DISCLOSURES

I have the following financial relationships to report with ACCME defined ineligible companies:

Riverain Technologies  Advisory Board
Coreline  Consultant

I will NOT be discussing unlabeled/investigational uses of medical devices or pharmaceuticals during this presentation.
Evidence-based approach
Study methods, size, analysis, and strength of conclusions

Expert consensus in the absence of sufficient data
ACR LUNG-RADS® v2022

1. Atypical Pulmonary Cysts
2. Infectious/Inflammatory Findings
3. Airway Nodules
4. Juxtipleural Nodules
5. Stepped Management
Atypical Pulmonary Cysts
How would you classify this lesion?

- Solid?
- Part-solid?
- Non-solid?
- Ignore it?
ATYPICAL PULMONARY CYSTS

- **Lung cancers associated with cysts**
  - 9.3%

- **NELSON missed cancers associated with cysts**
  - 22.7%

References:

- Mendoza DP et al. AJR. 2021; 216:318–329
- Byrne D et al. JTI. 2021; 36:373-381
- Farooqi AO et al. AJR 2012; 199: 781-786
Thin-walled Cyst

- unilocular
- wall thickness < 2 mm

Not classified or managed in Lung-RADS
ATYPICAL PULMONARY CYSTS

Lung-RADS 4A

- Thick-walled cyst
  - unilocular
  - wall thickness $\geq 2$ mm

uniform asymmetric nodular
ATYPICAL PULMONARY CYSTS

- Thick-walled cyst
- Multilocular cyst on baseline screen or thin- or thick-walled cyst that becomes multilocular
# ATYPICAL PULMONARY CYSTS

<table>
<thead>
<tr>
<th>Lung-RADS 4A</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thick-walled cyst</td>
<td></td>
</tr>
<tr>
<td>Multilocular cyst on baseline screen or thin- or thick-walled cyst that becomes multilocular</td>
<td></td>
</tr>
<tr>
<td>3-month LDCT; PET-CT if solid component ≥ 8 mm</td>
<td></td>
</tr>
</tbody>
</table>
ATYPICAL PULMONARY CYSTS

Lung-RADS 4B

- Thick-walled cyst with growing wall nodularity/thickness
ATYPICAL PULMONARY CYSTS

Lung-RADS 4B

- Thick-walled cyst with growing wall nodularity/thickness
- Growing multilocular cyst (total mean diameter)

23 mm @ Baseline

28 mm @ 12 mths
ATYPICAL PULMONARY CYSTS

• Thick-walled cyst with growing wall nodularity/thickness
• Growing multilocular cyst (total mean diameter)
• Multilocular cyst with increased loculation or opacity (nodular, ground glass, or consolidation)

RADS 4B

ATYPICAL PULMONARY CYSTS

Lung-RADS 4B

Management

- Thick-walled cyst with growing wall nodularity/thickness
- Growing multilocular cyst (total mean diameter)
- Multilocular cyst with increased loculation or opacity (nodular, ground glass, or consolidation)

Diagnostic CT, PET-CT, tissue sampling, or referral for further clinical evaluation
OTHER CONSIDERATIONS

- Cysts with associated nodules:
  - Solid, part-solid, ground glass
  - Internal (endophytic)
  - External (exophytic)

Management by the most concerning feature
TAKE HOME

Lung-RADS v2022 adds classification criteria for atypical pulmonary cysts:

- Thick-walled
- Multilocular
- APCs with associated nodules
- Growth criteria
Infectious/ Inflammatory Findings
# Inflammatory/Infectious

**Lung-RADS v2022:**

<table>
<thead>
<tr>
<th>Lung-RADS</th>
<th>Incomplete:</th>
<th>Benign:</th>
<th>Classified and managed by size and composition criteria.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1-3 month LDCT</td>
<td>12-month screening LDCT</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
INFLAMMATORY/INFECTIOUS

- Segmental or lobar consolidation
- Multiple (>6) new nodules
- New large (≥ 8 mm) solid nodules
- New nodules in specific clinical contexts (e.g. immunocompromised pt)
New on annual LCS
New on annual LCS

Lung-RADS 0

Incomplete

1-3 month LDCT
At 1-3 month follow-up, a new Lung-RADS category & recommendation is provided based on the most concerning nodule.
Lung-RADS 4B
Size & Composition

Very Suspicious

Diagnostic CT, PET/CT, biopsy, and/or referral for clinical evaluation

New on annual LCS
New on annual LCS
New on annual LCS

Lung-RADS 2

Benign

12-month screening LDCT
Inflammatory or infectious nodules can be managed in several ways:

- LR 0
- LR 2
- by size & composition criteria
Airway Nodules
AIRWAY NODULES

- Location
- Number
- Morphology
- Persistence
AIRWAY NODULES

Location

Lung-RADS 4A

- Trachea
- Mainstem
- Lobar
- Segmental
AIRWAY NODULES

Location

Lung-RADS 2
AIRWAY NODULES

- Location
- Number
  - Single - More suspicious
AIRWAY NODULES

Location

Number

• **Single** - More suspicious
• **Multiple** - Consider other pathology
AIRWAY NODULES

- Location
- Number
- Morphology

Lung-RADS 2 12-month annual screening LDCT
Lung-RADS 2 12-month annual screening LDCT
AIRWAY NODULES

- Location
- Number
- Morphology
- Persistence

Baseline
Persistent Airway Nodule

- Requires evaluation

3-month

Lung-RADS 4B

Diagnostic CT, PET-CT, tissue sampling, or referral for further clinical evaluation
TAKE HOME

- Airway nodules characterized by location, number, shape, and air
- Subsegmental = LR 2
- Segmental or more proximal = LR 4A
- Persistent at follow-up = LR 4B
Juxtапleural Nodules
PERIFISSURAL NODULES

• Lentiform, Oval, Triangular, smooth

• < 10 mm mean diameter

Lung-RADS 2
12-month annual screening LDCT
Juxtpleural Nodules:
Nodules arising within lung in contact with the visceral pleura.
peri-fissural
peri-fissural

costal
pleural

peri-fissural
costal
pleural
peri-fissural
peri-mediastinal
peri-mediastinal
costal
pleural
peri-fissural
peri-diaphragmatic
<table>
<thead>
<tr>
<th>Features</th>
<th>Location</th>
<th>Malignancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• &lt; 10 mm mean diameter</td>
<td>Peri-fissural</td>
<td>0%</td>
</tr>
<tr>
<td>• Solid</td>
<td>Costal Pleural</td>
<td>0%</td>
</tr>
<tr>
<td>• Smooth margins</td>
<td>Peri-mediastinal</td>
<td>0%</td>
</tr>
<tr>
<td>• Lentiform, Ovoid, Triangular</td>
<td>Peri-diaphragmatic</td>
<td>0%</td>
</tr>
</tbody>
</table>

Chelala L et al. RSNA 2021; SSCH08-5  
Zhu Y et al. Radiology 2020; 297:710–718  
Zhu Y et al. IASLC 2022 abstract
JUXTAPLEURAL NODULES

Lung-RADS 2

• < 10 mm mean diameter at baseline or new **AND**
• Solid; smooth margins **AND**
• Oval, lentiform, or triangular shape

12-month LDCT

Same criteria as for perifissural nodules in Lung-RADS v 1.1
How would you classify this nodule?

Baseline

9 mm (mean)
FINDINGS

- 9 mm solid nodule
- Costal pleural
- Round

Baseline

Lung-RADS 4A

3-month LDCT; or PET-CT
TAKE HOME

- **Juxtapleural** solid nodules < 10 mm (mean diameter) with smooth margins & lentiform, ovoid, or triangular shape
  - 0% risk of malignancy
  - LR 2
Stepped Management
PRIOR MANAGEMENT

LR3

Baseline | 6 m | 6 m | 12 m

3
STEPPED MANAGEMENT

Baseline 6 m 6 m 12 m
LR3 2
Baseline 6 m 12 m
LR3 2
PRIOR MANAGEMENT

Baseline 3 m 9 m 12 m

LR4A 2
STEPPED MANAGEMENT

LR4A 2

Baseline 3 m 9 m 12 m

LR4A 3 2

Baseline 3 m 6 m 12 m
Classify and manage by the most concerning feature
LR 4A lesions stable or decreased on 3-month interval follow-up CT

6-month LDCT from the date of the current exam
• LR 3 lesions stable or decreased on 6-month interval follow-up CT
• LR 3 or 4A lesions that resolve on interval follow-up CT
• LR 4B lesions proven benign after workup or that resolve on interval follow-up CT
• 11 x 9 mm
  (10 mm mean diameter)
• Solid nodule
TAKE HOMES

Nodules that are stable or decreased at follow-up can be downgraded to the next lower Lung-RADS category:
TAKE HOMES

- For nodules that completely resolve or proven benign after workup, reclassify based on the most concerning finding.
- Follow-up recommendations are timed from the current exam.
Summary
SUMMARY

- Lung-RADS will continue to evolve
  - Evidence-based approach
  - Expert consensus best practices

Data is the limiting factor!
ACR LUNG-RADS® v2022

- Atypical Pulmonary Cysts
- Infectious/Inflammatory
- Airway Nodules
- Juxta Pleural Nodules
- Stepped Management
- Interval Diagnostic CTs
- S-Modifier
- Growth
- Volumetrics
- Lung-RADS FAQ
- Lung-RADS Atlas
- ... and more
Thank You!

ACR Lung-RADS® v2022

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Chair, ACR Lung-RADS Committee

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