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ACR Lung-RADS<sup>®</sup> 2022 introduces several important updates to the classification and management of findings identified at lung cancer screening (LCS). The updates are driven by an evidence-based approach. In the absence of data, consensus expert agreement informed best practice guidance. This document represents a broad overview of ACR Lung-RADS<sup>®</sup> 2022 and expands upon the notes provided with the Lung-RADS table. A more detailed description of the updates with the associated rationale and supporting data will be provided in a forthcoming publication.

The ACR Lung-RADS Committee

## I. New Classification Criteria

### A. Atypical Pulmonary Cysts

Lung cancers associated with cysts are not uncommon. New criteria for the classification and management of atypical pulmonary cysts are introduced in Lung-RADS<sup>®</sup> 2022. Lung-RADS classification with associated description:

1. **3** - A previously stable thick-walled cysts with a growing cystic component
2. **4A** - Thick-walled ( $\geq 2$  mm) or multilocular cysts
3. **4B** - Growing thick-walled or multilocular cysts as well as multilocular cysts with increased loculation or density
4. Cysts with adjacent nodules are classified and managed by the most concerning feature.
5. Unilocular thin-walled cysts are not classified or managed by Lung-RADS.
6. Cavitory nodules — those where the soft tissue component is greater than the cavitory/cystic component — are classified and managed by soft tissue nodule criteria.

### B. Juxtapleural Nodules

New data indicate that the size and composition criteria applied to peri-fissural nodules in Lung-RADS<sup>®</sup> v1.1 can safely be applied to all juxtapleural nodules (peri-fissural, costal pleural, peri-mediastinal, and peri-diaphragmatic). Classification and description:

1. **2** - Juxtapleural nodules that are solid;  $\leq 10$  mm in mean diameter; smoothly marginated; and triangular, lentiform, or ovoid in shape

### C. Inflammatory or Infectious Findings

Lung-RADS v1.1 introduced the option to classify a new, large nodule potentially representing an infectious or inflammatory process as category 4B with a 1-month CT

follow-up to assess for resolution. New criteria for the classification and management of potentially infectious or inflammatory findings recognize that such findings are heterogeneous and may warrant variable management at the discretion of the interpreting radiologist. Classification and management options include:

1. **0** - Segmental or lobar consolidation, multiple new nodules (more than six in number), large solid nodules ( $\geq 8$  mm) appearing in a short interval, and new nodules in certain clinical contexts (e.g. immunocompromised patient). Such findings may be indeterminate for infection/inflammation or obscure underlying lung parenchyma constituting an incomplete exam. A management recommendation of **1-3 month LDCT** is appropriate to ensure resolution. At the time of follow-up imaging a new Lung-RADS category is assigned based on the most concerning finding.
2. **2** - Findings such as tree-in-bud nodules that are most likely infectious or inflammatory without concern for underlying malignancy.
3. New findings where the concern for malignancy is greater than an infectious or inflammatory process should be classified and managed based on nodule size and composition criteria.

#### D. Airway Nodules

Revised classification and management criteria for airway nodules reflect new data on the prevalence of cancer for airway lesions at screening:

1. **2** - Subsegmental airway nodules or any airway nodule with features favoring a benign process, such as the presence of air and absence of a soft tissue component.
2. **4A** - Solid endotracheal or endobronchial nodule that is segmental or more proximal.
3. **4B** - Persistent endotracheal or endobronchial 4A lesions at 3-month LDCT. Such lesions should undergo diagnostic workup and may include a new management option: **referral for further clinical evaluation** (often for bronchoscopy). Persistent 4A airway lesions do not get downgraded by stepped management (see section III. Management Considerations).
4. Subsegmental and/or multiple tubular endobronchial abnormalities favor an infectious process. If no underlying obstructive nodule is identified, these lesions may be classified as Lung-RADS **0** (likely infectious or inflammatory) or **2** (benign) at the discretion of the interpreting radiologist.

## II. Clarifications

### A. Growth Definitions

Lung-RADS® 2022 introduces a revised definition of nodule growth to include a time interval (e.g., growth rate). New definitions and management guidance for slow-growing nodules are also provided.

1. **Growth** - An increase  $> 1.5$  mm *mean diameter* (previously in any dimension) *within a 12-month interval*.

2. **Slow-Growing-Solid or Part-Solid Nodules** - A solid or part-solid nodule demonstrating growth over multiple screening exams but not meeting the > 1.5 mm increase in size for any 12-month interval is suspicious and may be classified as Lung-RADS **4B** with a recommendation for diagnostic evaluation. Slow-growing nodules may not have increased metabolic activity on PET-CT; therefore, biopsy, if feasible, or surgical referral may be the most appropriate management.
3. **Slow-Growing–Ground-Glass Nodules** - A ground-glass nodule (GGN) demonstrating growth over multiple screening exams but not meeting the > 1.5 mm increase in size for any 12-month interval may be classified as Lung-RADS **2** until the nodule meets findings criteria of another category, such as developing a solid component.
4. When a nodule crosses a new size threshold for another Lung-RADS category, even if not meeting the definition of growth, the nodule may be reclassified based on size and managed accordingly.

#### B. S Modifier

Lung-RADS® 2022 provides additional resources for significant or potentially significant findings identified at LCS with management recommendations per ACR Incidental Findings publications. We have also clarified that incidental findings that are known, under evaluation, or treated do not require the continued use of an exam S modifier.

### III. Management Considerations

#### A. Stepped Management

Lung-RADS® 2022 introduces a stepped management approach for Lung-RADS categories 3 and 4A. Past versions of Lung-RADS set the timing of annual screening from the baseline exam. For example, a nodule classified as Lung-RADS 3 is followed in 6 months; if stable at that time, then the exam is reclassified as Lung-RADS 2 with a return to annual screening, meaning the patient would return in 6 months from the current exam or 12 months from the baseline exam.

In practice, adherence to the timing of follow-up often varies from the Lung-RADS recommendation and some patients were returning in 1-2 months for annual screening after a stable follow-up study was obtained.

Data around the timing of exams within the National Lung Screening Registry and limited research suggest that a new stepped management approach is reasonable. Management guidance is updated as follows:

1. The timing of follow-up imaging dictated by the Lung-RADS category is from the date of the exam being interpreted.
2. **Lung-RADS 3, stable or decreased at 6-month follow-up:** Reclassify as Lung-RADS **2**, with 12-month screening LDCT *from the date of the current exam* (not from the baseline or annual screening exam).
3. **Lung-RADS 4A, stable or decreased at 3-month follow-up:** Reclassify as Lung-RADS **3**, with 6-month screening LDCT *from the date of the current exam*. At the 6-month follow-

up, if the finding remains stable or decreased then reclassify as noted above to Lung-RADS 2 with a recommendation for 12-month annual screening LDCT *from the date of the current exam*.

4. **Lung-RADS 3 or 4A, resolved at follow-up OR Lung-RADS 4B proven benign after appropriate diagnostic workup:** Stepped management is unnecessary. The study should be reclassified based on the most suspicious nodule. If no new or growing nodules are present, then these exams can be reclassified as Lung-RADS 2 with a recommendation for 12-month annual screening LDCT *from the date of the current exam*.

#### **B. Interval Diagnostic CTs**

Although not included in the Lung-RADS® 2022 table, the upcoming manuscript on Lung-RADS® 2022 will provide expert consensus recommendations on managing interval diagnostic CTs obtained in LCS patients, including when a diagnostic CT may substitute for an annual LCS exam and whether the timing of subsequent LCS imaging should be modified based on an interval diagnostic chest CT.

### **IV. Other**

#### **A. Risk of Malignancy**

The “risk of malignancy” column in the Lung-RADS table has been removed. Although there are statistics that quantify the incidence of lung cancer by Lung-RADS category, there is insufficient data for atypical pulmonary cysts; therefore including the “risk of malignancy” percentages seemed potentially misleading. Furthermore, malignancy risk is highly variable and is ultimately lesion-specific.