CLINICAL GUIDELINE

Pulmonary nodules in radiology, (assessment of)

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

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Approval Group:	Diagnostics Directorate Clinical Governance Group

Important Note:

The Intranet version of this document is the only version that is maintained.
Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

Assessment of pulmonary nodules in radiology

Pulmonary nodules are a common incidental discovery on CT scans, with a small but significant risk of malignancy, either now or in the future. However there are issues around the organisation of follow up.

Use of guidelines is inconsistent, with Fleischner and BTS guidelines in use simultaneously. Radiologists often recommend “follow up as per guidelines” without specifying which ones, or what they recommend; this is particularly unreasonable when the referrer is not a chest specialist. Or they recommend inconsistently. This leads to confusion, variable follow up, and either under or over scanning.

We suggest all radiologists use and refer to the BTS guideline for the investigation and management of pulmonary nodules (Thorax supplement August 2015). A corresponding app is available called Pulmonary Nodule Risk, it has relevant risk calculators for malignancy post CT (Brock) and post PETCT (Herder) and volume doubling time calculator as well as detailed follow up advice and the text of the guideline.

It is often unclear who is responsible for the follow up, or whether these patients require to be seen in a chest clinic; a significant resource drain if they do, but a risk of failure of follow up if they don’t.

The following is a proposal to improve the way these patients are managed, while reducing the resource consumed.

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J Van Der Horst December 2020

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Solid non-calcified nodules

Initial CT

When a radiologist identifies a pulmonary nodule, for which no previous imaging is available, the initial decision making is simple and should be within the capability of all radiologists. It is based on BTS guidelines, which should be the standard.

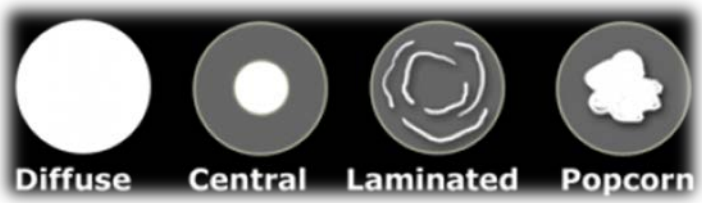
1. Is it actually a nodule, or something benign (see notes) in which case it can be dismissed.
2. How large is it? This should be both by largest diameter, and by volumetric measurement on Carestream PACS or Vitrea workstation, as this determines what happens next.
   - <80mm^3 or <5mm – recommend no follow up required
   - 5-6mm – recommend one year non contrast CT volume follow up (CCHES)
   - 6-8mm – recommend 3 month non contrast CT volume follow up (CCHES)
   - >8mm or >300m^3 – recommend chest referral (clinic / MDT) or apply Brock model (see Notes)
     - Risk <10% – recommend scan at 3 months
     - Risk >10% – chest referral

All reports of nodules should have one of these recommendations.

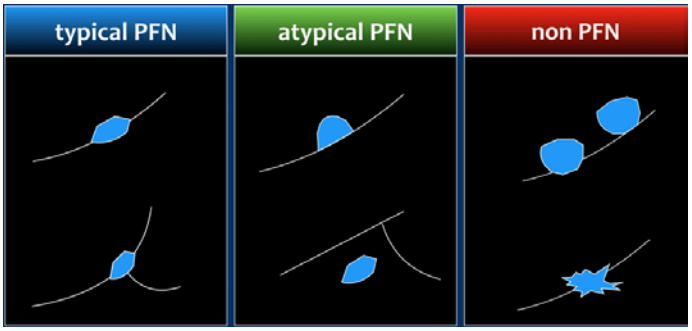
Notes:

If there are multiple nodules, measure the largest.
Benign lesions might include:

- Diffuse, central, laminated or popcorn calcification pattern



- Perifissural location: homogeneous solid nodules, attached to a fissure with a lentiform or triangular shape, may be subpleural



- No change from historical imaging at least one year old – review PACS record

Some lesions may not be suited to volumetric measurement. Manual measurement on PACS or a workstation may be worthwhile to prevent unnecessary follow up. Visually sense check all automated volume estimations, and edit if necessary.

Some lesions >8mm or >300m^3 that are referred on may, after further assessment, be put back to CT follow up if their risk of malignancy is considered <10%. If a radiologist feels competent, they may be able to estimate this risk themselves using a Brock Model calculator (see Notes).

Follow up CT

Patients whose nodule does not require further investigation at 3 months should be recommended for scanning again at 1 year from the original scan.

Nodule follow up studies should be reported by radiologists who feel competent in nodule assessment including volume analysis and comfortable in advising future management.

It should again be considered if the lesion actually looks benign, and doesn't require long term follow up.

At follow up, whether at 3 months or 1 year, the largest diameter and the volume should again be estimated. If the lesion was recorded correctly on PACS on the initial scan, PACS will attempt to do this automatically. It will then also estimate % volume change, and the volume doubling time (VDT) in days (this may not be true by default on all PACS servers – depends how they were set up).

Any volume change of less than 25% is within respiratory variation and not considered significant. When using the BTS nodule volume doubling time calculator for instance any change of less than 25% will give an estimate of N/A.

BTS guidelines recommend a 2 year scan if a nodule is deemed stable on diameter measurements only. Thus a volumetric assessment may avert the need for a 2 year scan, and should be performed wherever possible.

Presence of significant growth is determined as follows:

- <25% increase in volume at one year or VDT >600 days – recommend discharge with no further follow up (referrer should consider patient age, fitness & preference)
- VDT 400-600 days at 1 year – repeat CT at 2 years, or biopsy, at patient's preference – this is therefore best achieved by recommending chest referral
- >25% increase in volume at 3/12 or 1 year – recommend chest referral
- VDT <400 days at 3/12 or 1 year – recommend chest referral

Notes:

Not applicable to known extrapulmonary malignancy; consider the growth rate in the context of the primary and any treatment thereof.

Subsequent management of nodules requiring further investigation (Brock model, biopsy. PET, etc) is beyond the scope of this simplified guidance, and should be conducted by chest physicians and/or chest radiologists, hence the recommendation for referral.

If a radiologist feels competent, they may be able to estimate this risk themselves using a Brock Model calculator (see Notes).

Sub solid nodules

Initial scan

When a radiologist identifies a SSN the initial decision making is relatively simple, and should be within the capability of all radiologists. It is based on BTS guidelines.

How large is it? This should be by largest diameter, as this determines what happens next.

- <5mm or stable 4 years – recommend no follow up required
- >5mm – recommend 3 month non contrast CT volume follow up, if patient deemed fit for future treatment

All reports of SSNs should have one or other of these recommendations.

Follow up scan

Nodule follow up studies should be reported by radiologists who feel competent in sub solid nodule assessment including volume analysis and comfortable in advising future management.

It should again be considered if the lesion actually looks benign, and doesn't require long term follow up.

At follow up the largest diameter should again be estimated, and any suspicious changes in morphology identified.

Presence of significant growth is determined as follows:

- Resolved – recommend discharge with no further follow up
- Stable – chest referral, or Brock model calculation (see Notes)
    - Risk <10% – recommend scan at 1, and 4 years from baseline – chest referral
    - Risk >10% – chest referral
- Growth of 25% or more, or altered morphology – in particular increasing solid component - chest referral

Notes:

Subsequent management of nodules requiring further investigation (Brock model, biopsy. PET, etc) is beyond the scope of this simplified guidance, and should be conducted by chest physicians and/or chest radiologists, hence the recommendation for referral.

If a radiologist feels competent, they may be able to estimate this risk themselves using a Brock Model calculator for instance the calculator contained within the BTS app or website.

Note a Brock Model calculation can be performed from the CT scan alone; only the family history cannot be determined, and this can be tested to determine if it affects the outcome. A safe approach would be to assume the worst case scenario. Brock Model calculators are available online; we recommend the BTS calculator:

https://brit-thoracic.org.uk/quality-improvement/guidelines/pulmonary-nodules/pn-risk-calculator/

There is also a BTS approved iOS app. The Android version is currently under revision and unavailable.

https://apps.apple.com/gb/app/pulmonary-nodule-risk/id1142255949