

# AMSER Case of the Month

## August 2020

### Lower Respiratory Infection in the Setting of Incarceration During Ongoing Respiratory Virus Pandemic

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# Patient Presentation

- Mr. Z is a 52 y/o M
- History of Present Illness
  - 1 week of non-productive cough
  - Progressively worsening dyspnea
  - Subjective fever
  - Decreased appetite
  - Loss of taste
  - Placed on 3L NC by EMS
  - COVID19 Test Negative 1 month ago
- PMH
  - HTN
  - GERD
  - Arthritis
- Social History
  - Inmate at regional correctional facility (Incarceration 27 years)
  - Multiple active COVID-19 positive cases at facility
  - Denies contact with known positives
  - 2 pack/day x 25 years smoking history, quit 2010
  - “Worked in charcoal plant”

# Pertinent Vitals and Physical Exam

- No Acute Distress, A&Ox4
- HEENT & Neck: Normal
- Cardiovascular: RRR, no murmur, normal perfusion, no edema
- Respiratory: Decreased vesicular breath sounds, no wheezing rales, ronchi, or accessory muscle use
- SpO2 90% on NC, RR 18
- T 36.8 C (s/p Tylenol), BP 99/67

What Imaging Should We Order?

Name	Category	Adult RRL
Radiography chest	Usually appropriate	☢ <0.1 mSv
US chest	May be appropriate	0 0 mSv
MRI chest without and with IV contrast	Usually not appropriate	0 0 mSv
MRI chest without IV contrast	Usually not appropriate	0 0 mSv
CT chest with IV contrast	Usually not appropriate	☢☢☢ 1-10 mSv
CT chest without and with IV contrast	Usually not appropriate	☢☢☢ 1-10 mSv
CT chest without IV contrast	Usually not appropriate	☢☢☢ 1-10 mSv

**CXR was ordered in the ED**  
**Exam performed @ 13:01**

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

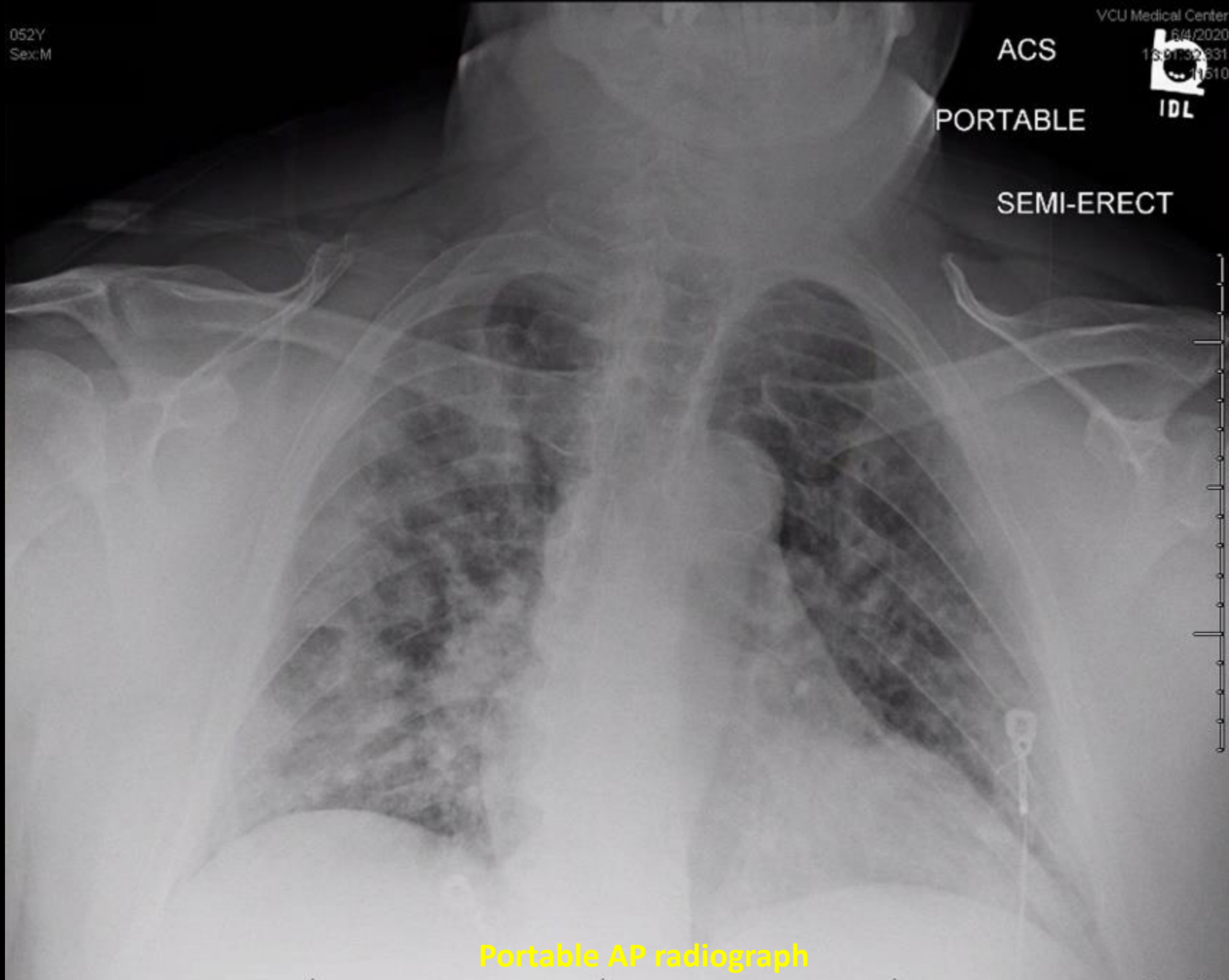
052Y  
Sex:M

ACS

VCU Medical Center  
6/4/2020  
13:01:37.931  
11510  
IDL

PORTABLE

SEMI-ERECT

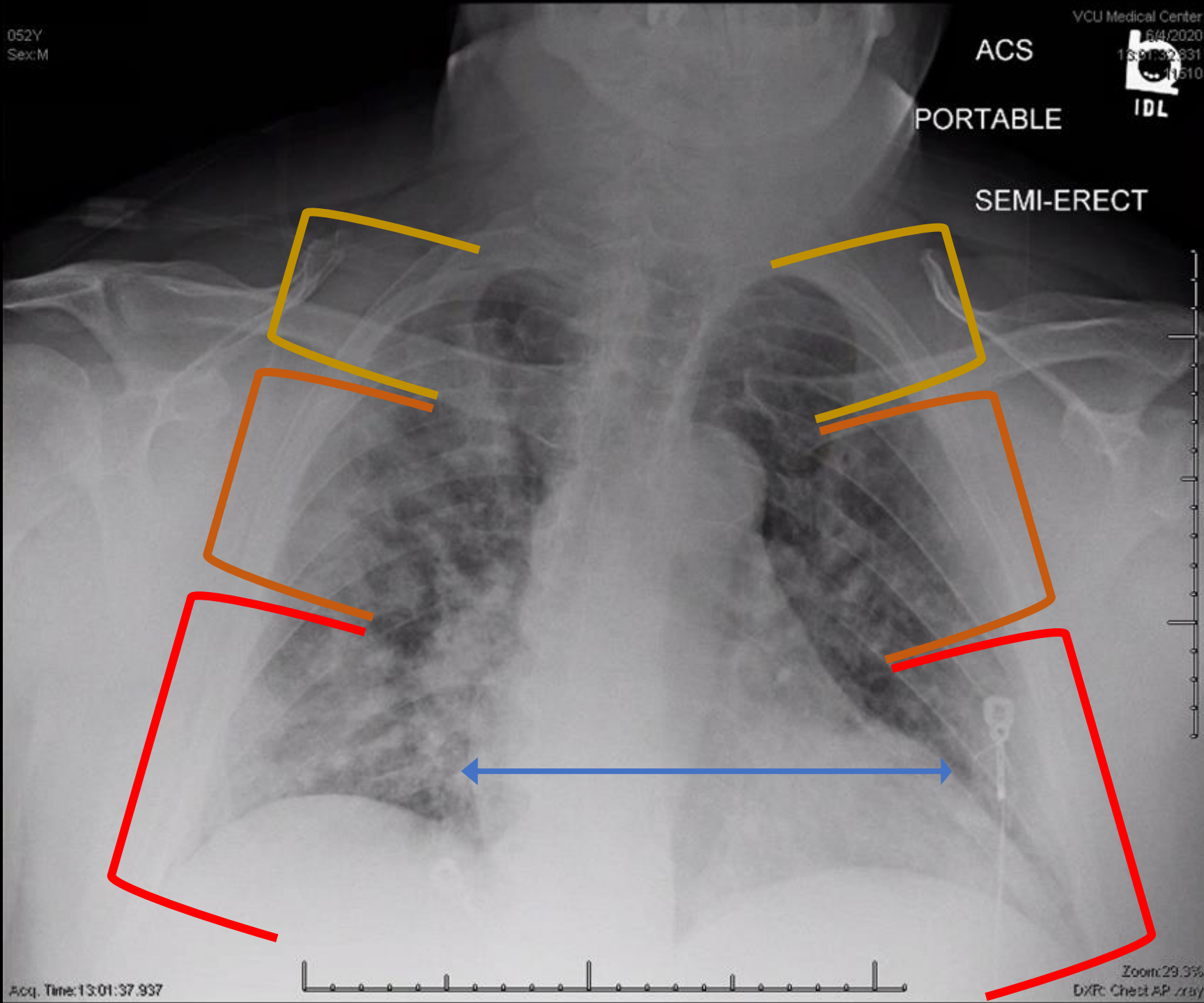


Portable AP radiograph

Acq. Time: 13:01:37.937

Zoom: 29.3%  
DXF: Chest AP.ray





### Portable AP

- Mild enlargement of cardiac silhouette
- Bilateral airspace consolidation present diffusely in all fields, but more prominent in lower lung fields.
- “radiographic findings are typical and can be associated with COVID-19 pneumonia”

#### COVID-19 Patient Characteristics on Presentation

Characteristic	Number (% of 64 patients)
Number of normal baseline CXRs	20 (31%)
Number of abnormal baseline CXRs	44 (69%)
Number of patients with normal baseline CXRs later becoming abnormal	7 (11%)
<b>Type of parenchymal opacity at baseline CXR</b>	
Consolidation	30 (59%)
Ground glass opacities	21 (41%)
<b>Distribution at baseline CXR</b>	
Peripheral predominant	26 (51%)
Perihilar predominant	6 (12%)
Neither peripheral nor perihilar	19 (37%)
Right lung	10 (20%)
Left lung	9 (18%)
Bilateral lungs	32 (63%)
Upper zone predominant	0 (0%)
Lower zone predominant	32 (63%)
No zonal predominance	19 (37%)

- Nasopharyngeal Swab @ 11:27
- Reported SARS-CoV-2 Positive @ 14:23

## Final Diagnosis

COVID-19 Associated Pneumonia



# Discussion: When is a CXR Necessary for COVID-19?

March 11, 2020

## ACR Recommendations for the use of Chest Radiography and Computed Tomography (CT) for Suspected COVID-19 Infection

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UPDATED MARCH 22, 2020

- For the initial diagnostic testing for suspected COVID-19 infection, the CDC recommends collecting and testing specimens from the upper respiratory tract (nasopharyngeal AND oropharyngeal swabs) or from the lower respiratory tract when available for viral testing.
- Generally, the findings on chest imaging in COVID-19 are not specific, and overlap with other infections, including influenza, H1N1, SARS and MERS. Being in the midst of the current flu season with a much higher prevalence of influenza in the U.S. than COVID-19, further limits the specificity of CT.
- The current [ACR Appropriateness Criteria® statement on Acute Respiratory Illness](#), last updated in 2018 states that chest CT is “Usually Not Appropriate.”
- A [review from the Cochrane Database of Systematic Reviews on chest radiographs for acute lower respiratory tract infections](#) concluded that CXR did not improve clinical outcomes (duration of illness) for patients with lower respiratory tract infection; the review included two randomized trials comparing use of CXRs to no CXRs in acute lower respiratory tract infections for children and adults.

- Primary care and other medical providers are attempting to limit visits of patients with suspected influenza or COVID-19 to health care facilities, to minimize the risk of spreading infection. The CDC has also asked that patients and visitors to health care facilities be screened for symptoms of acute respiratory illness, be asked to wear a surgical mask and be evaluated in a private room with the door closed.
- In addition to environmental cleaning and decontamination of rooms occupied by a patient with suspected or known COVID-19 infection by thorough cleaning of surfaces by someone wearing proper protective equipment, air-flow within fixed radiography or CT scanner rooms should be considered before imaging the next patient. Ventilation is an important consideration for the control of airborne transmission in health care facilities [↗](#). Depending on the air exchange rates, rooms may need to be unavailable for approximately 1 hour after imaging infected patients; air circulation rooms can be tested.
- These measures to eliminate contamination for subsequent patients may reduce access to imaging suites, leading potentially to substantial problems for patient care.

## The Role of Chest Imaging in Patient Management during the COVID-19 Pandemic: A Multinational Consensus Statement from the Fleischner Society

Published Online: Apr 7 2020 | <https://doi.org/10.1148/radiol.2020201365>

- Imaging is not indicated in patients suspected of having coronavirus disease 2019 (COVID-19) and mild clinical features unless they are at risk for disease progression.
- Imaging is indicated in a patient with COVID-19 and worsening respiratory status.
- In a resource-constrained environment, imaging is indicated for medical triage of patients suspected of having COVID-19 who present with moderate-to-severe clinical features and a high pretest probability of disease.

# Summary

- In a normal setting, “Acute respiratory illnesses in immunocompetent patients with positive physical examination, abnormal vital signs, organic brain disease or other risk factors”, the initial imaging is chest radiography.
- For cases suspicious for COVID-19
  - Imaging is **not for establishing the diagnosis of COVID-19**
  - Imaging is for **assessing patient decline** and triage of serious cases
  - Imaging does not change the course of treatment for a mild symptom, stable patient
  - Imaging CAN change the course of treatment for a patient in decline
- In resource-poor situations:
  - Consider the ability to limit the exposure of technicians to the contagious patient
  - Consider equipment and room sanitation, safety of other patients, and the time needed for the availability of the room and equipment
  - If the patient is **stable**, and the situation and **resources are limited**, the **imaging can wait**.

# Mr. Z

- Upon his presentation to the ED in early-June, the patient was admitted to the floor
- The next day, his condition deteriorated; he was intubated and transferred to the Medical Respiratory ICU
- After several complications, including sepsis and pneumothorax, Mr. Z was extubated in mid-July
- He has been transferred back to the floor, slowly-but-steadily improving
- The injuries suffered will likely result in permanent disability

# References

American College of Radiology. ACR Appropriateness Criteria Acute Respiratory Illness in Immunocompetent Patients. Last Revised 2018. Retrieved from: <https://acsearch.acr.org/docs/69446/Narrative/>

American College of Radiology. ACR Recommendations for the use of Chest Radiography and Computed Tomography (CT) for Suspected COVID-19 Infection. Last Revised March 22, 2020. Retrieved from: <https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Recommendations-for-Chest-Radiography-and-CT-for-Suspected-COVID19-Infection>

Rubin GD, Ryerson CJ, Haramati LB, et al. The Role of Chest Imaging in Patient Management During the COVID-19 Pandemic: A Multinational Consensus Statement From the Fleischner Society [published online ahead of print, 2020 Apr 7]. Chest. 2020;158(1):106-116. doi:10.1016/j.chest.2020.04.003

Wong HYF, Lam HYS, Fong AH, et al. Frequency and Distribution of Chest Radiographic Findings in COVID-19 Positive Patients [published online ahead of print, 2019 Mar 27]. Radiology. 2019;201160. doi:10.1148/radiol.2020201160

For Current Resources from ACR on COVID-19: <https://www.acr.org/Clinical-Resources/COVID-19-Radiology-Resources>

# Bonus Slide: Sensitivities of Initial Imaging for COVID-19 from select Publications

	Chest CT (Meta-analysis: Bao, et al.)	Chest CT (Meta-analysis: Xu, et al.)	CXR (Wong, et al.)	CXR (Cozzi, et al.)
Sensitivity (95% C.I. in parentheses)	89.8% (84.4-93.8%) ["Pooled + Rate"]	92% (86-96%)	69% (56-80%)	68%

- RT-PCR is the reference standard
- Must consider variation in PCR results due to diversity of available test kits and hospital testing protocols.
- Specificity was reported twice in CT studies incorporated into meta-analysis; 25% (22-30%) and 33% (23-44%)

# Bonus References

Bao C, Liu X, Zhang H, Li Y, Liu J. Coronavirus Disease 2019 (COVID-19) CT Findings: A Systematic Review and Meta-analysis. *J Am Coll Radiol*. 2020;17(6):701-709. doi:10.1016/j.jacr.2020.03.006

Cozzi D, Albanesi M, Cavigli E, et al. Chest X-ray in new Coronavirus Disease 2019 (COVID-19) infection: findings and correlation with clinical outcome. *Radiol Med*. 2020;125(8):730-737. doi:10.1007/s11547-020-01232-9

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Xu B, Xing Y, Peng J, et al. Chest CT for detecting COVID-19: a systematic review and meta-analysis of diagnostic accuracy [published online ahead of print, 2020 May 15]. *Eur Radiol*. 2020;1-8. doi:10.1007/s00330-020-06934-2