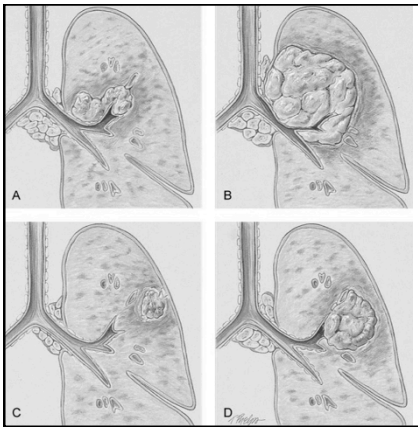
Cancer of the Lung

RSPT 2310



A, Squamous cell carcinoma

B, Adenocarcinoma

C, Large cell carcinoma

D, Small cell (oat cell) carcinoma

Anatomic Alterations of the Lungs

- Inflammation, swelling, and destruction of the bronchial airways and alveoli
- Excessive mucus production
- Tracheobronchial mucus accumulation and plugging
- Airway obstruction
  - Blood
  - Mucous accumulation
  - Tumor projecting into a bronchus

Anatomic Alterations of the Lungs

- Atelectasis
- Alveolar consolidation
- Cavity formation
- Pleural effusion

Etiology

- Lung cancer is the leading cause of cancer deaths in the United States
- More than 214,000 new cases are reported in the United States annually
  - About 114,000 in males
  - About 100,000 in females

Types of Cancer

- Non–small-cell cancer (NSCLC)
  - Squamous cell carcinoma
  - Adenocarcinoma
  - Large-cell carcinoma (Undifferentiated)
- Small-cell lung cancer (SCLC)
  - Small-cell (or oat cell carcinoma)

TABLE 26-1 Characteristics of Lung Cancers

Tumor Type	Growth Rate	Metastasis	Means of Diagnosis
Squamous cell carcinoma	Slow	Late; mostly to hilar lymph nodes	Biopsy, sputum analysis, bronchoscopy, electron microscopy, immunohistochemistry
Adenocarcinoma	Moderate	Early	Radiography, fiberoptic bronchoscopy, electron microscopy
Large cell carcinoma	Rapid	Early and widespread	Sputum analysis, bronchoscopy, electron microscopy (by exclusion of other cell types)
Small cell (oat cell) carcinoma	Very rapid	Very early; to mediastinum or distally in lung	Radiography, sputum analysis, bronchoscopy, electron microscopy, immunohistochemistry, and clinical manifestations (cough, chest pain, dyspnea, hemoptysis, localized wheezing)

Screening and Diagnosis

- Routine chest x-ray is the most common
- Computed tomography (CT) scan
- Positron emission tomography (PET) scan
- View a tissue sample (biopsy) under a microscope—used for a definitive diagnosis

Screening and Diagnosis

- Procedures used to obtain a tissue biopsy
  - Bronchoscopy
  - Thoracoscopy
  - Mediastinoscopy
  - Transbronchial needle biopsy
  - Open-lung biopsy
  - Sputum cytology
  - Thoracentesis
  - Video thoracoscopy

Staging of Lung Cancer

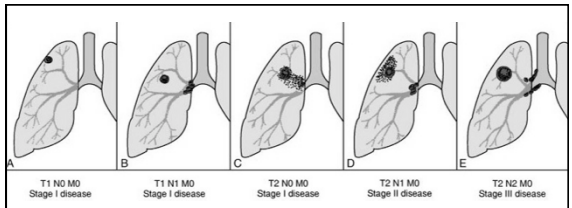
- Staging is the process of classifying information about cancer
  - Cancer type
  - Size of the tumor
  - Level of lymph node involvement
  - The extent to which the cancer has spread
- The patient's prognosis and treatment depend on the staging results

Staging of Lung Cancer

System most often used for staging lung cancer

- TNM classification
  - T represents the extent of the primary tumor
  - N denotes the lymph node involvement
  - M indicates the extent of metastasis
- Roman numerals are used to identify stages
  - 0 being the least advanced
  - IV being the most advanced

Symbol	Definition
Primary tumor (T)	
T0	No evidence of tumor
Tx	Tumor that cannot be assessed
Lymph nodes (N)	
Nx	Regional lymph nodes cannot be assessed
N0	Absence of regional lymph involvement
Distant metastasis (M)	
Mx	Metastasis cannot be assessed
M0	Absence of distant metastasis



Staging of lung cancer by the TNM classification system.
A, B, Stage I disease includes tumors classified as T1, with or without metastasis to the lymph nodes in the ipsilateral hilar region.

C, Also included in stage I are tumors classified as T2 but having no nodal or distant metastases.

D, Stage II disease includes those tumors classified as T2, with metastasis only to the ipsilateral hilar lymph nodes.

E, Stage III includes all tumors more extensive than T2 or any tumor with metastasis to the lymph nodes in the mediastinum or with distant metastasis.

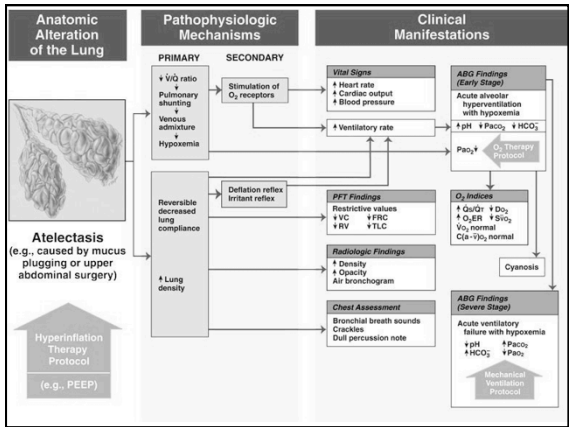
Non–Small-Cell Cancer Staging

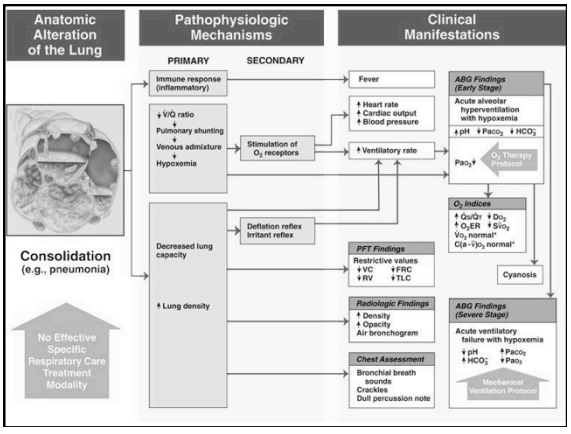
- The stages for non–small-cell lung cancer include these subcategories:
  - Stage 0
  - Stage I
  - Stage II
  - Stage III A
  - Stage III B
  - Stage IV

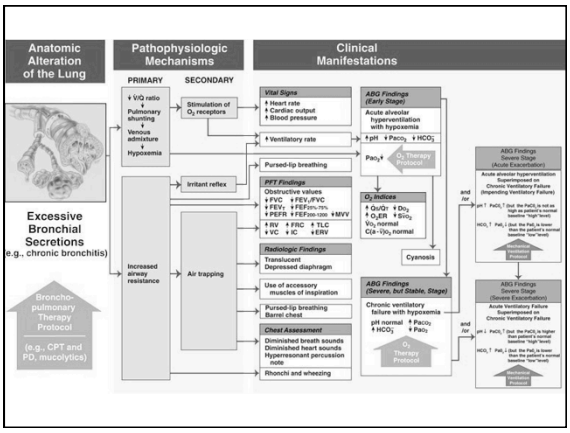
Non–Small-Cell Cancer Staging

- Small-cell cancer is staged differently than non–small-cell cancer
- Usually classified as
  - Limited: cancer confined to only one lung and to its neighboring lymph nodes
  - Extensive: cancer has spread beyond one lung and nearby lymph nodes. It may have invaded both lungs, more remote lymph nodes, or other organs

Overview of the Cardiopulmonary Clinical Manifestations Associated with Cancer of the Lung







Clinical Data Obtained at the Patient's Bedside

The Physical Exam

- Vital Signs
  - Increased
    - Respiratory Rate
    - Pulse
    - Blood pressure
  - Cyanosis
  - Cough, sputum production
  - Chest assessment
    - crackles, rhonchi, wheezing

Clinical Data Obtained from Laboratory Tests and Special Procedures

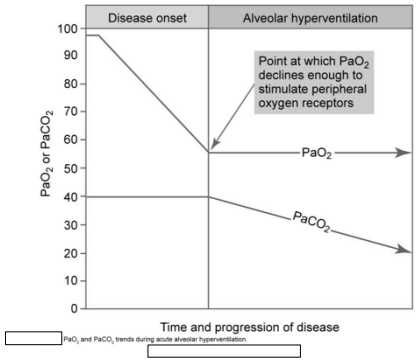
Pulmonary Function Tests

- Relative to where the malignancy originates, the PFT values may show either obstructive or restrictive values
  - when the malignancy obstructs major airways, the PFTs may show obstructive pathology—especially when there is COPD present
  - when large amounts of pulmonary tissue, and/or diaphragm is involved (extensive bronchioalveolar carcinoma), then the pathology may show restrictive PFT values

Arterial Blood Gases

- Localized (e.g., lobar) Lung Cancer
  - Acute Alveolar Hyperventilation with Hypoxemia

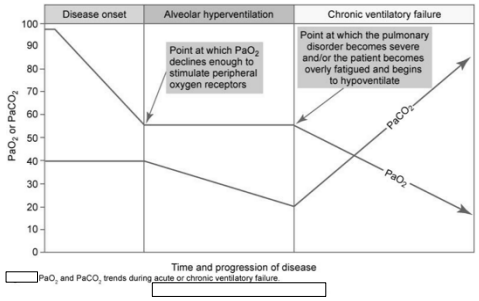
pH	$PaCO_2$	HCO_3	PaO_2
⇧	⇩	⇩	⇩



Arterial Blood Gases

- Extensive or Widespread Lung Cancer
  - Acute Ventilatory Failure with Hypoxemia

pH	$PaCO_2$	HCO_3	PaO_2
⇩	⇧	⇧	⇩



Oxygenation Indices

Q_S/Q_T	DO_2	VO_2	$C(a\text{-}v)O_2$	O_2ER	SvO_2
⇧	⇩	**N**	**N**	⇧	⇩

Hemodynamic Indices

- When hypoxemia and acidosis are present, or when a tumor invades the mediastinum and compresses the superior vena cava

CVP	RAP	PA	PCWP	CO	SV
↑	↑	↓	↓ or N	↓ or N	↓ or N

SVI	CI	RVSWI	LVSWI	PVR	SVR
↓ or N	↓ or N	↑	↓ or N	↑	N

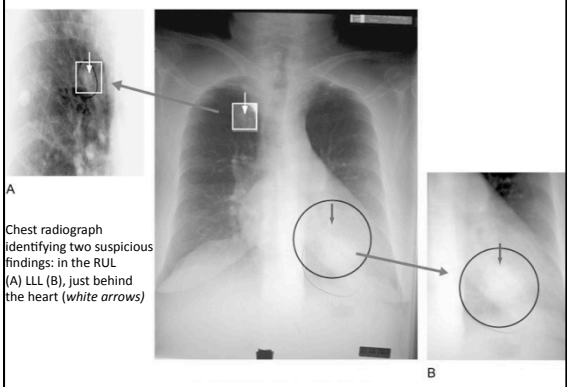
Radiographic Findings

- Chest Radiograph
  - Small oval or coin lesion
  - Large irregular mass
  - Alveolar consolidation
  - Atelectasis
  - Pleural effusion
  - Involvement of the mediastinum or diaphragm

Radiographic Findings

- CA of lung is often first diagnosed on a routine PA
- Depending on length of growth, the CXR may show a small radiodense nodule (coin lesion) or large irregular mass
- By the time most tumors are seen they have become invasive and are hard to treat
- Most common CXR presentation is a loss of lung volume

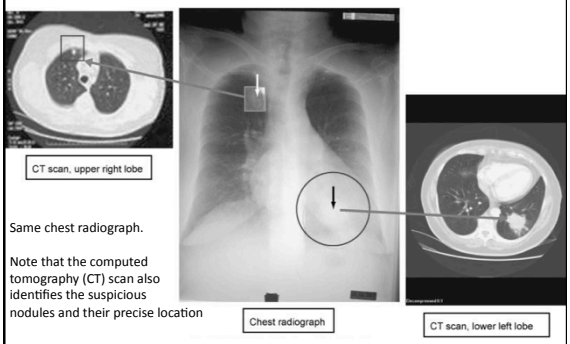
Right lung squamous cell carcinoma of the bronchus illustrating the huge size these tumors may attain before discovery.



A

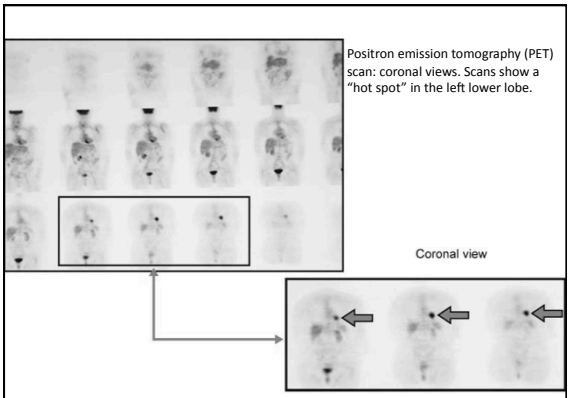
B

Chest radiograph identifying two suspicious findings: in the RUL (A) LLL (B), just behind the heart (*white arrows)*

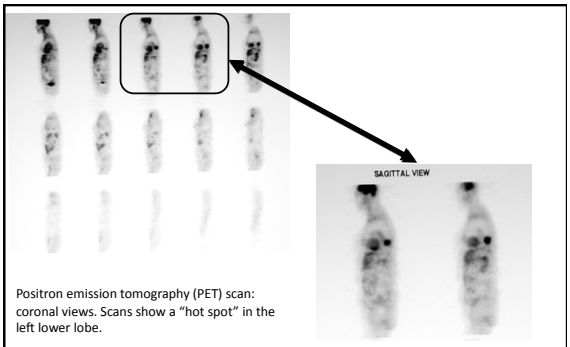


Same chest radiograph.

Note that the computed tomography (CT) scan also identifies the suspicious nodules and their precise location



Positron emission tomography (PET) scan: coronal views. Scans show a "hot spot" in the left lower lobe.



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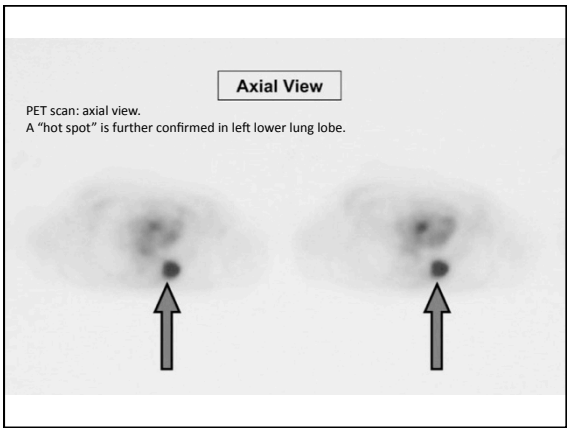
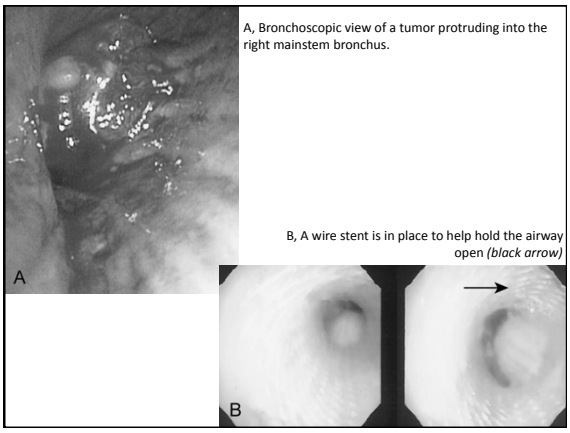


PET scan: axial view.
A "hot spot" is further confirmed in left lower lung lobe.



A, Bronchoscopic view of a tumor protruding into the right mainstem bronchus.

B, A wire stent is in place to help hold the airway open *(black arrow)*

Non-respiratory Clinical Manifestations

- Hoarseness
- Difficulty in swallowing
- Superior vena cava syndrome
- Weakness
- Distention of the neck veins
- Neck and facial edema
- Electrolyte abnormalities

Clinical Manifestations

- Clinical manifestations may be caused by
  - local effects
  - tumor extensions into mediastinum
  - paraneoplastic endocrine syndromes
  - tumor metastasis
- Most common local symptoms
  - cough
  - chest pain
  - dyspnea
  - hemoptysis

General Management

- Surgery
  - Wedge resection (partial removal of a lung lobe)
  - Segmentectomy (removal of a lung segment or segments)
  - Lobectomy (removal of one lung lobe)
  - Bilobectomy (removal of two lung lobes)
  - Pneumonectomy (removal of whole right or left lung)

General Management

- Chemotherapy
  - General term for any treatment involving the use of chemical agents or drugs that are selectively destructive to malignant cancer cells

General Management

- Radiation Therapy
  - External radiation is often given with chemotherapy
  - May be used with curative intent in patients with non-small cell lung carcinoma who are not eligible for surgery

Supportive Care

- Radiation therapy and chemotherapy may not be tolerated when the patient has extensive small-cell lung cancer and is in poor health
- The patient may choose to receive only comfort or palliative care, which means treating the symptoms of the cancer rather than the cancer itself

Respiratory Protocols

- Oxygen Therapy Protocol
- Bronchopulmonary Hygiene Therapy Protocol
- Lung Expansion Therapy Protocol
- Aerosolized Medication