COVID-19 Diagnostic Imaging Experience in Seattle WA:

Protocols for Imaging Patients in Isolation

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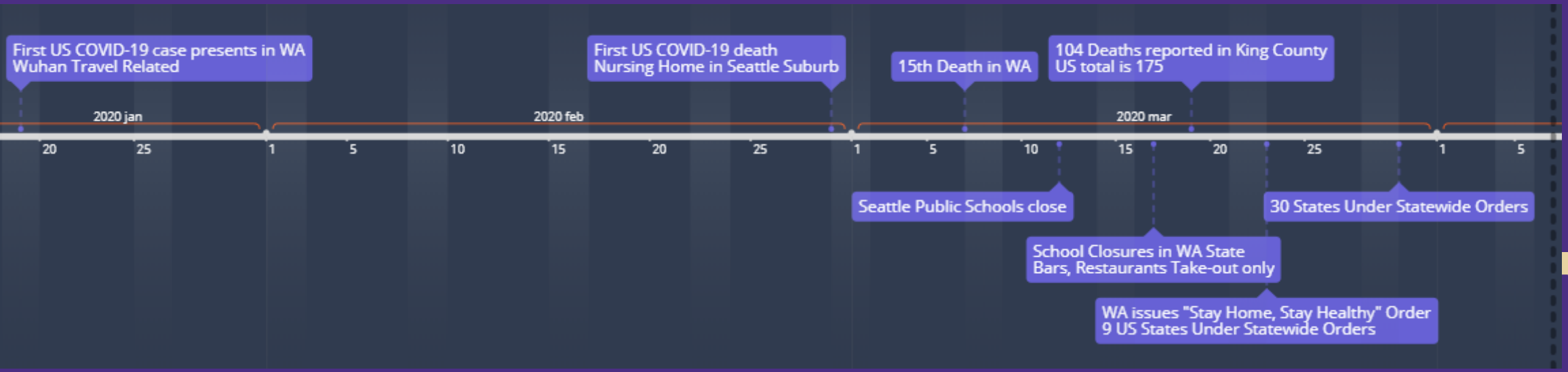
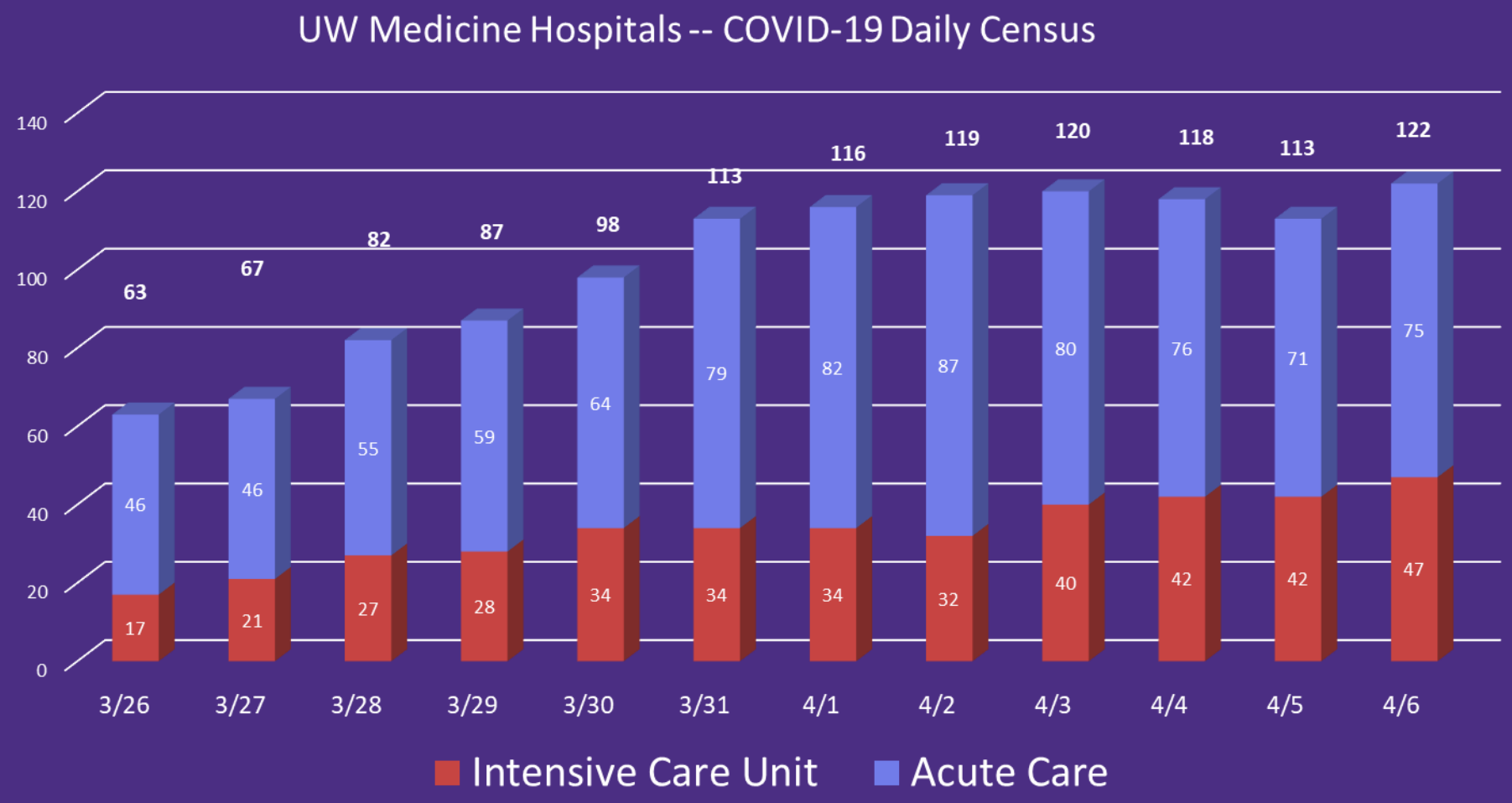
Washington COVID-19 Timeline

- Jan 19– First Covid-19 Case in the US
- Feb 28– First COVID-19 Death in the US
- Mar 7– 15 Deaths in WA
- Mar 12– Seattle Public Schools Close
- Mar 17 – WA Schools close. Bars, Restaurants takeout only (San Francisco Shelter In Place)
- Mar 19 - 104 Deaths in King County (US total 175) California first state to issue statewide orders
- Mar 23 – WA “Stay Home, Stay Healthy” order
- Mar 30 – 30 States have issued statewide orders



University of Washington Medical Center



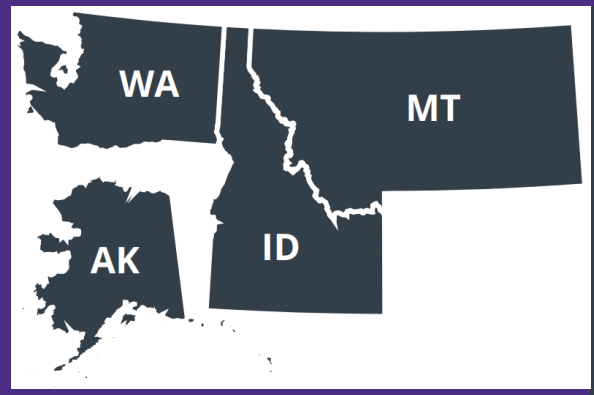
It’s difficult to make predictions, especially about the future

University of Washington Medical Center

University of Washington Medical Center

HARBORVIEW MEDICAL CENTER

UW Medicine | King County



- Public Hospital Managed by UW Medicine
- Level 1 Trauma Center serving 4 states
- Disaster preparedness and disaster control hospital for Seattle and King County

Use of Imaging for COVID-19

- **Chest X-Ray or CT are NOT RECOMMENDED for diagnosis of COVID-19**

- Highly nonspecific, particularly when compared to RT-PCR

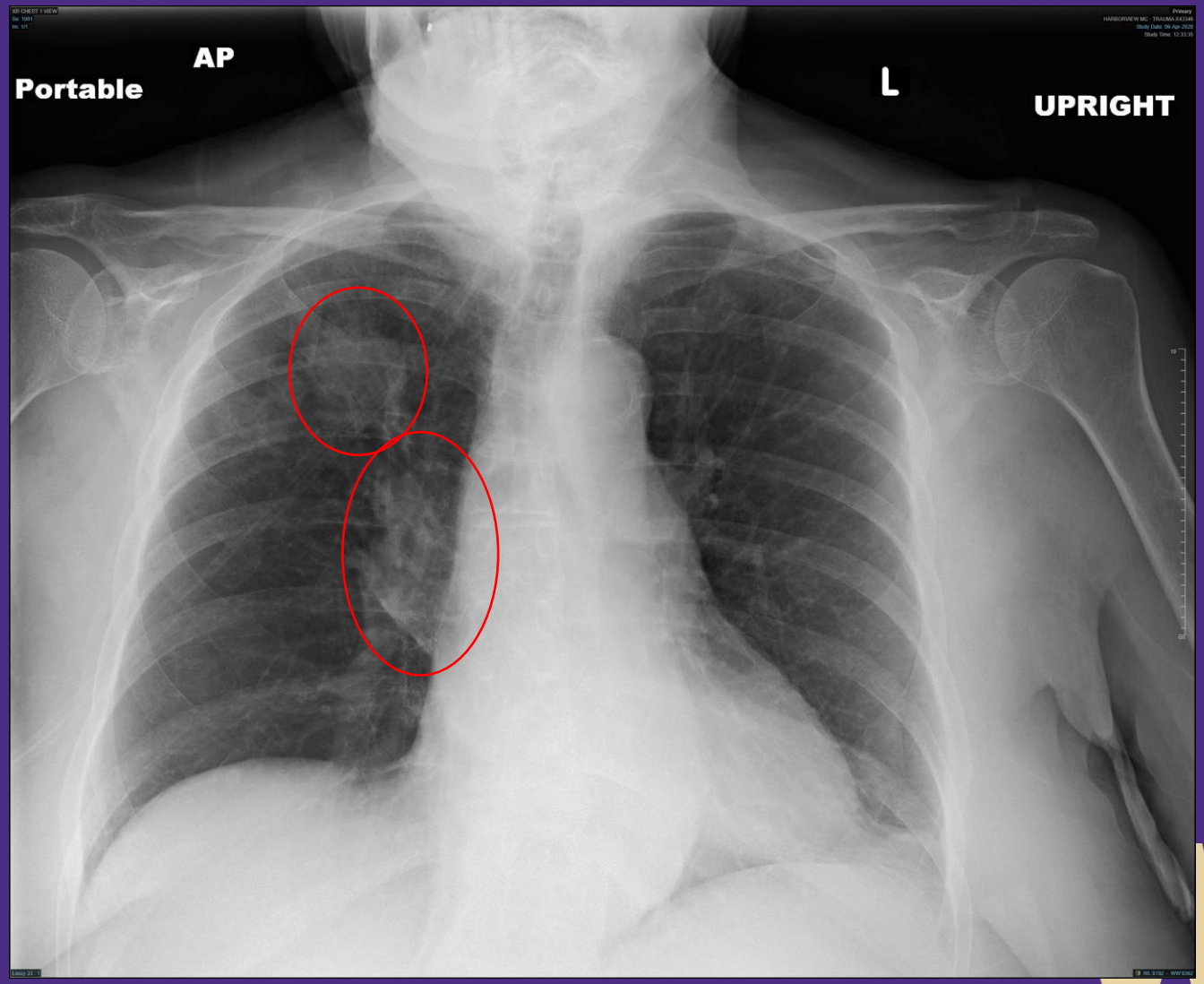
- *Diamond Princess* cruise ship Inui et al. Radiology: Cardiothoracic Imaging 2020 2:2
  - CT scans of 112 cases of RT-PCR-confirmed COVID-19
  - Less than two-thirds (61%) of cases had lung opacities on CT
  - 20% of symptomatic patients had negative CTs

Use of Imaging for COVID-19

- **When is imaging used for COVID-19 patients?**
  - Emergent need for imaging
  - Alternative diagnosis being considered that would affect management
  - Assessments that affect management

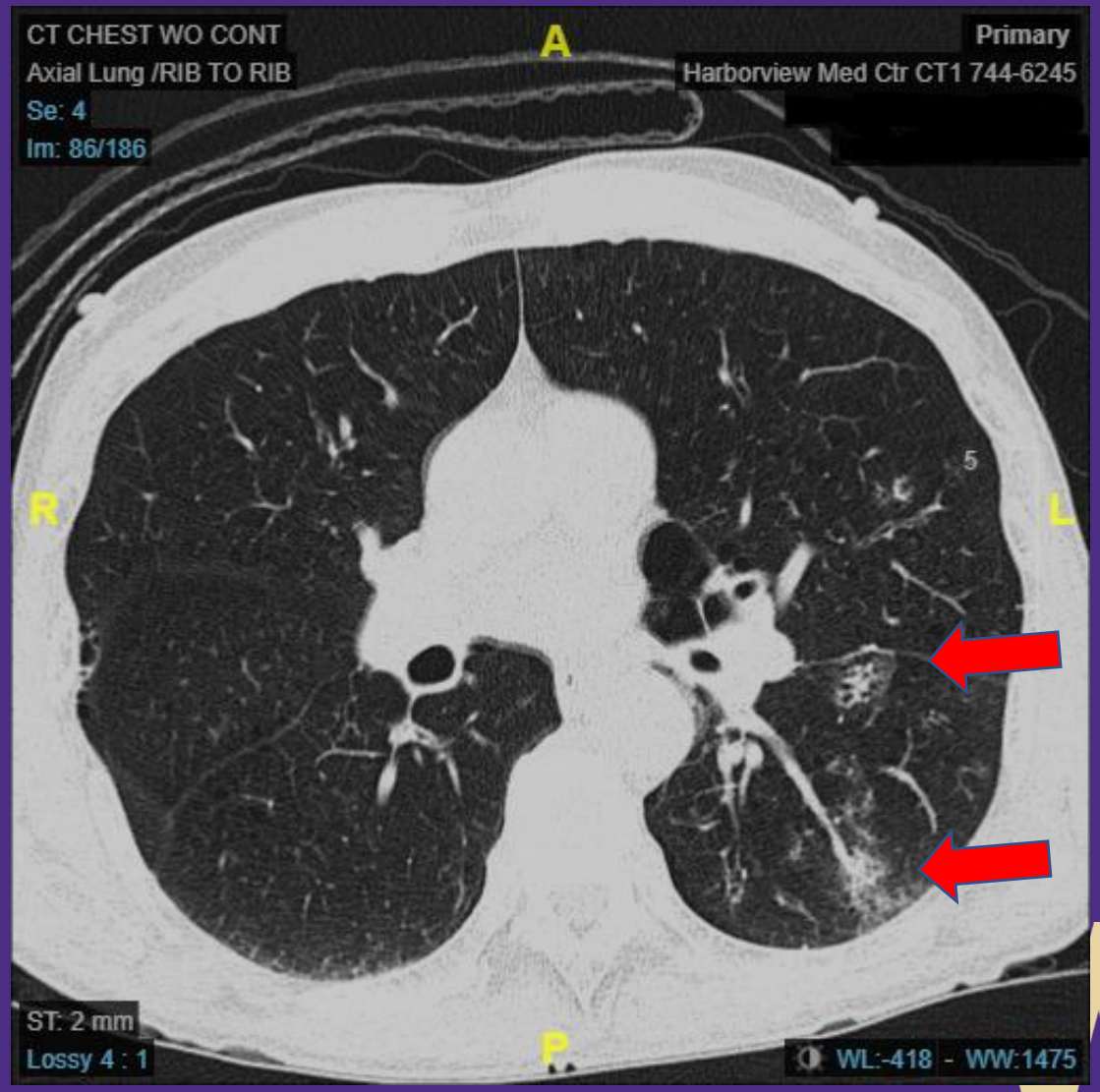
COVID-19 Typical Chest Radiography Findings

- Increased attenuation
- Opacities
- No loss of lung volume



COVID-19 Typical Chest CT Findings

- **Ground Glass Opacities**
  - Hazy area of increased attenuation
  - Non-specific
  - “Crazy Paving” Pattern



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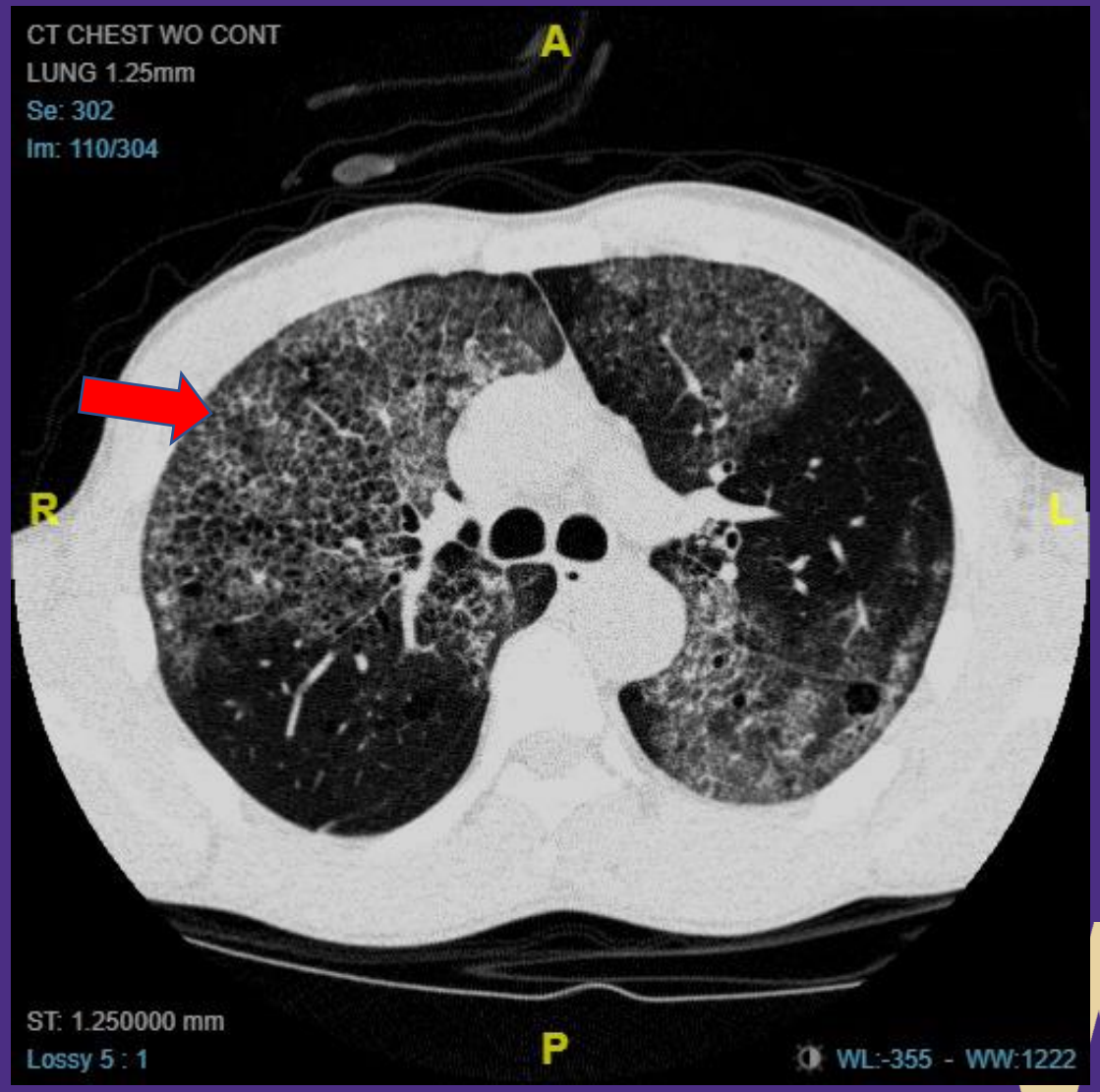


Use of Imaging for COVID-19

- **Goals for Imaging Department:**
  - Support for affected patients
    - Monitor and respond to changing situation
  - Maintain operational capabilities
    - Conserve PPE
    - Keep equipment functional and accessible
  - Reduce risk to staff

Use of Imaging for COVID-19

- **How do we do it? By following CDC and ACR guidelines.**

Exams within Radiology

- Observe Contact and Droplet precautions
- Airborne precautions for aerosolized procedures
- Try to use one room/scanner for all COVID-19 patients. ~1 hour turnover for aerosolized procedures.

Isolation Rooms

- Portable X-rays taken from outside the room using “through the glass” protocol

“Through the Glass” Portable Imaging

- Radiologic Technologists developed protocol during preparations for Ebola outbreak in 2014-2015, used minimally

- Adapted for COVID-19 and it is now our default protocol for isolated patients.

“Through the Glass” Portable Imaging

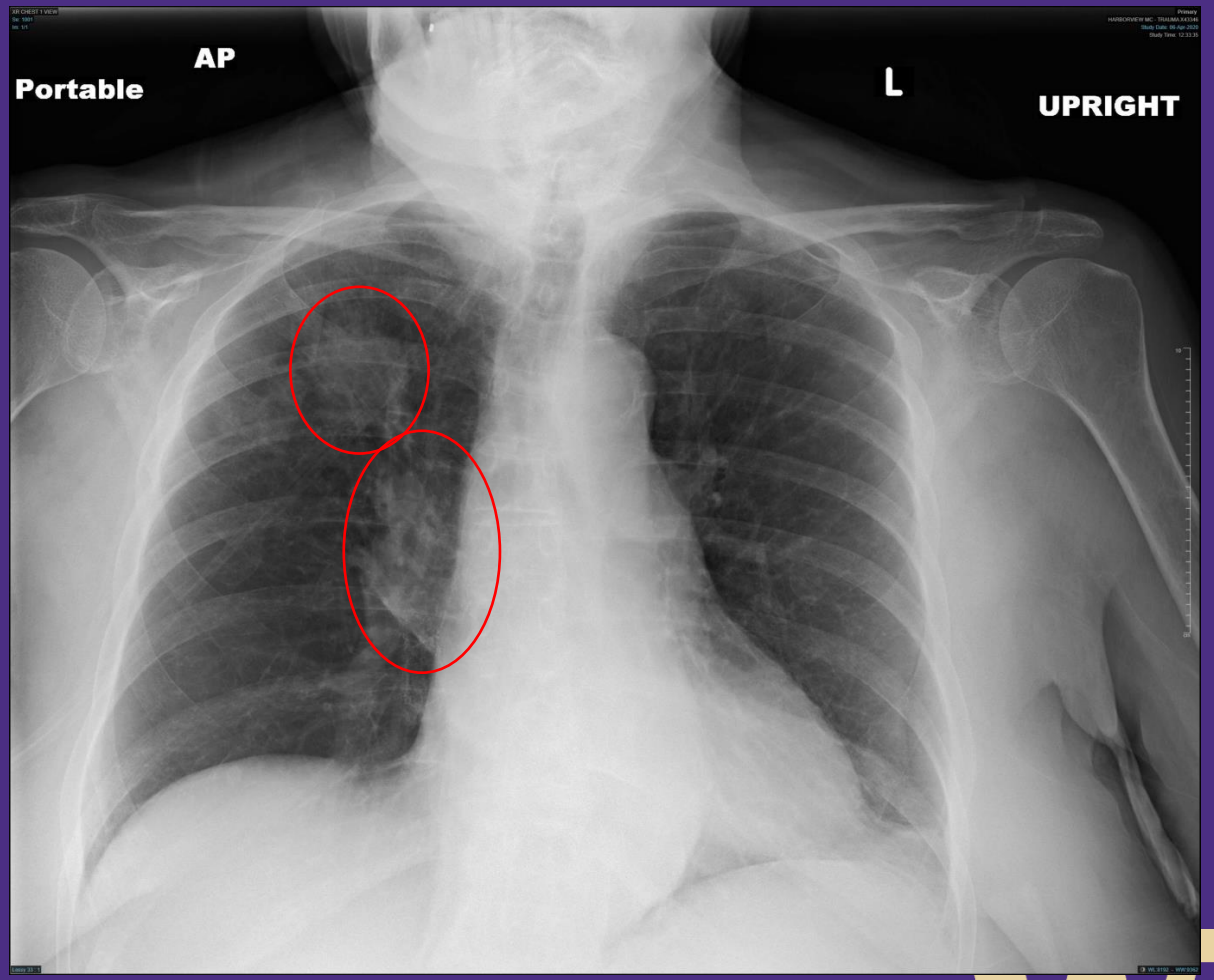
- Staff remain outside isolation area
  - No risk of transmission
  - No need to use PPE
- Patient can hold image receptor
  - Double bagged and passed inside
  - After imaging, decontaminate and remove outside bag, then pass back outside room. Inner bag then cleaned and receptor removed.
- Alternatively, someone in room must assist with positioning.
  - Often non-radiology staff. Communication with other departments is important.
  - Bed or wheelchair is fine if patient can sit upright

“Through the Glass” Portable Imaging

- DR portable units only
  - Instant feedback on positioning and exposure
  - Virtual Grid
- Typical technique varies:
  - Most common is 125 kVp 6 mAs
  - SID is highly variable 180-550 cm
  - Meeting targeted exposure indices

“Through the Glass” Portable Imaging

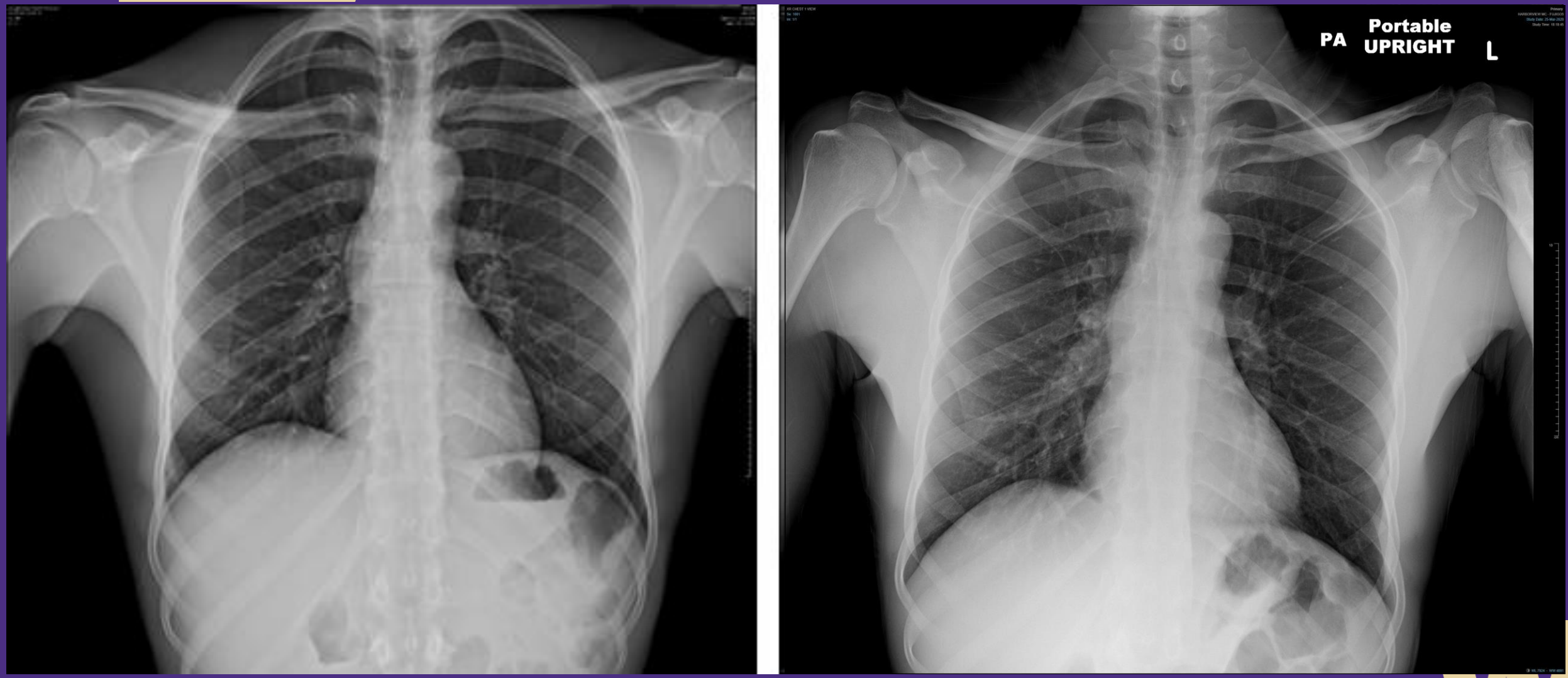
- Excellent feedback on TTG protocol from Radioloigists
  - Many exams difficult to tell
  - Motion artifacts main issue
  - Beam hardening issues
  - Window/Level as needed



Previous slide was a TTG image

Comparison Imaging : Standard Room vs. TTG CXR

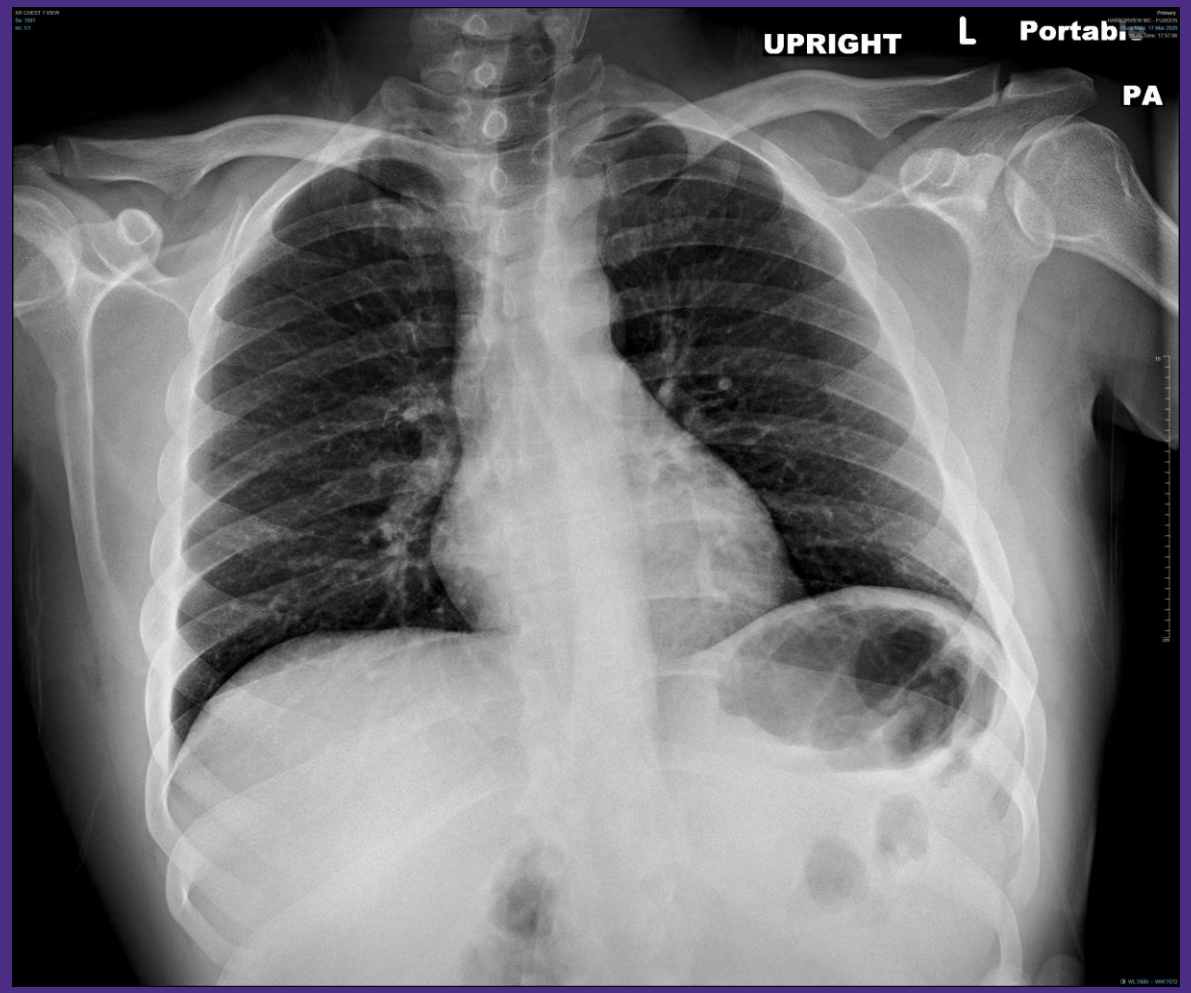
Same Patient, 2 months apart



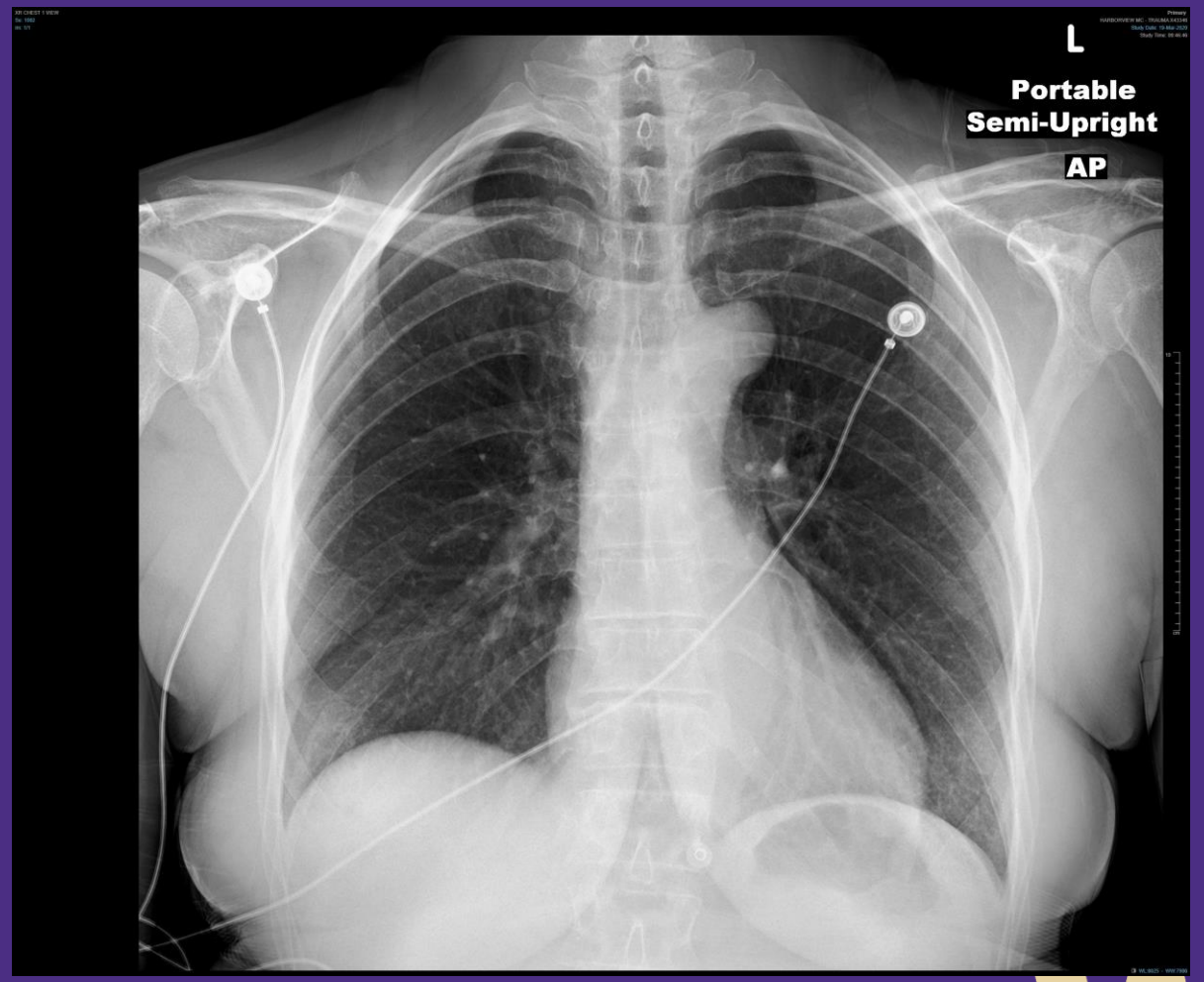
Conventional Fixed Tube Chest Bucky Room

Through the Glass Portable

Through the Glass CXR Example images



TTG Protocol. Note patient rotation and angle, issue common to all portable CXR.



Patient sitting semi-upright in bed

Motion Artifacts

- Portable units generally use fixed mA
- Exposure time will increase when mAs is increased

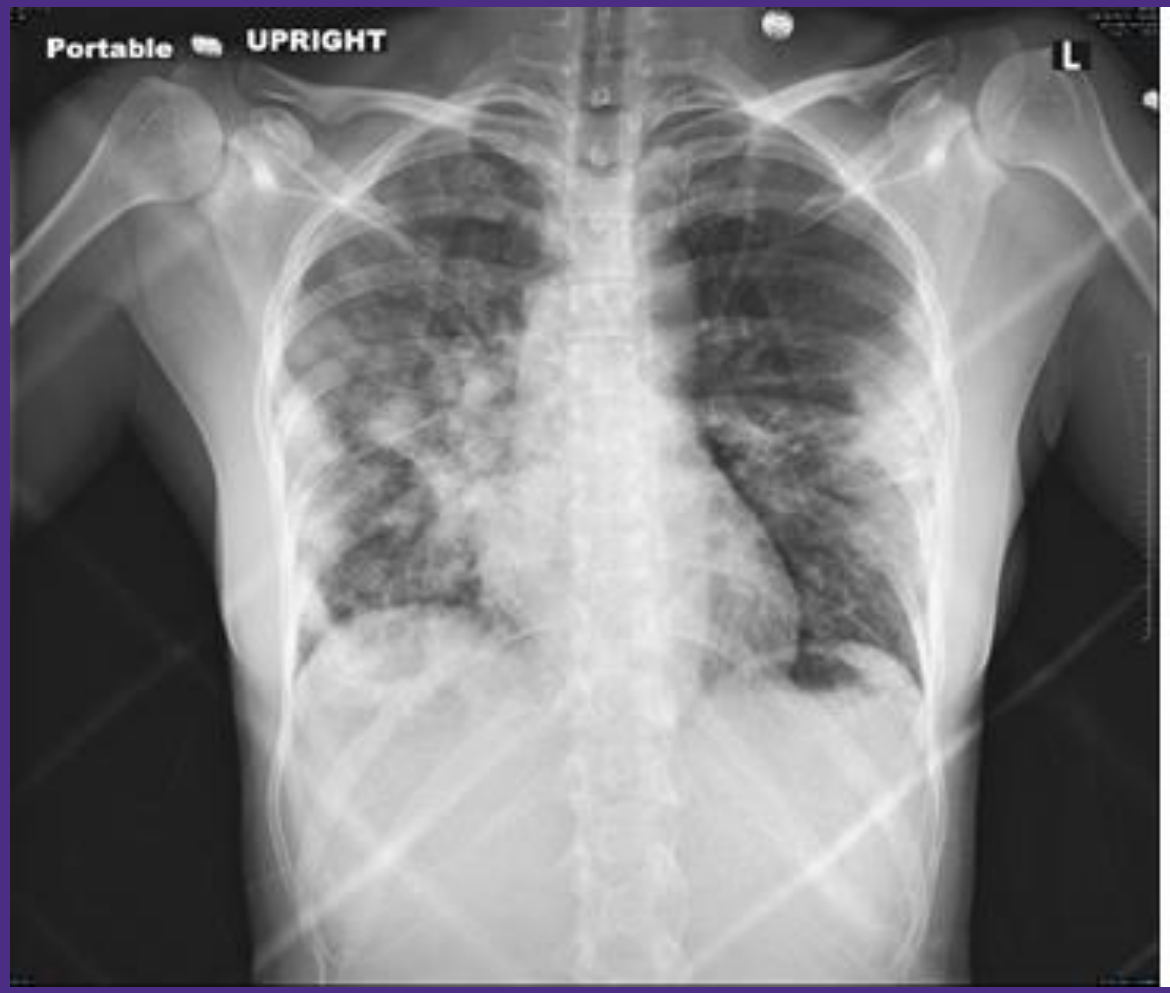
- Reduce SID where possible

- Motion artifacts worst for large patients on ventilators
  - Breath hold by Respiratory Therapist

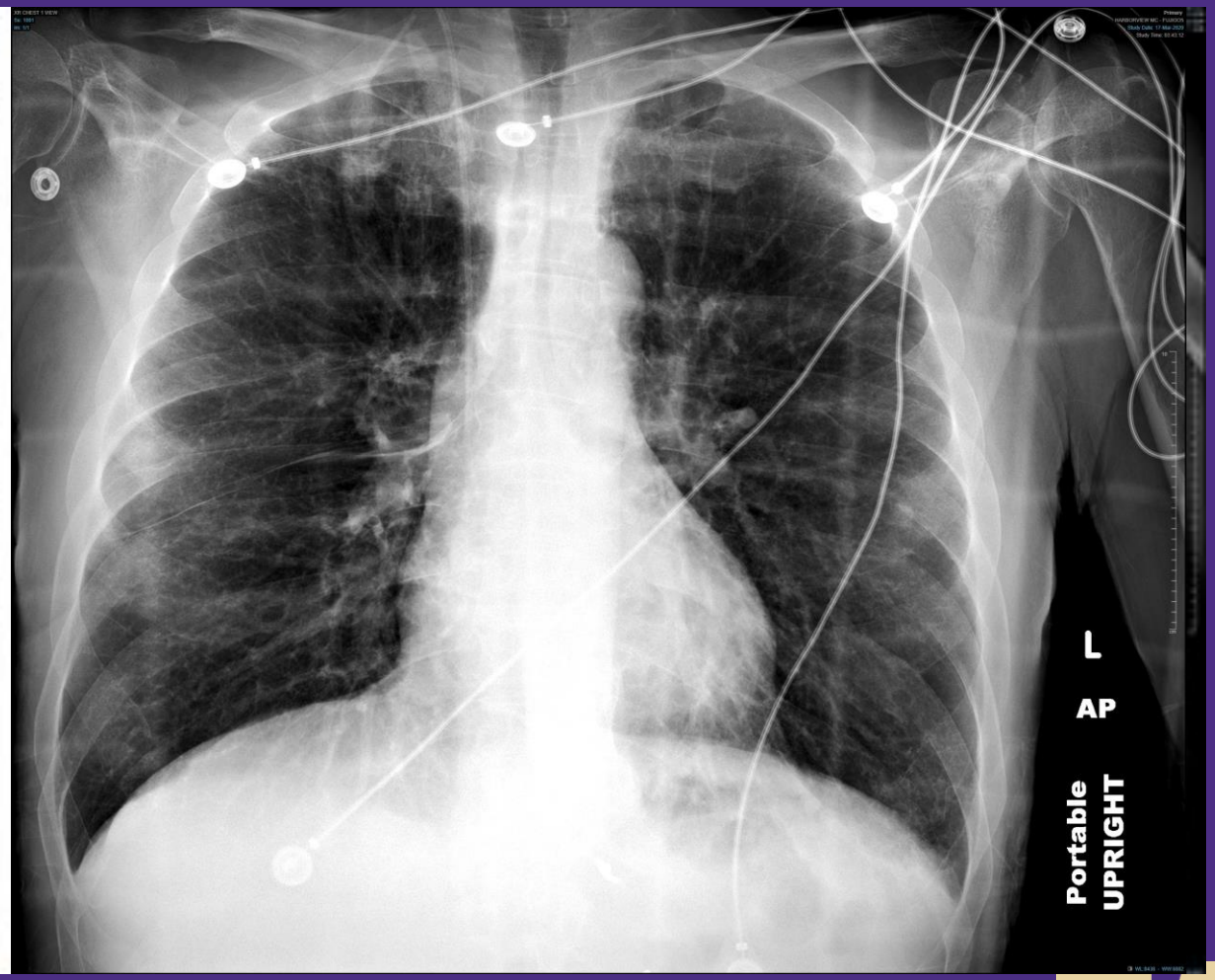
Wire Artifact

- Glass can have fireproof wire embedded inside
- Can appear on the image if wire crosses the x-ray field
- Fix by moving focal spot as close to window as possible. Longer SID will also reduce size of field.

Wire Artifact

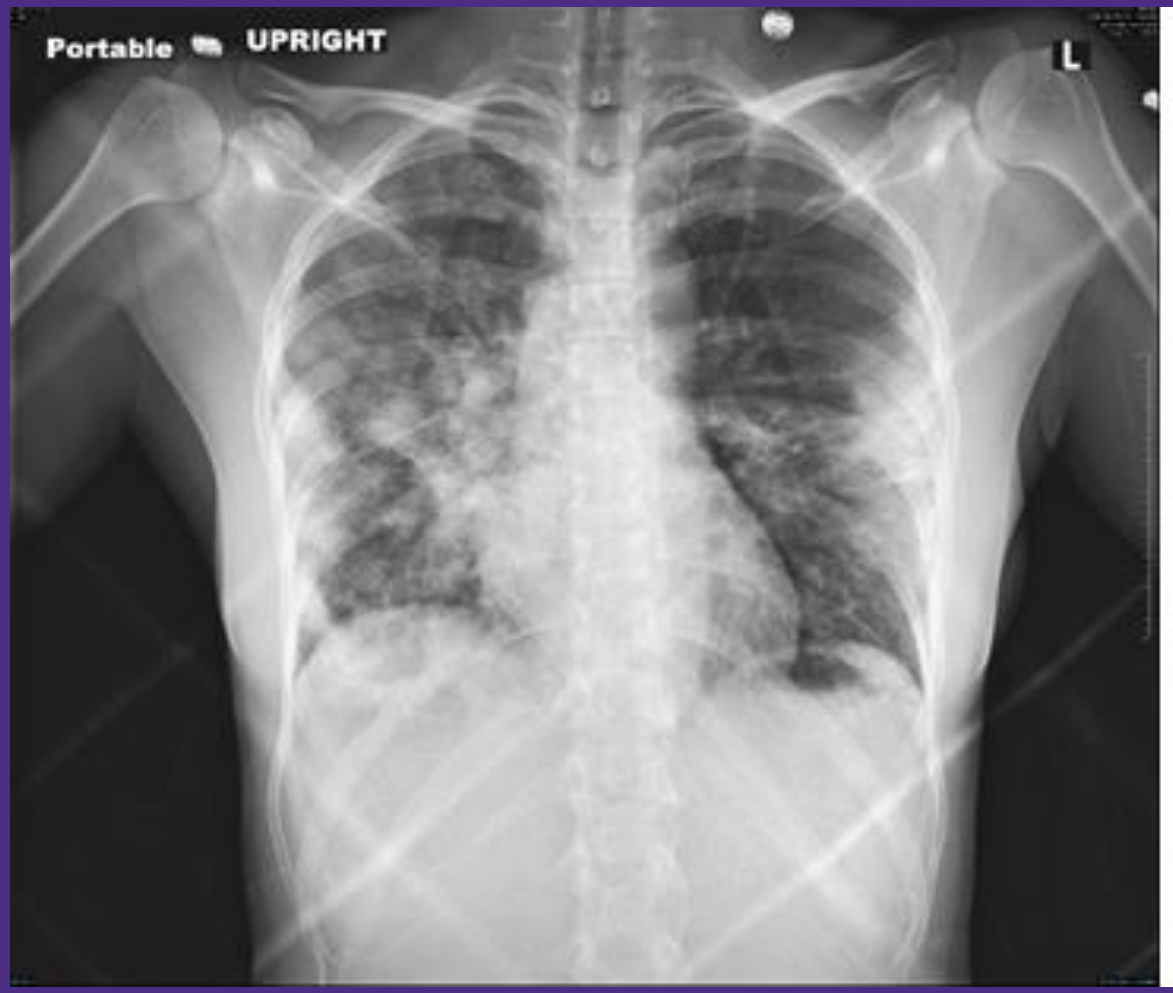


Diamond pattern wire artifact



Square pattern wire artifact

Wire Artifact



Diamond pattern wire artifact

Same room as left image, artifact resolved

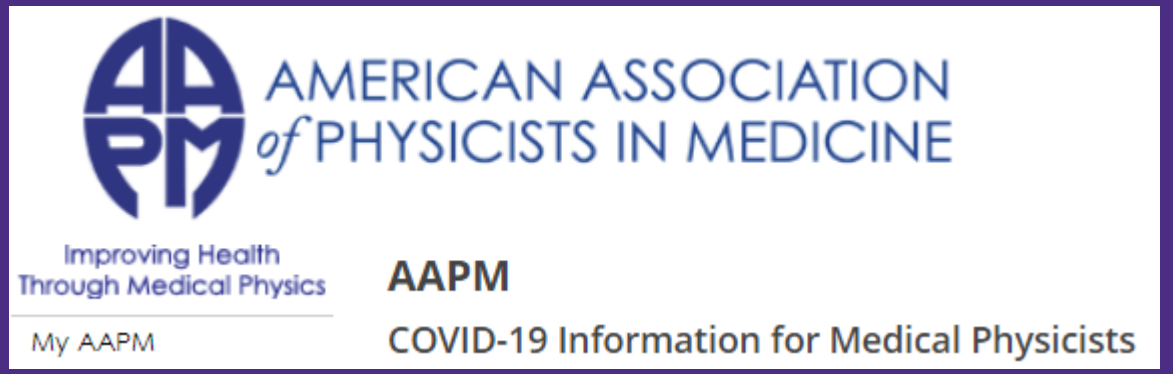
Through the Glass Considerations

- Radiation Safety - ALARA
  - Backscatter from glass
  - Scatter inside room- movable shields

- Regulatory aspects
  - Some states require technologist to do positioning
  - Ask for permission rather than beg for forgiveness

What can the Medical Physicist do to help?

- Assess risk vs benefit of equipment surveys- Is It Essential? Patient Safety?
  - ACR has extended deadlines to 16 months
  - FDA has suspended mammography inspections; 16 months for surveys
  - Joint Commission suspended inspections; can apply for waiver to extend deadlines
  - IAC deadlines extended to 18 months
  - Stay home! Stay safe!
  - Adapt
- Remote workstation assistance
- Reach out- offer help



aapm.org/COVID19 - Excellent resource from Brent Parker and AAPM Professional Council

https://www.acr.org/Clinical-Resources/COVID-19-Radiology-Resources

Acknowledgements

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