# Lung-RADS v2022 Clinical Guidance Module

## Executive Summary

The Lung-RADS v2022 Clinical Guidance module is a structured decision support application embedded within Nuance PowerScribe. It provides radiologists with real-time, guideline-concordant Lung-RADS category assignment and management recommendations for lung cancer screening CT examinations. The module encodes the complete decision logic from the American College of Radiology's Lung-RADS v2022 guideline.

The module operates within the PowerScribe Clinical Guidance framework. It supports input via dropdown selectors and voice entry, with each selection mapped to a discrete lexicon element defined by the guideline. The module dynamically resolves the appropriate Lung-RADS category (0–4X) based on encoded rule pathways and returns the corresponding management recommendation. Each rule is directly derived from published ACR consensus criteria.

The module inserts standardized category and recommendation text into the report's Impression section, formatted for readability and accompanied by a citation to the source publication.

This document defines the design, logic structure, input specification, output schema, and interaction model for the Lung-RADS v2022 module. It is intended for implementation stakeholders, including clinical informaticists, software engineers, QA specialists, and reviewers.

## Clinical and Technical Scope

### Clinical Scope

The module encodes the complete classification and management framework defined in the ACR Lung-RADS v2022 guideline. It applies exclusively to low-dose chest CT performed for lung cancer screening in high-risk patients; it is not intended for incidental pulmonary nodule reporting.

Lesion types included in scope:

- Solid nodules (baseline, new, growing, or stable)
- Non-solid (ground-glass) nodules
- Part-solid nodules with defined solid components
- Atypical pulmonary cysts (thin-walled, thick-walled, multilocular, or progressive)
- Juxtapleural/perifissural nodules with triangular/oval/lentiform morphology
- Airway nodules (subsegmental, segmental, or proximal)
- Special handling for stable/decreasing nodules, proven benign lesions, and slow-growing nodules
- Application of the "S" modifier for clinically significant incidental findings
- Application of "4X" for nodules with additional suspicious features

The module also encodes management recommendations ranging from annual screening to short-interval follow-up CT to diagnostic work-up (diagnostic CT, PET/CT, biopsy, or surgical referral).

The logic conforms as exactly as possible to the published guideline. No local modifications or institution-specific heuristics are applied.

### Technical Scope

The module is implemented as a Clinical Guidance (CG) module within Nuance PowerScribe. It is accessible during report creation and can be invoked by voice or macro trigger. Input is collected through a structured interface using dropdown menus, each linked to a defined lexicon value. Voice navigation is supported for all selectable fields.

The output is generated as standardized text and inserted into the Impression section, including an embedded citation to the Lung-RADS v2022 publication. The impression content is dynamically assembled based on selected features and resulting category, with grammatical variation to support narrative readability.

Out of scope for this module:

- Extraction of nodule characteristics from free-text.
- Application to non-screening CT studies.
- Customization of management recommendations beyond guideline-defined pathways.

## Guideline Background and Source Authority

The Lung-RADS Clinical Guidance module is derived from the American College of Radiology's Lung Imaging Reporting and Data System (Lung-RADS®) v2022. This guideline defines a standardized lexicon, decision framework, and management schema for classification of findings on low-dose CT performed for lung cancer screening.

### Purpose of the Source Guideline

Lung-RADS was developed to:

- Standardize CT terminology for describing pulmonary nodules in the screening setting.
- Assign numeric categories (0–4X) based on nodule size, growth, morphology, and context.
- Link each category to a management recommendation that balances early detection with avoidance of unnecessary testing.

The v2022 update incorporates:

- Clarified definitions for airway nodules.
- Formal criteria for atypical pulmonary cysts, including wall thickness and multilocularity.
- Explicit guidance for slow-growing nodules.
- Clarifications on growth definition (>1.5 mm in 12 months) and size threshold crossing.
- Updated recommendations for use of the "S" modifier for significant incidental findings.

### Implementation Scope within the Module

This module encodes the guideline in full, without omission or modification. The decision logic reflects all assessment categories:

- 0 – Incomplete
- 1 – Negative
- 2 – Benign

- 3 – Probably Benign
- 4A – Suspicious
- 4B – Very Suspicious
- 4X – Suspicious with Additional Features

The module supports classification of solid, non-solid, part-solid, airway, juxtapleural, and cystic lesions, with downgrade rules for stable/decreasing nodules and reversion for proven benign findings.

### Citation

ACR Lung-RADS v2022: Assessment categories and management recommendations. Christensen J, Prosper AE, Wu CC, et al. J Am Coll Radiol. 2024;21(3):473–488. doi:10.1016/j.jacr.2023.09.009

Available online: https://www.jacr.org/article/S1546-1440(23)00761-5/fulltext

## Data Inputs

The Lung-RADS module accepts a fixed set of structured inputs corresponding to guideline descriptors. All inputs are collected via dropdown menus or voice-selectable fields.

Required Inputs

- Lesion type (solid, non-solid, part-solid, cystic, juxtapleural, airway)
- Nodule status (baseline, new, growing, stable, decreasing)
- Mean nodule diameter (mm)

Optional Inputs

- Lobe location
- “4X” upgrade flag
- “S” modifier for incidental findings
- Validation ensures that all required fields are present before category assignment.

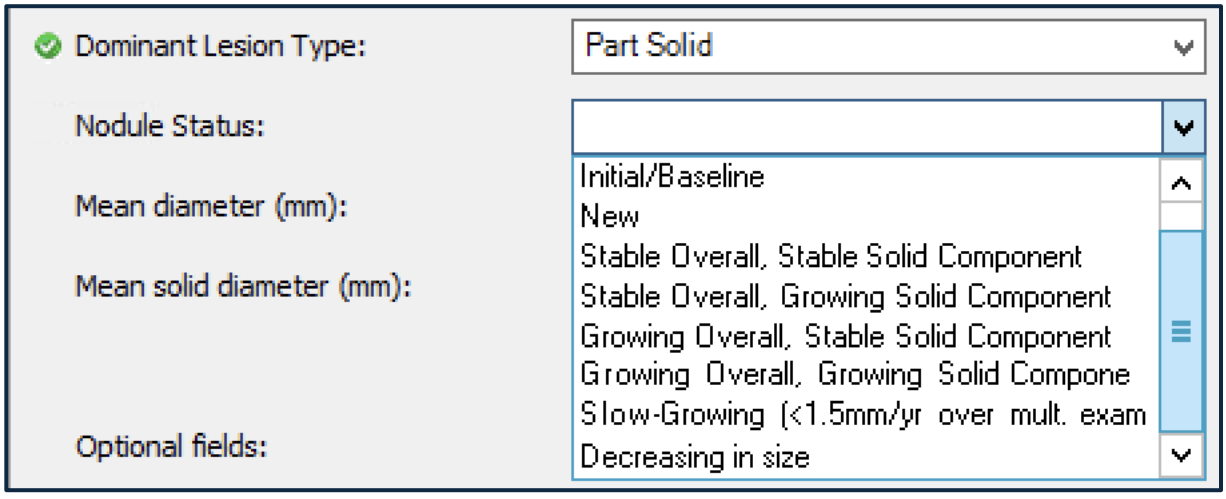



**Figure 1**. The module comprises required and optional inputs to drive generation of impression text.

## Decision Logic and Category Assignment

The module encodes the full categorical logic of Lung-RADS v2022. Logic execution is deterministic, and each terminal pathway resolves to a single category with a linked management recommendation.

Decision Pathways:

- The most suspicious nodule determines category.
- Growth: >1.5 mm increase in mean diameter within 12 months; slow growth over years → 4B.
- Threshold crossing: size change sufficient to enter a higher-risk category prompts upgrade.
- Stable/decreasing nodules: downgraded (4A→3, 3→2).
- Airway nodules: subsegmental = 2; segmental/proximal = 4A, persistent = 4B.
- Atypical cysts: thin-walled = benign; thick-walled/multilocular or enlarging = 4A/4B.
- Infection/inflammation: findings suspicious for acute process may be assigned Category 0 with 1–3 month follow-up.

## Output Generation

The Lung-RADS module inserts standardized content into the Impression section of the radiology report.

Output components include:

- Category statement (e.g., “Lung-RADS Category 3: Probably benign.”)
- Lesion description (nodule type, size, stability)
- Management recommendation (e.g., “Follow-up LDCT in 6 months.”)
- Citation

If required inputs are missing, no output is inserted and the user is prompted to review.

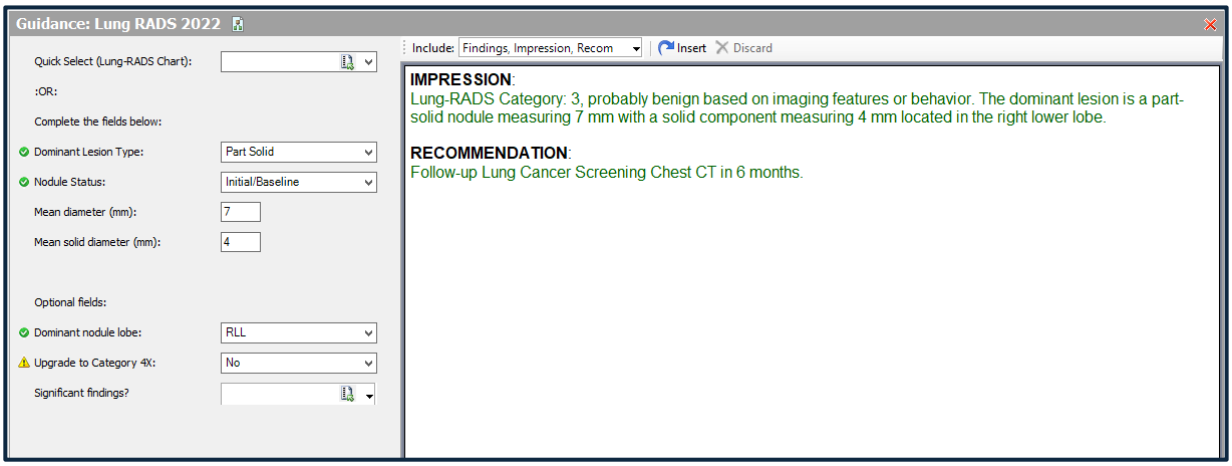
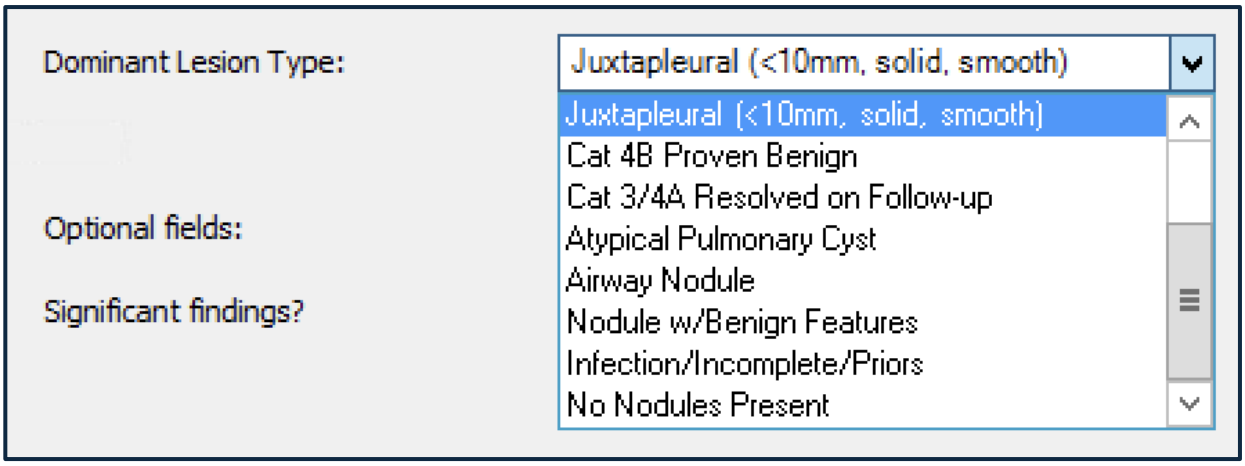
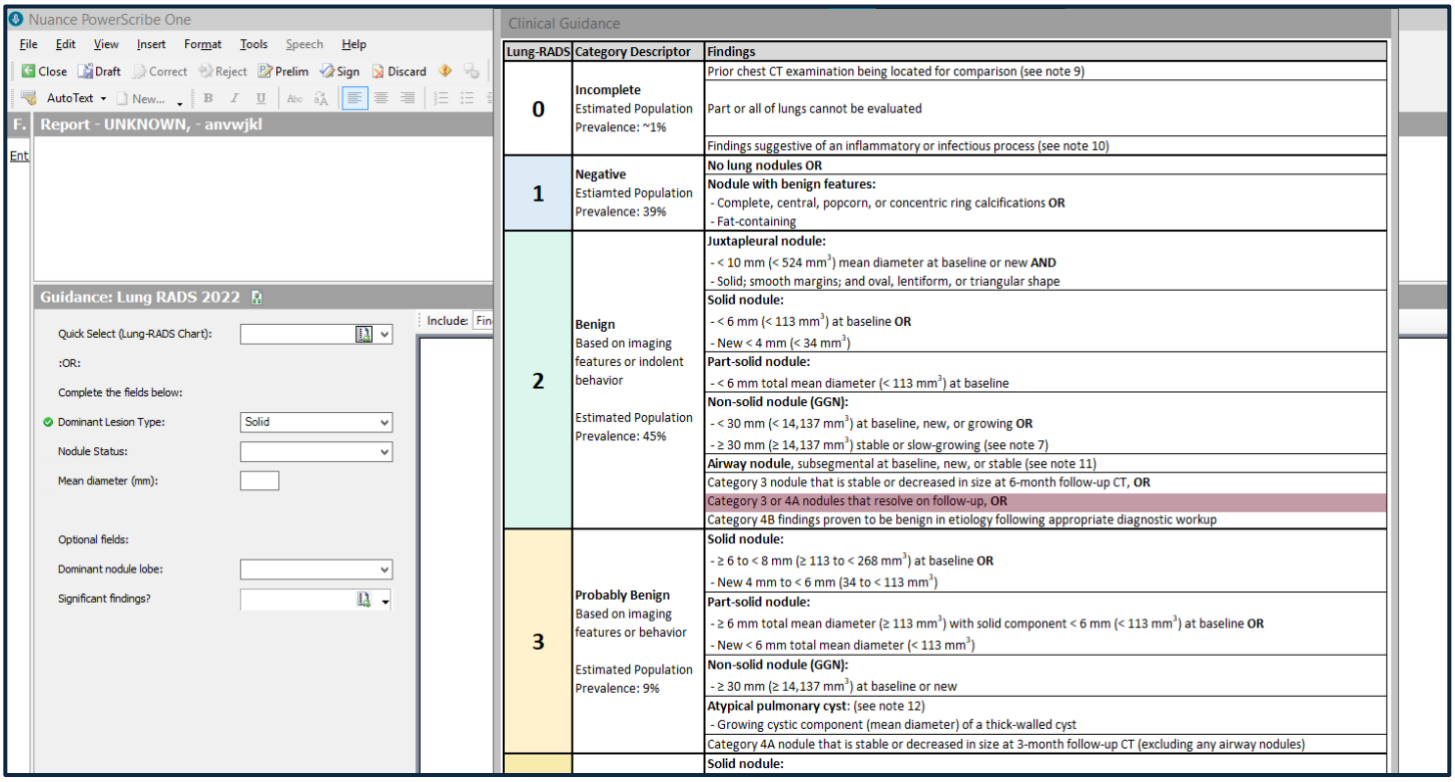



**Figure 2.** Example impression and recommendation text.

## User Interface and Interaction Behavior

- Invoked by voice command, sidebar selection, or macro.
- Structured input panel guides completion of required and optional fields.
- Logic executes automatically once required fields are present.
- Quick Select mode allows direct category assignment.
- An optional interactive flowchart mirrors the Lung-RADS decision structure, allowing visual navigation and direct category selection.

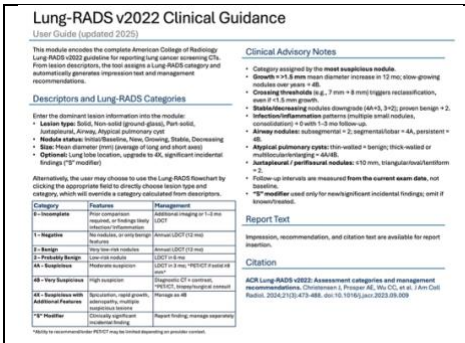



**Figures 3 and 4**. The user may either input nodule information by field or select a clickable Lung-RADS chart to prepopulate fields.

## Appendix: User Reference Material

Within the tool, the user has access to several references to aid in their use of the tool, both logistically and clinically.


Lung-RADS v2022 Clinical Guidance

User Guide (updated 2025)

This module encodes the complete American College of Radiology Lung-RADS v2022 guideline for reporting lung cancer screening CTs. From lesion descriptors, the tool assigns a Lung-RADS category and automatically generates impression text and management recommendations.

Descriptors and Lung-RADS Categories

Enter the dominant lesion information into the module:

- **Lesion type:** Solid, Non-solid (ground-glass), Part-solid, Juxtapleural, Airway, Atypical pulmonary cyst
- **Nodule status:** Initial/Baseline, New, Growing, Stable, Decreasing
- **Size:** Mean diameter (mm) (average of long and short axes)
- **Optional:** Lung lobe location, upgrade to 4X, significant incidental findings ("S" modifier)

Alternatively, the user may choose to use the Lung-RADS flowchart by clicking the appropriate field to directly choose lesion type and category, which will override a category calculated from descriptors.

| Category | Features | Management |
|---|---|---|
| 0 – Incomplete | Prior comparison required, or findings likely infection/inflammation | Additional imaging or 1–3 mo LDCT |
| 1 – Negative | No nodules, or only benign features | Annual LDCT (12 mo) |
| 2 – Benign | Very low-risk nodules | Annual LDCT (12 mo) |
| 3 – Probably Benign | Low-risk nodule | LDCT in 6 mo |
| 4A – Suspicious | Moderate suspicion | LDCT in 3 mo; *PET/CT if solid ≥8 mm* |
| 4B – Very Suspicious | High suspicion | Diagnostic CT + contrast; *PET/CT, biopsy/surgical consult* |
| 4X – Suspicious with Additional Features | Spiculation, rapid growth, adenopathy, multiple suspicious lesions | Manage as 4B |
| "S" Modifier | Clinically significant incidental finding | Report finding; manage separately |

*Ability to recommend/order PET/CT may be limited depending on provider context.

Clinical Advisory Notes

- Category assigned by the **most suspicious nodule**.
- **Growth = >1.5 mm** mean diameter increase in 12 mo; slow-growing nodules over years = 4B.
- **Crossing thresholds** (e.g., 7 mm + 8 mm) triggers reclassification, even if <1.5 mm growth.
- **Stable/decreasing** nodules downgrade (4A→3, 3→2); proven benign = 2.
- **Infection/inflammation** patterns (multiple small nodules, consolidation) = 0 with 1–3 mo follow-up.
- **Airway nodules:** subsegmental = 2; segmental/lobar = 4A, persistent = 4B.
- **Atypical pulmonary cysts:** thin-walled = benign; thick-walled or multilocular/enlarging = 4A/4B.
- **Juxtapleural / perifissural nodules:** ≤10 mm, triangular/oval/lentiform = 2.
- Follow-up intervals are measured **from the current exam date**, not baseline.
- **"S" modifier** used only for new/significant incidental findings; omit if known/treated.

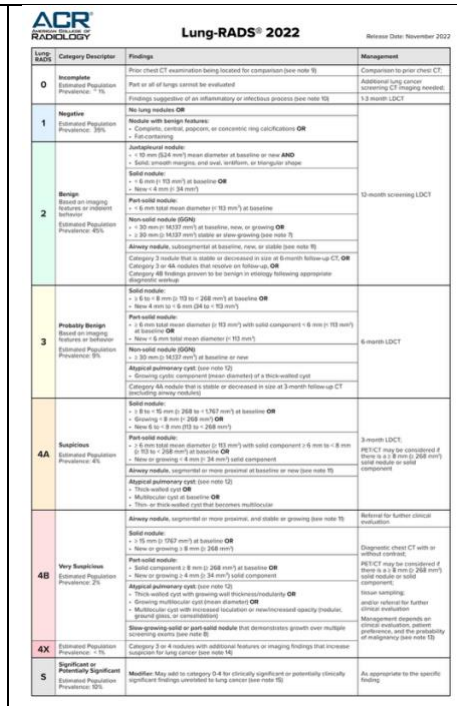
Report Text

Impression, recommendation, and citation text are available for report insertion.

Citation

**ACR Lung-RADS v2022: Assessment categories and management recommendations.** Christensen J, Prosper AE, Wu CC, et al. J Am Coll Radiol. 2024;21(3):473-488. doi:10.1016/j.jacr.2023.09.009

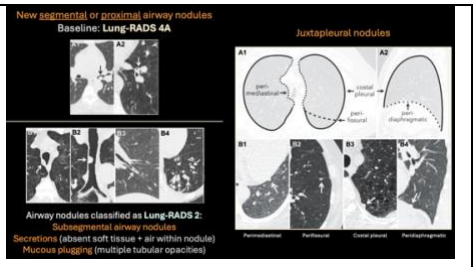
Module use quick reference.


ACR Lung-RADS® 2022

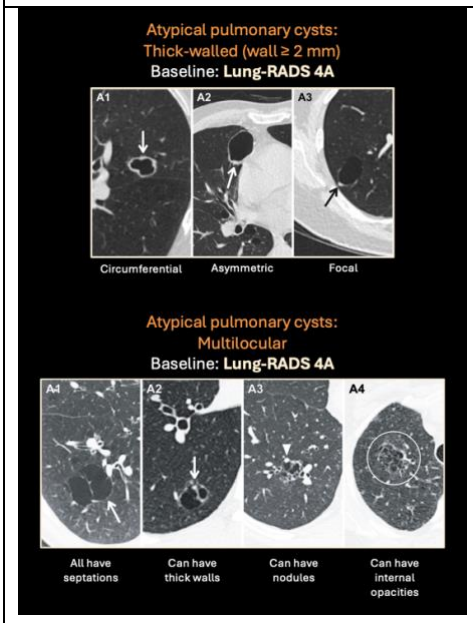
Release Date: November 2022

| Lung-RADS | Category Descriptor | Findings | Management |
|---|---|---|---|
| 0 | **Incomplete** Estimated Population Prevalence: ~ 1% | Prior chest CT examination being located for comparison (see note 9) | Comparison to prior chest CT |
| | | Part or all of lungs cannot be evaluated | Additional lung cancer screening CT imaging needed |
| | | Findings suggestive of an inflammatory or infectious process (see note 10) | 1-3 month LDCT |
| 1 | **Negative** Estimated Population Prevalence: 39% | **No lung nodules OR** | |
| | | **Nodule with benign features:** • Complete, central, popcorn, or concentric ring calcifications **OR** • Fat-containing | |
| 2 | **Benign** Based on imaging features or indolent behavior Estimated Population Prevalence: 45% | **Juxtapleural nodule:** • < 10 mm (≤24 mm³) mean diameter at baseline or new **AND** • Solid; smooth margins, oval, oval, lentiform, or triangular shape | 12-month screening LDCT |
| | | **Solid nodule:** • < 6 mm (< 113 mm³) at baseline **OR** • New < 4 mm (< 34 mm³) | |
| | | **Part-solid nodule:** • < 6 mm total mean diameter (< 113 mm³) at baseline | |
| | | **Non-solid nodule (GGN):** • < 30 mm (< 14,137 mm³) at baseline, new, or growing **OR** • ≥ 30 mm (≥ 14,137 mm³) stable or slow-growing (see note 7) | |
| | | **Airway nodule**, subsegmental at baseline, new, or stable (see note 11) | |
| | | Category 3 nodule that is stable or decreased in size at 6-month follow-up CT, **OR** Category 3 or 4A nodules that resolve on follow-up, **OR** Category 4B findings proven to be benign in etiology following appropriate diagnostic workup | |
| 3 | **Probably Benign** Based on imaging features or behavior Estimated Population Prevalence: 9% | **Solid nodule:** • ≥ 6 to < 8 mm (≥ 113 to < 268 mm³) at baseline **OR** • New 4 mm to < 6 mm (34 to < 113 mm³) | 6-month LDCT |
| | | **Part-solid nodule:** • 6 mm total mean diameter (≥ 113 mm³) with solid component < 6 mm (< 113 mm³) **OR** • New < 6 mm total mean diameter (< 113 mm³) | |
| | | **Non-solid nodule (GGN)** • ≥ 30 mm (≥ 14,137 mm³) at baseline or new | |
| | | **Atypical pulmonary cyst** (see note 12) • Growing cystic component (mean diameter) of a thick-walled cyst | |
| | | Category 4A nodule that is stable or decreased in size at 3-month follow-up CT (excluding airway nodules) | |
| 4A | **Suspicious** Estimated Population Prevalence: 4% | **Solid nodule:** • ≥ 8 to < 15 mm (≥ 268 to < 1,767 mm³) at baseline **OR** • Growing (< 8 mm (< 268 mm³) **OR** • New 6 to < 8 mm (113 to < 268 mm³) | 3-month LDCT; PET/CT may be considered if there is a ≥ 8 mm (≥ 268 mm³) solid nodule or solid component |
| | | **Part-solid nodule:** • ≥ 6 mm total mean diameter (≥ 113 mm³) with solid component ≥ 6 mm to < 8 mm (≥ 113 to < 268 mm³) at baseline **OR** • New or growing < 6 mm (< 34 mm³) solid component | |
| | | **Airway nodule**, segmental or more proximal at baseline or new (see note 11) | |
| | | **Atypical pulmonary cyst** (see note 12) • Thick-walled cyst **OR** • Multilocular cyst at baseline **OR** • Thin- or thick-walled cyst that becomes multilocular | |
| 4B | **Very Suspicious** Estimated Population Prevalence: 2% | **Airway nodule**, segmental or more proximal, and stable or growing (see note 11) | Referral for further clinical evaluation |
| | | **Solid nodule:** • ≥ 15 mm (≥ 1767 mm³) at baseline **OR** • New or growing ≥ 8 mm (≥ 268 mm³) | Diagnostic chest CT with or without contrast; PET/CT may be considered if there is a ≥ 8 mm (≥ 268 mm³) solid nodule or solid component; tissue sampling; and/or referral for further clinical evaluation |
| | | **Part-solid nodule:** • Solid component ≥ 8 mm (≥ 268 mm³) at baseline **OR** • New or growing ≥ 6 mm (≥ 34 mm³) solid component | |
| | | **Atypical pulmonary cyst** (see note 12) • Thick-walled cyst with growing wall thickness/nodularity **OR** • Growing multilocular cyst (mean diameter) **OR** • Multilocular cyst with increased loculation or new/increased opacity (nodular, ground glass, or consolidation) | Management depends on clinical evaluation, patient preference, and the probability of malignancy (see note 13) |
| | | **Slow-growing solid or part-solid nodule** that demonstrates growth over multiple screening exams (see note 8) | |
| 4X | Estimated Population Prevalence: < 1% | Category 3 or 4 nodules with additional features or imaging findings that increase suspicion for lung cancer (see note 14) | |
| S | **Significant or Potentially Significant** Estimated Population Prevalence: 50% | **Modifier:** May add to category 0-4 for clinically significant or potentially clinically significant findings unrelated to lung cancer (see note 15) | As appropriate to the specific finding |

ACR Lung-RADS categorization table.




Airway nodule and juxtapleural/perifissural nodule reference images.




Pulmonary cyst reference images.