

REFERRAL AND CLINICAL GUIDELINES FOR LUNG CANCER

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REFERRAL PROCESS

- Appointment Pathway
- Suspicious X-Ray Policy
- Clinical Assessment
- Fitness for Investigation/Treatment
- Bronchoscopy/PCNB/Mediastinoscopy/Interventional bronchoscopy Procedures
- Radiology Protocols
- Follow-Up Arrangements
- Histology/Cytology Protocols
- MDTM Arrangements
- Surgery
- Radiotherapy
- Chemotherapy

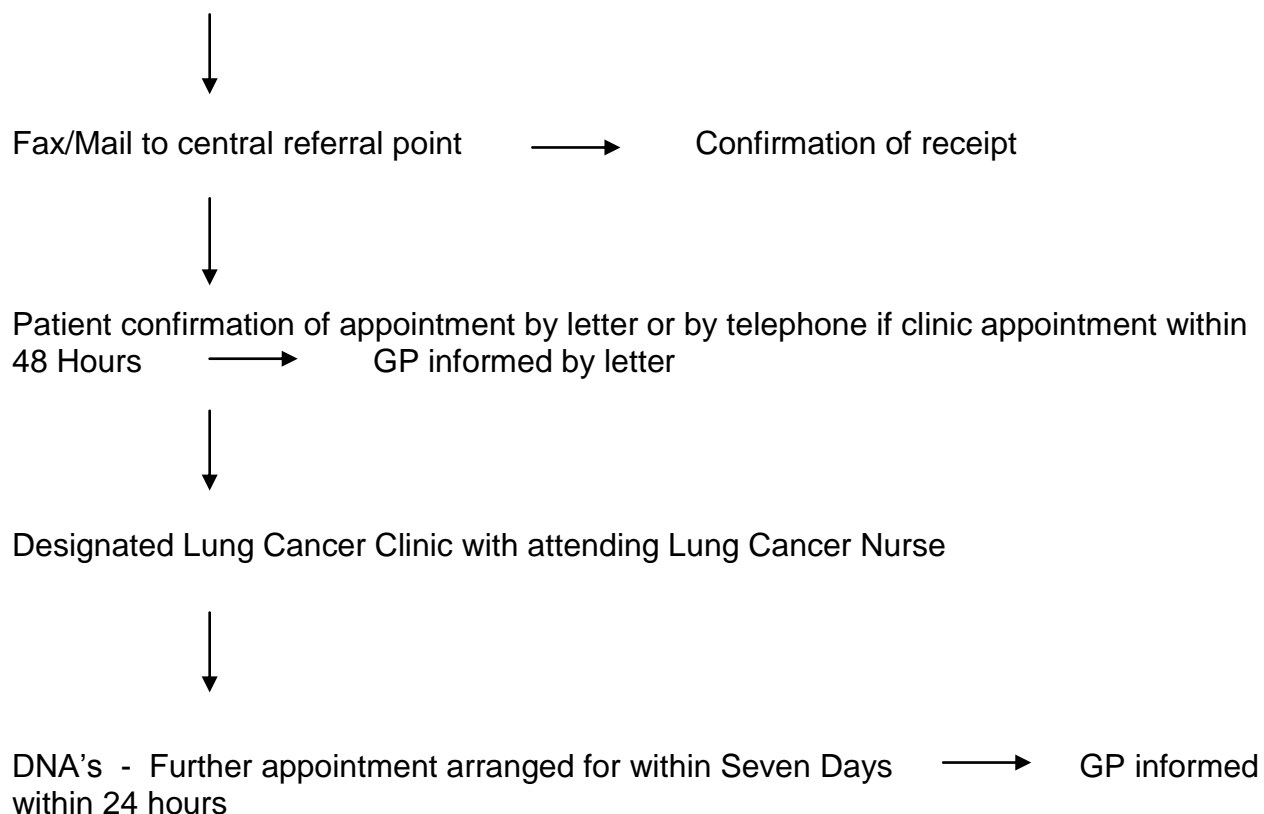
General Practitioner Information Arrangement

REFERRAL PROCESS

1. Central information point providing telephone, fax, e-mail facilities
2. General Practice - Generic or Fast Track Lung Cancer Forms to be used
3. Hospital : In-house referrals from the Wards, Out-Patients or Casualty to be notified through the Central Referral System

APPOINTMENT PATHWAY - THE CASES OF SUSPECTED LUNG CANCER

1. Open Lung Cancer Referral Proforma



SUSPICIOUS X-RAY POLICY

The following procedure is to be undertaken when a report of a **routine** chest x-ray raises the possibility of lung cancer.

Radiology Department

1. Inform the patient's General Practitioner by fax or phone by the next working day of the unsuspected finding
2. Post the full confirmatory written report to the General Practitioner
3. Copy the report to the Chest Physician and the Chest Clinic and cancer data team if appropriate
4. In some cases it will be appropriate to arrange urgent CT scan, before, or on the day of, chest clinic appointment

General Practitioner

The General Practitioner will initiate the referral under the **14 Day Rule**.

Chest Clinic

The Chest Clinic or cancer data team will number and check referrals received against the copy x-ray reports.

FIRST CLINIC VISIT

1. Clinical Assessment

- a) History including smoking habits, employment history (for suspected mesothelioma)
- b) Examination - Height/Weight
- c) Performance Status

2. Investigations

- a) Spirometry
- b) Chest X-Ray
- c) Bloods - FBC/Serum Biochemistry/LFT's/Bone Profile/LDH
- d) CT thorax/upper abdo to be arranged urgently or on same day (if not already done)
- e) Bronchoscopy to be arranged if appropriate

3. Patient Information

Provision of literature and contact arrangements by Lung Cancer Nurse

FITNESS FOR INVESTIGATION/TREATMENT

All patients should be considered for investigations to obtain histological or cytological confirmation of their disease.

Patients who after the initial assessment are deemed too seriously ill for further investigation should be discussed at the MDTM for registration and consideration for supportive care without a confirmatory histological diagnosis.

Patients who decline investigations or treatment should similarly be reviewed and a management strategy documented.

BRONCHOSCOPY

1. Consent

Informed consent to be obtained by the Operator

2. Patient Information

Arrangements for the procedure to be explained by the Chest Clinic staff and with accompanying literature which should include a contact telephone number for any subsequent enquiries.

3. Follow-up

Follow-up arrangements to be initiated at the first visit for next results clinic after bronchoscopy or following CT/Histology/MDTM review.

CT Guided Lung Biopsy

1. **Suitability.** Most lung and mediastinal lesions can be considered for CT Guided Lung biopsy. However peripheral lesions >10mm are most suitable (to be discussed with the radiologist performing the test). As per local MDT protocols, PET scan can be done before CT guided biopsy.
2. **Fitness.** Resting hypoxia and impaired lung function (FEV1 < 1 litre, or <40%) are relative contraindications. Cognitive impairment which renders the patient uncooperative is a near absolute contraindication.
3. **Consent.** Outline consent should be obtained in the OPC, and written consent obtained by the operator on or before the day of procedure. Patient information literature should be given at the first opportunity.

REFERRAL GUIDELINES FOR IMAGING IN LUNG CANCER

CT Scan Referral

1. Requests received on a standard CT request card or by electronic referral.
2. Consultant Radiologist vets request to determine the appropriate protocol and level of urgency
3. Scans are booked on the next available urgent slot. Where possible and appropriate, scans will be performed on or before the day of clinic attendance. All scans are reported by a Consultant Radiologist or designated Registrar.
4. Where confirmed histology is available, a report should contain the following features:
 - Tumour site and maximum dimension
 - Multiplicity or satellite lesions
 - Evidence of pleural or fissural involvement
 - Evidence of pericardial involvement
 - Presence of associated pneumonitis or collapse
 - Presence of ipsilateral or contralateral lung nodules (T3/N3/M1a)
 - Evidence of mediastinal invasion, and comment on whether only mediastinal fat invaded
 - Proximity to the main carina or carina of the main bronchi
 - Location and short axis diameter of nodes
 - Evidence of distant metastasis
5. From this, a TNM stage will be offered, or alternative TNM stages dependent upon further investigation and a radiological tumour stage.
6. If there is a doubt as to histology no definite TNM stage is offered. A provisional TNM stage contingent upon histology may be offered if possible. In this instance, protocol indicating tumour stage should be confirmed at the MDT once histology is confirmed.
7. If reports identify a previously unsuspected lung cancer, a report should be faxed to the GP within 24 hours of the report being typed and a copy of the report sent to the MDT secretary.

HISTOLOGICAL PATHWAYS FOR LUNG CANCER

The sample (cytology, biopsy or resected tumour) is reported as promptly as possible i.e. ideally a provisional working diagnosis provided within 48 hours for biopsies and cytology and 5 working days for resected specimens. It is recognised that if extended immunohistochemistry or external opinion is required it will take longer to report the resection specimens.

A report is then sent to the requesting clinician so that details of the specimen are available at the weekly MDT. In addition, a copy report of the resected specimen should be sent to the respective lung cancer nurse to facilitate further discussion at the MDT

The vast majority of malignant tumours will be either small cell, squamous or adenocarcinoma and it is recognised that H and E staining alone will be sufficient to categorise most tumours appropriately. In difficult cases immunohistochemical and mucin staining may be required including a neuroendocrine panel (chromogranin, synaptophysin and CD56) as well as CK7, TTF1 and CK5/6. The reporting of resected tumours will be based on the Pathology Lung Cancer National Minimal Data Set (enclosed in appendix 6).

The adenocarcinoma cases, discussed at MDT, should be sent for EGFR, ALK and PD-L1 assay. These patients will usually be those with adenocarcinoma and little smoking history. The appropriate cases with diagnosis of squamous cell carcinoma will be sent for PD-L1 testing after MDT discussion.

POST INVESTIGATION FOLLOW-UP

1. Bronchoscopy

Follow-up appointment to be made at the first visit for the next results clinic, or appointment to be made subsequently when the MDTM/Histology/CT results are available.

2. CT Scan

Copies to Clinicians and Lung Cancer Nurses for urgent attention.

3. PCNB/Pleural Biospy/Mediastinoscopy/VAT Biopsy

Appointment to be given to the patient after the procedure for the next clinic or the Lung Cancer Nurse to be contacted to arrange further supervision.

4. Histology/Cytology Report

Copies to Clinicians and Lung Cancer Nurses.

GENERAL PRACTITIONER COMMUNICATION

The General Practitioner must be informed by the end of the following working day of all patients who have been informed of their diagnosis of lung cancer.

1. Out-Patients

The General Practitioner/Surgery would be notified by telephone on the next working day that the patient had been informed of the diagnosis. The Clinician should ensure that a full report is available to the General Practitioner by the end of the following working day.

2. In-Patients

The medical team/Consultant office is responsible for telephone/fax confirmation of the patient information.

The record of date/time/author of the fax/telephone information should be recorded in the patient's notes.

Multi-Disciplinary Team (MDT)

Once investigations have been completed all patients should be discussed at the weekly MDT meeting where individual treatment options will be determined. The completed MDT proforma would be an accepted referral letter for surgery/oncology/palliative care. All patients deemed suitable for radical treatment (surgery, radiotherapy or chemoradiation) should be referred for a PET scan via the electronic referral form.

PET/CT SCANNING - REFERRAL STRATEGY

Clinical Indications in respiratory cancers

Following detailed discussion and taking into account current evidence base the following clinical indications were agreed.

1. Evaluation of solitary pulmonary nodules
2. Staging of non-small cell lung cancer

Patients meeting the above criteria are discussed in the local MDT. Referral should be made on the electronic request form, which must be fully completed, or it will be returned. This is in order to comply with IRMER regulations and the requesting process. Particular care should be taken in giving a full relevant clinical history and noting whether a patient is diabetic.

Brain scanning before radical treatment including surgery

Selected patients with large central tumours, T4 tumours, N2 diseases and patient requiring pneumonectomy should have Brain scan (CT/MRI) as part staging.

GUIDELINES ON INDICATIONS FOR SURGERY FOR LUNG CANCER

Surgery for stage I-IIIa should be considered if patient has the necessary respiratory reserve and is deemed medically fit for major surgery. There is a customised surgical referral form (Appendix 7) available (with bundle of information) for referral to cardiac.referral@bfwhospitals.nhs.uk

Based on the BTS Guidelines from 2010

FITNESS

a) Age:

- i) Perioperative morbidity increases with advancing age. Elderly patients undergoing lung resection are more likely to require intensive perioperative support. Preoperatively, a careful assessment of co-morbidity needs to be made.
- ii) Age over 80 alone is not a contraindication to lobectomy or wedge resection for clinically stage I disease.
- ii) Pneumonectomy is associated with a higher mortality risk in the elderly. Age should be a factor in deciding suitability for pneumonectomy.

b) Cardiovascular Fitness:

Previous MI – interval of 6 weeks + cardiological opinion
Previous CABG – no increased risk if asymptomatic
Previous CVA – Doppler for carotid artery stenosis
Murmur – ECHO
Angina or SOB due to cardiac disease – exercise test

c) Performance status:

WHO 0,1 or 2

d) Further Assessment and Planning of Patients for Surgery (Based on NICE Guidance 2011)

- Perform spirometry in all patients being considered for treatment with curative intent. Measure TLCO if breathlessness is disproportionate or there is other lung pathology (for example, lung fibrosis).
- Offer patients surgery if they have an FEV₁ within normal limits and good exercise tolerance.
- When considering surgery perform a segment count to predict postoperative lung function.
- Offer patients with predicted postoperative FEV₁ or T_LCO below the recommended limit of 30% the option of undergoing surgery if they accept the risks of dyspnoea and associated complications.
- Consider using shuttle walk testing (using a distance walked of more than 400 m as a cut-off for good function) to assess fitness of patients with moderate to high risk of postoperative dyspnoea.

- Consider cardiopulmonary exercise testing to measure VO₂ max and assess lung function in patients with moderate to high risk of postoperative dyspnoea, using more than 15 ml/kg/minute as a cut-off for good function.
- Offer patients with NSCLC who are medically fit and suitable for treatment with curative intent, lobectomy (either open or thoracoscopic) as the treatment of first choice. For patients with borderline fitness and smaller tumours (T1a–b, N0, M0), consider lung parenchymal-sparing operations (segmentectomy or wedge resection) if a complete resection can be achieved.
- Offer more extensive surgery (bronchoangioplastic surgery, bilobectomy, pneumonectomy) only when needed to obtain clear margins.
Perform hilar and mediastinal lymph node sampling or en bloc resection for all patients undergoing surgery with curative intent.

e) **Special Situations:**

1. Advanced local disease: consider for surgery only if N0/N1

- Chest wall invasion:** Potentially operable if T3N0. Pain is a good predictor. CT 90% accurate. MRI may be indicated. High resolution Ultrasound is also a useful modality.
- Adherence to vertebral column:** surgery may be contemplated in individual cases. Erosion = inoperable. MRI may be indicated.
- Superior sulcus tumours:** Horner's syndrome, invasion of brachial plexus and subclavian vessels or vertebrae = inoperable. In this situation induction treatment with chemotherapy and radiotherapy might be attempted to downsize the tumour with subsequent surgery as an option for very selected patients

2. N2 diseases: Surgery should be considered in all single station N2 patient, the selection should depend on the potential of curability and overall fitness of patient

3. Small cell lung cancer: for stage I only (T1N0, T2N0)

Following resection patients should be discussed at the MDT for consideration of adjuvant treatment (see under radiotherapy/chemotherapy section).

4. Reinvestigation and selection of patients for surgery after Neo adjuvant chemotherapy

A complete re-staging need to be done as per protocol after Neo adjuvant chemotherapy and re-discuss in MDT. The modality for re-staging should be individualised and plan agreed on before the start of Neo adjuvant chemotherapy to prevent delay.

5. Oligometastasis

Fit patients with single curable metastasis and potentially curable local diseases should be considered for radical curative surgery.

L&SC Lung Network second opinion guidance

Cardiothoracic Surgery

1) Internal (High risk Thoracic Surgery MDT at Blackpool Victoria Hospital)

It is felt that referral to Thoracic surgeons outside the network will rarely be necessary, as a full range of techniques and procedures are now available from the surgeons based at Blackpool Victoria Hospital. However it is recognised that in difficult, complex or borderline fitness cases, the opinion of more than one surgeon may be valuable. Should a referring MDT feel that a particular patient requires discussion with a second surgeon, a referral should be made in writing on the High risk thoracic surgery MDT form (Appendix 8) to the thoracic surgery nurse specialist at: cardiac.referral@bfwhospitals.nhs.uk

2) External

Referrals for Cardiothoracic surgical opinions outside the network should, it is envisaged, be only occasional, however should a referring MDT deem this necessary, then a referral should be made to the clinician of your choice. The external referral should be done only after the internal second opinion route has been explored. The core surgical member of the MDT should be aware about such referral, - for reference purposes this should be copied to the chair of the Lung NSSG together with a note of the outcome, if any. It is emphasised that the referring MDT retains clinical responsibility for the patient at all times.

GUIDELINES FOR REFERRAL FOR RADIOTHERAPY AND CHEMOTHERAPY IN LUNG CANCER AND MESOTHELIOMA

NON SMALL CELL LUNG CANCER

Appropriate treatment choice for individual patients depends largely on the stage of disease at presentation and their performance status.

Investigations to determine these should be performed prior to referral to an oncologist.

All patients should be discussed at an MDT meeting

Radical Radiotherapy

Stages I,II and selected III patients may be suitable if either surgery is declined or the patient is medically unfit for surgery. These patients would be offered radical radiotherapy with 55Gy/20# over 4 weeks.

Combined modality treatment concurrently with chemotherapy (Navelbine/Cisplatin week 1+4) is available for patients with good PS and confirmed histological diagnosis for Stage III

It should be made clear to the patient that conventional radiotherapy is inferior in outcome to surgical resection but could be appropriate if the patient is not medically fit for resection.

Stereotablative Body Radiotherapy (SABR):

This involves high intensity radiotherapy to a small focal area of the lung. Patients with relatively small peripherally situated tumours who should be considered for surgical therapy but who are unsuitable by reason of co-morbidity or personal preference should be considered for referral for this service.

Inclusion Criteria:

Patients may be suitable if they fulfil the following criteria:

- T1-T3 N0 M0
- Tumour <5 cm situated outside the "No-fly zone" (>2cm distance to airways proximal to segmental bronchi)
- PS 0-2 (PS 3 may be suitable if due to comorbidity)
- Peripheral tumour (> 20 mm distal to origin of segmental bronchus)
- Histological or Radiological Features of Lung Cancer determined by MDT discussion
- Lung function not a contra – indication

Postoperative radiotherapy

Patients with incompletely resected disease or resection of single station N2 disease should be considered for post-operative radiotherapy (50Gy in 20# over 4 weeks) +/- adjuvant chemotherapy with Vinorelbine/Cisplatin if their PS is good.

Post operative radiotherapy for unexpected N2 disease is the subject of a clinical trial (Lung ART)

Chemotherapy

Neoadjuvant chemotherapy

Neoadjuvant chemotherapy is currently not advised outside the context of a clinical trial in Stage I and II patients.

Selected Stage III patients may be suitable for oral Vinorelbine at 60mg/m² day 1 and 8) and cisplatin 80mg/m² day 1 q 3/52 x 4 cycles prior to considering surgical resection or radical radiotherapy. Carboplatin (AUC5) can be considered in place of cisplatin in patients with poor renal function.

The patient fitness for possible surgery should be assessed and Post neoadjuvant chemo restaging plan should be in place before considering for Neo adjuvant chemotherapy

Adjuvant Chemotherapy

Adjuvant chemotherapy with oral Vinorelbine 60mg/m² day 1 and 8) and Cisplatin 80mg/m² day 1 q 3/52 x 4 cycles should be offered to patients who had a complete resection for Stage II Ib (>4cm) to III disease. Carboplatin (AUC5) can be considered in place of cisplatin in patients with poor renal function.

Advanced Disease

Stage IIIA/B, small volume, good PS:

Patients with small volume Stage III disease who are not suitable for surgical resection should be considered for combined modality treatment with chemotherapy and radiotherapy. This could either be given sequentially or concurrently. The chemotherapy regimen consists of Cisplatin +/- Vinorelbine, radiotherapy would be given over 4-6.5 weeks.

Palliative Chemotherapy

Patients with Stage III/IV disease unsuitable for radical treatment who have PS 0-1 should be considered for palliative chemotherapy.

All specimen should be checked for biomarkers at diagnosis.

Depending on the histological subtype chemotherapy for non-squamous histology should be a platinum/Pemetrexed combination, squamous cell carcinoma with Gemcitabine or Vinorelbine and Carboplatin. Some patients with Stage III/IV disease and PS 2 could be considered for Carboplatin and weekly Paclitaxel.

All non-squamous histological subtypes should be sent for EGFR mutation testing. If an activating mutation is confirmed, these patients should be treated with an EGFR Tyrosine Kinase Inhibitor (Gefitinib, Erlotinib, or Afatinib) in the first line setting, rather than standard chemotherapy.

All patients with adenocarcinoma histology should be sent for ALK fusion gene testing and patients who are positive should be offered treatment with Crizotinib

All patients deemed suitable for palliative treatment should have their PDL-1 status checked at diagnosis. Patients who express PDL1 \geq 50% could be offered immunotherapy with Pembrolizumab 1st line.

1st line maintenance chemotherapy

Patients with non-squamous histology who had at least stable disease after 4 cycles of Cisplatin/Pemetrexed should be offered maintenance treatment with Pemetrexed every 3 weeks until disease progression.

2nd line therapy:

Patients with non-squamous histology (EGFR/ALK negative) who do not respond to, progress or relapse after 1st line chemotherapy and whose PS is 0-1 should be considered for 2nd line chemotherapy. Options include Docetaxel 75mg/m² every 3/52 for 4 cycles +/- Nintedanib or Pembrolizumab (if they have at least 1% PDL1 expression). Patients with known EGFR mutation who progress after an initial response to TKI should be considered for re-biopsy to establish whether they are suitable for 2nd line TKI with Osimertinib which is directed at the T790M mutation. If a biopsy is not feasible consideration should be given to do a plasma based test for T790M mutation.

Patients with ALK mutations who progress on Crizotinib should be offered a 2nd line ALK directed treatment.

Patients should be reviewed at the beginning of a new cycle of treatment by the clinician and at disease progression treatment should be withdrawn.

Further lines of chemotherapy depend on previous response and duration of response to treatment, fitness and are at the discretion of the treating clinician.

Palliative Radiotherapy

Palliative radiotherapy to the thorax should be considered for patients with locally advanced NSCLC for whom radical radiotherapy is unsuitable.

Patients with good performance status (WHO 0-1) may benefit from “high dose” fractionated treatment. In this group there is a 36% 1yr and 12% 2yr survival.

Those with WHO performance status 2-3 who are symptomatic from their disease are likely to be suitable for a shorter treatment. The median duration of palliation has been shown to be at least 50% of their remaining life.

For those patients with poor performance status whose life expectancy is less than 3 months radiotherapy is not indicated.

Symptoms that are most likely to be helped by radiotherapy are:

- Haemoptysis
- Chest pain
- Dysphagia due to extrinsic oesophageal compression
- Cough

Metastasis – Radiotherapy may help in metastatic lung cancer especially in patients with:

- Bone metastases
- Skin metastases

- Brain metastases (especially in the under 65 year olds who have a good performance score and no symptoms from their metastatic disease)

Patients with no more than 3 brain metastases on MRI scan who are fit with an anticipated reasonable life-expectancy should be discussed at the neuro-oncology MDT as they might fulfil the criteria for debulking surgery and/or stereotactic radiotherapy.

SMALL CELL LUNG CANCER

Appropriate treatment choice for individual patients depends largely on the stage of disease at presentation and their performance status. Stage 1 may be considered for surgical resection (followed by adjuvant chemo- and radiotherapy).

Investigations to determine these should be performed prior to referral to an oncologist. This includes recent blood tests (FBC, U/E, LDH, LFT), full PFT, PET/CT and brain CT.

Limited Stage Disease, good Manchester Score (0/1)

Fit patients should be offered concurrent chemoradiation with Cisplatin 80mg/m² day1 and Etoposide 100-120mg/m² day 1-3 x 4-6 cycles (oral Etoposide 200mg/m² can be substituted for days 2-3). Radiotherapy will start with cycle 2.

A dose of 45Gy in 30 fractions twice daily will be given to the involved areas.

Patients with initial disease volume too large to be treated with radical radiation should be reassessed after induction chemotherapy with platinum based chemotherapy and could be offered sequential radiotherapy with a dose of 40-55Gy in 15-20 fractions.

Following a response patients under the age of 75 should be considered for prophylactic cranial irradiation (25Gy/10#).

In patients where SIADH might prevent the use of Cisplatin, referral to the endocrinologists should be urgently done as these patients could be considered for treatment with Tolvaptan.

Limited stage, poor Manchester Score OR Extensive stage, good Manchester Score

Combination chemotherapy with Carboplatin AUC5 day1 and Etoposide 100mg/m² day 1-3 (oral Etoposide 200mg/m² can be substituted for days 2-3) followed by thoracic consolidation radiotherapy should be considered for these patients.

All patients should receive primary prophylaxis with GCSF.

Extensive Stage Disease, poor Manchester score

Treatment with single agent Carboplatin AUC5 could be considered as alternative to combination treatment initially. However, as soon as the performance status improves patients should be reassessed for use of combination chemotherapy.

Patients under the age of 75 who had at least stable disease following their first line chemotherapy should be considered for prophylactic cranial irradiation (20Gy / 5#).

Radiotherapy may also be used for symptom control.

Second Line Chemotherapy

Patients who recur more than 3 months after completion of 1st line treatment should be considered chemosensitive and may be offered further chemotherapy with a platinum rechallenge, topotecan or CAV. Their overall prognosis is however very poor and median survival is < 4 months.

Metastasis – Radiotherapy may help in metastatic small cell lung cancer especially in patients with:

- Bone metastasis
- Brain metastasis
- Skin metastasis

MESOTHELIOMA

Appropriate treatment choice for individual patients depends largely on the stage of disease at presentation and their performance status.

Investigations to determine these should be performed prior to referral to an oncologist. All patients should be discussed at an MDT.

Patients with recurrent effusions should be considered for an indwelling pleural catheter.

Surgery

Decortication and pleurectomy can be considered in selected patients. Entry into surgical trials (if available) should be considered.

VATS pleurodesis may be useful in the treatment of recurrent pleural effusion.

Radiotherapy

The role of prophylactic irradiation of chest drain sites is controversial and we are currently awaiting the outcome of a national trial (PIT) to determine efficacy of radiotherapy. Palliative radiotherapy to areas of tumour causing symptoms from local invasion may be beneficial.

Metastasis – Radiotherapy may help in metastatic mesothelioma especially in patients with:

- Bone metastasis
- Brain metastasis
- Skin metastasis

Chemotherapy

Patients with PS 0-1 may be considered for palliative chemotherapy with a Pemetrexed and Platinum combination.

Patients should be monitored with regards to response and side effects whilst on this treatment. Up to 6 cycles can be given.

Motivated patients could be considered for clinical trials in Manchester.

INTERVENTIONAL BRONCHOSCOPY/THORACOSCOPY SERVICES

Among the many areas of respiratory medicine which have been revolutionised by technological advances, bronchoscopy is one of the most obvious examples. Parallel to the development of ever finer flexible bronchoscopes and working tools, there has been considerable expansion in the diagnostic and therapeutic techniques that can be practised via the bronchoscope, particularly in lung cancer. Diagnostic flexible bronchoscopy available in all centres of the network.

Therapeutic Flexible Bronchoscopy (Service available at Preston)

Tracheo-bronchial obstruction due to malignant processes can lead to recurrent pneumonia, respiratory insufficiency and death. Curative resection is not possible in the majority of cases, and treatment instead is focussed upon palliation. Techniques available for treatment of tracheobronchial obstruction include electrocautery, argon plasma coagulation, airway stents, laser therapy, cryotherapy, brachytherapy, balloon dilatation and photodynamic therapy. At Preston, we are able to offer majority of these techniques.

Endobronchial Electrocautery (Diathermy) and Argon Plasma Coagulation (Service available at Preston)

Indications: These techniques are particularly useful when there is a clear evidence of endobronchial disease and the patient presents with one of the following:

1. Marked volume loss such as lobar or extensive lung collapse.
2. Stridor.
3. Worsening dyspnoea.
4. Post-obstructive pneumonia.
5. Haemoptysis caused by an accessible, visible lesion.

The following points are worth noting with regard to diathermy and argon plasma coagulation.

1. The more central the obstruction in the bronchus, the greater the likelihood of palliation. For more distal obstruction, benefit achieved is small. However, treatment of tracheal lesions carries a slightly greater risk.
2. These techniques are best considered after the more established treatment options have been looked at, such as surgery, radiotherapy and chemotherapy.
3. Diathermy is not indicated in the presence of massive haemoptysis, as adequate visualisation is essential to this technique, and in that situation surgical help with rigid bronchoscopy or interventional vascular radiology input would be needed.

Tracheobronchial Stenting (Service available at Preston and Blackpool)

The ultraflex (Nitinol) stent can be placed to relieve acute or sub-acute obstruction of the central airways, in patients who present with stridor, marked volume loss, increasing dyspnoea and post-obstructive pneumonia. This technique is useful essentially where the lesion is 'extrinsic' causing obstruction. Also, they are most effective where there is a relatively short segment of stenosis in the mid/lower trachea, right main and intermediate bronchi, and the left main

bronchus (in rare situations where there is a combination of localised intrinsic and extrinsic obstruction, diathermy debulking can be followed up with stenting).

Stenting can also be effective in the presence of a localised tracheo-oesophageal fistula, where double stenting is required, that is tracheal followed by oesophageal stent.

Stent placement through the flexible bronchoscope is not possible when:

- (a) There is a high tracheal lesion.
- (b) The obstruction extends from the lower trachea into both main bronchi – where rigid bronchoscopy and an inverted Y stent is indicated.
- (c) When the mucosa is involved by an extremely vascular, fragile process.

Transbronchial Needle Aspiration (TBNA) (Service available at Preston, Blackpool, Lancaster and Blackburn)

Over the last decade, TBNA has improved the diagnostic yield and extended the role of flexible bronchoscopy in the evaluation of mediastinal pathology and the diagnosis and staging of lung cancer.

Indications:

- 1. Peri-bronchial disease causing extrinsic compression.
- 2. Sub-mucosal disease.
- 3. Necrotic, haemorrhagic endobronchial lesions.
- 4. Mediastinal and/or hilar lymphadenopathy – to help diagnose malignant and benign lesions.

TBNA is particularly safe and carries a high yield when the abnormality is in the sub-carinal, right para-tracheal or right hilar region.

EBUS-Guided TBNA (Service available at Preston, Blackpool, Lancaster and Blackburn)

Endobronchial ultrasound-guided transbronchial needle aspiration is a new technique which has largely superseded TBNA in majority of situations. This is a procedure using a dedicated bronchoscope with a convex ultrasound probe at the tip. Real time ultrasound images of mediastinal nodes are obtained, along with Doppler flow to differentiate blood vessels from the lymph nodes. Through a side port, a needle can be advanced into the lymph node and targeted samples can be obtained. With practice, this technique has a greater than 90% positive yield and samples can be aspirated from a variety of lymph nodes including sub-carinal, right paratracheal, left paratracheal, right hilar and left hilar regions. With the advantage of dynamic ultrasound guidance, larger samples are acquired and the procedure carries a very low risk of bleeding.

Therefore, any patient with unexplained or malignant appearing mediastinal/ hilar adenopathy can be referred for this procedure. In addition, peribronchial lesions can be diagnosed and mediastinal staging can be completed.

Semi-Rigid Medical Thoracoscopy (Service available at Preston)

The technique involves a single incision of just over a centimetre in the mid-axillary line under local anaesthesia and standard sedation. It is performed in the Endoscopy Suite and the patient is usually required to stay overnight after the procedure.

Indications

1. Undiagnosed unilateral, exudative pleural effusion – drainage, pleural biopsy and if appropriate TALC pleurodesis can be performed in one sitting
2. Hydropneumothorax or pneumothorax when an underlying parietal pleural pathology is suspected.
3. Recurrent pleural effusions – for complete drainage and TALC pleurodesis.
4. Early cases of empyema.

All such patients should have normal clotting, liver and renal function, and a contrast enhanced CT scan of the thorax, besides a recent chest x-ray prior to the procedure.

Guidelines for Referrals (based on the Preston services)

1. If the indication for the procedure is obvious, as outlined above, please fax a referral over and arrange for the images to be uploaded to LTHT PACS.
2. It is essential that the patient's clotting profile, renal and hepatic function are satisfactory. If the patient is on warfarin, this will need to be discontinued for about seven days before the procedure. The same applies to Clopidogrel.
3. In cases of therapeutic bronchoscopy, the patient and relatives need to be aware that the treatment is purely for palliation of symptoms/obstruction. Also, the risk of bleeding and other usual complications of bronchoscopy need to be mentioned. Further details of the possible complications of the specific procedure will be outlined when the patient is seen.
4. The patient will often need to stay overnight after the procedure on the respiratory ward.
5. Patients referred for stenting will occasionally have to stay for a few days in the hospital, as the stents may have to be measured and ordered after the initial assessment, and the patient may require a further bronchoscopy after the stent is deployed.

Referral contact details

BTHT	ELHT	LTHTR	UHMBT
TBNA & EBUS-TBNA Tel: 01253 956706 Dr Bhatta Dr Mirakhur T/B STENTING Tel: 01253 951466 Mr Duncan Mr Bittar	TBNA Tel: 01254 734360 Dr Wilson EBUS-TBNA Tel: 01254 734338 Dr Zaman Fax for all: 01254 735910	ALL SERVICES Tel: 01772 522416 01772 522412 01772 522189 Fax: 01772 522810 Dr Munavvar	Tel: 01524 511979 01524 512249 Fax: 01524 583981

Management and Investigation of Unilateral Pleural Effusions

❶ Take a full history and perform a clinical examination

Clinical assessment can be used to identify transudative effusions which will not require sampling and can therefore be managed medically.

❷ Perform pleural aspiration

Collect a 50 ml sample of the pleural fluid using a 21G (green) needle. Note the colour and odour of the fluid; if it is turbid, collect an additional sample using an ABG syringe and analyse it immediately using the ABG machine.

❸ Request appropriate analysis of the pleural fluid

Add 10 ml to two universal containers (for cytology and AAFB/gram stain/TB culture), 10 ml to each of anaerobic and aerobic blood culture bottles and the remainder to citrate (yellow, for glucose), gel (brown, for LDH/protein) tubes. If the fluid is frankly blood-stained, add 2 ml to an EDTA (red) tube to measure the haematocrit. Ensure the sample is analysed within 4 hours.

❹ Apply Light's Criteria to the results received from the laboratory

The fluid is an exudate if $[\text{protein}]_p \div [\text{protein}]_s > 0.5$ or $[\text{LDH}]_p \div [\text{LDH}]_s > 0.6$

❺ Interpret the results

- **pH < 7.2 with evidence of infection or positive gram stain**
Empyema requiring prompt tube drainage; refer to the Respiratory team
- **Transudate**
Drain only if there is respiratory distress; treat the underlying cause.
- **Exudate**
Request a contrast-enhanced CT of the thorax optimised for pleural assessment and refer to the Respiratory Team.

RESPIRATORY PHYSICIANS

❻ Discuss

The contrast-enhanced CT scan of the thorax should be reviewed ASAP with a radiologist or discussed in the next Chest Radiology meeting.

⑦ **Direct as necessary for tissue diagnosis or case review**

Thoracoscopy

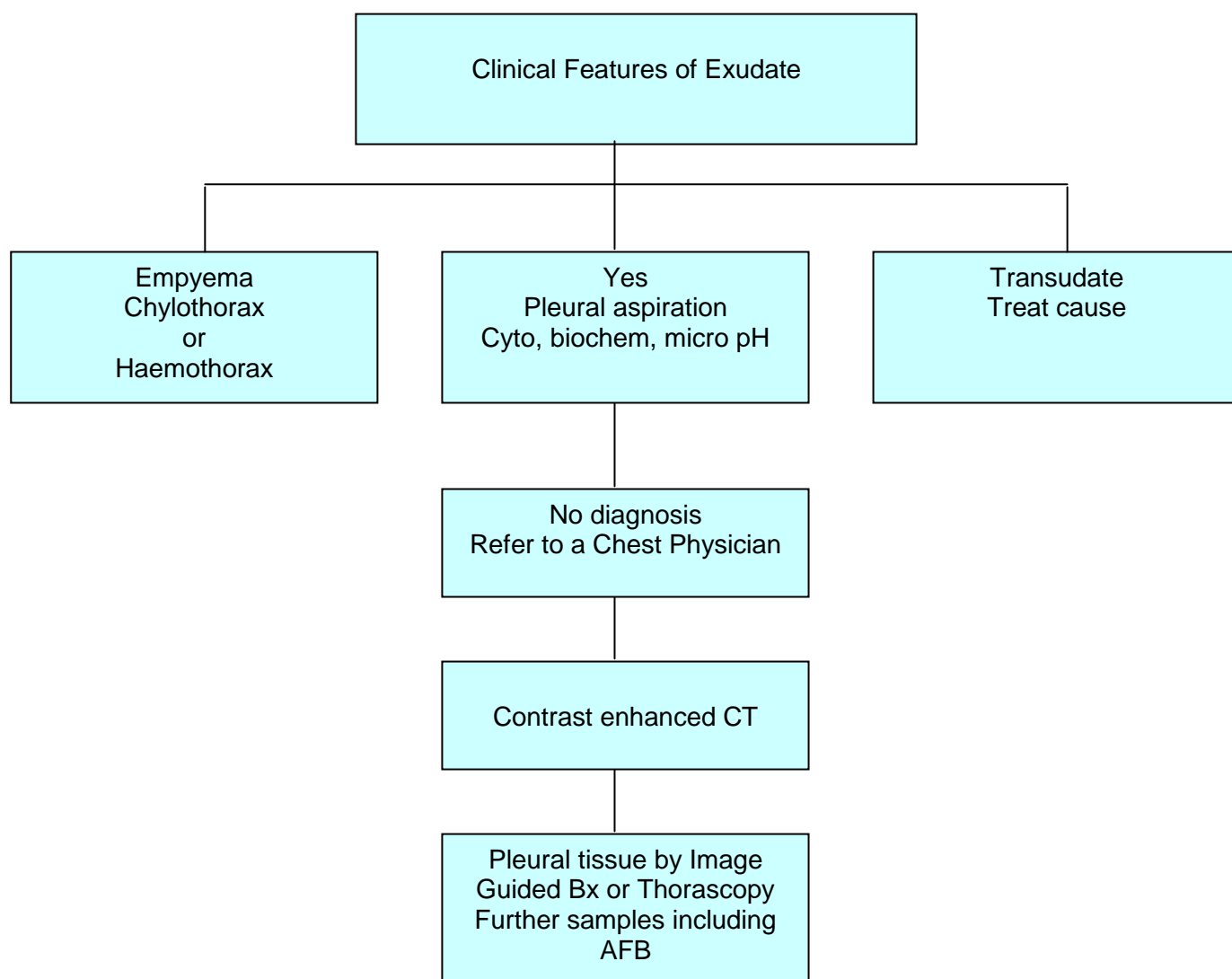
Direct visualisation of any pleural lesions. Sampling, drainage and talc poudrage performed in one sitting. Semi-rigid thoracoscopy (minimally invasive, under LA and sedation)

Image guided Pleural biopsy- Ultrasound or CT guided- discuss with Consultant Radiologist

VATS

Requires GA and single lung ventilation- discuss with Cardio-thoracic Surgeon

Algorithm for investigation of Pleural Effusion



Non Small Cell Lung Cancer staging

Revised Staging System. See <http://chestjournal.chestpubs.org/content/136/1/260.full.pdf>

T-primary tumour

- TX Primary Tumour cannot be assessed
- T0 No evidence of Primary Tumour
- Tis Carcinoma in situ
- T1** Tumour 3cm or less in greatest dimension, surrounded by lung or visceral pleura, not involving the main bronchus.
- T1a Tumour \leq 2cm in greatest dimension
- T1b Tumour >2 cm but \leq 3cm in greatest dimension
- T2** Tumour >3 cm but \leq 7cm or with *any* of the following features of size or extent (Tumours with these features are classified as T2a if <5 cm):
- More than 3cm in maximum dimension
 - Involves main bronchus, 2cm or more distal to the carina
 - Invades visceral pleura
 - Associated with atelectasis or obstructive pneumonitis that extends to the hilar region but does not involve the entire lung
- T2a Tumour >3 cm but \leq 5cm in greatest dimension
- T2b Tumour >5 cm but \leq 7cm in greatest dimension
- T3** Tumour >7 cm or one that directly invades any of the following:
- Chest wall inc. superior sulcus
 - Diaphragm
 - Phrenic Nerve
 - Mediastinal pleura
 - Parietal pericardium
- or tumour in the main bronchus less than 2cm distal to the carina but not involving the carina
- or associated atelectasis or obstructive pneumonitis of the entire lung
- or separate tumour nodule or nodules in the same lobe
- T4** Tumour of any size that invades any of the following:
- Mediastinum
 - Heart

- Great vessels
- Trachea
- Recurrent laryngeal nerve
- Oesophagus
- Vertebral body
- Carina
- Separate tumour nodules in a different ipsilateral lobe

N-REGIONAL LYMPH NODES

NX Regional lymph nodes cannot be assessed

N1 Metastasis in ipsilateral peribronchial and/or subcarinal lymph nodes and intrapulmonary nodes

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 nodes

M-DISTANT METASTASIS

MX Distant metastasis cannot be assessed

M0 No distant metastasis

M1 Distant metastasis (includes separate tumour nodule(s) in a different lobe)

M1a Separate tumour nodules in a contralateral lobe; tumour with pleural nodules or malignant pleural or pericardial effusion.

M1b Distant metastasis

Stage Grouping TNM Subsets

TABLE 8. Proposed TNM Stage Groupings

Occult Carcinoma	TX	N0	M0
Stage 0	Tis	N0	M0
Stage IA	T1a, b	N0	M0
Stage IB	T2a	N0	M0
Stage IIA	T1a, b	N1	M0
	T2a	N1	M0
	T2b	N0	M0
Stage IIB	T2b	N1	M0
	T3	N0	M0
Stage IIIA	T1, T2	N2	M0
	T3	N1, N2	M0
	T4	N0, N1	M0
Stage IIIB	T4	N2	M0
	Any T	N3	M0
Stage IV	Any T	Any N	M1a, b

Performance Status

KP		WHO
100	Normal, no complaints, no evidence of disease	0
90	Able to carry on normal activity; minor signs or symptoms of disease	
80	Normal activity with effort, some signs and symptoms of disease	1
70	Cares for self but unable to carry on normal activity or do work	
60	Requires occasional assistance but is able to care for most personal needs	2
50	Requires considerable assistance and frequent medical care	
40	Disabled; requires special care and assistance	3
30	Severely disabled; hospitalisation indicated, death no imminent	
20	Very ill; hospitalisation and active supportive care necessary	4
10	Moribund	
0	Dead	

Small Cell Lung Cancer Staging

Small Cell Lung Cancer Staging should be done according to the TNM staging in addition to description of limited/extensive stage disease

Limited stage – disease confined to one hemithorax (can include ipsilateral SCF and contralateral hilar nodes but excludes pleural effusion)

Extensive stage – disease beyond one hemithorax

Prognostic factors

- LD vs ED
- KP >60 vs ≤ 60
- Serum Na (low vs normal)
- Serum LDH (normal vs high)
- Serum alk phos (normal vs high)
- Each adverse features scores +1

Scores of 0 and 1 have better prognosis

Calculation of predicted post-operative FEV1 (ppoFEV1)

$$\text{ppoFEV1} = \text{pre FEV1} \times \frac{(19 - \text{segments to be removed})}{19}$$

If any obstructed segments:

$$\text{ppoFEV1} = \text{pre FEV1} \times \frac{(19 - a) - b}{19 - a}$$

a = no of obstructed segments

b = no of obstructed segments to be resected

Right upper lobe	= 3	Left upper lobe	= 3
Middle lobe	= 2	Lingula	= 2
Right lower lobe	= 5	Left lower lobe	= 4

Dataset for lung cancer histopathology reports (3rd edition)

Histopathology reporting proforma for lung cancer resection specimens

Surname	Forenames	Date of birth	Sex
Hospital	Hospital no	NHS/CHI no	
Date of receipt	Date of reporting	Report no	
Pathologist	Surgeon/physician	Lab no	

Previous treatment (neoadjuvant chemotherapy/radiotherapy) Yes ☐ No ☐

Specimen type

Right lung <input type="checkbox"/>	VATS <input type="checkbox"/>
Left lung <input type="checkbox"/>	VATS converted to open <input type="checkbox"/>
	Open <input type="checkbox"/>
Single wedge resection <input type="checkbox"/>	Pneumonectomy (extra-pericardial) <input type="checkbox"/>
Multiple wedge resections <input type="checkbox"/>	Pneumonectomy (intra-pericardial) <input type="checkbox"/>
Segmentectomy <input type="checkbox"/>	
Lobectomy/bi-lobectomy <input type="checkbox"/>	Other <input type="checkbox"/> (specify)

Other surgical procedures

Sleeve resection ☐ Other (e.g. chest wall)

Macroscopic features

Main bronchus within 20 mm of carina (T3) (if known) ☐

Main bronchus more than 20 mm from carina (T2) ☐

Location of tumour:

Hilar/endobronchial/central ☐

Right upper lobe <input type="checkbox"/>	Right middle lobe <input type="checkbox"/>	Right lower lobe <input type="checkbox"/>
Left upper lobe <input type="checkbox"/>	Left lower lobe <input type="checkbox"/>	Not assessable <input type="checkbox"/>

Tumour size.....mm (maximum dimension) Not assessable ☐

(T1a ≤20 mm; T1b 21–≥30 mm; T2a 31–≤50 mm; T2b 51–≤70 mm; T3 >70 mm).

Distance of tumour (or stapled margin if completion lobectomy) from bronchial or medial resection margin:mm

Extent of atelectasis/obstructive pneumonia: None/less than the two categories below ☐

Involving hilar region but not whole lung (T2) ☐

Involving whole lung (T3) ☐

Microscopic features

Histological type

Squamous cell carcinoma ☐ Large cell undifferentiated ☐ Small cell carcinoma ☐

Adenocarcinoma ☐

Adenocarcinoma-in-situ ☐

Minimally invasive adenocarcinoma (invasive component less than 5 mm) ☐

Predominant pattern (lepidic, acinar, papillary, micropapillary, solid)

Mucinous ☐

Non-mucinous ☐

Mixed mucinous/non-mucinous (>10% of each) ☐

Combined tumours ☐ (specify)

Other tumour ☐ (specify, e.g. carcinoid, etc.)

Local invasion

Visceral pleura (T2) ☐

Parietal pleura/chest wall (T3) ☐

Mediastinal pleura (T3) ☐

Pericardium (T3) ☐

Diaphragm (T3) ☐

Great vessel (aorta, central pulmonary artery or vein) (T4) ☐

Atrium, heart (T4) ☐

Malignant pleural effusion (M1a) ☐

Satellite nodules

Satellite tumour nodules in same lobe (T3) ☐

Satellite tumour nodules in different ipsilateral lobe (T4) ☐

Satellite tumour nodules in contralateral lobe (M1a) ☐

Pleural invasion

PL0 (no pleural involvement) ☐

PL1 (breaching of the outer layer of the visceral pleura but no extension to the pleural surface) ☐

PL2 (breaching of the outer layer of the visceral pleura **and** extension to the pleural surface) ☐

PL3 (involvement of the parietal pleura) ☐

Lymph node spread

Ipsilateral hilar/intrapulmonary (node stations 10–14)	Submitted <input type="checkbox"/>	Involved (N1) <input type="checkbox"/>
Ipsilateral mediastinal (node stations 1–9)	Submitted <input type="checkbox"/>	Involved (N2) <input type="checkbox"/>
Contralateral mediastinal, hilar nodes	Submitted <input type="checkbox"/>	Involved (N3) <input type="checkbox"/>
Ipsilateral or contralateral scalene or supraclavicular nodes	Submitted <input type="checkbox"/>	Involved (N3) <input type="checkbox"/>

Margins

Bronchial	Clear <input type="checkbox"/>	Involved <input type="checkbox"/>	N/A <input type="checkbox"/>
Mediastinal	Clear <input type="checkbox"/>	Involved <input type="checkbox"/>	N/A <input type="checkbox"/>
Vascular	Clear <input type="checkbox"/>	Involved <input type="checkbox"/>	N/A <input type="checkbox"/>
Chest Wall	Clear <input type="checkbox"/>	Involved <input type="checkbox"/>	N/A <input type="checkbox"/>

Other pathology (non-core)

Emphysema	No <input type="checkbox"/>	Yes <input type="checkbox"/>	Specify degree(mild/moderate/severe)
Interstitial fibrosis	No <input type="checkbox"/>	Yes <input type="checkbox"/>	State cause (if known)
Other <input type="checkbox"/>	Details:		

Metastases

Unknown (MX) ☐ Absent (M0) ☐ Present (M1a) ☐ (M1b) ☐

Details:

Ancillary data

Epidermal growth factor mutation Yes ☐ No ☐ Not assessed ☐

Other genetic data (specify)

Summary of pathological staging

(Select highest stage from above data; for synchronous primaries, use protocol above;
use prefix 'y' for resection during or following treatment and 'r' for recurrence after treatment)

...pTpNpM

Complete resection at all margins Yes ☐ No ☐

SNOMED code:

Comments

Signature

Date/...../.....

Thoracic Surgery Referral FormPlease email the form to: Cardiac.Referral@bfwhospitals.nhs.uk Date Email/Fax.....

NHS No:	Consultant:
Hosp. No DOB:	Key Worker (Local Nurse Specialist)
Name:	62 day Cancer Treatment Target Date:
Address:	MDT Date Accepted/Referred Surgeon in MDT Mr. Bittar/ Mr. Duncan/Mr. Purohit/ Mr. Zacharias/NONE
Patient Tel No:	

Presenting Symptoms:

Incidental..... Chest Pain SOB
 Cough Hemoptysis Bone Pain Wt. Loss
 Other.....

Performance Status (Tick as appropriate): 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐
 Exercise Tolerance..... Limited by.....

CT Scan: ☐ STAGING T N M Date: _____
Site of Nodule/Tumor(Circle as appropriate)
 Right – RUL Left- LUL Other Important Findings.....
 RML LLL
 RLL

PET CT Scan: ☐ STAGING T N M Date: _____

CT Scan **Head** (Large central Tumours, T4 tumours, N2 diseases, Possible pneumonectomy) : ☐

Histological Diagnosis: If Histology available report must be attached
 State method used for tissue sample: Date: _____

Previous Medical History
 IHD Y ☐ N ☐ Previous Malignancy1.....
 CVA Y ☐ N ☐ 2.....
 Asbestos exposure Y ☐ N ☐ PVD Y ☐ N ☐

Lung Function Test: FEV1- L % ,RATIO FEV1/FVC TLCO KCO
All patients for lung resection must have Full Lung Function Tests included with referral.

Smoking history
 Current smoker: ☐ Ex-smoker: ☐ Never smoked: ☐ Year Stopped: _____ Number per day: _____ Pack year: _____

Antiplatelet/Anticoagulation Medication:
Other Medication

Has the patient been informed of this referral? YES ☐ NO ☐

Other relevant information:(e.g. **Specific MDT discussion, i.e assessment only/wedge only/biopsy/Lymph nodes etc**)

Authors: Mr M Purohit, Consultant Cardiothoracic Surgeon / Bernie McAlea, Thoracic Specialist Nurse
V2.31/01/2017

High Risk Lung Cancer Surgical MDT Referral for 2nd opinion at BVH

Please email to Cardiac.Referral@bfwhospitals.nhs.uk

NHS NO	Consultant
H No DOB	Lung Ca Nurse specialist
Name Address Pt Tel no	Surgeon Present in MDT AD/MP/MNB/JZ Date of MDT CT/PET/MRI/Bone Scan
Site Right U,M,L Left U,L	Date of Breach
Final Staging T N M Any Important Invasion-	Important Bronchoscopy finding
Histology Obtained by	Cardiac History
Lung Function FEV1 L (%) DLCO FEV1/FVC KCO	Other Comorbidities 1 2 3 4
Performance Status 0 1 2 3 4	Smoking History:- Current Ex Never
<u>The Question for the High Risk MDT</u> <u>(Reason for referral)</u> 1. 2.	
Alternative Treatment 1. 2.	

Authors: Mr M Purohit, Consultant Cardiothoracic Surgeon / Bernie McAlea, Thoracic Specialist Nurse
 V1.23/02/2016