If IV epinephrine ordered instead of IM	RN states that she has IM epinephrine more readily available and she has seen providers administer IM formulation in this situation	See above for resolution of the case with IM epinephrine
Labs are ordered	WBC 9,000/mm^3; Hgb 11.4 mg/dL Hct 35%; Plts 267,000/mcL; diff – 15% eosinophils Na 138 mmol/L; K 3.8 mmol/L; Cl 102 mmol/L; CO_2 22 mmol/L; BUN 16 mg/dL; Cr 0.7 mg/dL; glucose 143 mg/dL AST 28 U/L; ALT 30 U/L; ALP 42 U/L; Total bilirubin 1.1 mg/dL; albumin 3.7 g/dL; Ca 9.7 mg/dL; total protein 6.3 g/dL TSH: 3.02 µIU/mL ABG when respiratory distress: pH 7.49, pCO_2 = 28, pO_2 = 90, HCO_3 = 25 Lactate = 1.4 Tryptase (if asked) = 25 ng/mL [1-11]	
CXR is ordered	Multiple scattered nodules and cavitary lesion in RLL	See Appendix for CXR***
EKG is ordered	Sinus tachycardia	

Ideal Scenario Flow

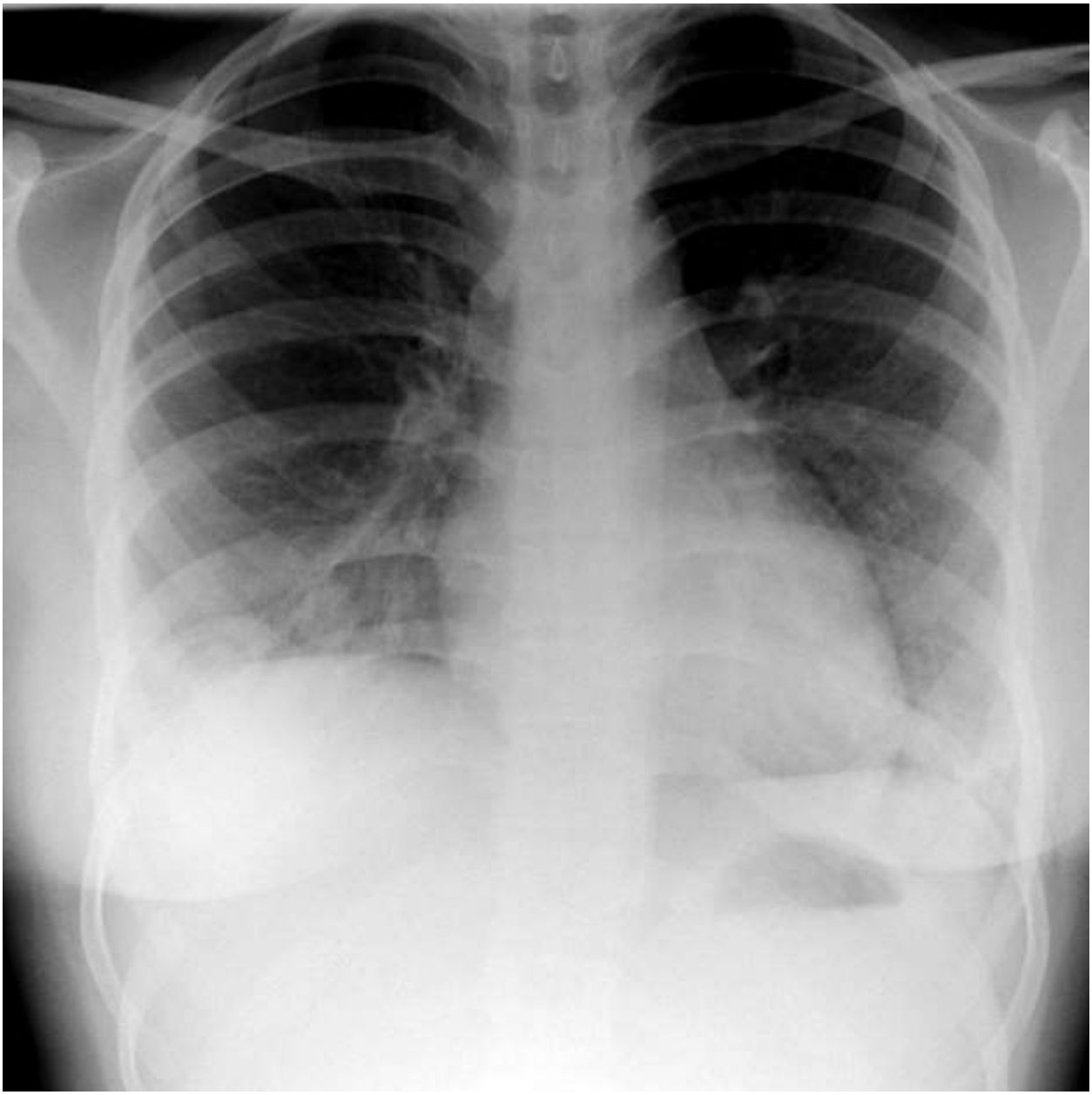
Provide a detailed narrative description of the way this case should flow if participants perform in the ideal fashion.

The learners find the patient is in no significant distress initially, complaining only of dizziness and itching. They check the vitals, including temperature, do a quick but thorough exam (mucosa, chest, heart, abdomen, skin), talk to the patient, inquire about any infusions/dose/rate/initiation. They ask to slow down infusion, +/- give diphenhydramine for itching, and get an update in 10-15 minutes. We pretend 15 minutes have passed, they get paged again that patient now has difficulty breathing. They notice patient now has anaphylaxis, immediately stop the infusion, call emergency response, place her on oxygen, recheck vitals, and ask for IM epinephrine. Pads are placed on the patient while epinephrine is being brought to the room. When IM epinephrine is found, it is administered into the thigh immediately without removing clothes if any. IV fluids and IV Diphenhydramine +/- IV H2 blocker (e.g., famotidine)

are given shortly after. Rituximab is placed on the patient's allergy list. She is monitored on telemetry and advanced to step-down status.

Anticipated Management Mistakes
Provide a list of management errors or difficulties that are commonly encountered when using this simulation case.

1. Failure to recognize anaphylaxis
2. IV epinephrine suggested at the cardiac arrest dose instead of IM epinephrine or IM dose given IV
3. Failure to call the emergency response (rapid response team)
4. IV solumedrol is given instead of or prior to epinephrine
5. Incorrect administration of epinephrine
6. Failure to place rituximab on the allergy list



Case courtesy of Dr Angela Byrne, Radiopaedia.org, rID: 8123