



## NORTHWEST AIDS EDUCATION AND TRAINING CENTER

# Pneumocystis Pneumonia (PCP): Part 1

Brian R. Wood, MD

Medical Director, NW AETC ECHO

Assistant Professor of Medicine, University of Washington

Presentation prepared by:

Brian R. Wood, MD

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# Pneumocystis Pneumonia (PCP): Part 1

- Background and Biology
- Risk factors
- Clinical Manifestations
- Diagnosis

# Background and Biology

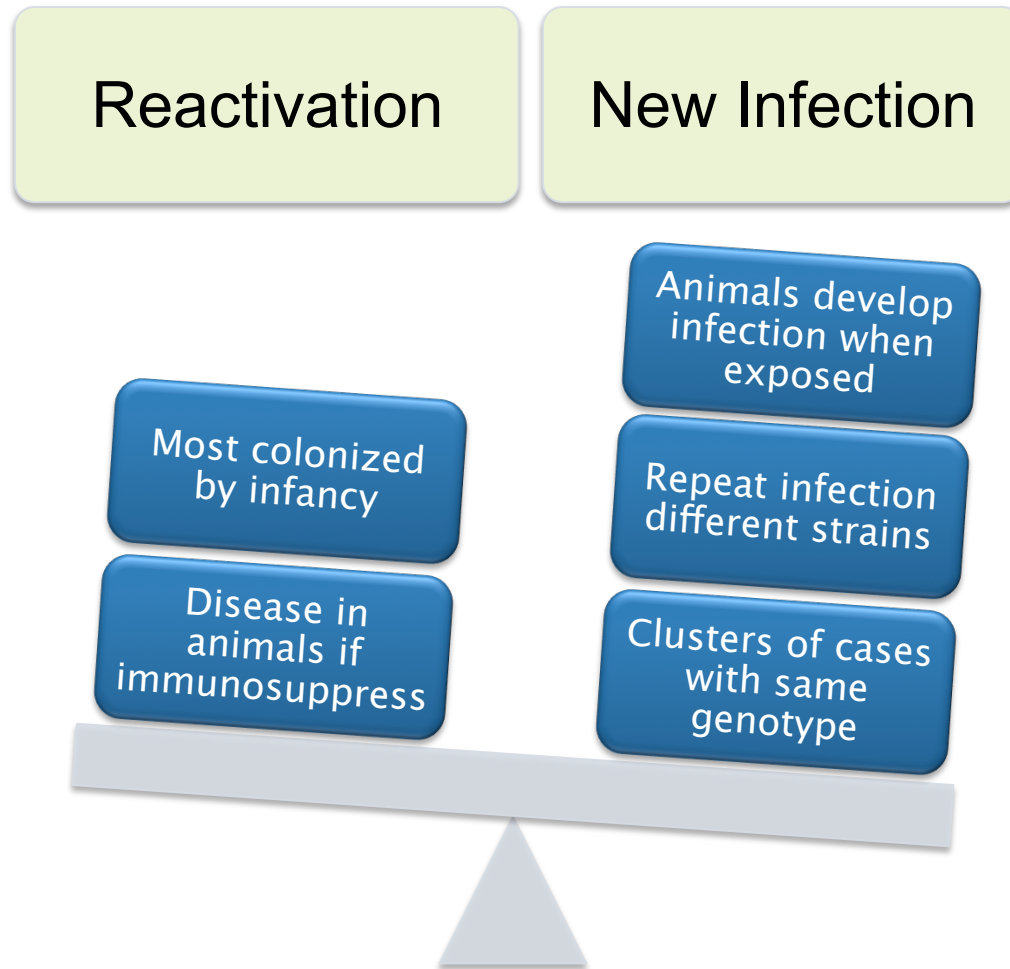
# Background

- First identified in 1909 by Chagas; reported as part of the life cycle of *Trypanosoma cruzi*
- Recognized as separate organism in 1912; named *Pneumocystis carinii*
- 1940's and 50's: cause of pneumonia epidemics in premature and malnourished infants
- 1980's and 90's: leading cause of death in AIDS

# Biology

- Initially classified as protozoa; now fungus
- Each species infected with unique strain:
  - *Pneumocystis carinii*: rats
  - *Pneumocystis jirovecii* (yee-row-vet-zee): humans
- Worldwide distribution
- Ubiquitous exposure: nearly all infected in infancy

# Biology: Reactivation vs. New Infection



Huang L, et al. HIV-Associated *Pneumocystis* Pneumonia. Proc Am Thorac Soc, 2011; 8: 294–300

# Risk Factors

# Risk Factors

- Key = **Immunosuppression**
  - Multicenter AIDS Cohort Study:
    - Incidence with CD4 count 201 to 350 = **0.5%**
    - Within 6 months of falling below 200 = **8.4%**
    - Within 12 months of falling below 200 = **18.4%**
    - Within 6 months of developing thrush = **29.5%**
- Environmental factors?
- Exposure to infected or colonized persons?

1) Phair J, et al. *NEJM* 1990, 322(3): 161-165.

2) Djawe K et al. *Clin Infect Dis* 2012 Nov 5; [e-pub ahead of print]



# Risk Factors

- Factors associated with development of PCP:
  - CD4 count  $<200$  cells/mm<sup>3</sup>
  - CD4 percentage  $<14\%$
  - Previous episode of PCP
  - Oral thrush

# Clinical Manifestations

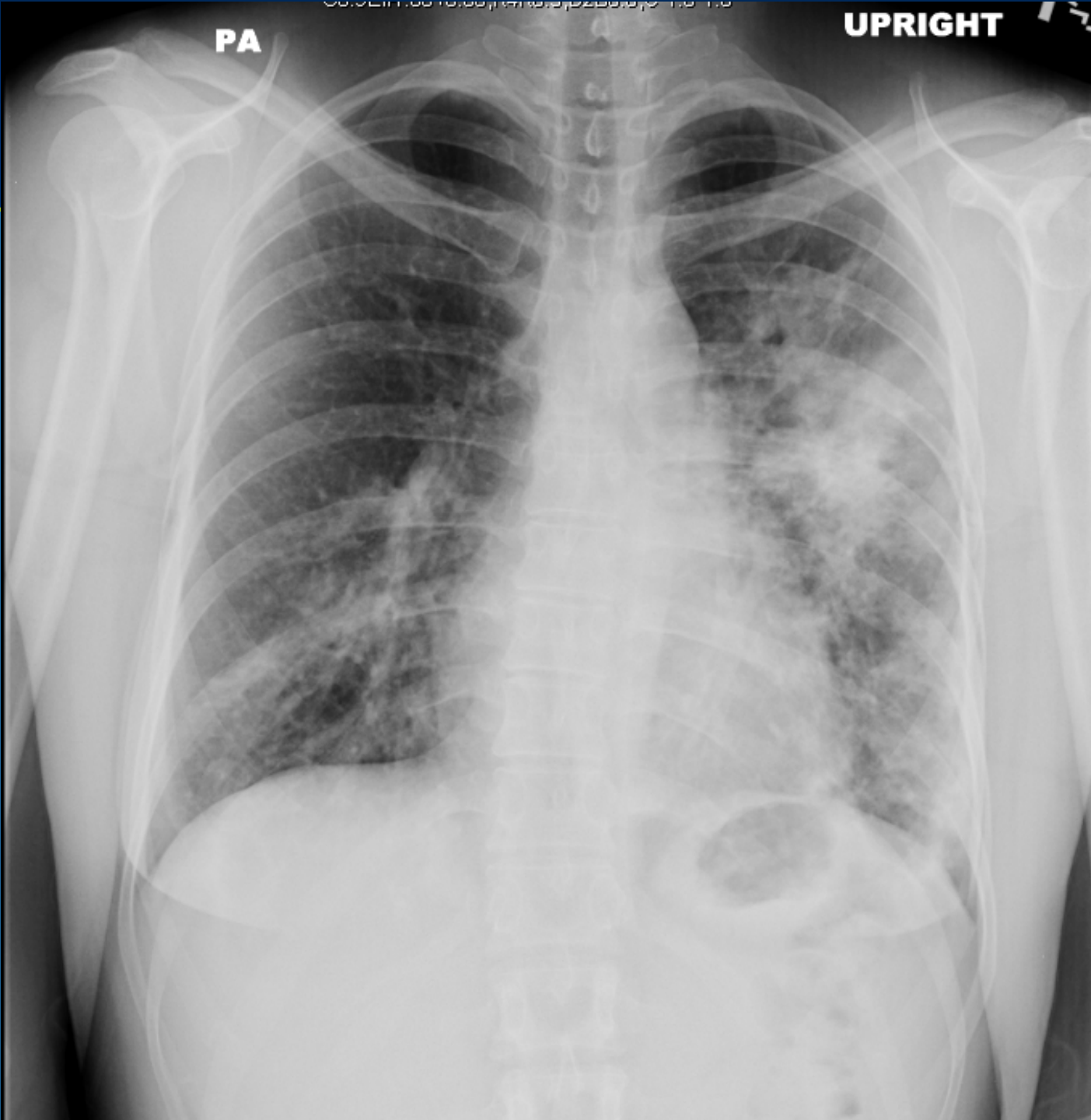
# Clinical Manifestations

| Symptoms (usually subacute) | Signs                              | CXR Findings                                            |
|-----------------------------|------------------------------------|---------------------------------------------------------|
| Fever                       | Hypoxia (especially with exertion) | Diffuse, bilateral, hazy infiltrates (“butterfly”)      |
| Dyspnea (“door-stop”)       | Tachypnea, Tachycardia             | Pneumothorax                                            |
| Dry cough                   | Inspiratory crackles               | Pleural effusion, lobar infiltrate, nodules less common |
| Pleuritic chest pain        | Elevated A-a gradient              | <b>*CXR normal in 25%</b>                               |
| Malaise                     | <b>*Chest exam normal in 50%</b>   |                                                         |

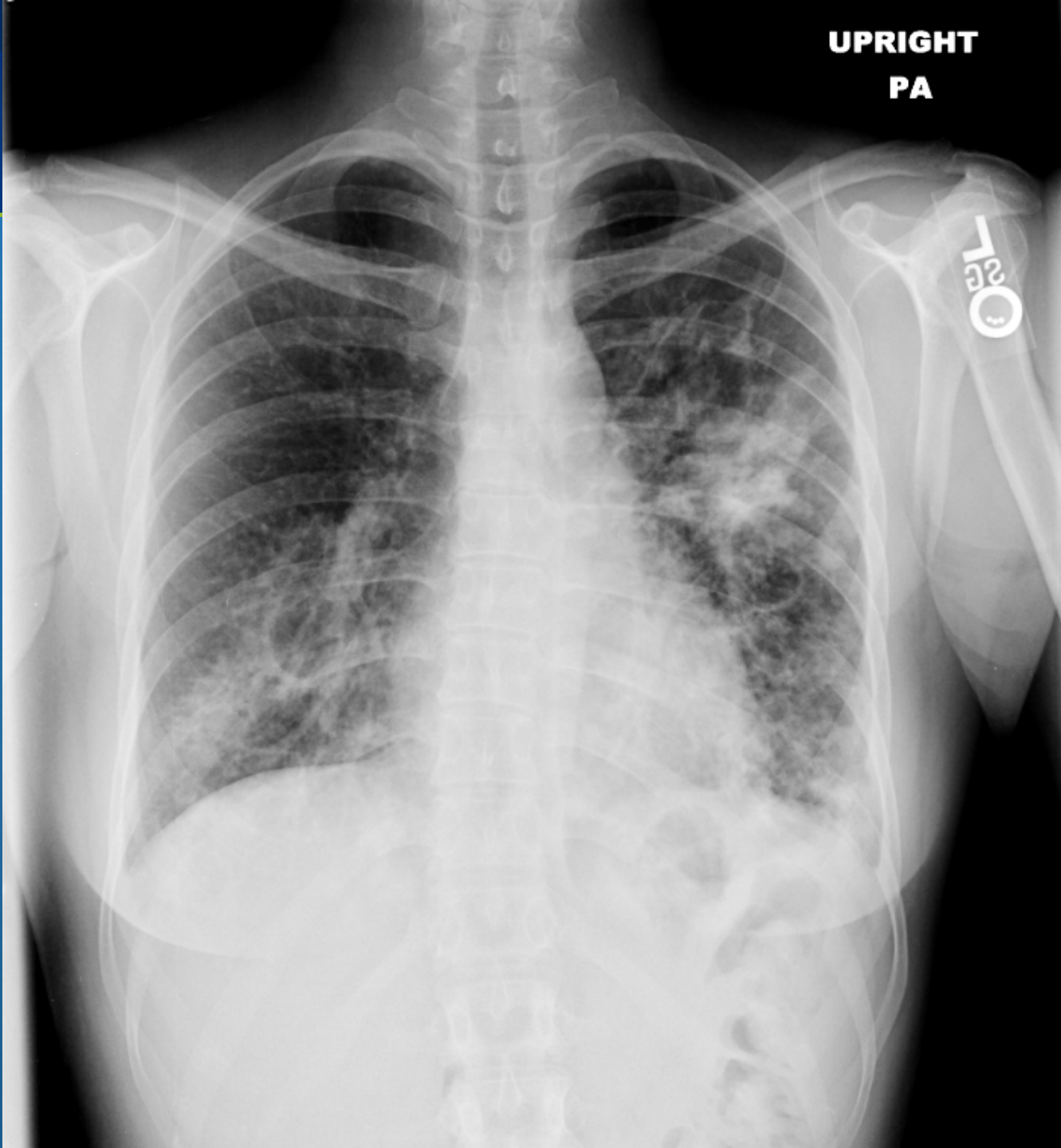


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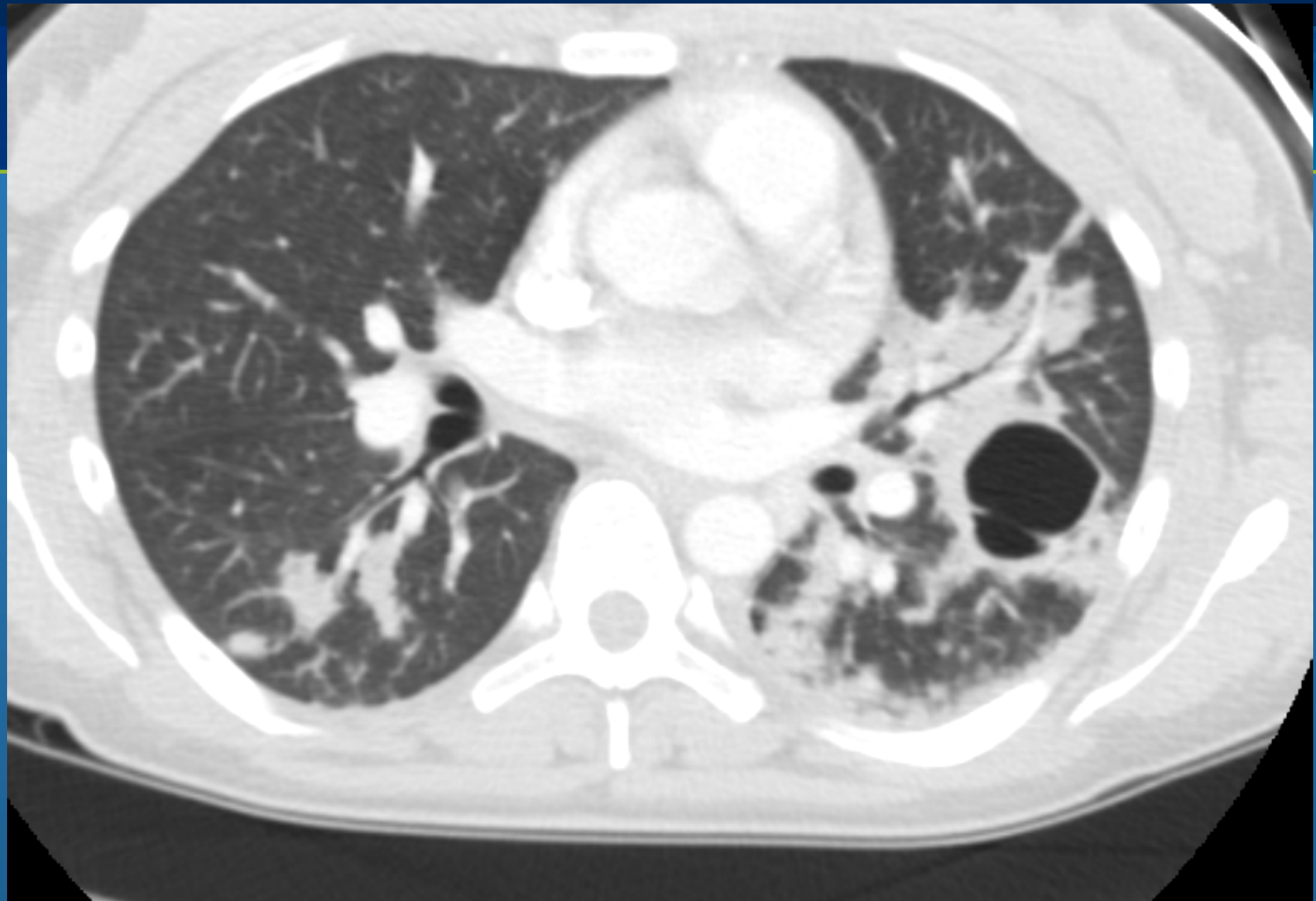
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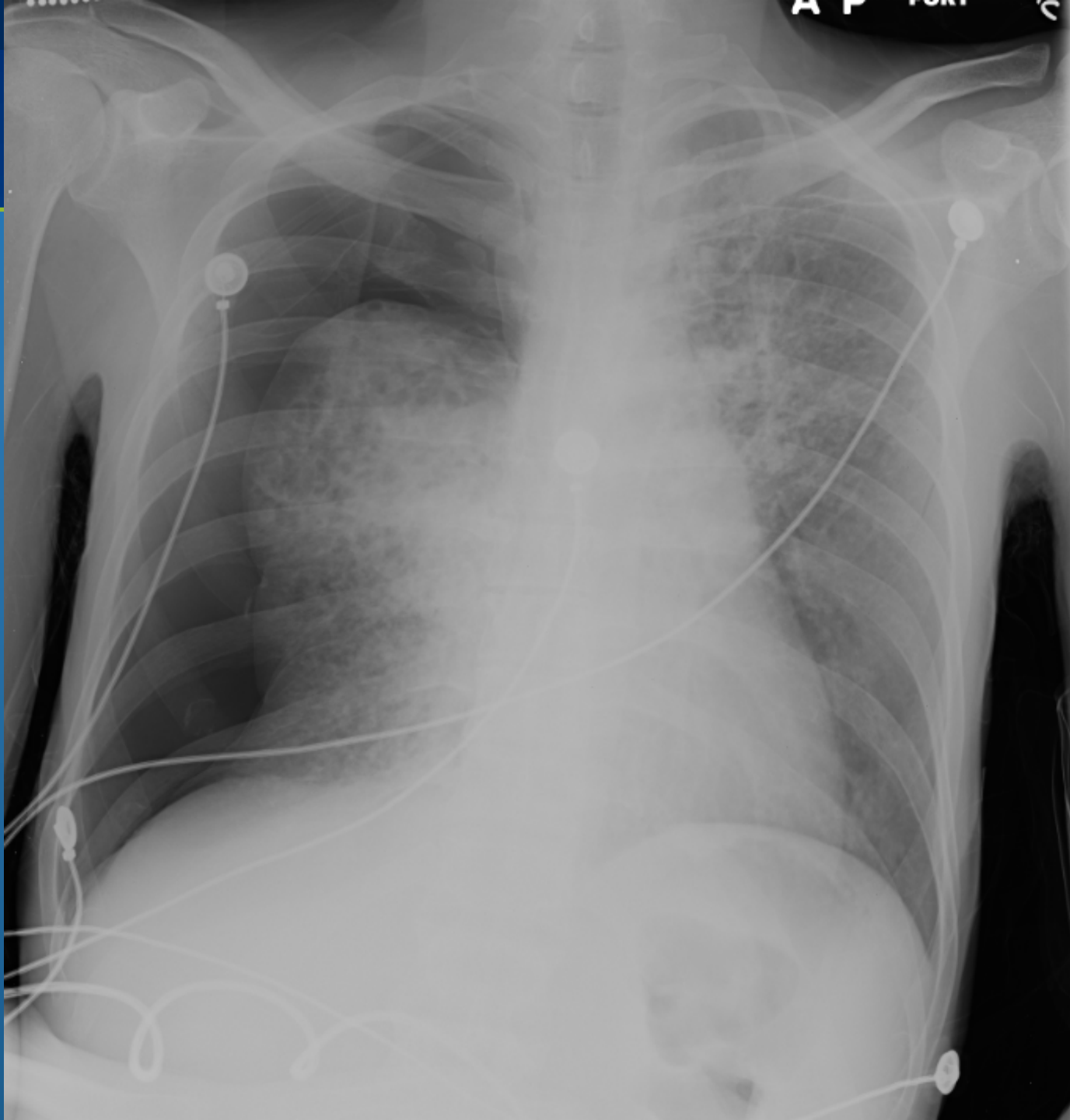
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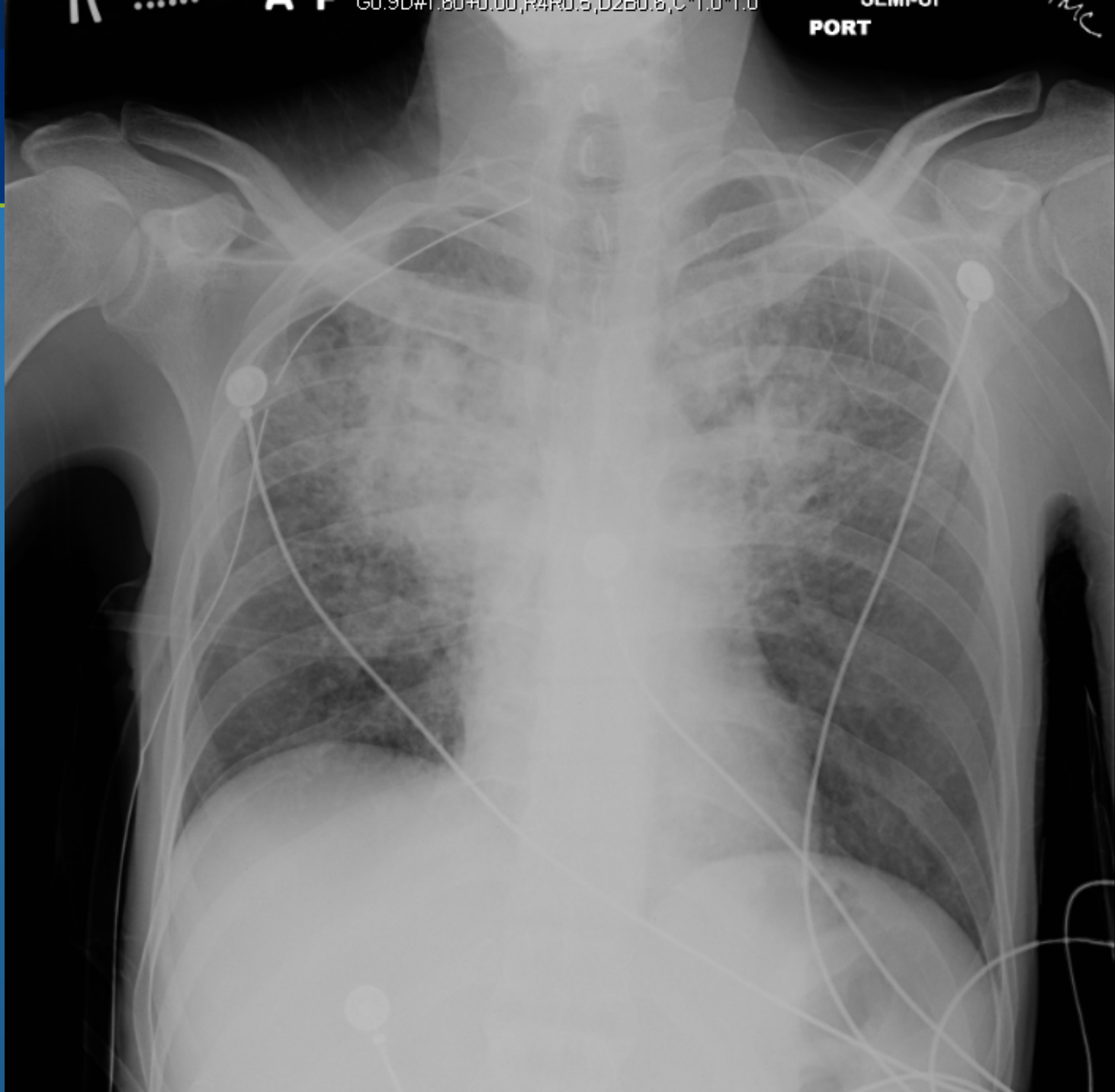


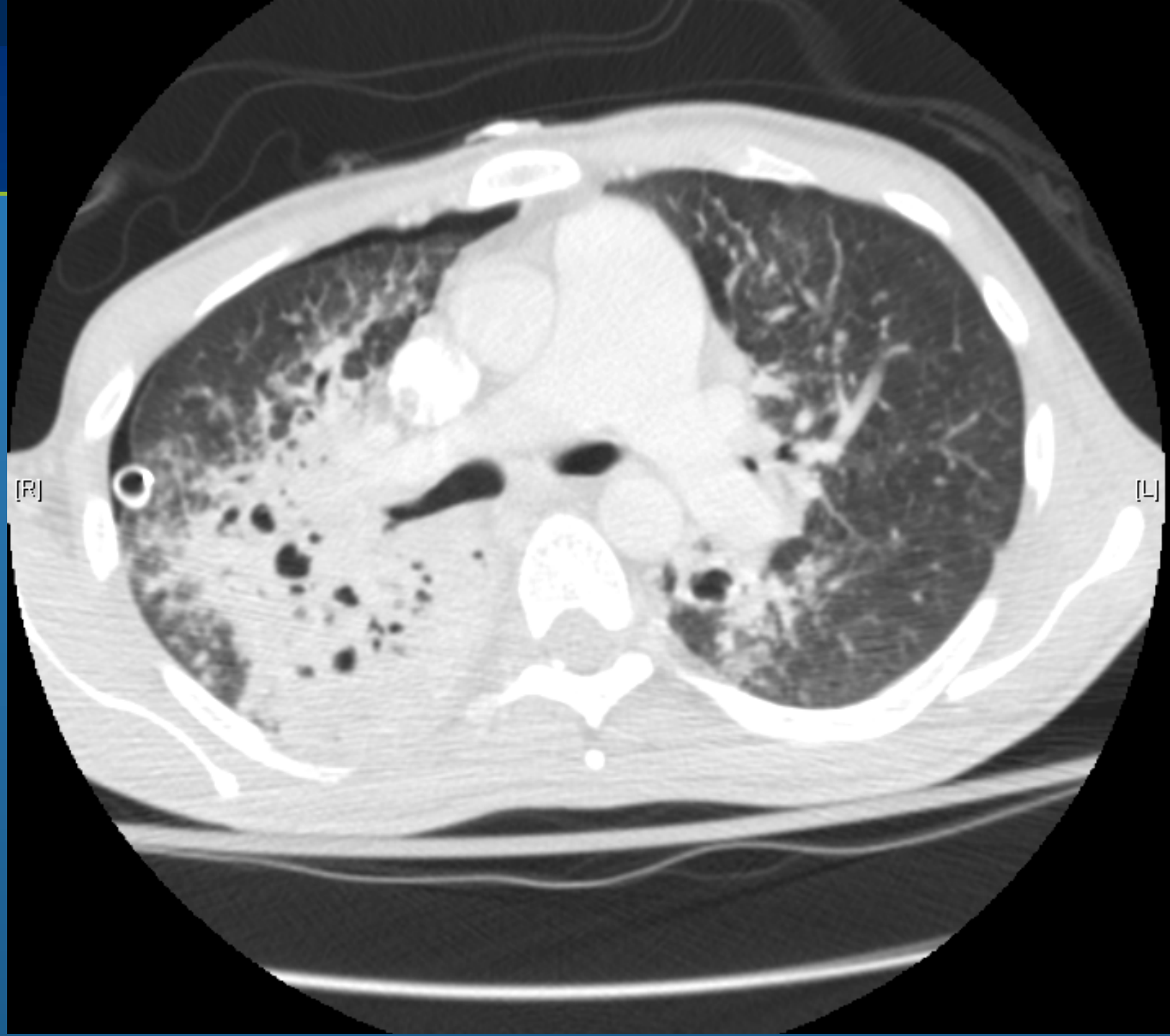






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# Diagnosis

# Diagnosis

- Gold standard: identification of organism on stain of respiratory secretions or tissue
- Induced sputum: sensitivity **<50-90%**
  - Generally not improved by repeating
- Bronchoscopy with BAL: sensitivity **90-99%**
- Lung biopsy: sensitivity **95-100%**

1) Wang Y, et al. Yield of primary and repeat induced sputum testing for *Pneumocystis jiroveci*. Arch Pathol Lab Med. 2007;131(10):1582-4.

2) CDC MMWR: Guidelines for Prevention and Treatment of Opportunistic Infections in HIV-Infected Adults and Adolescents; April 2009 (Vol 58)

# Diagnosis: Non-Invasive Tests

## LDH

- Not specific
- Prognostic?

## PCR

- Infection vs. colonization?
- Not commercially available

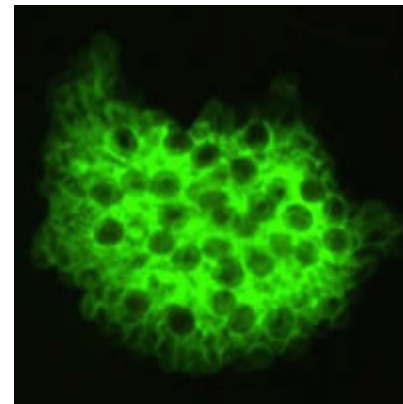
## Beta-Glucan

- Sensitivity 92.8%
- Specificity 75%
- PPV 96.3%
- NPV 60.0%

- 1) Gilroy SA, Bennett NJ. *Semin Respir Crit Care Med* 2011;32(6):775-82.
- 2) Wood BR, et al. Test performance of beta-glucan in AIDS patients with respiratory symptoms. *AIDS* 2012; doi: 10.1097/QAD.0b013e32835cb646

# Summary of Diagnostic Evaluation

- CXR, if normal and high suspicion → chest CT
- ABG, beta-glucan, +/- LDH
- Induced sputum, if negative → bronchoscopy/BAL
- Lung biopsy if still unclear



[dpd.cdc.gov](http://dpd.cdc.gov)