AMSER Case of the Month
May 2020

70-year-old female presenting with shortness of breath.

Christopher Sherry, OMS-III

Lake Erie College of Osteopathic Medicine

Timothy Mickus, M.D.

Mathew Hartman, M.D

Allegheny Health Network

Patient Presentation

- HPI: 70-year-old female, with a past medical history of asthma, presenting with productive cough, shortness of breath, diarrhea, and nausea. Stated she had a fever of 101^{o}, starting the day prior, and a cough with clear to yellow production.
- PMHx: Asthma
- PSHx: None
- Medications: None
- SHx: never a smoker
- Physical Exam: Rales on Right side
- Vital Signs: Temp: 97.8 ^{o} F (36.6 C), HR: 76 bpm

  RR: 22 bpm, BP: 114/72, mild hypoxemia on SpO2%

Pertinent Labs

- CBC
  - WBC: 5.34
  - Hemoglobin: 12.8
  - Hematocrit: 36.6
  - Platelets: 139,000
- Influenza A and B (PCR): Normal

What Imaging Should We Order?

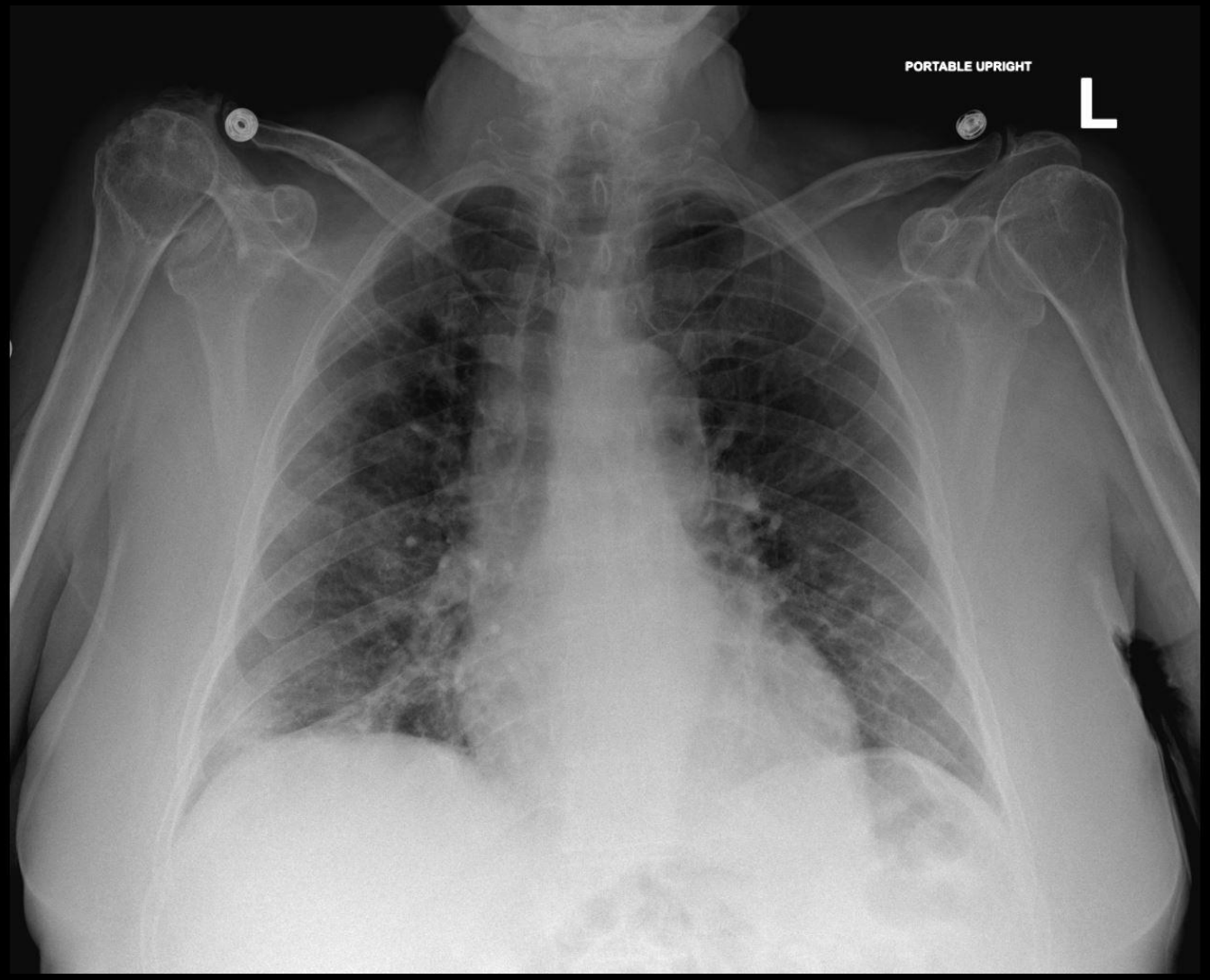
Select the applicable ACR Appropriateness Criteria

Variant 2: **Acute respiratory illnesses in immunocompetent patients with positive physical examination, abnormal vital signs, organic brain disease, or other risk factors. Initial imaging.**

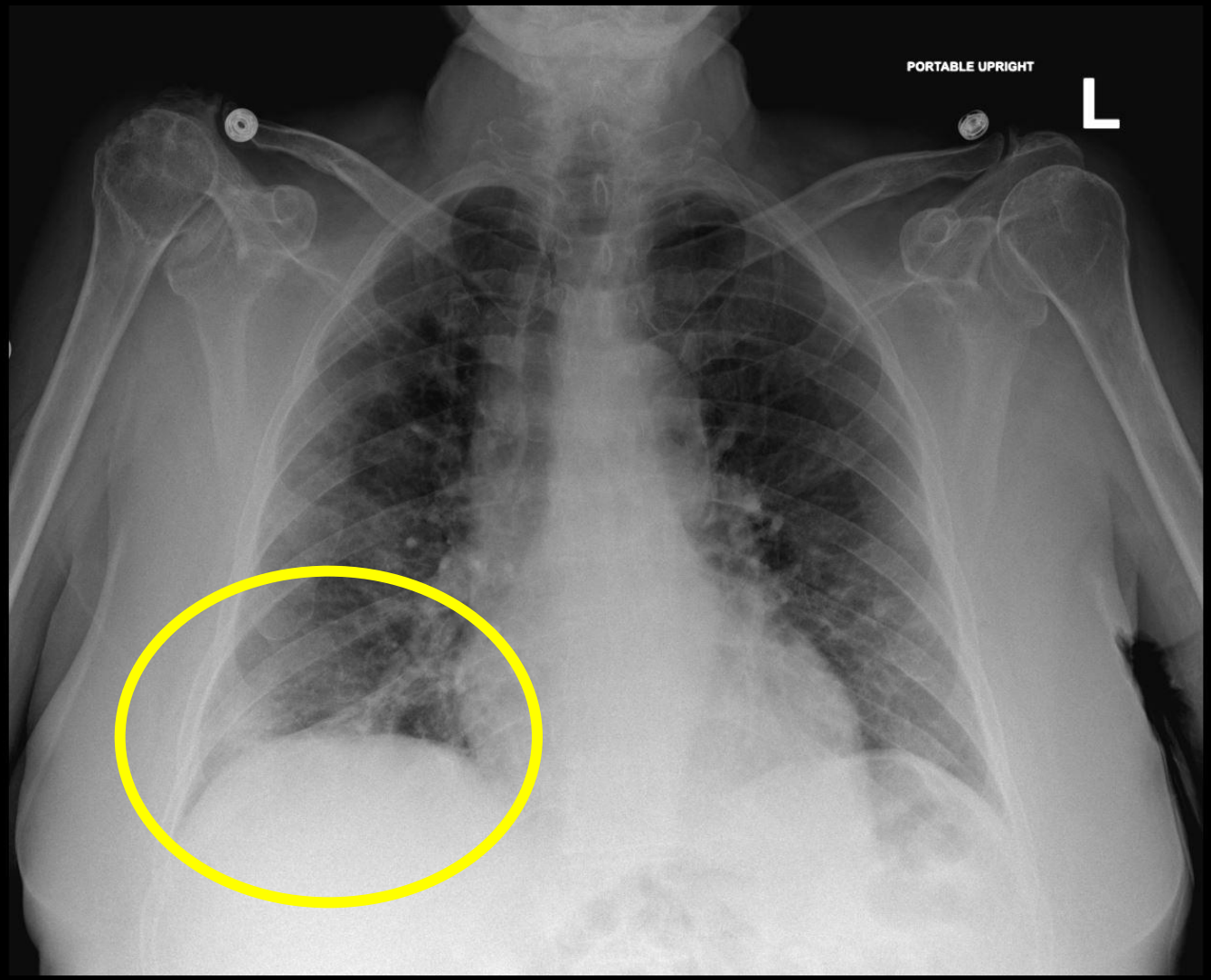
Procedure	Appropriateness Category	Relative Radiation Level
Radiography chest	Usually Appropriate	☢
US chest	May Be Appropriate	O
CT chest with IV contrast	Usually Not Appropriate	☢☢☢
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
CT chest without IV contrast	Usually Not Appropriate	☢☢☢
MRI chest without and with IV contrast	Usually Not Appropriate	O
MRI chest without IV contrast	Usually Not Appropriate	O

This imaging modality was ordered by the ER physician

Chest X-Ray



Chest X-Ray Findings



- Subtle opacity overlying the right lung base (circle)
- Lungs are otherwise clear
- Cardiomediastinal silhouette is normal
- No pleural effusion or pneumothorax

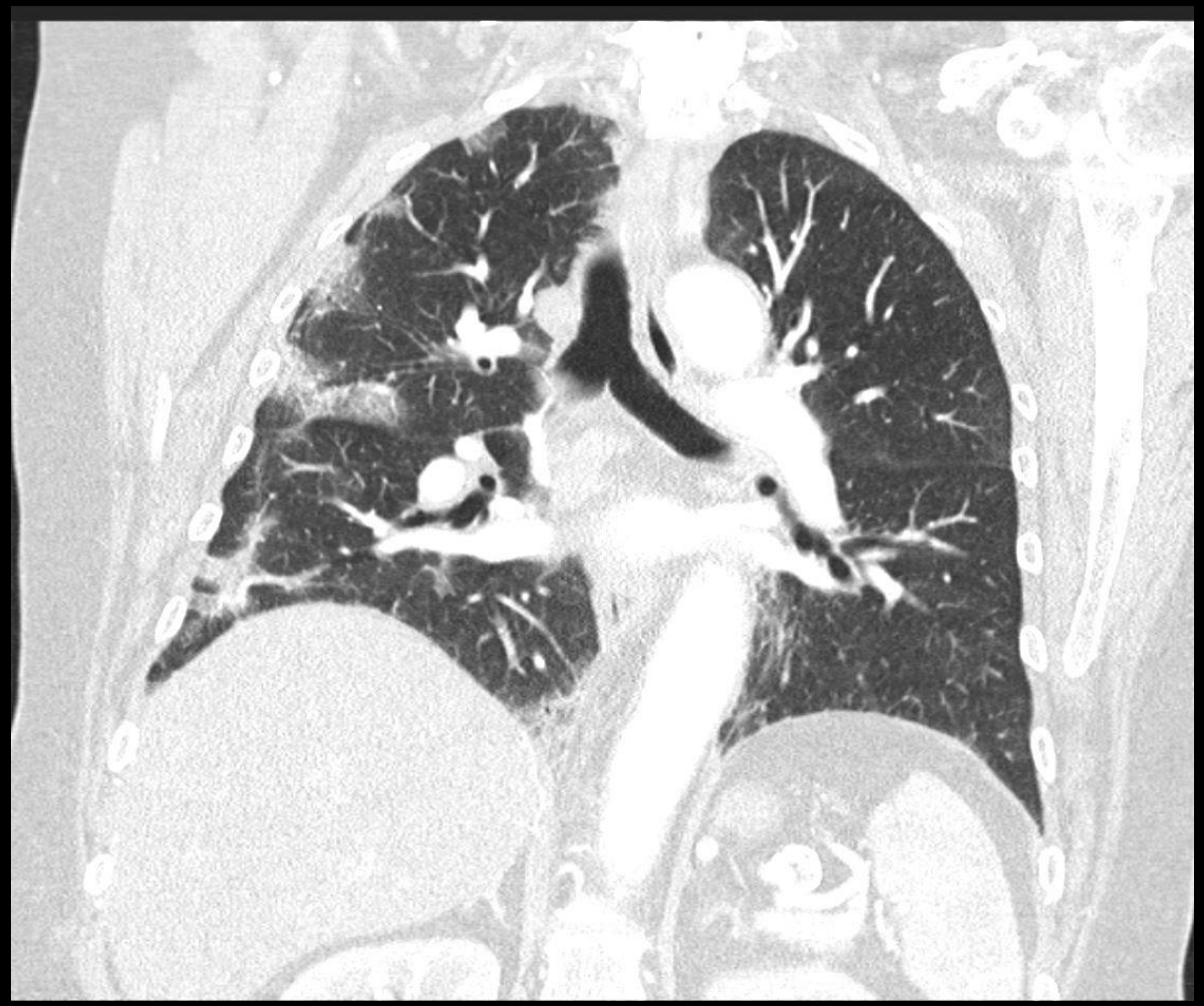
Next Step

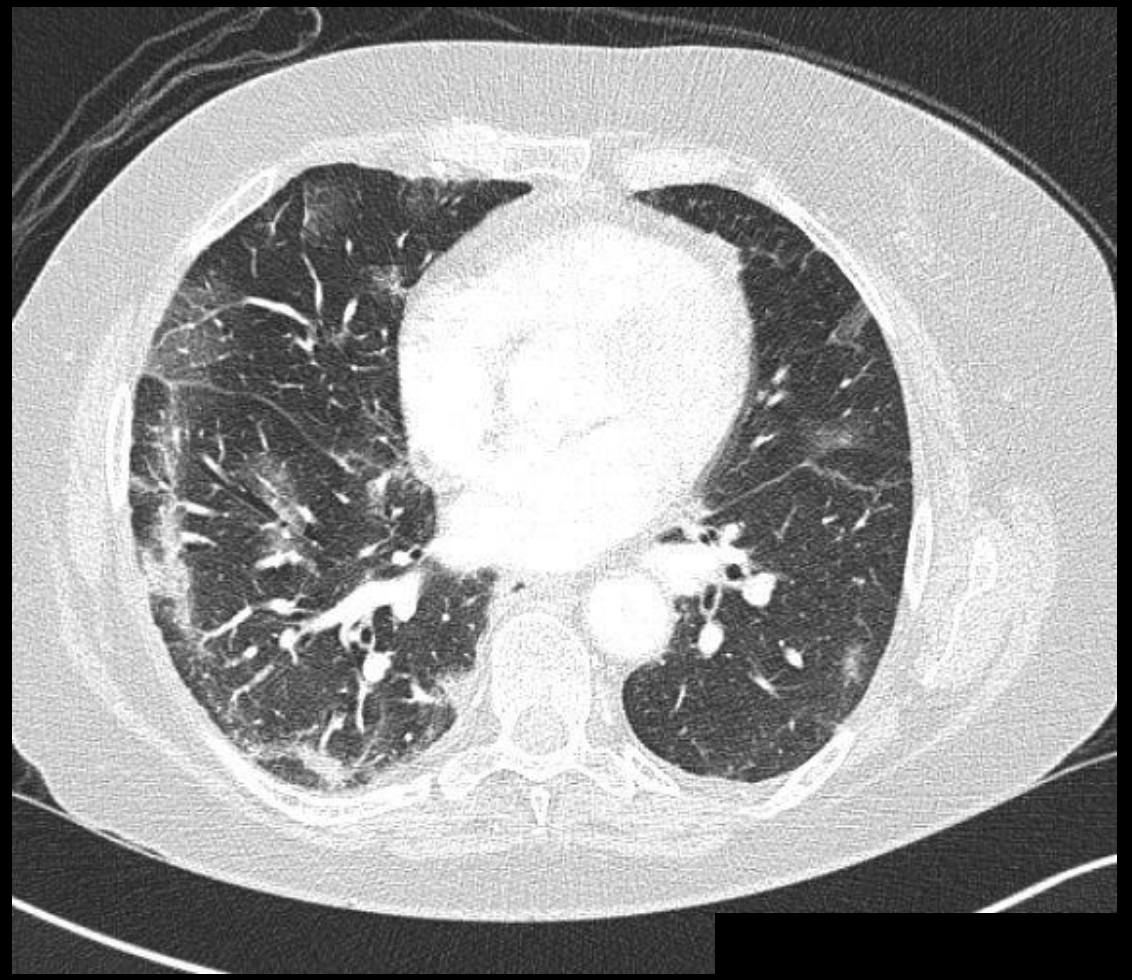
Variant 3: **Acute respiratory illness in immunocompetent patients with positive physical examination, abnormal vital signs, organic brain disease, or other risk factors and negative or equivocal initial chest radiograph. Next imaging study.**

Procedure	Appropriateness Category	Relative Radiation Level
CT chest without IV contrast	Usually Appropriate	☢ ☢ ☢
CT chest with IV contrast	May Be Appropriate (Disagreement)	☢ ☢ ☢
US chest	May Be Appropriate	O
CT chest without and with IV contrast	Usually Not Appropriate	☢ ☢ ☢
MRI chest without and with IV contrast	Usually Not Appropriate	O
MRI chest without IV contrast	Usually Not Appropriate	O

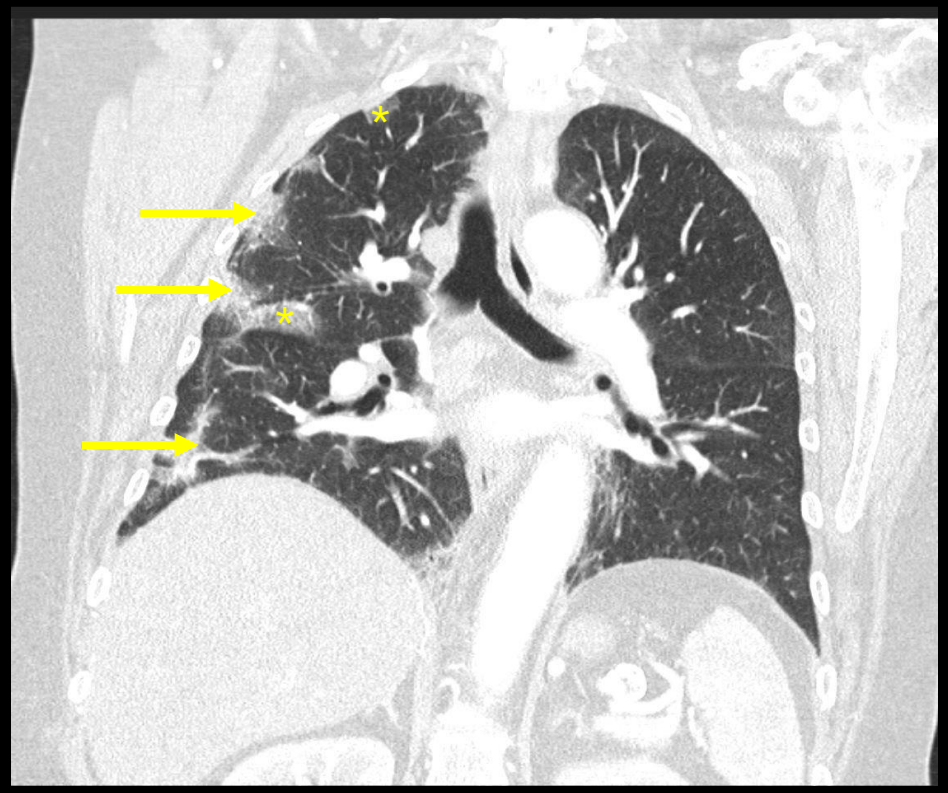
This imaging modality was then ordered by the ER physician

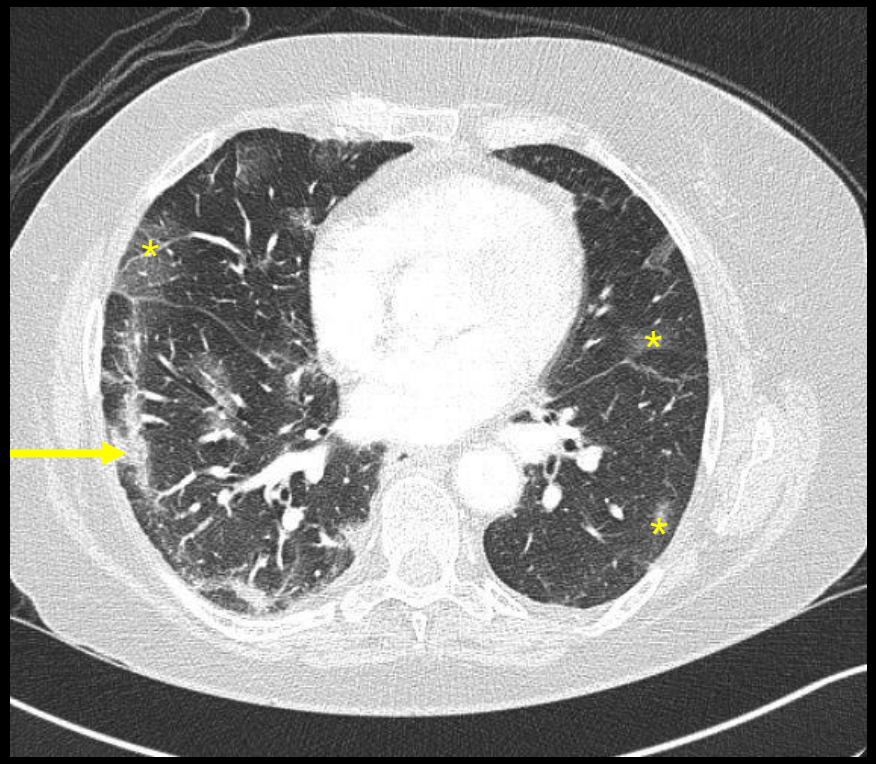
CT scan with IV contrast





CT Findings





Coronal and Axial CT images with contrast show patchy bilateral ground glass opacities (*) in all lobes, with more confluent peripheral band-like areas of consolidation in the right upper and lower lobes (arrows)

The patient was initially treated with IV antibiotics as CT showed questionable viral versus bacterial pneumonia. COVID-19 testing was ordered, which returned positive. Antibiotics were discontinued, the patient was admitted with droplet precautions, and appropriate treatment for asthma exacerbation was administered.

Final Dx:

COVID-19 infection

Case Discussion

- ACR Recommendations for the use of Chest Radiography and Computed Tomography for suspected COVID-19 infection:
  - The Centers for Disease Control (CDC) does not currently recommend CXR or CT to diagnose COVID-19. Viral testing with reverse transcriptase PCR, collected from the upper respiratory (nasopharyngeal and oropharyngeal swabs) or lower respiratory tract, remains the only specific method of diagnosis.
  - Findings on chest imaging in COVID-19 are not specific, and overlap with other infections, including influenza, H1N1, SARS, and MERS.
- Therefore:
  - CT or CXR should not be used to screen or as the first line test for diagnosis of COVID-19 as abnormal results is not specific to COVID-19. Also normal chest imaging should not exclude COVID-19 diagnosis, especially with new onset symptoms.

Discussion continued

- COVID-19 was first reported in Wuhan, China where it was presumed to be zoonotic in origin. Either pangolin or bat are the most likely original host.

- While chest radiographs and chest CT should not be used for screening patients for COVID-19, radiographic findings can be identified in asymptomatic patients, and it is important for the radiologist to be aware of the findings and to communicate this to the primary team.

Discussion continued

- Chest radiographs may be equivocal on presentation and early stages but may progress to show multifocal, bilateral airspace consolidation.
- CT imaging may show peripheral distribution of ground-glass opacities. “Crazy-paving” (ground glass opacity with superimposed intra- and interlobular septal thickening) and “reverse-halo” (focal ground glass opacity surrounded by more dense consolidation) signs may be seen as the disease progresses.
- Pleural effusions, pulmonary nodules, and thoracic lymphadenopathy are not a typical findings.
- Differential diagnosis should include: COVID-19 pneumonia, bilateral viral or bacterial pneumonia, cryptogenic organizing pneumonia, acute eosinophilic pneumonia.

References:

- Bernheim A, Mei X, Huang M, et al. Chest CT findings in coronavirus disease-19 (COVID-19): relationship to duration of infection [published online ahead of print February 20 200463]. Radiology. 2020.
- Pan F, Ye T, Sun P, et al. Time course of lung changes on chest CT during recovery from 2019 novel coronavirus (COVID-19) pneumonia [published online ahead of print February 13 200370]. Radiology. 2020.
- American College of Radiology ACR Appropriateness Criteria® Acute Respiratory Illness in Immunocompetent Patients. https://acsearch.acr.org/docs/69446/Narrative/

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