

Diagnostic Imaging Pathways - Non-Small Cell Lung Cancer (Staging)

Population Covered By The Guidance

This pathway provides guidance on imaging patients with confirmed non-small cell lung carcinoma on histology. This staging process will determine further definitive treatment.

Date reviewed: April 2017

Date of next review: April 2020






Published: May 2018

Quick User Guide

Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the **PINK** text box will bring up the full text.

The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram



Date reviewed: April 2017
Please note that this pathway is subject to review and revision

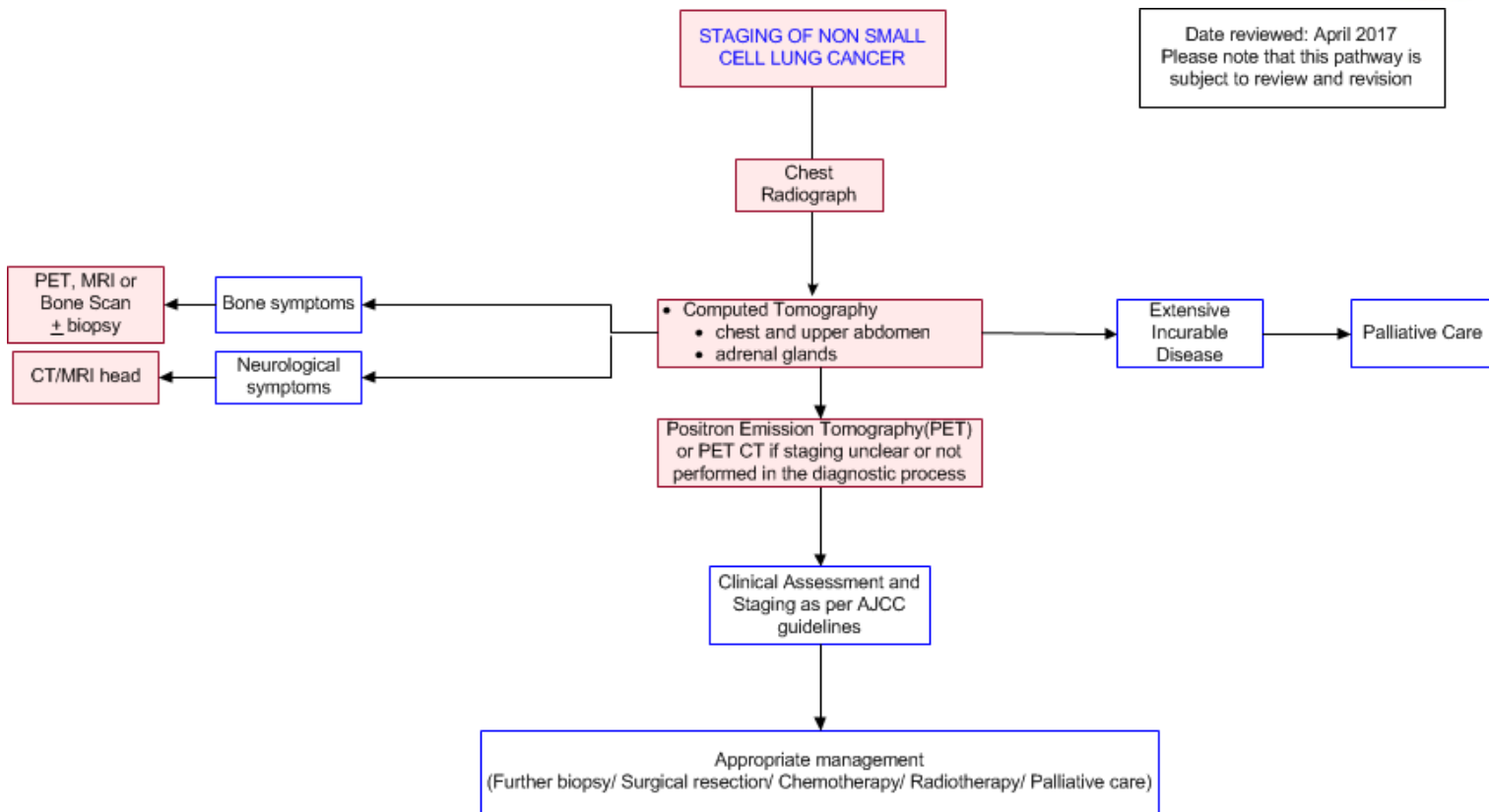


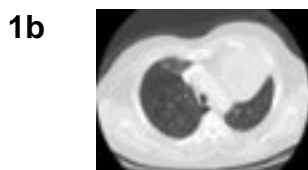
Image Gallery

Note: These images open in a new page

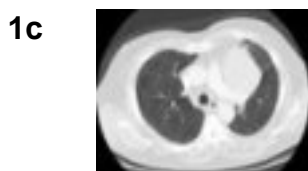


Lung Carcinoma

Image 1a (Chest radiograph: Left hilar mass causing collapse of the left upper lobe and elevation of the left main bronchus.



Images 1b, 1c, and 2d (Computed Tomography): CT of the same patient reveals a large, relatively homogenous mass within the left upper lobe measuring 95mm and extending from the apex to the hilum. Central areas of low attenuation are compatible with tissue necrosis. There is also encasement of the left upper lobe bronchus and pulmonary artery with extensive background emphysema.



Lung Carcinoma

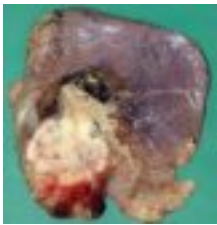


Image 2a: Lobectomy showing a large non-small cell lung carcinoma arising from the proximal bronchus and invading into the surrounding parenchyma. Note the patchy central necrosis and punctate areas of haemorrhage.

2b



Images 2b and 2c: Post-mortem specimens showing infiltration of lung parenchyma by bronchoalveolar carcinoma.

2c

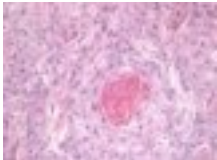


2d



Images 2d (H&E, x2.5) and 2e (H&E, x20): Histological sections of a moderately well differentiated squamous cell carcinoma of the lung showing infiltrating sheets and tongues of malignant squamous cells with whorls of keratin (blue arrows). At higher power, the malignant cells demonstrate marked nuclear atypia with abundant glassy eosinophilic cytoplasm.

2e



Teaching Points

- It is important to accurately stage NSCLC, as stages I to III are potentially resectable and in some instances curable. Accurately staging NSCLC can result in a higher quality of life in those with the disease as a result of more targeted and appropriate treatment
- Chest radiography is indicated in all patients but has low sensitivity for detecting lesion spread
- A CT of the chest and upper abdomen is indicated in all patients, as it allows for the evaluation of the size and extent of the primary tumour and metastatic spread to the mediastinum/upper abdomen
- A PET scan is indicated in all patients with NSCLC who DO NOT have evidence of stage IV (non-curative) disease on CT scans
- Increasingly, NSCLC is staged with combined PET-CT which is as accurate or superior to PET alone or CT alone
- Site specific symptoms warrant directed evaluation of that site with the most appropriate study
- Palliative care for NSCLC may include non-curative chemotherapy, radiation and/or surgery



Staging Of Non-Small Cell Lung Cancer (NSCLC)

- Precise staging is essential for therapeutic decision making and prognostic information [1-3](#)
- TNM classification is the preferred system of staging [2, 4, 5](#)
- Important to accurately differentiate stages I to IIIA (potentially resectable) from stage IIIB to IV (non-resectable) cancer [6, 7](#)

TNM Staging of Non-Small Cell Lung Cancer [8](#)

T: Primary Tumour	
Tx	Primary tumour cannot be assessed or tumour proven by presence of malignant cells in sputum or bronchial washings but not visualized by imaging or bronchoscopy
T0	No evidence of primary tumour
Tis	Carcinoma in situ
T1	Tumour ≤3 cm in greatest dimension surrounded by lung or visceral pleura without bronchoscopic evidence of invasion more proximal than the lobar bronchus (ie, not in the main bronchus)
T1a(mi)	Minimally invasive adenocarcinoma
T1a	Tumour ≤1 cm in greatest dimension
T1b	Tumour >1 cm but ≤2 cm in greatest dimension
T1c	Tumour >2 cm but ≤3 cm in greatest dimension
T2	Tumour >3 cm but ≤5 cm or tumour with any of the following features <ul style="list-style-type: none"> • Involves main bronchus regardless of distance from the carina but without involvement of the carina • Invades visceral pleura • Associated with atelectasis or obstructive pneumonitis that extends to the hilar region, involving part



	or all of the lung
T2 a	Tumour >3 cm but ?4 cm in greatest dimension
T2 b	Tumour >4 cm but ?5 cm in greatest dimension
T3	Tumour >5 cm but ?7 cm in greatest dimension or associated with separate tumour nodule(s) in the same lobe as the primary tumour or directly invades any of the following structures: chest wall (including the parietal pleura and superior sulcus tumours), phrenic nerve, parietal pericardium
T4	Tumour >7 cm in greatest dimension or associated with separate tumour nodule(s) in a different ipsilateral lobe than that of the primary tumour or invades any of the following structures: diaphragm, mediastinum, heart, great vessels, trachea, recurrent laryngeal nerve, oesophagus, vertebral body, and carina
N: Regional lymph node involvement	
Nx	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in ipsilateral peribronchial and/or ipsilateral hilar lymph nodes and intrapulmonary nodes, including involvement by direct extension
N2	Metastasis in ipsilateral mediastinal and/or subcarinal lymph node(s)
N3	Metastasis in contralateral mediastinal, contralateral hilar, ipsilateral or contralateral scalene, or supraclavicular lymph node(s)
M: Distant metastasis	
M0	No distant metastasis
M1	Distant metastasis present
M1	Separate tumour nodule(s) in



a	a contralateral lobe; tumour with pleural or pericardial nodule(s) or malignant pleural or pericardial effusion
M1 b	Single extrathoracic metastasis
M1 c	Multiple extrathoracic metastases in one or more organs

Stage groupings	T	N	M
Occult carcinoma	TX	N0	M0
Stage 0	Tis	N0	M0
Stage IA1	T1a(mi)	N0	M0
	T1a	N0	M0
Stage IA2	T1b	N0	M0
Stage IA3	T1c	N0	M0
Stage IB	T2a	N0	M0
Stage IIA	T2b	N0	M0
Stage IIB	T1a to c	N1	M0
	T2a	N1	M0
	T2b	N1	M0
	T3	N0	M0
Stage IIIA	T1a to c	N2	M0
	T2a to b	N2	M0
	T3	N1	M0
	T4	N0	M0
	T4	N1	M0
Stage IIIB	T1a to c	N3	M0
	T2a to b	N3	M0
	T3	N2	M0
	T4	N2	M0
Stage IIIC	T3	N3	M0
	T4	N3	M0
Stage IVA	Any T	Any N	M1a
	Any T	Any N3	M1b
Stage IVB	Any T	Any N	M1c

Plain Chest Radiography (CXR)

- Routinely indicated in patients with lung cancer [6](#)
- Readily available, inexpensive, and minimal effective radiation dose [9](#)
- Limitations - lacks sensitivity in the detection of mediastinal lymph node metastases, and in chest wall and mediastinal invasion [10](#)

Computed Tomography (CT)

Chest, Upper Abdomen

- For patients with either a known or suspected lung cancer who are eligible for treatment, CT scan of the chest with contrast is recommended [11](#)
- The usual CT protocol for NSCLC involves a CT chest with extension into the upper abdomen (adrenals). This allows for evaluation of the size and extent of the primary tumour, and metastatic spread to mediastinum and upper abdomen (particularly liver, adrenal glands) [6, 11](#)
- IV contrast may be administered to help distinguish vascular structures from centrally located tumours & lymph nodes
- Limitations
 - CT has only moderate T staging accuracy. The positive predictive value (PPV) of CT for T3 or T4 disease is only 68% and as such, a positive result should be confirmed histologically before denying patients curative surgery (unless there is overt evidence of non-resectable disease such as bony destruction or vascular invasion) [3, 12, 13](#)
 - CT has low accuracy in the identification of mediastinal metastases compared to PET with a median sensitivity and specificity of 61% and 79% respectively. Thus CT is not a reliable modality for staging the mediastinum in patients with NSCLC [14](#)
 - Although the accuracy of CT in detecting malignant lymph nodes is only about 67%, it provides good anatomic information and can guide the choice of lymph nodes for further invasive biopsy [14, 15](#)
 - CT has limited ability to evaluate superior sulcus tumours due to its axial format and streak artefacts from the shoulders. MRI may be of benefit in this circumstance [3, 13](#)
 - The relatively low sensitivity and specificity of CT (55 and 81 percent) and PET (80 and 88 percent) can miss occult cancer (false negatives) [11, 16](#)
- More recently, CT has been integrated with PET (PET-CT) to provide combined functional & anatomical imaging in the same sitting [3](#)

Adrenal Glands

- CT is the primary imaging modality for characterisation of adrenal masses. [11, 17](#) While the majority of adrenal lesions are benign, the risk of malignancy increases with primary tumour stage & the size of the adrenal lesion. Lesions >5cm in size are likely to be malignant and these patients should be referred for surgery [17-19](#)
 1. Lesions of 20 HU are likely malignant and should be biopsied when the result influences management
 2. CT indeterminate lesions (11-20 HU) can be further characterised by MRI, PET, PET-CT or by using CT washout criteria [21](#)
- When the adrenal lesion is the sole potential site of metastatic disease, biopsy & histopathological confirmation should be sought [19, 20, 23, 24](#)

Positron Emission Tomography (PET)

- PET utilises a radioactive glucose-analogue (18-FDG) to image tissues that preferentially uptake glucose. Non-small cell lung cancer tumours have a very high affinity for glucose and readily take up 18-FDG [7, 25](#)
- PET is able to accurately detect unsuspected distant metastases in 15% of surgical candidates and changes management in 25% of patients [7, 11, 26](#)
- PET is superior to CT in differentiating resectable from non-resectable disease [12, 14, 25](#)
- PET is indicated in all patients with non-small cell lung cancer unless CT scan unequivocally shows overwhelming radiographic evidence of metastatic disease in multiple sites [11](#)
- If PET is unavailable, bone scan and abdominal CT are reasonable alternatives to evaluate for

- extra thoracic disease [7, 11](#)
- Advantages
 - Superior to CT for nodal staging of non-small cell lung cancer [12, 14, 23, 24, 27](#)
 - Superior to CT and bone scan for detection of distant metastases [7, 25](#)
- Cost-effective in reducing the number of unnecessary thoracotomies [25, 27, 28](#)
- Disadvantages
 - Relatively poor resolution to assess tumour size and determine invasion into adjacent tissues, such as chest wall, large vessels, or other features that define tumour status [27, 29, 30](#)
 - Low sensitivity for detection of brain metastases [11, 27](#)
 - Moderate positive predictive value (79%) for diagnosis of mediastinal lymph node metastases, thus histological confirmation of PET positive nodes has been recommended [25, 29, 31](#)
- There is no need for curative surgical resection in Stage IV because of distant metastasis. An important advantage of PET-CT is the use of whole-body scanning to detect distant metastasis [25](#)

PET-CT

- The role of PET-CT in the management of non-small cell lung cancer continues to emerge with time. [32](#) Despite its increasing use, there is no consensus regarding the routine use of integrated PET/CT as a staging modality for patients with suspected NSCLC [33](#)
- The limited evidence so far indicates that PET-CT is as accurate or superior to PET alone. [23, 26, 31, 34](#)
- PET-CT has a good sensitivity & specificity for nodal staging (84%, 89% respectively), and for staging distant metastases (93%, 96% respectively). If this technique is not available, visual correlation of PET and CT can be a valuable alternative [3, 35](#)
- Limitations
 - Sensitivity for brain metastases is limited (60%) [11, 23](#)
 - Limited availability and high expense [3, 36](#)
 - Due to technological limitations of PET/CT, lesions that measure less than two to three times the spatial resolution of the scanner will usually appear less active due to the partial volume effect [13](#)
- The limited evidence suggests that PET/CT represents the best non-invasive modality for the detection of nodal metastasis, although mediastinoscopy is still required whenever there is uncertainty regarding the status of any one lymph node in patients with NSCLC [3](#)

Bone Scan or Magnetic Resonance Imaging (MRI)

- Site specific symptoms warrant directed evaluation of that site with the most appropriate study [11](#)
- Routine skeletal imaging is usually not indicated [37](#)
- Some studies have indicated that bone scintigraphy following PET is of limited use as PET is more sensitive and specific in detecting bone metastases secondary to NSCLC. Some authors have recommended use of MRI when an abnormality on PET has been detected [38-40](#)

Computed Tomography (CT) / Magnetic Resonance Imaging (MRI) Head

- Routine use of brain imaging in asymptomatic patients with NSCLC is not indicated and should be limited to patients with symptoms or in those who are more likely to have metastatic disease [41](#)

- Clinical examination is useful for ruling out cerebral metastases with a negative predictive value of 94% [14, 24, 42](#)
- CT may be the preferred initial investigation for cerebral metastases, but MRI has higher sensitivity. [23](#) CT and MRI are more effective than PET for assessing cerebral metastases due to high physiological glucose uptake in the brain [23, 41](#)

References

Date of literature search: January 2017

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. [Download the document](#)

1. Patz EF, Jr. **Imaging bronchogenic carcinoma.** Chest. 2000;117(4):90s-5s. (Review Article). [View the reference](#)
2. Saeed I, Anderson J. **Cancer of the lung: staging, radiology, surgery.** Surgery - Oxford International Edition. 2011;29(5):221-6. (Review article). [View the reference](#)
3. Hochegger B, Alves GRT, Irion KL, Fritscher CC, Fritscher LG, Concatto NH, et al. **PET/CT imaging in lung cancer: indications and findings.** Jornal Brasileiro de Pneumologia. 2015;41:264-74. (Review article). [View the reference](#)
4. Tsim S, O'Dowd CA, Milroy R, Davidson S. **Staging of non-small cell lung cancer (NSCLC): A review.** Respiratory Medicine. 2010;104(12):1767-74. (Review article). [View the reference](#)
5. Chheang S, Brown K. **Lung Cancer Staging: Clinical and Radiologic Perspectives.** Seminars in Interventional Radiology. 2013;30(2):99-113. (Review article). [View the reference](#)
6. Park BJ, Louie O, Altorki N. **Staging and the surgical management of lung cancer.** Radiol Clin North Am. 2000;38(3):545-61. (review article). [View the reference](#)
7. Ibeas P, Cantos B, Gasent JM, Rodriguez B, Provencio M. **PET-CT in the staging and treatment of non-small-cell lung cancer.** Clin Transl Oncol. 2011;13(6):368-77. (Level III evidence). [View the reference](#)
8. Amin MB ES, Greene FL et al. **AJCC (American Joint Committee on Cancer) Cancer Staging Manual, 8th edition.** Springer Chicago. 2017 [View the reference](#)
9. Nickoloff EL, Lu ZF, Dutta AK, So JC. **Radiation dose descriptors: BERT, COD, DAP, and other strange creatures.** Radiographics. 2008;28(5):1439-50. (Level III evidence). [View the reference](#)
10. Webb WR, Gatsonis C, Zerhouni EA, Heelan RT, Glazer GM, Francis IR, et al. **CT and MR imaging in staging non-small cell bronchogenic carcinoma: report of the Radiologic Diagnostic Oncology Group.** Radiology. 1991;178(3):705-13. (Review article). [View the reference](#)
11. Silvestri GA, Gonzalez AV, Jantz MA, Margolis ML, Gould MK, Tanoue LT, et al. **Methods for staging non-small cell lung cancer: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines.** Chest. 2013;143(5 Suppl):e211S-50S. (Guidelines). [View the reference](#)
12. Birim O, Kappetein AP, Stijnen T, Bogers AJ. **Meta-analysis of positron emission tomographic and computed tomographic imaging in detecting mediastinal lymph node metastases in nonsmall cell lung cancer.** Ann Thorac Surg. 2005;79(1):375-82. (Level II evidence). [View the reference](#)
13. Chao F, Zhang H. **PET/CT in the Staging of the Non-Small-Cell Lung Cancer.** Journal of Biomedicine and Biotechnology. 2012:783739. (Review article). [View the reference](#)
14. Toloza EM, Harpole L, McCrory DC. **Noninvasive staging of non-small cell lung cancer: a review of the current evidence.** Chest. 2003;123(1):137-46. (Review Article). [View the reference](#)

15. Bauman K, Arenberg D. **Multidisciplinary Evaluation of Patients With Suspected Lung Cancer.** Clinical pulmonary medicine. 2010;17(1):35-41. (Review article). [View the reference](#)
16. Fischer B, Lassen U, Mortensen J, Larsen S, Loft A, Bertelsen A, et al. **Preoperative staging of lung cancer with combined PET-CT.** N Engl J Med. 2009;361(1):32-9. (Level I evidence). [View the reference](#)
17. Young Jr WF. **Management approaches to adrenal incidentalomas. A view from Rochester, Minnesota.** Endocrinology and Metabolism Clinics of North America. 2000;29(1):159-85. (Review Article). [View the reference](#)
18. Herrera MF, Grant CS, van Heerden JA, Sheedy PF, Ilstrup DM. **Incidentally discovered adrenal tumors: an institutional perspective.** Surgery. 1991;110(6):1014-21. (Level II evidence). [View the reference](#)
19. Pender SM, Boland GW, Lee MJ. **The incidental nonhyperfunctioning adrenal mass: an imaging algorithm for characterisation.** Clin Radiol Review article. 1998;53 (11):796-804. (Review article). [View the reference](#)
20. Stone WZ, Wymer DC, Canales BK. **Fluorodeoxyglucose-Positron-Emission Tomography/Computed Tomography Imaging for Adrenal Masses in Patients with Lung Cancer: Review and Diagnostic Algorithm.** Journal of Endourology. 2014;28(1):104-11. (Review article). [View the reference](#)
21. Caoili EM, Korobkin M, Francis IR, Cohan RH, Platt JF, Dunnick NR, et al. **Adrenal masses: characterization with combined unenhanced and delayed enhanced CT.** Radiology. 2002;222(3):629-33. (Level II/III evidence). [View the reference](#)
22. Boland GWL, Lee MJ, Gazelle GS. **Characterization of adrenal masses using unenhanced CT: an analysis of the CT literature** AJR. 1998;171(1):201-4. (Level II evidence). [View the reference](#)
23. Lim E, Baldwin D, Beckles M, Duffy J, Entwisle J, Faivre-Finn C, et al. **Guidelines on the radical management of patients with lung cancer.** Thorax. 2010;65 Suppl 3:1-27. (Guidelines). [View the reference](#)
24. Patz EF, Jr., Lowe VJ, Goodman PC, Herndon J. **Thoracic nodal staging with PET imaging with 18FDG in patients with bronchogenic carcinoma.** Chest. 1995;108(6):1617-21. (Level II/III evidence). [View the reference](#)
25. Yousefi-Koma A, Panah-Moghaddam M, Kalff V. **The Utility of Metabolic Imaging by 18F-FDG PET/CT in Lung Cancer: Impact on Diagnosis and Staging.** Tanaffos. 2013;12(1):16-25. (Review article). [View the reference](#)
26. Reed CE, Harpole DH, Posther KE, Woolson SL, Downey RJ, Meyers BF, et al. **Results of the American College of Surgeons Oncology Group Z0050 trial: the utility of positron emission tomography in staging potentially operable non-small cell lung cancer.** J Thorac Cardiovasc Surg. 2003;126(6):1943-51. (Level II evidence). [View the reference](#)
27. Marom EM, McAdams HP, Erasmus JJ, Goodman PC, Culhane DK, Coleman RE, et al. **Staging non-small cell lung cancer with whole-body PET.** Radiology. 1999;212(3):803-9. (Level II evidence). [View the reference](#)
28. Scott WJ, Shepherd J, Gambhir SS. **Cost-effectiveness of FDG-PET for staging non-small cell lung cancer: a decision analysis.** Ann Thorac Surg. 1998;66(6):1876-83. (Level III evidence). [View the reference](#)
29. Betancourt-Cuellar SL, Carter BW, Palacio D, Erasmus JJ. **Pitfalls and limitations in non-small cell lung cancer staging.** Semin Roentgenol. 2015;50(3):175-82. (Review article). [View the reference](#)
30. Purandare NC, Rangarajan V. **Imaging of lung cancer: Implications on staging and management.** The Indian Journal of Radiology & Imaging. 2015;25(2):109-20. (Review article). [View the reference](#)
31. De Leyn P, Doooms C, Kuzdzal J, Lardinois D, Passlick B, Rami-Porta R, et al. **Revised ESTS guidelines for preoperative mediastinal lymph node staging for non-small-cell lung cancer.**



- Eur J Cardiothorac Surg. 2014;45(5):787-98. (Guidelines). [View the reference](#)
32. Garg PK, Singh SK, Prakash G, Jakhetiya A, Pandey D. **Role of positron emission tomography-computed tomography in non-small cell lung cancer.** World Journal of Methodology. 2016;6(1):105-11. (Review article). [View the reference](#)
 33. Schmidt-Hansen M, Baldwin DR, Hasler E, Zamora J, Abaira V, Roque IFM. **PET-CT for assessing mediastinal lymph node involvement in patients with suspected resectable non-small cell lung cancer.** Cochrane Database Syst Rev. 2014(11):(Level I evidence). [View the reference](#)
 34. Cerfolio RJ, Ojha B, Bryant AS, Raghuvver V, Mountz JM, Bartolucci AA. **The accuracy of integrated PET-CT compared with dedicated PET alone for the staging of patients with nonsmall cell lung cancer.** Ann Thorac Surg. 2004;78(3):1017-23. (Level II evidence). [View the reference](#)
 35. Padma S, Sundaram PS, George S. **Role of positron emission tomography computed tomography in carcinoma lung evaluation.** J Cancer Res Ther. 2011;7(2):128-34. (Review article). [View the reference](#)
 36. Rankin S. **PET/CT for staging and monitoring non small cell lung cancer.** Cancer Imaging. 2008;8(Spec Iss A):S27-S31. (Review article). [View the reference](#)
 37. Michel F, Soler M, Imhof E, Perruchoud AP. **Initial staging of non-small cell lung cancer: value of routine radioisotope bone scanning.** Thorax. 1991;46(7):469-73. (?Level II evidence). [View the reference](#)
 38. Cheran SK, Herndon JE, 2nd, Patz EF, Jr. **Comparison of whole-body FDG-PET to bone scan for detection of bone metastases in patients with a new diagnosis of lung cancer.** Lung Cancer. 2004;44(3):317-25. (Level III evidence). [View the reference](#)
 39. Gayed I, Vu T, Johnson M, Macapinlac H, Podoloff D. **Comparison of bone and 2-deoxy-2-[18F]fluoro-D-glucose positron emission tomography in the evaluation of bony metastases in lung cancer.** Mol Imaging Biol. 2003;5(1):26-31. (Level III evidence). [View the reference](#)
 40. Hsia TC, Shen YY, Yen RF, Kao CH, Changlai SP. **Comparing whole body 18F-2-deoxyglucose positron emission tomography and technetium-99m methylene diophosphate bone scan to detect bone metastases in patients with non-small cell lung cancer.** Neoplasma. 2002;49(4):267-71. (Level III evidence). [View the reference](#)
 41. Yokoi K, Kamiya N, Matsuguma H, Machida S, Hirose T, Mori K, et al. **Detection of brain metastasis in potentially operable non-small cell lung cancer: a comparison of CT and MRI.** Chest. 1999;115(3):714-9. (Level II evidence). [View the reference](#)
 42. Backhus LM, Farjah F, Varghese TK, Cheng AM, Zhou X-H, Wood DE, et al. **Appropriateness of Imaging for Lung Cancer Staging in a National Cohort.** Journal of Clinical Oncology. 2014;32(30):3428-35. (Level II evidence). [View the reference](#)

Information for Consumers

Information from this website	Information from the Royal Australian and New Zealand College of Radiologists' website
Consent to Procedure or Treatment Radiation Risks of X-rays and Scans	Computed Tomography (CT) Contrast Medium (Gadolinium versus



[Bone Scan](#)

[Computed Tomography \(CT\)](#)

[Magnetic Resonance Imaging \(MRI\)](#)

[Positron Emission Tomography \(PET\)](#)

[Ultrasound](#)

[Chest Radiograph \(X-ray\)](#)

[Iodine\)](#)

[Gadolinium Contrast Medium](#)

[Iodine-Containing Contrast Medium](#)

[Magnetic Resonance Imaging \(MRI\)](#)

[Plain Radiography/X-rays](#)

[Radiation Risk of Medical Imaging During Pregnancy](#)

[Radiation Risk of Medical Imaging for Adults and Children](#)

[Ultrasound](#)

[Nuclear Medicine](#)

[Nuclear Medicine Bone Scan](#)

[PET Scan](#)

Copyright

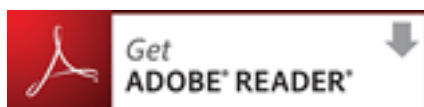
© Copyright 2018, Department of Health Western Australia. All Rights Reserved. This web site and its content has been prepared by The Department of Health, Western Australia. The information contained on this web site is protected by copyright.

Legal Notice

Please remember that this leaflet is intended as general information only. It is not definitive and The Department of Health, Western Australia can not accept any legal liability arising from its use. The information is kept as up to date and accurate as possible, but please be warned that it is always subject to change

File Formats

Some documents for download on this website are in a Portable Document Format (PDF). To read these files you might need to download Adobe Acrobat Reader.





[Legal Matters](#)