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Fleischner Society pulmonary nodule recommendations



Last revised by Yuranga Weerakkody (/users/weer06?lang=us) on 25 Nov 2025

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The **Fleischner Society pulmonary nodule recommendations** pertain to the follow-up and management of indeterminate pulmonary nodules (/articles/pulmonary-nodule-1?lang=us) detected incidentally on CT and are published by the Fleischner Society (/articles/fleischner-society?lang=us). The guideline does not apply to lung cancer screening, patients younger than 35 years, or patients with a history of primary cancer or immunosuppression.

NB: This article reflects the 2017 revision ⁴, which supersedes prior versions published in 2005 ¹ and 2013 ².

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Solid nodules

Single

Single solid nodule <6 mm (<100 mm³)

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continue you must accept our use of cookies (/terms?lang=us#cookies) and the site's Accept Terms of Use (/terms?lang=us). Upper lobe location, see "Risk assessment" below

Solitary solid nodule 6-8 mm (100-250 mm³)

- low-risk patients: CT at 6-12 months, then consider CT at 18-24 months
- high-risk patients: CT at 6-12 months, then CT at 18-24 months

Solitary solid nodule >8 mm (>250 mm³)

- low-risk and high-risk patients: consider CT at 3 months, PET-CT, or tissue sampling

Multiple

Multiple solid nodules <6 mm (<100 mm³)

- low-risk patients: no routine follow-up required
- high-risk patients: optional CT at 12 months

Multiple solid nodules 6-8 mm (100-250 mm³)

- low-risk patients: CT at 3-6 months, then consider CT at 18-24 months
- high-risk patients: CT at 3-6 months, then at 18-24 months

Multiple solid nodules >8 mm (>250 mm³)

- low-risk patients: CT at 3-6 months, then consider CT at 18-24 months
- high-risk patients: CT at 3-6 months, then at 18-24 months

When multiple nodules are present, the most suspicious nodule should guide further individualized management.

Subsolid nodules

Single

Single ground glass nodule <6 mm (<100 mm³)

- no routine follow-up required

Single ground glass nodule ≥6 mm (>100 mm³)

- CT at 6-12 months, then if persistent, CT every 2 years until 5 years

Single part-solid nodule ≥6 mm (>100 mm³)

- CT at 3-6 months, then if persistent and solid component remains <6 mm, annual CT until 5 years

Multiple

Multiple subsolid nodules <6 mm (<100 mm³)

- CT at 3-6 months, then if stable consider CT at 2 and 4 years in high-risk patients

Multiple subsolid nodules ≥6 mm (>100 mm³)

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Practical points

Nodule measurement

Certain technical parameters for imaging nodules have been recommended^{5,6}:

- image production and viewing
 - images should be acquired in full inspiration
 - nodules should usually be measured in the axial (transverse) plane, although the coronal or sagittal plane may be used if the greatest dimensions lie in those planes
 - nodules should be measured in lung windows, although soft tissue windows can help evaluate changes in nodule density over time
 - small nodules (<10 mm) should be viewed and measured on images reconstructed in thin slices (≤ 1.5 mm, ideally 1 mm) using a high-spatial frequency (sharp) algorithm, in order to avoid partial volume averaging, and identify fat or calcified components
 - if automated or semi-automated volumetry is performed it should be done using the same software for the initial and follow-up studies
- nodule description and assessment
 - by size
 - small nodules 3-10 mm should be expressed, for risk estimation purposes, as the average of the short-axis and long-axis diameters (measured on the same slice)
 - small nodules <3 mm should not be measured and should be described as micronodules
 - larger nodules >10 mm and masses, for descriptive purposes, should be described in both short- and long-axis measurements
 - measurements should be rounded to the nearest whole millimeter
 - part-solid nodules
 - solid components >3 mm should have the maximal diameter reported
 - part-solid nodules cannot be discerned as such when <6 mm
 - when multiple nodules are present, only the largest or morphologically most suspicious need to be measured and have their location(s) reported
 - the dominant nodule refers to the morphologically most suspicious lesion, which is not necessarily the largest
 - an increase in nodule dimension by ≥ 2 mm is required to identify significant growth
 - volume doubling time (/articles/volume-doubling-time?lang=us) can be used as an ancillary feature to characterize nodule behavior
 - perifissural nodules (/articles/peripheral-pleura-based-and-perifissural-nodules?lang=us) that demonstrate characteristic morphology (triangular or oval shape in the axial plane, and a flat or lentiform morphology in the sagittal and coronal planes) do not necessarily require follow-up even if >6 mm

Guideline exclusions

- patients aged < 35 years or younger
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- management of incidentally-found pulmonary nodules in this group should be individualized
- patients with known malignancy
 - an incidentally-detected pulmonary nodule is more likely to be cancer-related than in the general population
- immunocompromised patients (/articles/immunocompromised?lang=us)
 - higher risk for opportunistic pulmonary infections
- lung cancer screening population
 - these patients are on active screening due to a high-risk for lung cancer development, usually current and former smokers, and, therefore, should have their scans reported accordingly to Lung-RADS (/articles/lung-imaging-reporting-and-data-system-lung-rads?lang=us)

Specific scenarios

- thick-slice scans (>2 mm thickness)
 - although the revised 2017 guideline does not approach this scenario, some authors advise that for nodules ≥ 6 mm, a complete thin-slice CT of the chest should be recommended as early as possible to further determine an accurate management⁵
- incomplete CT scans (e.g. abdomen and neck scans)
 - ≤ 8 mm nodules should follow the guideline
 - >8 mm nodules or those with very suspicious features need a further complete chest CT as early as possible^{4,5}

Risk assessment

Because some categories are stratified by low and high risk (e.g. for solitary solid pulmonary nodules <6 mm), clinicians are asked to assess the risk of malignancy using factors other than the nodule descriptors included in the guidelines (size, multiplicity, and attenuation). The guidelines recommend considering high-risk as an estimated risk of cancer $>5\%$.

Suggested risk factors to consider include older age, heavy smoking (/articles/tobacco-use-1?lang=us), irregular or spiculated margins, and upper lobe location. There is considerable ambiguity in the guidelines regarding this task, affording radiologists and other clinicians significant flexibility for tailoring recommendations to the individual clinical scenario and imaging findings. According to the American College of Chest Physicians, risk assessment can be performed qualitatively by using one's clinical judgment and/or quantitatively by using a validated model⁷.

When multiple nodules are detected and persistent on the follow-up scan, the most suspicious nodule should guide further management. Suspicious imaging features to consider include interval growth of a solid component that is ≥ 6 mm, spiculated margins, interval increase in density, or a new microcystic component⁵. Persistent part-solid nodules with solid components ≥ 6 mm should also be considered highly suspicious. The presence of these features may prompt further diagnostic evaluation rather than continued follow-up according to these guidelines.

See also

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- Fleischner Society (/articles/fleischner-society?lang=us)
- solitary pulmonary nodules (/articles/solitary-pulmonary-nodule-1?lang=us)

External links

- Fleischner Calculator For Incidental Lung Nodules on CT (RadioGyan)
(<https://radiogyan.com/fleishner-calculator/>)
- Fleischner Calculator: Management of Incidental Pulmonary Nodules Detected on CT (Rad At Hand)
(<https://radathand.com/radiology-calculators/cardiothoracic-imaging/fleischner-calculator-for-incidentally-detected-pulmonary-nodules/>)

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