

Follow-up and Management of Indeterminate Lung Nodules Detected Incidentally on Nonscreening CT

The appropriate recommendation based on the nodule to be followed should be incorporated in every report. If risk factors are unknown; report both follow-up options. Below are the Fleischner Society Guidelines adopted by the MCMS for newly detected indeterminate nodule(s) in persons 35 years of age or older. The recommended follow up is based on the size of the largest indeterminate nodule and, for solid nodules, whether or not the patient is considered at low or high risk. In the occasion there are solid and subsolid nodules, both guidelines should be followed and combined when possible. Please note that in individual circumstances exceptions may be made in a clinician's assessment of a single case.

Fleischner Society Guidelines for Solid Nodules*

Nodule Size	Follow-up for Low Risk Patient	Follow-up for High-Risk Patient
≤ 4 mm	No follow-up needed	Follow-up CT at 12 mo; if unchanged, no further follow-up
> 4 - ≤6 mm	Follow-up CT at 12 mo; if unchanged, no further follow-up needed	Initial follow-up CT at 6-12 mo then at 18-24 mo if no change; then no further testing necessary
> 6 - ≤8 mm	Follow-up CT at 6-12 mo then at 18-24 mo if no change; then no further testing necessary	Initial follow-up CT at 3-6 mo then at 9-12 mo and 24 mo if no change; then no further testing necessary
> 8 mm	Follow-up CT at 3, 9, 24 mo, dynamic contrast enhanced CT, PET and/or biopsy	Same as for low risk patients

Notes: diameter = average of length and width.

High risk is defined as one or more of the following:

- >20 pack year smoking history or equivalent second hand exposure
- Family history of lung cancer
- Occupational Exposure (asbestos, beryllium, silica, uranium, radon)
- Chronic Interstitial/Fibrotic Lung Disease

Low risk is defined as:

- Minimal or absent history of smoking or other known risk factors

Cautionary Notes:

- Caution is advised in the setting of fever/immunocompromised state which may require early pulmonary evaluation or follow up CT based on clinical concern for pulmonary infection.
- These guidelines may not apply for individuals with known or suspected malignant disease.

Fleischner Society Guidelines for Subsolid Nodules**

Subsolid Nodules include pure Ground Glass Nodules (GGN) and Part-Solid Nodules

Nodule Size	Nodule Type	Recommended Follow-up
≤ 5 mm	Solitary GGN	No CT follow-up required. (a)
	Multiple GGN's	Follow-up CT at 2 and 4 yrs. (b)
	Solitary Part-Solid	Follow-up CT at 3 mo to determine persistence; if persistent and unchanged, yearly CT for a minimum of 3 yrs. (c)
	Multiple Part-Solid	Follow-up in 3 mo; if persistent, biopsy or surgical resection is recommended especially if the solid component becomes > 5 mm. (d)
> 5 mm	Solitary GGN	Follow-up CT in 3 mo; if persistent and unchanged, yearly CT for a minimum of 3 years. (e)
	Multiple GGN	Same as solitary GGN
	Solitary Part-Solid	Follow-up CT in 3 mo; if persistent and solid component < 5 mm, yearly CT for a minimum of 3 yrs; if solid component ≥ 5 mm, biopsy or surgical resection is recommended. (f)
	Multiple Part-Solid	Follow-up CT in 3 mo; if persistent, biopsy or surgical resection is recommended especially if solid component is ≥ 5mm. (d,f)

Notes:

1. There are no data at present to suggest that traditional risk factors for lung cancer, such as smoking history or family history, are applicable to subsolid nodules. Therefore work-up of subsolid nodules is not stratified by cancer risk factors at this time.
2. Subsolid nodules, especially pure GGN's, exhibit an indolent growth pattern if persistent with doubling times of 3-5 yrs. Therefore follow-up of subsolid nodules is performed less frequently but for a longer duration than solid nodules.

Nodule Specific Remarks/Rationale:

- a. The low likelihood of malignancy of this lesion does not justify the monetary expense or excess radiation exposure associated with CT follow-up.
- b. The natural history of multiple small GGN's is unknown. Therefore a conservative follow-up strategy is recommended while alternative diagnoses such as respiratory bronchiolitis are considered.
- c. While the presence of a solid component to a subsolid nodule has been shown to increase the likelihood of an invasive carcinoma, solid components measuring < 5 mm more often represent carcinoma-in-situ or minimally invasive carcinoma and are best managed conservatively.
- d. Multiple part-solid nodules with a solid component that changes from < 5mm to ≥ 5mm have been found to represent multiple synchronous primary lung cancers. Furthermore, aggressive lung sparing resection of these lesions has been shown to be clinically beneficial for all histologies except mucinous adenocarcinoma. (4)
- e. Most of these lesions have been shown to be either benign (20%) or represent foci of atypical adenomatous hyperplasia, carcinoma-in-situ, or minimally invasive carcinoma. It has also been shown that delaying surgical resection until there is evidence of interval growth produced no adverse effect on patient outcome. (5)
- f. As in "d" above, the presence of a part-solid component increases the likelihood of invasive carcinoma which is especially true if the solid component exceeds 5 mm prompting a variable work-up strategy based on the size of the solid component.

*Adapted from the Fleischner Society Statement on CT of Small Pulmonary Nodules (Radiology 2005; 237:395-400). Available from: <http://radiology.rsna.org/content/237/2/395.full.pdf+html> **Adapted from the Fleischner Society Statement on Recommendations for the Management of Subsolid Pulmonary Nodules Detected at CT (Radiology; 266(1): 304-317). Available from: <http://pubs.rsna.org/doi/pdf/10.1148/radiol.12120628>