

# MANAGEMENT OF LUNG CANCER

Jason Ali

Specialist Registrar in Thoracic Surgery, NNUH

Director of Studies in Medicine, Churchill College,  
University of Cambridge

[ja297@cam.ac.uk](mailto:ja297@cam.ac.uk)

# LEARNING OBJECTIVES

- ◎ Understand the staging of lung cancer
- ◎ Understand the decision making process in determining the management for a patient with lung cancer
- ◎ Understand the treatment modalities available

# LUNG CANCER STAGING

# WHAT IS STAGING?

- ◎ Staging is the process of determining the severity of an individuals cancer:
  - Location of the primary tumour
  - Tumour size and extent
  - Lymph node involvement
  - Presence of distant metastasis

# WHY STAGE?

- ◎ Staging provides a common language for communicating the severity of an individual's cancer
- ◎ Prognostic information
- ◎ Determine the treatment options

# STAGING IN LUNG CANCER

- ◎ 'TNM' classification

- T = extent of the tumour
- N = extent of spread to lymph nodes
- M = presence of metastasis

- ◎ Focus of this presentation is 'Non Small-Cell Lung Cancer (NSCLC) which accounts for 75% of lung cancer

# LUNG CANCER TNM STAGING

Supraclavicular	Scalene	Mediastinal		Subcarinal	Hilar		Peribronchial (ipsilateral)	Lymph Node (N)
		Contra-	Ipsi-		Contra-	Ipsi-		

Stage IV (Metastatic: M1a or M1b, any T, any N)								
+	+	+			+			N3
-	-	-	+ &/ +		-			N2
-	-	-	-	-	-	+ &/ +		N1
-	-	-	-	-	-	-	-	N0

**Metastatic (M):**

**M1a:**

**Local intrathoracic spread:**

- Malignant pleural/pericardial effusion
- Separate tumor nodule(s) in the contralateral lung

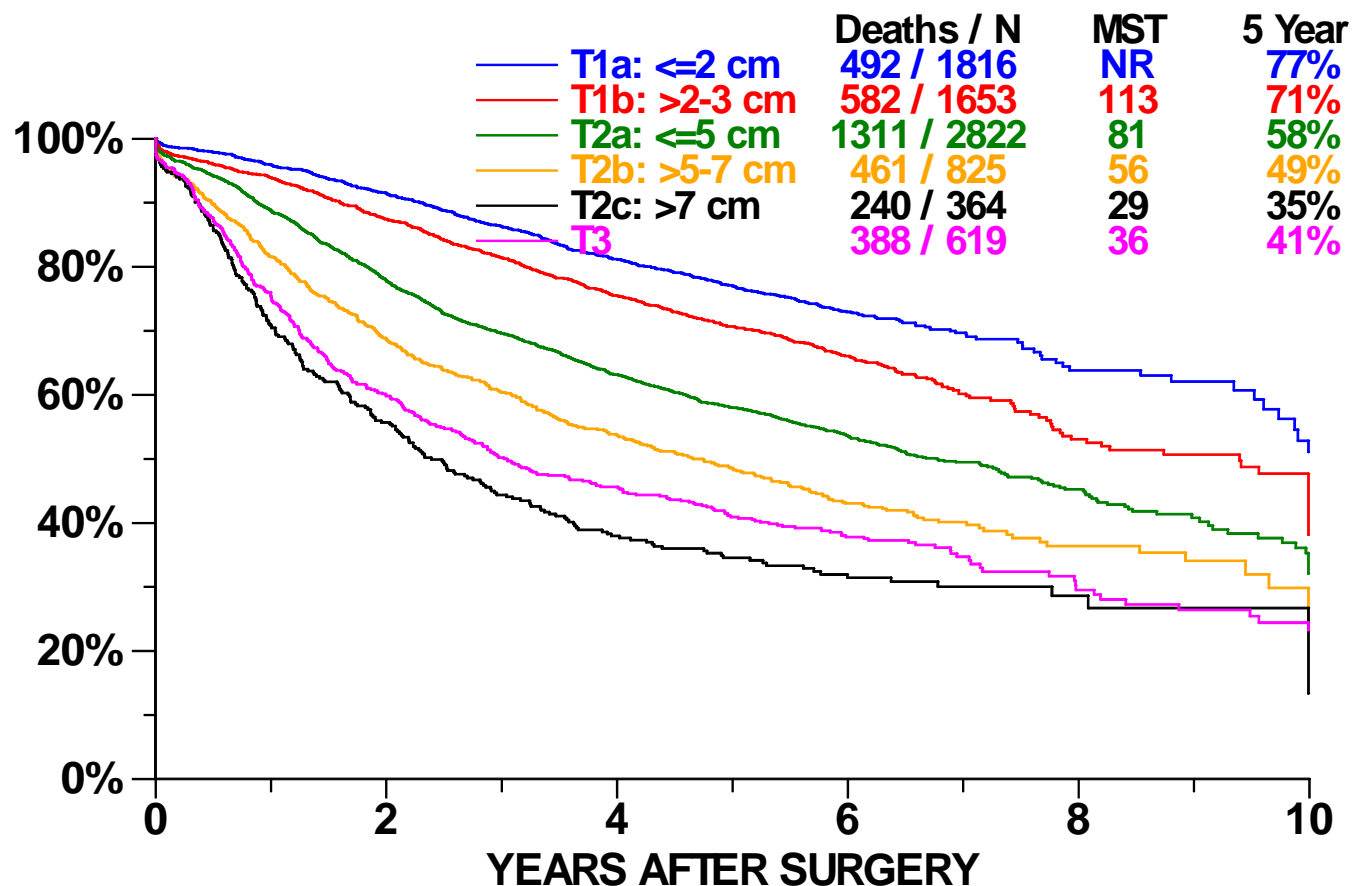
**M1b:**

**Disseminated (extrathoracic) disease:**

Liver, bone, brain, adrenal gland, etc.

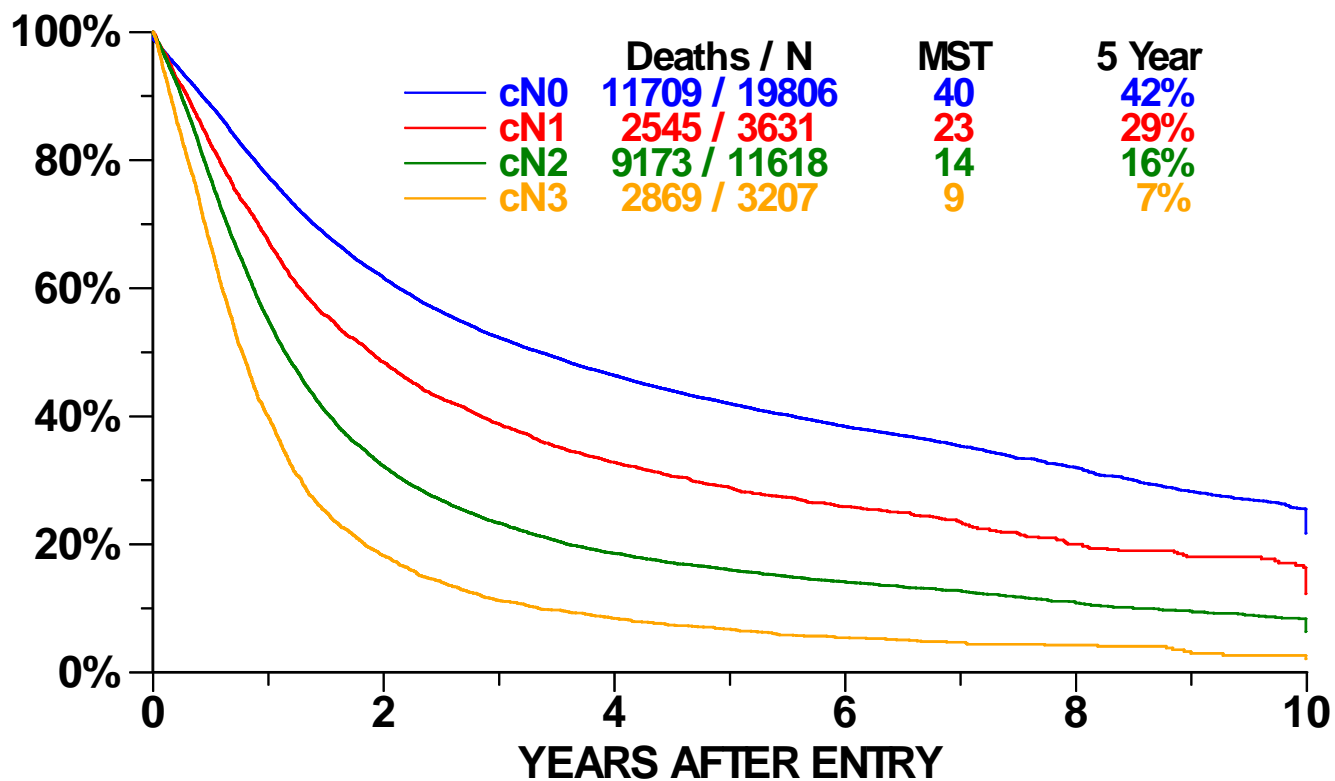
T1a	T1b	T2a	T2b	T3	T4	Primary Tumor (T)
≤2cm	>2cm but ≤3cm	>3cm but ≤5cm	>5cm but ≤7cm	>7cm	Any	a. Size
No invasion proximal to lobar bronchus		Main bronchus (≥2cm distal to the carina)		Main bronchus (<2cm distal to the carina)	-	b. Endo-bronchial location
Surrounded by lung or visceral pleura		Visceral pleura		Chest wall/diaphragm/mediastinal pleura/parietal pericardium	Mediastinum/trachea/heart/great vessels/esophagus/vertebral body/carina	c. Local Invasion
		Atelectasis/obstructive pneumonitis that extends to the hilar region but does not involve the entire lung		Atelectasis/obstructive pneumonitis of entire lung; separate tumor nodule(s) in ipsilateral primary tumor lobe	Separate tumor nodule(s) within the ipsilateral lung but different lobe as the primary mass	d. Other

# T STAGE AND PROGNOSIS



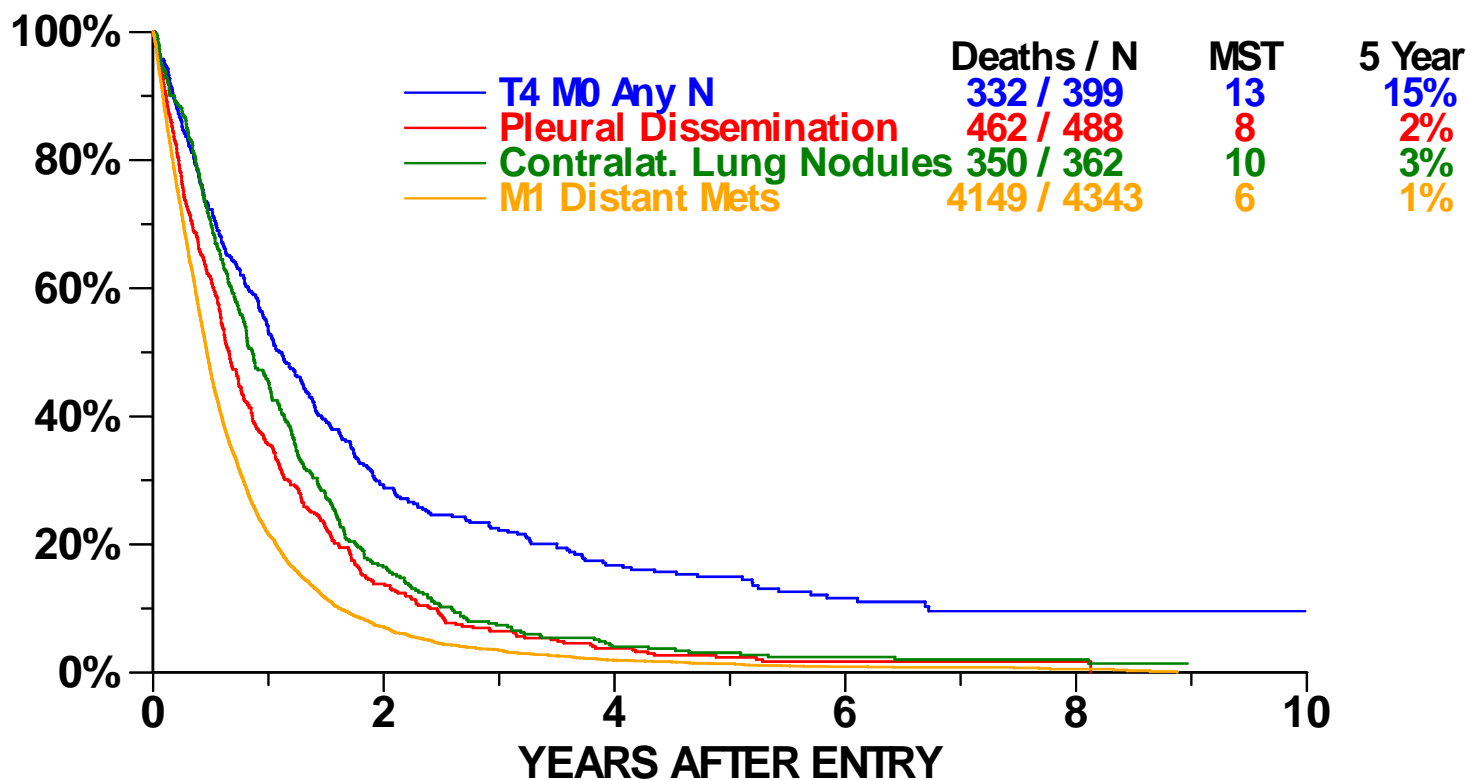
From: Rami-Porta R, Ball D, Crowley J et al. The IASLC lung cancer staging project: proposals for the revision of the T descriptors in the forthcoming (seventh) edition of the TNM classification for lung cancer. J Thorac Oncol 2007; 2: 593-602

# N STAGE AND PROGNOSIS



From: Rusch VW, Crowley J, Giroux DJ et al. The IASLC lung cancer project: proposals for the revision of the N descriptors in the forthcoming seventh edition of the TNM classification for lung cancer. J Thorac Oncol 2007; 2: 603-612

# M STAGE AND PROGNOSIS



From: Postmus PE, Brambilla E, Chansky K et al. The IASLC lung cancer project: proposals for revision of the M descriptors in the forthcoming (seventh) edition of the TNM classification of lung cancer. J Thorac Oncol 2007; 2: 686-693

# SUMMARY OF TNM STAGING

<b>T/M</b>	<b>Subgroup</b>	<b>N0</b>	<b>N1</b>	<b>N2</b>	<b>N3</b>
<b>T1</b>	T1a	Ia	IIa	IIIa	IIIb
	T1b	Ia	IIa	IIIa	IIIb
<b>T2</b>	T2a	Ib	IIa	IIIa	IIIb
	T2b	IIa	IIb	IIIa	IIIb
<b>T3</b>	T3 <sub>&gt;7</sub>	IIb	IIIa	IIIa	IIIb
	T3 <sub>Inv</sub>	IIb	IIIa	IIIa	IIIb
	T3 <sub>Satell</sub>	IIb	IIIa	IIIa	IIIb
<b>T4</b>	T4 <sub>Inv</sub>	IIIa	IIIa	IIIb	IIIb
	T4 <sub>Ipsi Nod</sub>	IIIa	IIIa	IIIb	IIIb
<b>M1</b>	M1a <sub>Contra Nod</sub>	IV	IV	IV	IV
	M1a <sub>Pl Disem</sub>	IV	IV	IV	IV
	M1b	IV	IV	IV	IV

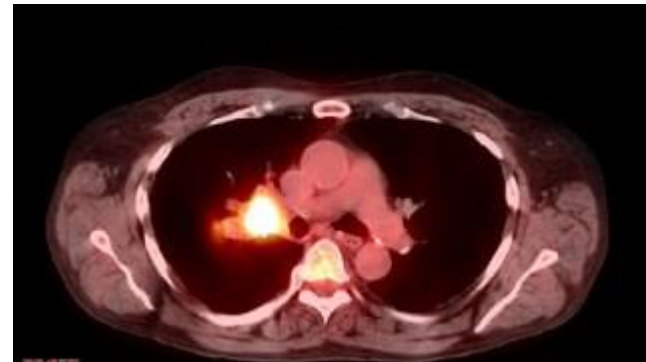
<b>Stage</b>	<b>5-year survival</b>
IA	73%
IB	58%
IIA	46%
IIB	36%
IIIA	24%
IIIB	9%
IV	13%

# HOW IS LUNG CANCER STAGED

## ◎ Imaging tools:

- High resolution CT scan
  - Head, chest, abdomen, pelvis
- CT PET scan
  - Radiolabelled glucose administered which is taken up in tissues with high metabolic activity

Particularly looking for evidence of nodal involvement and metastasis

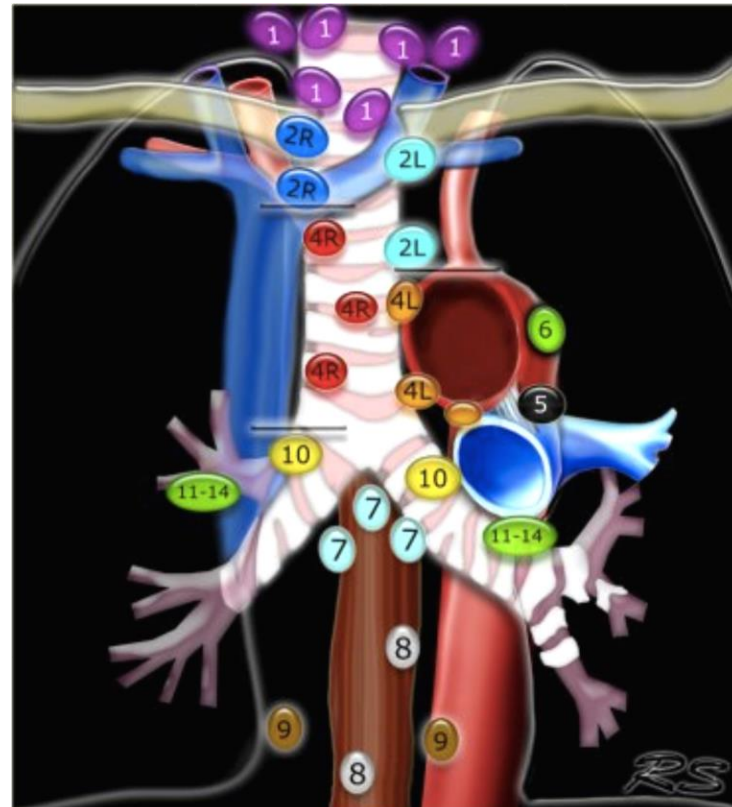


# HOW IS LUNG CANCER STAGED

- ◉ If there is any evidence of nodal metastasis further investigation is required to accurately stage the disease

Suggested by:

- >1cm on CT scan
- Increased uptake on PET

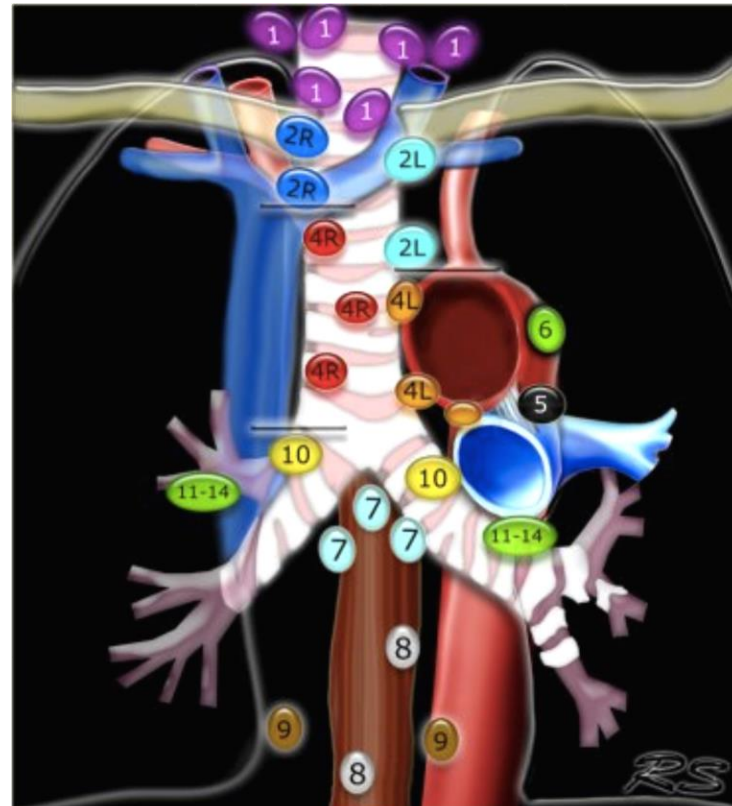


# HOW IS LUNG CANCER STAGED

- ◉ If there is any evidence of nodal metastasis further investigation is required to accurately stage the disease

Depends on site:

- Endobronchial ultrasound guided fine needle aspiration (EBUS)
- Cervical mediastinoscopy



# OBTAINING A BIOPSY FROM THE PRIMARY LESION

- ◎ Aim of obtaining histological diagnosis:
  - NSCLC vs SCLC
  - ? Metastatic lesion
  - ?? Benign
- ◎ Generally distinction between NSCLC and SCLC can be made clinically
- ◎ Not necessary in every case to have a histological diagnosis in low stage lesions

# LUNG CANCER MANAGEMENT

# MULTIDISCIPLINARY TEAM

- ◎ Management of any cancer is decided by a multidisciplinary team
- ◎ MDT members:
  - Respiratory physician
  - Thoracic surgeon
  - Oncologist
  - Radiologist
  - Histopathologist
  - Lung cancer specialist nurse
  - Palliative care

# MANAGEMENT OPTIONS

◎ Management options principally depend on staging

- Surgery
- Chemotherapy
- Radiotherapy
- Palliation

# 1. SURGERY

# SURGERY

- ◉ Indicated for stage I and II disease
- ◉ Some stage III disease
  - Generally low N stage, and depending on position of tumour
  - Down-staged following neo-adjuvant therapy

# SURGERY

- ◎ BUT this depends on *RESECTABILITY* and *OPERABILITY*
  - Resectability = ability to completely excise the tumour at surgery
  - Operability = Risk of morbidity/mortality

# PERFORMANCE STATUS

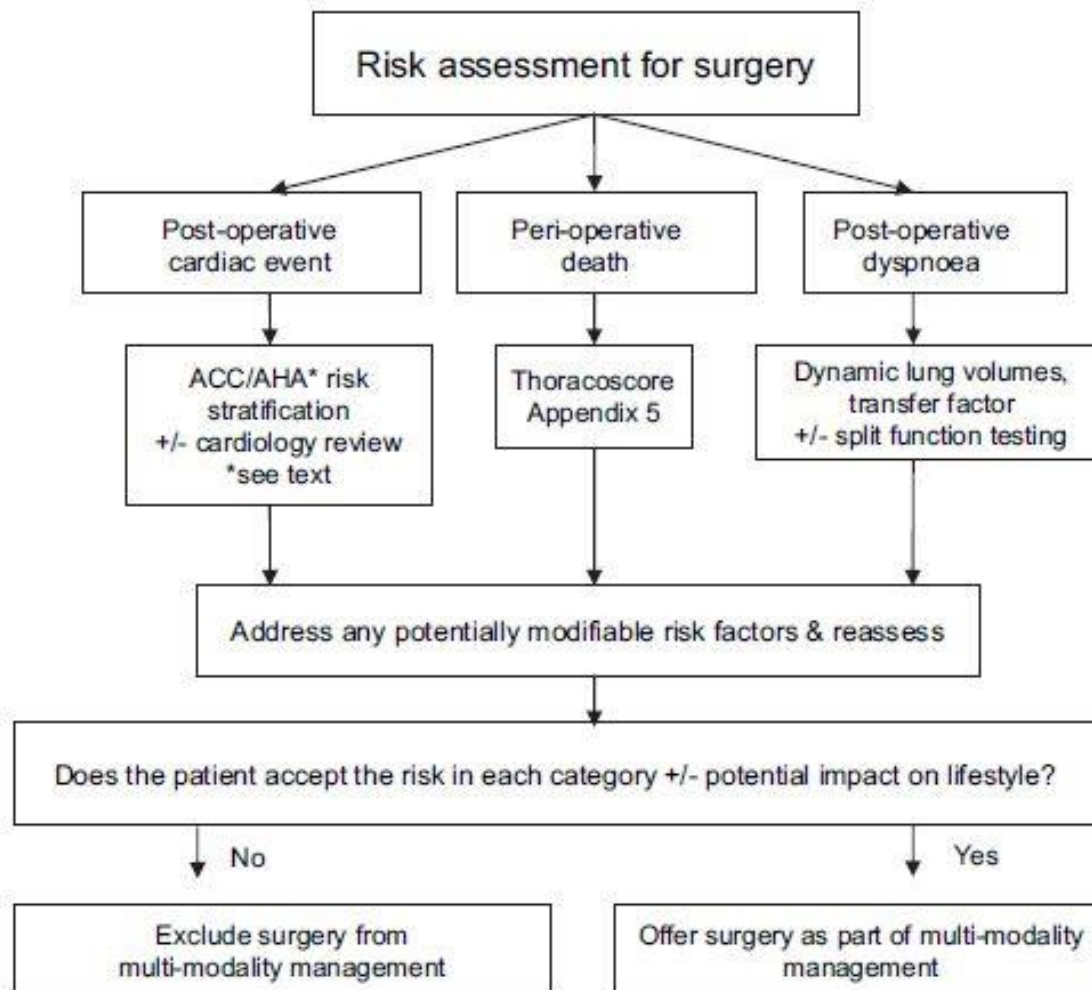
- A patients general condition

## Eastern Cooperative Oncology Group (ECOG, Zubrod, WHO) performance scale

Performance status	Definition
0	Fully active; no performance restrictions.
1	Strenuous physical activity restricted; fully ambulatory and able to carry out light work.
2	Capable of all selfcare but unable to carry out any work activities. Up and about >50% of waking hours.
3	Capable of only limited selfcare; confined to bed or chair >50% of waking hours.
4	Completely disabled; cannot carry out any selfcare; totally confined to bed or chair.

Excerpted from: Oken MM, et al. *Am J Clin Oncol* 1982; 5:649.

# OPERABILITY

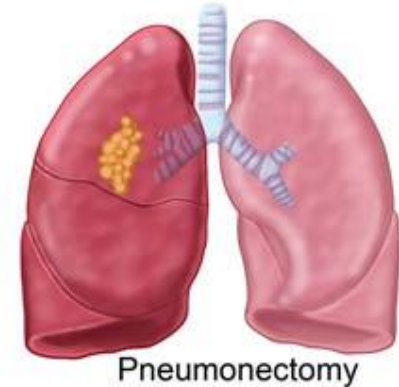
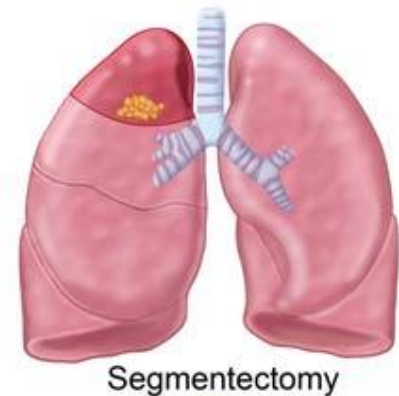


# POST OPERATIVE DYSPNOEA

- ⦿ Assessed by spirometry
- ⦿ Predicted post-operative  $FEV_1$  or  $TLCO$  <40% predicted is considered moderate - high risk for dyspnoea
- ⦿ Functional testing with cardiopulmonary exercise testing, which examines cardiorespiratory reserve may aid decision making in this context

# OPERATIVE STRATEGY

- ⦿ Anatomical resection - i.e. lobectomy, if possible, is the standard (mortality ~2%)
- ⦿ Pneumonectomy may be required due to tumour position but has higher morbidity/mortality (~8%)
- ⦿ Move towards VATS approaches



# OPERATIVE STRATEGY

## ◎ General stages of operation

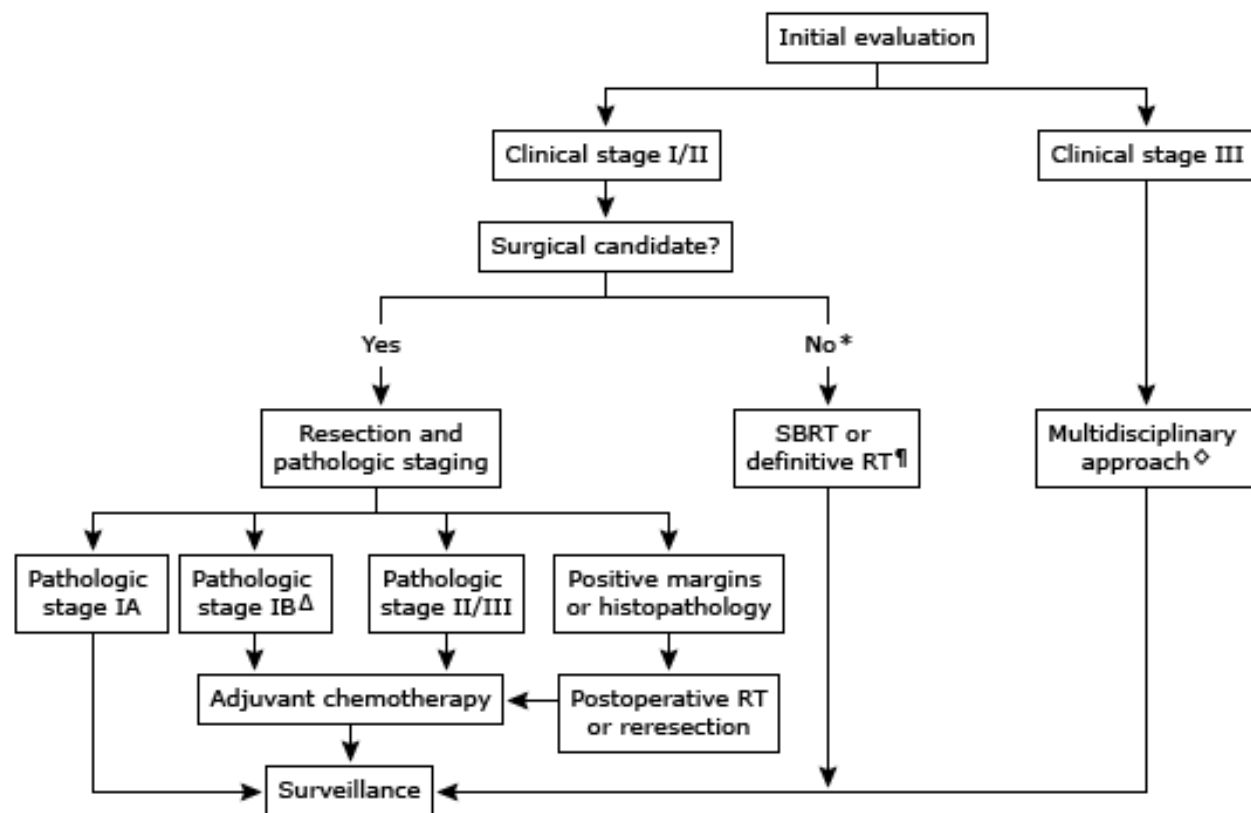
- Inspection to confirm no disease progression
- Define anatomy
- Divide vein, artery, bronchus (typically)
  
- LYMPHADENECTOMY

◎ May do an intra-operative ‘frozen section’ if no pre-operative histology

# POSTOPERATIVE MANAGEMENT

- Following histological analysis of the tumour the final 'pathological' staging is confirmed
- Patient re-discussed at MDT to determine ongoing management
  - 'Adjuvant' chemotherapy may be considered
    - Unexpected higher staging
    - Confirmed nodal involvement
    - Large tumour size

## Treatment of potentially resectable non-small cell lung cancer



NSCLC: Non-small cell lung cancer; RT: radiation therapy; SBRT: stereotactic body radiation therapy.

\* Based upon comorbidities, age, or refusal of surgery.

$\¶$  SBRT preferred for tumors <5 cm; definitive RT with conventional fractionation for larger lesions.

$\Delta$  Primarily for tumors >4 cm; observation is an alternative.

$\diamond$  Consultation with medical oncology, radiation oncology, and thoracic surgery indicated prior to definitive therapy. Concurrent chemoradiotherapy, surgery, or induction therapy followed by resection in carefully selected patients.

## 2. RADIOTHERAPY

# RADIOTHERAPY

- Use of ionising radiation to control or kill malignant cells
- External beam radiation - delivered by a linear accelerator



# RADIOTHERAPY

- ◎ Radiation deposits energy into cells and damages by:
  - Damaging DNA and cell structure
  - Preventing cell replication
  - Inducing cell death

# RADIOTHERAPY FOR LUNG CANCER

## ◉ Indications:

- Curative intention 'Radical'
  - Stage I and II tumours considered unfit for surgery (or who do not consent), with low volume disease (tolerable in terms of toxicity)
  - Stage III tumours - combination chemo-radiotherapy
- Neo-adjuvant
  - Chemo-radiotherapy to down-stage stage IIIa disease
- Adjuvant
  - Can be used for hilar and mediastinal nodes
- Palliative
  - Symptom relief (e.g. haemoptysis, metastatic disease)

# RADIOTHERAPY

- ◎ Radical radiotherapy is typically given 5 days a week for 4-5 weeks
- ◎ Multiple beams from various angles
- ◎ Centred and conformed to the shape of the tumour to maximise tumour dose whilst sparing surrounding structures

# RADIOTHERAPY PLANNING



# SIDE EFFECTS OF RADIOTHERAPY

## ◎ Acute effects

- Oesophagitis
- Pneumonitis
- Nausea/vomiting
- Bone marrow suppression

## ◎ Longer term effects

- Pneumonitis and pulmonary fibrosis
- Rib fractures
- Cardiac fibrosis and dysfunction
- hypothyroidism

# 3. CHEMOTHERAPY

# CHEMOTHERAPY

- ◎ Drugs administered with the aim of killing cancer cells
- ◎ Target various cell functions
  - DNA replication/repair
  - Cytoskeleton
  - Nucleotide synthesis
  - Hormones
  - Specific receptors - e.g. herceptin

# CHEMOTHERAPY IN LUNG CANCER

- ◎ Not curative

- ◎ Indications

- First line treatment for advanced stage IIIb and IV disease (palliative)
- Neoadjuvant therapy to downstage IIIa disease
- Adjuvant for unexpected advanced disease on pathological staging. Shown to improve survival

# SMALL CELL LUNG CANCER

# SMALL CELL LUNG CANCER

- ◎ ~15% of lung cancers
- ◎ Malignant neuroendocrine epithelial pulmonary tumours
- ◎ Exhibit aggressive behaviour and associated with paraneoplastic syndromes
- ◎ At presentation >60% have disseminated disease
- ◎ Overall 5-year survival is 5-10%
- ◎ Very sensitive to chemo and radiotherapy

# MANAGEMENT

## ◎ Limited stage disease

- Platinum based chemotherapy with thoracic radiotherapy
- +/- surgery for T1-2a N0 M0 disease

## ◎ Extensive stage disease

- Chemotherapy alone

## ◎ +/- Prophylactic cranial irradiation

# SUMMARY

- ◎ Lung cancer management is a multidisciplinary process
- ◎ Staging is central to decision making
- ◎ Surgery is the standard curative option for low stage NSCLC
- ◎ Radiotherapy and chemotherapy also play a role in improving survival