

# Curriculum

## DrNB Super Specialty

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# Thoracic Surgery

- ◆ Introduction
- ◆ Objectives of the Programme
- ◆ Teaching and Training Activities
- ◆ Syllabus
- ◆ Competencies
- ◆ Log Book
- ◆ Recommended Text Books and Journals

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## **I. INTRODUCTION:**

Thoracic surgery encompasses the operative, peri-operative, and critical care of patients with pathologic conditions within the chest. This includes the surgical care of: coronary artery disease; diseases of the trachea, lungs, esophagus, and chest wall; abnormalities of the great vessels and heart valves; congenital anomalies of the chest and heart; tumors of the mediastinum; diseases of the diaphragm; and management of chest injuries.

## **II. OBJECTIVES OF THE PROGRAMME:**

### **1. Patient Care and Procedural Skills:**

- Residents must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.
- Residents must be able to competently perform all medical, diagnostic, and surgical procedures considered essential for the area of practice.

### **2. Residents:**

- Must demonstrate competence in the development and execution of patient care plans;
- Must demonstrate competence in technical ability, and use information technology as they pertain to patient care;
- Must demonstrate competence in evaluation of diagnostic studies;
- Must demonstrate competence, under supervision of members of the thoracic surgery faculty:
  - Providing pre-operative management, including the selection and timing of Operative intervention and the selection of appropriate operative procedures;
  - Providing post-operative management of thoracic and cardiovascular patients;
  - Providing critical care of patients with thoracic and cardiovascular surgical disorders, including trauma patients, whether or not operative intervention is required;
- Correlating the pathologic and diagnostic aspects of cardiothoracic disorders, demonstrating skill in diagnostic procedures (e.g., bronchoscopy and esophagoscopy), and interpreting appropriate imaging studies (e.g., ultrasound, computed tomography, roentgenographic, radionuclide, cardiac catheterization, pulmonary function, and esophageal function studies).

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### 3. Medical Knowledge

- Residents must demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social behavioral sciences, as well as the application of this knowledge to patient care.
- Residents:
  - Must demonstrate knowledge of current medical information, and critically evaluate scientific information;
  - Must demonstrate knowledge in the use of cardiac and respiratory support devices.
- Practice-based Learning and Improvement
- Residents must demonstrate the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and life-long learning.
- Residents are expected to develop skills and habits to be able to meet the following goals:
  - identify strengths, deficiencies, and limits in one's Thoracic Surgery knowledge and expertise;
  - Set learning and improvement goals;
  - Identify and perform appropriate learning activities;
  - Systematically analyze practice using quality improvement methods, and implement changes with the goal of practice improvement;
  - incorporate formative evaluation feedback into daily practice;
  - locate, appraise, and assimilate evidence from scientific studies related to their patients' health problems;
  - use information technology to optimize learning;
  - participate in the education of patients, families, students, residents and other health professionals;
  - demonstrate the ability to practice lifelong learning, analyze personal practice outcomes, and use information technology to optimize patient care.

#### **Interpersonal and Communication Skills**

Residents must demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals.

Residents are expected to:

- Communicate effectively with patients, families, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds;

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- Communicate effectively with physicians, other health professionals, and health related agencies;
  - Work effectively as a member or leader of a health care team or other professional group;
  - Act in a consultative role to other physicians and health professionals; and, Thoracic Surgery
  - Maintain comprehensive, timely, and legible medical records, if applicable.

#### **4. Professionalism:**

Residents must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles. Residents are expected to demonstrate:

- compassion, integrity, and respect for others;
- responsiveness to patient needs that supersedes selfinterest;
- respect for patient privacy and autonomy;
- accountability to patients, society and the profession;
- sensitivity and responsiveness to a diverse patient population, including but not limited to diversity in gender, age, culture, race, religion, disabilities, and sexual orientation;
- high standards of ethical behavior; demonstrate continuity of care (pre-operative, operative, and post-operative); demonstrate sensitivity to age, gender, culture, and other differences; and demonstrate honesty, dependability, and commitment.

#### **5. Systems-based Practice:**

Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care. Residents are expected to:

- Work effectively in various health care delivery settings and systems relevant to their clinical specialty;
- Coordinate patient care within the health care system relevant to their clinical specialty;
- Incorporate considerations of cost awareness and risk-benefit analysis in patient and/or population based care as appropriate;
- advocate for quality patient care and optimal patient care systems;
- Work in interprofessional teams to enhance patient safety and improve patient care quality;
- Participate in identifying system errors and implementing potential systems solutions;

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- Practice cost-effective care without compromising quality, promote disease prevention, demonstrate risk-benefit analysis, and know how different practice systems operate to deliver care.

### III. TEACHING AND TRAINING ACTIVITIES

The fundamental components of the teaching programme should include:

- Case presentations & discussion- once a week
- Seminar – Once a week
- Journal club- Once a week
- Grand round presentation (by rotation departments and subspecialties)- once a week
- Faculty lecture teaching- once a month
- Clinical Audit-Once a Month
- A poster and have one oral presentation at least once during their training period in a recognized conference.

The rounds should include bedside sessions, file rounds & documentation of case history and examination, progress notes, round discussions, investigations and management plan) interesting and difficult case unit discussions.

The training program would focus on knowledge, skills and attitudes (behavior), all essential components of education. It is being divided into theoretical, clinical and practical in all aspects of the delivery of the rehabilitative care, including methodology of research and teaching.

- a) Theoretical: The theoretical knowledge would be imparted to the candidates through discussions, journal clubs, symposia and seminars. The students are exposed to recent advances through discussions in journal clubs. These are considered necessary in view of an inadequate exposure to the subject in the undergraduate curriculum.
- b) Symposia: Trainees would be required to present a minimum of 20 topics based on the curriculum in a period of three years to the combined class of teachers and students. A free discussion would be encouraged in these symposia. The topics of the symposia would be given to the trainees with the dates for presentation.
- c) Clinical: The trainee would be attached to a faculty member to be able to pick up methods of history taking, examination, prescription writing and management in rehabilitation practice.
- d) Bedside: The trainee would work up cases, learn management of cases by discussion with faculty of the department.

- e) **Journal Clubs:** This would be a weekly academic exercise. A list of suggested Journals is given towards the end of this document. The candidate would summarize and discuss the scientific article critically. A faculty member will suggest the article and moderate the discussion, with participation by other faculty members and resident doctors. The contributions made by the article in furtherance of the scientific knowledge and limitations, if any, will be highlighted.
- f) **Research:** The student would carry out the research project and write a thesis/ dissertation in accordance with NBE guidelines. He/ she would also be given exposure to partake in the research projects going on in the departments to learn their planning, methodology and execution so as to learn various aspects of research.

#### IV. SYLLABUS

The curriculum includes both clinical teaching (in the operating room, on the wards, and in the outpatient clinic), and classroom teaching (lectures, small group discussions, and simulation).

##### 1. Basic Knowledge

Topic	Core Surgical foundation	General Thoracic surgery	Adult Cardiac surgery	Congenital surgery
<b>Anatomy</b>  Gross, surface and imaging and anatomy of:	Thorax Abdomen Pelvis Limbs Head and neck Spine	Tracheobronchial tree and lungs Thoracic inlet, neck and mediastinum Esophagus and upper GI tract Chest wall and diaphragm Pleura	See Core Surgical Foundation Heart, pericardium and great vessels Coronary anatomy Valvular anatomy Anatomy of the peripheral vascular system Anatomy of cardiac	Basic embryology of the heart, lungs, great vessels Coronary Anatomy and variants Location and course of the conduction System in congenital heart Disease Anatomy as it pertains to Vascular conduits Including aortopulmonary shunts

			innervations	
<b>Physiology</b>	Homeostasis Thermoregulation Metabolic pathways and abnormalities Blood loss and hypovolemic shock Sepsis and septic shock Fluid balance and fluid replacement therapy Acid base balance Bleeding and coagulation Nutrition Pulmonary physiology, ventilation and gas exchange Metabolic response to trauma Digestive, renal and hepatic physiology	See Core Surgical Foundation	See Core Surgical Foundation Myocardial cellular physiology Electrophysiology Physiology of congestive heart failure	Fetal circulation & circulatory changes at birth Relevant general Physiology of childhood Hemodynamics, physiology And measurement including shunt calculations, PVR, SVR Physiology of pulmonary vasculature Immature myocardial cell physiology Electrophysiology, including conduction disorders Acidbase balance (including Ph and alpha stat CPB mgmt) Physiology of pediatric cardiopulmonary bypass

	Cardiac arrhythmia			including low – flow and circulatory arrest.
<b>Pharmacology</b>	Analgesics Antibiotics Anesthetics Cardiovascular drugs (inotropes, vasodilators and vasoconstrictors, antiarrhythmic drugs, nitric oxide antagonists) Antiplatelet, anticoagulant and thromolytic drugs Hemostatic drugs Respiratory drugs Drugs used for management of endocrine disorders (including diabetes) Familiarity with drugs used in the treatment	See Core Surgical Foundation Bronchodilators	See Core Surgical Foundation Drugs used in the treatment of hypertension, heart failure and angina Inotropes, vasodilators and vasoconstrictors	Specific drugs used in the treatment of congenital heart disease (beta blockers, ACE inhibitors, Digoxin, Diuretics, PGE1) Specific dosing and application of inotropes, anti-arrhythmic drugs, hemostatic drugs, antiplatelet, anticoagulant and thromolytic drugs, analgesics, antibiotics, anesthetic agents, and vasodilators (systemic and pulmonary) in the pediatric population

	of common malignancies Bronchodilators H2 antagonists and proton pump inhibitors Drugs used in transplantation Antilipid agents Steroids			
<b>Pathology</b> General pathological principles including:	Inflammation Wound healing Cellular injury Tissue death including necrosis and apoptosis ARDS Systemic inflammatory response Bleeding disorders and HIT Vascular disorders (including atherosclerosis) Disorders of growth, differentiation and morphogenesis	See Core Surgical Foundation	See Core Surgical Foundation Atheroma, medial necrosis Myocardial infarction and complications Endocarditis Pericarditis Tumors of the heart	Effect of growth and pregnancy

	Surgical immunology Pathology of neoplasia Tumor classification and biology Cancer staging and grading Principles of cancer therapy including surgery, radiotherapy (and radiation safety), chemotherapy and hormone therapy Principles of cancer screening			
<b>Microbiology</b>	Hospital acquired infections	See Core Surgical Foundation Intrapleural sepsis	See Core Surgical Foundation Antibiotic prophylaxis for cardiac surgery	
<b>Imaging</b> Principles and indications for diagnostic and interventional imaging including:	Plain film xrays CT MRI/MRA PET/CT Echocardiography Ultrasonography	See Core Surgical Foundation PET/CT Quantitative V/Q scanning Sestamibi Scanning	ECHO Cardiac catheterization	

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## 2. History of Thoracic Surgery

### i. Preoperative Evaluation

- Introduction
- Estimation of Cardiac Risk
- Predicted Postoperative Forced Expiratory Volume in the First Second
- Diffusing Capacity of the Lung for Carbon Monoxide
- Exercise Testing

### ii. Perioperative Management

- Introduction
- Preparation for Surgery
- Airway Management
- Pain Management
- Postoperative Monitoring
- Chest Tube Management
- Fast track Recovery

### iii. Intensive Care after Thoracic Surgery

- Monitoring of Patient Vital Variables
- Pain Monitoring and Control
- Sedation and Muscle Paralysis
- Fluid Resuscitation and Balance
- Vascular and Heart Failure
- Management of Respiratory Failure
- Sepsis
- Renal Failure

### iv. Postoperative Complications

- Early Postoperative Complications

### v. Delayed Complications in Thoracic Surgery

### vi. Clinical Knowledge

- Open versus minimally invasive approaches to thorax and abdomen
- Early and late complications of thoracic incisions, and abdominal incisions

### a) Clinical Skills

- 
- History and Examination
    - System specific and general history and examination, including drug history, identification of comorbidity and functional status
  - Data Interpretation
  
  - Patient Management
    - Risk assessment and stratification
    - Management of post-thoracic surgical complications
    - Postoperative management of pain control
    - Treatment of cardiac arrhythmias
    - Physiotherapy and rehabilitation
    - Understanding thoracic-specific ventilatory techniques (e.g., lung isolation)
  
  - b) Technical Skills
    - Endoscopy
    - Bronchoscopy
    - Tracheostomy
    - Correct positioning of patient for thoracic surgery
    - Select, perform and close thoracic incisions, including lateral, anterior, muscle sparing, median sternotomy and VATS incisions
  
  - c) NEOPLASM OF LUNG
    - Knowledge
    - Benign and malignant tumors of trachea, bronchus, lung

### **Strategies for Non small Cell Lung**

- d) Cancer Treatment
  - Introduction
  - Early Stage Non small Cell Lung Cancer
  - Locally Advanced Non small Cell Lung Cancer
  - Advanced Non small Cell Lung Cancer
  - Small Cell Lung Cancer
  
- e) Classification
  - Epidemiology
  - Aetiology and Pathogenesis

- 
- Clinical Presentation
  - Diagnosis and Staging
  - Treatment
  - Prognosis
  - Prevention
- f) Lung Carcinoid Tumours
- Definition
  - Incidence
  - Classification
  - Clinical Symptoms
  - Diagnosis
  - Mediastinal Lymph Node Involvement
  - Treatment
- g) Bronchial Gland Tumours
- Introduction
  - Incidence
  - Clinical Presentation
  - Adenoid Cystic Carcinoma
  - Mucoepidermoid Carcinoma
  - Pleomorphic Adenoma
  - Mucous Gland Adenoma
  - Epithelial- Myoepithelial Carcinoma
- h) Rare Tumours of the Lung
- Introduction
  - Pleuropulmonary Blastoma
  - Primary Pulmonary Carcinosarcoma
  - Primary Intrapulmonary Thymoma
  - Primary Malignant Melanoma of the Lung
  - Primary Malignant Germ Cell Tumours
  - Primary Sarcoma of the Lung
  - Primary Malignant Lymphoreticular Disorders
  - Epidemiology, genetic signatures, presentation, and diagnosis
  - Staging including all staging tools (CT, CT/PET, EBUS, EUS, Mediastinoscopy)
  - Multimodality management of thoracic malignancy
  - Non-resectional techniques (SBRT, RFA, etc)

- 
- Survival and recurrence patterns
  - Postop complications (BP fistula, space problems, empyema, prolonged air leak, etc.)
  - Surgical palliative techniques (stents, RFA, etc.)
  - Secondary and metastatic neoplasms of the lung
  - Patient Management/Clinical Skills
  - Clinical assessment to establish clinical stage (radiologic interpretation)
  - Assessment of function and risk
  - Diagnosis and management of non-thoracic metastatic lesions
  - Postop management including complications such as empyema, bronchopleural fistulae, space issues, prolonged air leak, pneumonia, chylothorax, hemorrhage, etc.
  - Technical Skills
  - Surgery for benign and malignant conditions of the lungs (open and VATS)
  - Wedge resection
  - Lobectomy
  - Segmentectomy
  - Bilobectomy
  - Sleeve lobectomy
  - Resection with chest wall, including reconstruction techniques
  - Pneumonectomy
  - Carinal pneumonectomy
  - Extrapleural pneumonectomy
  - Pancoast tumors
  - Extended resections (SVC, spine, etc.)
  - Repeat resections for benign and malignant conditions of the lung, including completion
  - pneumonectomy
  - Clagett procedure and Eloesser flap
  - Soft tissue flaps for stump coverage
- i) Lung Cancer Screening Ugo Pastorino
- Background
  - Early Trials of Lung Cancer Screening
  - Observational Studies With Low Dose Spiral Computed Tomography
  - Randomised Trials With Low Dose Spiral Computed Tomography
  - Critical Issues in Low Dose Computed Tomography Screening Trial

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- j) Pulmonary Metastases
    - Introduction
    - Biology of Metastases
    - Question of the Effectiveness of Metastasectomy
    - Clinical Presentation of Pulmonary Metastases
    - Is Imaging Sufficiently Sensitive or Must the Lung Always Be Palpated?
    - Factors Associated With a Good Outcome
    - The Role of Lymph Node Dissection
    - Evolving Criteria for Pulmonary Metastasectomy
    - Evidence on Particular Primary Cancer Types
  
  - k) Principles of the Surgical Treatment of Lung Cancer
    - Introduction
    - Aims of the Surgical Treatment of Lung Cancer
    - Selection of Patients for Lung Cancer Surgery
    - Technique of Lung Cancer Surgery
    - Audit and Outcomes
  
  - l) Principles of Radiation, Chemotherapy and Biological Therapy for Lung Cancer
    - Current Status of Chemotherapy and Radiotherapy in Resected Early Non-small Cell Lung Cancer
    - Neoadjuvant Chemotherapy in Early Stage Non small Cell Lung Cancer
    - Current Status of Radiotherapy in Non small Cell Lung Cancer
    - Genetic Determinants of Prognosis in Resected Early Non small Cell Lung Cancer
    - Gene Expression Signatures and Recurrence free Survival in Early Non small Cell Lung Cancer
    - Prognostic and Predictive Roles of BRCA1
    - Non small Cell Lung Cancer with EGFR Mutations
  
  - m) Non resectional Alternatives in Lung Cancer Treatment
    - Introduction
    - Radiofrequency Ablation
    - Stereotactic Radiosurgery
    - Cryotherapy
  
  - n) BENIGN LUNG CONDITIONS

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- i. Bronchiectasis
    - Knowledge
      - Medical therapy
      - Role of surgery
      - Criteria for surgical resection
      - Diagnostic studies
    - Patient Management/Clinical Skills
      - Familiarity with medical therapy
      - Clinical evaluation and assessment for possible surgery
    - Technical Skills
      - Resection

- ii. Bacterial Infections
  - Knowledge
    - Community acquired pneumonias
    - Nosocomial pneumonias
    - Aspiration pneumonia
  - Lung Abscess
    - Pneumonia in the immunocompromised host
    - Antibiotic therapy
  - Patient Management/Clinical Skills
    - Clinical assessment
    - Techniques for culture
    - Interpretation of imaging
    - Advanced ventilator management (prone position)
    - Familiarity with medical therapy
    - Management of lung abscess

- iii. Tuberculosis and Atypical Mycobacteria

- Knowledge

- 
- Epidemiology and screening
  - Clinical presentation
  - Medical treatment
  - Indications for surgery, including complications and outcome
  - Patient Management/Clinical Skills
    - Familiarity with medical therapy
    - Management of complications of Tb
    - Timing and preparation of patients who are candidates for surgery
  - Technical Skills
    - Resection techniques (open and VATS)
    - Bronchial stump coverage

iv. Mycotic Infections

- Knowledge
  - Epidemiology of various fungal diseases
  - Diagnosis – cultures/serology
  - Imaging
  - Manifestations of:
    - Histoplasmosis
    - Aspergillus
    - Coccidioidomycosis
    - Blastomycosis
    - Pulmonary cryptococcus
    - Mucormycosis
- Patient Management/Clinical Skills
  - Familiarity with medical therapy
  - Role of Surgery

v. Parasitic Diseases

- Knowledge
  - Hydatid disease
  - Epidemiology
  - Complications

- 
- Laboratory testing
  - Imaging
  - Diagnostic techniques
  - Familiarity with medical therapy
  - Surgical treatment

vi. Interstitial Lung Disease

- Knowledge
  - Categorization
  - Presentation, laboratory and physiological testing, and imaging
  - Diagnostic options
  - Role of lung biopsy
- Patient Management/Clinical Skills
  - Assessment of surgical risk, probability of effecting treatment change
- Technical Skills
  - Open and VATS lung biopsy

vii. Emphysema and Bullae

- Knowledge
  - Etiology, pathology and physiology of COPD
  - Smoking cessation measures and outcomes
  - Imaging and physiological (V-Q scan, pulmonary function, DLCO, etc.) techniques
  - Surgical techniques and results used in the treatment of nonbullous emphysema and bullae
  - Lung volume reduction surgery: patient selection, criteria, and surgical techniques
  - Indications for bullectomy
- Patient Management/Clinical Skills
  - Interpretation of imaging and pulmonary function
  - Patient selection with assessment of function and risk
  - Postop management of patients undergoing surgery for emphysema or complications of the disease

- 
- Familiarity with pulmonary rehabilitation
  - Technical Skills
    - Procedures to deal with secondary pneumothorax and bullae by open and VATS techniques
    - Lung volume reduction surgery, unilaterally and bilaterally, using open and VATS techniques

viii. DISORDERS OF THE PLEURA

- Knowledge
  - Anatomy and physiology of the pleura
  - Inflammatory, infective and malignant diseases of parietal and visceral pleura
  - Pneumothorax (spontaneous, secondary, catamenial)
  - Complex pleural effusion/empyema
  - Mesothelioma
  - Hemothorax
  - Chylothorax
  - Fibrous tumor of the pleura
- Patient Management/Clinical Skills
  - Chest drains insertion, management, removal and treatment of complications
  - Interpretation of imaging of the pleura
  - Multimodality management of mesothelioma
  - Medical and surgical management of pleural disease, including radiological, open and VATS techniques
  - Techniques to deal with failure of primary treatment
- Technical Skills
  - Open and VATS procedures for uncomplicated pleural problems, (pneumothorax, effusions, hemothorax, etc.) including drainage, biopsy, lytic therapy, and pleurectomy
  - Open and VATS procedures for empyema, including techniques for decortication
  - Advanced techniques of pleural space obliteration
  - Surgical options for malignant mesothelioma
  - Resection of other pleural tumors

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ix. DISORDERS OF THE CHEST WALL

- Knowledge
  - Anatomy of chest wall
  - Chest wall tumors
  - Congenital lesions (e.g. pectus deformities)
  - Thoracic outlet syndrome
  - Inflammatory/infectious conditions affecting the chest wall
  - Clinical, laboratory and imaging techniques used in the evaluation of chest wall pathology
  - Techniques used in the diagnosis of chest wall disease
  - Techniques used to resect the sternum and chest wall, physiological and cosmetic sequelae
  - Techniques of chest wall reconstruction (prosthetic and muscle flaps)
- Patient Management/Clinical Skills
  - Interpretation of laboratory, physiological, and imaging techniques
  - Patient selection for operation
  - Diagnose and manage patients with thoracic outlet syndrome
- Technical Skills
  - Chest wall biopsy and choice of appropriate technique (incisional biopsy, excisional biopsy, FNA, core biopsy)
  - Chest wall resection for benign and malignant diseases, in combination with resection of underlying lung
  - Selection and insertion of prosthetic materials for reconstruction Surgery for complications of chest wall resection, and repeat surgery
    - to resect recurrent chest wall conditions
  - Complex chest wall reconstruction (muscle flaps)
  - Supraclavicular and transaxillary first rib approach to thoracic outlet syndrome
  - Chest wall deformity repair

x. DISORDERS OF THE DIAPHRAGM

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- Knowledge
    - Anatomy and physiology of the diaphragm
    - Pathology of the diaphragm
    - Clinical, physiological and imaging techniques in the assessment of diaphragmatic abnormalities
    - Physiologic consequences of diaphragmatic herniation or paresis
    - Surgical techniques used to biopsy and resect diaphragmatic tumors
    - Situations in which replacement of the diaphragm is required and reconstructive materials
  
  - Patient Management/Clinical Skills
    - Interpretation of physiological and imaging techniques
    - Patient selection
    - Management of patients after diaphragmatic operation
  
  - Technical Skills
    - Resection, repair and reconstruction of diaphragm
    - Diaphragmatic plication
    - Familiarity with diaphragmatic pacing

xi. DISORDERS OF THE MEDIASTINUM

- Knowledge
  - Anatomy of the mediastinum
  - Congenital, benign, infectious and malignant (primary and secondary) conditions of the mediastinum
  - Systemic conditions associated with the mediastinum
  - Clinical, laboratory and imaging techniques used in the diagnosis and assessment of patients with mediastinal disease
  - Myasthenia gravis: medical, surgical and periop management
  - Staging of thymoma
  - Oncologic treatment of malignant diseases of the mediastinum, including multidisciplinary care (Thymoma, germ cell cancers)
  - Surgical techniques for the treatment of myasthenia gravis, mediastinal cysts and tumors, complications, and results.
  
- Patient Management/Clinical Skills
  - Clinical history and exam

- 
- Interpretation of laboratory, physiological and imaging techniques
  - Patient selection with assessment of function and risk
  - Postop management and recognition of complications
  - Selection of appropriate routes for biopsy and excision of mediastinal tumor and cysts
  
  - Technical Skills
    - Biopsy of mediastinal masses
    - Thymectomy for myasthenia gravis
    - Resection of mediastinal tumors, including extended resection of adjacent structures
    - Mediastinal Lymph Node Dissection
    - HisaoAsamura
      - a) Evolution of Lung Cancer Surgery and Mediastinal Lymph Node Dissection
      - b) Definition of Mediastinal Lymph Node Dissection and the Relevant Procedures
      - c) The Lymph Node Map for Lung Cancer
      - d) Relative Advantages and Disadvantages of Mediastinal Lymph Node Dissection

xii. ENDOSCOPY

- Knowledge
  - Endoscopic anatomy of larynx, trachea, bronchi, esophagus, stomach
  - Thoracic lymph node stations (including foregut)
  - Role of rigid and flexible bronchoscopy in the investigation of airway and pulmonary disease
  - Role of rigid and flexible esophagoscopy in the investigation of esophageal disease
  - Role of mediastinoscopy, Chamberlain procedure or extended mediastinoscopy, endobronchial ultrasonography (EBUS), and endoscopic esophageal ultrasonography (EUS) in the staging of malignant and benign conditions of the thorax
  - Anesthetic management and ventilating management during rigid and flexible endoscopy
  - Types of bronchial and esophageal stents

- 
- Application of lasers, PDT, cryotherapy, radiofrequency ablation, and endomucosal resection (EMR) in Barrett's or malignant esophageal disease
  - Nonsurgical ablative airway techniques
  - Patient Management/Clinical Skills
    - Choice of endoscopic techniques to stage thoracic malignancies
    - Choice of endoscopic techniques to palliate thoracic malignancies
    - Indications for postop bronchoscopy
  - Technical Skills
    - Rigid and flexible bronchoscopy
    - Rigid and flexible esophagoscopy
    - Mediastinoscopy
    - Chamberlain procedure
    - Familiarity with EBUS and EUS
    - Endobronchial and esophageal stenting
    - Bronchoscopic and esophageal biopsy, including management of complications
    - VATS approaches for biopsy and resection
    - Endoscopic management of tumors –“core-out,” stents, laser, PDT
    - Techniques of esophageal dilation

xiii. DISORDERS OF THE AIRWAY

- Knowledge
  - Anatomy of the larynx, trachea, and bronchus
  - Inflammatory, infectious, benign and neoplastic diseases of the airways
  - Symptoms, signs of airway disease
  - Techniques for surgical resection of the trachea
  - Bronchoplastic procedures and the limitations of these techniques
  - Medical and oncologic airway disease treatments
  - Presentation, investigation, and management of anastomotic complications following airway surgery
  - Presentation, evaluation, and treatment of fistulas in the aerodigestive tract due to benign, malignant and iatrogenic causes

- 
- Patient Management/Clinical Skills
    - Interpretation of laboratory and imaging techniques
    - Diagnosis and assessment of airway obstruction
    - Patient selection with assessment of function and risk
    - Postop care of patients after airway surgery
  
  - Technical Skills
    - Sleeve resection of the trachea for simple benign conditions
    - Sleeve resection of the main bronchi, including lobectomy
    - Techniques for the relief of major airway obstruction, including stenting, "core-out," PDT, dilation, cryotherapy, etc.
    - Airway resection for tumors and complex benign conditions, and techniques for airway reconstruction, anastomosis, and laryngeal release
    - Repeat resections for recurrence and complications of prior resection
    - Management of fistulas in the aerodigestive tract by surgical and endoscopic techniques

xiv. MANAGEMENT OF BENIGN ESOPHAGEAL DISORDERS

- Knowledge
  - Esophageal and gastric anatomy
  - Anatomy of small and large intestine as related to reconstruction
  - Pathophysiology
  - Motility disorders (esophageal sphincter dysfunction, achalasia, esophageal spasm)
  - Diverticula (Zenker's, epiphrenic)
  - GE reflux and types of hiatal hernias – sliding and paraesophageal
  - Trauma (blunt, penetrating, iatrogenic perforations, radiation-induced, caustic ingestion, drug-induced)
  - Infection (Candida, herpetic)
  - Strictures (reflux-induced, caustic, anastomotic)
  - Tracheoesophageal fistula
  - Barrett's esophagus
  - Diagnostic procedures and their interpretation
  - Imaging: radiography (Barium swallow/UGI series), CT scan, nuclear medicine (gastric emptying, GE reflux)
  - Esophageal function tests (manometry, pH studies)

- 
- Drugs used in the treatment of GE reflux and dysmotility disorders
  - Treatment options for achalasia (pneumatic dilation, botox, surgery)
  - Patient Management
    - General and specific history and exam, including previous surgery, identification of comorbidity and risk assessment
    - Non-operative and operative options for treatment
    - Management of the postop patient
    - Management of postop complications
  - Technical Skills
    - Open and laparoscopic fundoplication (Belsey, Nissen, Dor, Toupet)
    - Open and laparoscopic esophagomyotomy
    - Reoperations (after failed anti-reflux/hiatal hernia surgery or surgery for motility disorders)
    - Surgical treatment (Stent, Repair, Diversion) of esophageal perforation
    - Open or minimally invasive resection/esophagomyotomy for diverticula (Zenker's, epiphrenic)

xv. MANAGEMENT OF ESOPHAGEAL NEOPLASIA

- Knowledge
  - Anatomy of the esophagus and its anatomical relationships from cricopharyngeus to cardia, including details of blood supply and lymphatic drainage
  - Anatomy of the stomach, including its anatomical relationships, blood supply and lymphatic drainage
  - Anatomy of the colon including its blood supply
  - Etiology and epidemiology of esophageal cancer
  - Metaplasia-dysplasia sequence
  - Role of induction therapy
  - Diagnosis, staging, and treatment options for esophageal cancer
  - Risk assessment of patients undergoing esophageal resection
  - Staging of esophageal cancer
  - Esophageal resection options
  - Palliative procedures (stents, laser, PDT, radiation therapy)

- 
- Treatment options for high grade dysplasia or very early esophageal cancer
  - Screening and prevention
  - Patient Management/Clinical Skills
    - Interpretation of staging tests
    - Risk assessment
    - Management of post-esophagectomy patient
    - Identification and management of post-resection complications (acute and chronic)
    - Long-term follow up and management of recurrence
  - Technical Skills
    - Mobilization of esophagus, stomach and colon
    - Esophageal resection (including different approaches)
    - Esophageal reconstruction including interposition techniques
    - Jejunostomy
    - Management of intraoperative complications

xvi. LUNG TRANSPLANTATION

- Knowledge
  - Patient and donor selection criteria
  - Basic pharmacology of immunosuppression
  - Reperfusion injury
  - Results of lung transplantation
- Patient Management/Clinical Skills
  - History and exam including identification of comorbidity and risk assessment
  - Management of postop lung transplant patient
  - Management of acute and chronic complications of lung transplantation
  - Management of rejection
- Technical Skills
  - Familiarity with donor retrieval, single and bilateral lung transplant, and management of anastomotic complications

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## 2. CONGENITAL HEART, LUNG AND THORACIC DISEASE

- Knowledge Congenital Heart Disease
- Physiology
  - Hemodynamics; physiology and measurement including shunt calculations, PVR, SVR determinations
  - Physiology of Left-to-Right shunts and Right-to-Left shunts
  - Physiology of pulmonary vasculature and changes with development
  - Basic conduction disorders
  - Acid base balance (including Ph stat and alpha stat CPB mgmt)
  - Physiology of pediatric cardiopulmonary bypass including hypothermia, low-flow, and circulatory arrest.
- Anatomy
  - Basic embryology of the heart, lungs, great vessels
  - Coronary anatomy and variants
  - Location and course of the conduction system in congenital heart disease
  - Anatomy as it pertains to vascular conduits including aortopulmonary shunts
  - Basic anatomy of atrial septum and ventricular septum
  - Basic concepts of cardiac position, situs, atrioventricular and ventriculoarterial connections
- Pathophysiology
  - Basic concepts of volume and pressure overload
- Pharmacology
  - Specific drugs used in the treatment of congenital heart disease (beta blockers, ACE inhibitors, Digoxin, Diuretics, PGE1, nitric oxide, systemic vasodilators)
  - Specific dosing and application
  - General indications and use of inotropes, anti-arrhythmic drugs, hemostatic drugs, antiplatelet, anticoagulant and thrombolytic drugs, analgesics, antibiotics, anesthetic agents, and vasodilators (systemic and pulmonary) in the pediatric population
- Clinical Knowledge

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- Proficiency with the anatomy, pathophysiology, natural history, management, and results of the following conditions or procedures:
    - Mechanisms of cyanosis
    - Manifestations of congestive heart failure in infants and children
    - Patent ductus arteriosus
    - Atrial septal defect
    - Ventricular septal defect
    - Coarctation
    - PA banding and shunts
    - Transposition of the great arteries/arterial switch procedure
    - Tetralogy of Fallot
    - Vascular rings
    - Familiarity with anatomy, pathophysiology, natural history, management, and results of the following congenital conditions or procedures.
    - Functional single ventricle leading to single ventricle pathway and principles of treatment (Fontan procedure)
    - Congenital aortic stenosis/insufficiency (Konno, Ross procedure)
    - Rastelli procedure
    - Hypoplastic left heart and Norwood procedure
    - Truncus arteriosus
    - Double outlet right ventricle
    - VSD, Pulmonary atresia, and MAPCAs
    - Pulmonary atresia and intact septum
    - Partial and complete atrioventricular septal defects
    - Mitral valve disease
    - Tricuspid valve disease including Ebstein's anomaly
    - Interrupted aortic arch
    - Total anomalous pulmonary venous drainage
    - Extra Corporeal Membrane Oxygenation
    - Transplantation – Heart and Lung
    - Vascular sling (Anomalous origin of LPA from RPA)
  - Patient Management/Clinical Skills History and Examination
    - Cardiovascular system and general history and examination of child or adult with congenital heart disease
  - Data Interpretation
    - Routine hematology and biochemical investigations

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- Chest radiograph and ECG
  - Cardiac catheterization data including interpretation of hemodynamic data, shunt and resistance calculation
  - Basic congenital heart disease imaging (Echo, MRI, CT) interpretation
  - Patient Management
    - Diagnosis, assessment, and treatment of common congenital heart disease
    - Collaborative and complementary role of interventional cardiology
    - Risk assessment and stratification
    - Basic pediatric intensive care to include ventilator management
    - Perioperative management of adults and children following congenital heart surgery
    - Mechanical assist (IABP, VAD, ECMO)
    - Indications for heart or lung transplantation referral
    - Management of complications of surgery
    - Cardiopulmonary resuscitation
    - Diagnosis and treatment of common congenital cardiac arrhythmias
    - Wound infection and sternal dehiscence
  - Technical Skills
    - Sternotomy - open and close
    - Thoracotomy - open and close
    - Preparation for and management of cardiopulmonary bypass including partial bypass
    - Basic ECMO techniques, cannulation, and management.
    - Basic Surgical management of uncomplicated cases:
      - Patent ductus arteriosus
      - Atrial septal defect
      - Coarctation
      - PA banding and shunts
      - Ventricular septal defect
  - Knowledge Congenital Thoracic Disease
    - Familiarity with anatomy, pathophysiology, natural history, management, and results of the following congenital conditions or procedures:
      - Congenital lung disease (cystic adenomatoid malformation, congenital lobar
      - emphysema, sequestration
      - Foregut duplication cysts

- Diaphragmatic hernia and eventration
- Esophageal atresia/fistula
- Diagnosis, assessment, and treatment of common congenital pulmonary and esophageal disease.

Below is the resulting rotation schedule:

<b>Cardiothorac</b>	Adult Cardiac	General Thoracic	Congenital	Adult Cardiac	General Thoracic
	6 months	3 months	3 months	7 months	3 months
<b>General Thoracic</b>	8 months	2 months	2 months	4 months	8 months

- Other areas in which knowledge is to be acquired:
  - Biostatistics, Research Methodology and Clinical Epidemiology
  - Ethics
  - Medico legal aspects relevant to the discipline
  - Health Policy issues as may be applicable to the discipline

## V. COMPETENCIES

### 1. OPERATIVE SKILLS

- a) Principles of Video assisted
  1. Thoracic Surgery
  2. Traditional Technical Approach and Instruments
  3. Recent Technical Developments
  
- b) Quality of Care in Thoracic Surgery
  1. Introduction
  2. Data Collection
  3. Selection of Quality Indicators
  4. ESTS Risk Models and Composite Score
  5. Benchmarking Activity and Clinical Accreditation
  6. European Global Quality Initiative: Database, Accreditation and Education
  
- c) Thoracic Incisions

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1. Posterolateral Thoracotomy
  2. Anterolateral Thoracotomy
  3. Muscle sparing Thoracotomy in the Auscultatory Triangle
  4. Median Sternotomy
  5. Clamshell Incision
  6. Hemiclamshell Approach for Thoracic Surgery
  7. Transmanubrial Approach to the Thoracic Inlet
- d) Pleura – operative techniques
1. Pleural Drainage
  2. Surgery for Pneumothorax
  3. Accelerated Treatment of Post-pneumonectomy Empyema
  4. Decortication
  5. Post pneumonectomy Bronchopleural Fistula: Transsternal Closure
  6. Open window Thoracostomy
  7. Post pneumonectomy Bronchopleural Fistula: Omentoplasty
  8. Chronic Pleural Empyema: Myoplasty
  9. Chronic Pleural Empyema: Thoracoplasty
  10. Extrapleural Pneumonectomy for Malignant Pleural Mesothelioma
  11. Pleurectomy/Decortication for Malignant Pleural Mesothelioma
  12. Thoracic Duct Ligation
- e) Trachea – operative techniques
1. Tracheostomy
  2. Bronchoscopic Management of Airway Obstruction
  3. Tracheal
  4. Subglottic Tracheal Resection
- f) Lung – operative techniques
1. Open Wedge Resection of the
  2. Videothoroscopic Wedge Resection 3 Open Segmentectomy
  3. Open Lobectomy
  4. Bronchial Sleeve Resections
  5. Videothoroscopic Lobectomy and Bilobectomy
  6. Videothoroscopic Segmentectomy

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7. Pneumonectomy
  8. Transsternal Transpericardial Carinal Resection
  9. Left Carinal Pneumonectomy
  10. Pulmonary Artery Reconstruction
  11. Extended Pulmonary Resection
  12. Pancoast Tumour: Cervicothoracic Transmanubrial Approach
  - 14 Pancoast Tumour: Posterior Approach
  13. Robotic Lung Lobectomy
  14. Pulmonary Metastasectomy
  15. Open Systematic Mediastinal Lymph Node Dissection
  16. Videothoroscopic Systematic Mediastinal Lymph Node Dissection
  17. Lung Volume Reduction Surgery
  18. Bronchoscopic Lung Volume Reduction
  19. Surgical Technique of Lung Transplantation

## VI. LOG BOOK

A candidate shall maintain a log book of operations (assisted / performed) during the training period, certified by the concerned post graduate teacher / Head of the department / senior consultant.

This log book shall be made available to the board of examiners for their perusal at the time of the final examination.

The log book should show evidence that the before mentioned subjects were covered (with dates and the name of teacher(s)) The candidate will maintain the record of all academic activities undertaken by him/her in log book.

1. Personal profile of the candidate
2. Educational qualification/Professional data
3. Record of case histories
4. Procedures learnt
5. Record of case Demonstration/Presentations
6. Every candidate, at the time of practical examination, will be required to produce performance record (log book) containing details of the work done by him/her during the entire period of training as per requirements of the log book.

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It should be duly certified by the supervisor as work done by the candidate and countersigned by the administrative Head of the Institution.

7. In the absence of production of log book, the result will not be declared.

## **VII. RECOMMENDED TEXT BOOKS AND JOURNALS**

### **A. Textbooks**

- General Thoracic Surgery ESTS - European Society of Thoracic Surgeons - Textbook
- Thoracic surgery - ERS White Book
- ESTS Textbook of Thoracic Surgery

### **B. Journals**

- Journal of Pulmonary & Respiratory Medicine
- International Journal of Cardiovascular Research
- The Annals of Thoracic Surgery
- Interactive CardioVasc Thoracic Surgery
- The Journal of Thoracic and Cardiovascular Surgery
- Open Journal of Thoracic Surgery



आयुर्विज्ञान में राष्ट्रीय परीक्षा बोर्ड  
स्वास्थ्य एवं परिवार कल्याण मंत्रालय, भारत सरकार  
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**NATIONAL BOARD OF EXAMINATIONS IN MEDICAL SCIENCES**

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