Cardiothoracic Surgery Syllabus
Contents

Cardiothoracic Surgery Syllabus

1. Specialty Overview

2. Key Conditions

3. Initial Stage

3.1 Overview

3.2 Conditions

Generic Surgical Skills and Knowledge- All Specialties

Module 1

Module 2

Module 3

Module 4

4. Intermediate (I) Stage

4.1 Overview

Intermediate (I) Phase of training (ST3 & ST4)

4.2 Conditions

Critical Care and Postoperative Management

Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support

Cardiopulmonary Bypass

Myocardial Protection

Circulatory Support

Ischaemic Heart Disease

Heart Valve Disease

Aortovascular Disease

Cardiothoracic Trauma

General Management of a Patient Undergoing Thoracic Surgery

Neoplasms of the Lung

Disorders of the Pleura

Disorders of the Chest Wall

Disorders of the Diaphragm

Emphysema and Bullae

Disorders of the Pericardium

Disorders of the Mediastinum

Disorders of the Airway

Congenital Heart Disease

Intrathoracic transplantation and surgery for heart failure

Disorders of the Oesophagus

5. Intermediate (II) Stage

5.1 Overview

Intermediate (II) Phase of training (ST5 & ST6)

5.2 Conditions

Critical Care and Postoperative Management

Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support


1. Specialty Overview

Overview

Cardiothoracic Surgery is the specialty of medicine that deals with the diagnosis, evaluation and surgical management of diseases of the heart, lungs, oesophagus and chest. Cardiothoracic surgeons undertake surgical treatment of a wide range of serious conditions, and cardiothoracic operations tend to be major and often complex procedures. Many of these operations require support from advanced forms of technology, such as cardiopulmonary bypass, invasive monitoring and minimally invasive equipment. Because of the serious nature of the conditions and the scale of the operations, many cardiothoracic patients require care on the intensive therapy unit, and cardiothoracic surgeons are also proficient in this aspect of their patients’ care.

Cardiothoracic surgeons generally work closely with their colleagues in Cardiology, Respiratory Medicine, Oncological Medicine, Anaesthesia and Intensive Care. They also have close professional relationships with other non-medical staff such as perfusionists, intensive care staff and operating department personnel.

Whilst many cardiothoracic surgeons develop proficiency in the broad range of the specialty, some other surgeons prefer to specialise into specific areas of interest and hence develop expertise in more complex areas of these fields.

The subdivisions of cardiothoracic surgery include:

- Cardiac surgery
- Thoracic surgery
- Surgery of the aorta
- Transplantation and heart failure surgery
- Congenital surgery in children
- Congenital surgery in adults
- Oesophageal surgery

Cardiothoracic surgery tends to be concentrated into large regional or teaching hospitals, where there is easy access to all medical and support facilities. There will usually be somewhere between 5 and 10 consultant surgeons in each unit, each performing approximately 200 major operations each year. Entry into cardiothoracic surgery is currently extremely competitive, and there is projected to be a shortage of consultant posts for future trainees. New ways of working in cardiothoracic surgery are currently being explored and debated.

The Society of Cardiothoracic Surgeons of Great Britain and Ireland represents the professional interests of the specialty and has a web site (www.scts.org) where further information can be obtained. Further information about cardiothoracic surgery, including training related material, can be found on the excellent CTSnet Site

Scope of the Specialty

The areas of practice in cardiothoracic surgery are:

- Critical Care and Postoperative Management
- Cardiopulmonary Bypass, Myocardial Protection and Circulatory Support
- Ischaemic Heart Disease
- Heart Valve Disease
- Aortovascular Disease
- Intrathoracic Transplantation and Surgery for Heart Failure
- Congenital Heart Disease
The specific requirements of each of these areas of practice are explained in depth in the syllabus.

**Training in Cardiothoracic Surgery**

The standards and the delivery of training are overseen by the Specialist Advisory Committee (SAC) in Cardiothoracic Surgery. The SAC has a nominated member (the Cardiothoraic Dean) responsible for direct contact with trainees and who is available to deal with problems or questions trainees may have.

The objective of the training programme is to produce trained cardiothoracic surgeons, who will have the clinical knowledge, the surgical expertise and the professional skills necessary for consultant practice.

The syllabus, therefore, defines the requirements of the training programme in cardiothoracic surgery. It identifies distinct topics within the specialty and defines the requirements or competencies within each of these areas, at each stage of training.

Within each module competencies are defined within the following domains:

**Knowledge:** basic scientific knowledge; clinical knowledge

**Clinical skills:** history, examination, data interpretation, patient management

**Technical skills and procedures:** technical procedures, operative management

**Professional Skills:** transferable or generic, professional skills

The curriculum also identifies the tools that will be used to assess competence and monitor progress. Cardiothoracic training is now to be seen as competence based, rather than, as in the past, determined by years in training or by numbers of procedures performed. The competence levels are defined for each key stage. The programme is therefore now defined by *initial, intermediate I and intermediate II, and final* phases.

At the end of the programme the Cardiothoracic Trainee will be able to demonstrate competence in all aspects of the management, (including operative management), of a number of Key Conditions.

**Special Interest Training**

Some trainees may wish to develop a particular special interest in the latter stages of their training and develop competencies in these areas, beyond those normally expected at CCT. These are described in the syllabus and are summarised below. It is recognised that
to develop these competencies may require an extension of the training period, and in some cases full competence will only be achieved by mentoring in the post CCT period.

<table>
<thead>
<tr>
<th>Special Interests</th>
<th>Definition</th>
</tr>
</thead>
</table>
| **Congenital Heart Disease**             | • The assessment and management of adults and children with congenital heart disease.  
• To include competence in the operative management of common uncomplicated congenital conditions (e.g. ductus, atrial and ventricular septal defects, coarctation, shunts and PA banding)  
• Exposure to and experience in more complex operative procedures (e.g. valve surgery, tetralogy of fallot/pulmonary atresia, fontan procedures, extra cardiac conduits, AV canal defects.)  
• Full competence in operative management of more complex cases, including secondary procedures to be developed in the post CCT period. |
| **Surgery for Heart Failure and Intrathoracic Transplantation** | • The assessment and management of a patient with heart failure including the selection criteria for various treatment options  
• Operative management of heart failure including transplantation, revascularisation, ventricular reverse remodelling and mitral valve surgery  
• Full competence in operative management of more complex cases, including secondary procedures to be developed in the post CCT period. |
| **Disorders of the Oesophagus**          | • The assessment and management of a patient with benign and malignant oesophageal disease including reflux disorders  
• Operative management of benign and malignant oesophageal disease in suitable situations  
• Full competence in operative management of more complex cases to be developed in the post CCT period. |

*Chris Munsch* - SAC Chair and Content Editor
2. Key Conditions

1. **Critical Care and Postoperative Management**
   - The management of critically ill cardiothoracic surgical patients in the pre and post operative periods

2. **Cardiopulmonary Bypass, Myocardial Protection and Circulatory Support**
   - The management of a patient undergoing cardiopulmonary bypass
   - The management of myocardial protection during cardiac surgery
   - The management of a patient requiring circulatory support

3. **Ischaemic Heart Disease**
   - The assessment and management of patients with coronary heart disease, including elective and emergency presentations. To include competence in both primary and secondary procedures, and where appropriate to include off pump and on pump strategies and arterial revascularisation
   - The preliminary assessment and initial management of patients with complications of myocardial infarction, including mitral regurgitation, aneurysm and septal defects. To include operative management in appropriate situations. Full competence in operative management of complex cases to be developed in the post CCT period

4. **Heart Valve Disease**
   - The assessment and management of patients with valvular heart disease; including both isolated and combined aortic and mitral valve disease.
   - The assessment and management of patients with combined coronary and valvular heart disease, including operative management.
   - Full competence in operative management of complex cases including mitral valve repair and secondary procedures to be developed in the post CCT period.

5. **Aortovascular Disease**
   - The preliminary assessment and initial management of patients with acute dissection of the ascending aorta. To include operative management in appropriate situations.
   - Full competence in operative management of complex cases to be developed in the post CCT period

6. **Cardiothoracic Trauma**
   - The assessment and management of patients with minor and major cardiothoracic trauma. To include operative management in appropriate situations.
   - Full competence in the operative management of complex cases including great vessel injury to be developed in the post CCT period

7. **General Management of a Patient Undergoing Thoracic Surgery**
Patient selection and determination of suitability for major thoracic surgery and the pre and postoperative management of a thoracic surgical patient.

The assessment and management of a patient by bronchoscopy including foreign body retrieval

The assessment and management of a patient by mediastinal exploration

Competence in performing appropriate thoracic incisions

8. Neoplasms of the Lung

The assessment and management of lung cancer, including the scientific basis of staging systems and techniques used in the determination of stage and fitness for surgery

An understanding of the role of surgical treatment in the multidisciplinary management of lung cancer and other intrathoracic malignant diseases, including an appreciation of the principles of other treatment modalities and their outcomes

9. Disorders of the Pleura

The assessment and management of patients with pleural disease; including pneumothorax and empyema, and including both VATS and open strategies

10. Disorders of the Chest Wall

The assessment and management of patients with chest wall abnormalities, infections and tumours

11. Disorders of the Diaphragm

The assessment and management of patients disorders of the diaphragm, including trauma to the diaphragm

12. Emphysema and Bullae

The assessment and management of patients with emphysematous and bullous lung disease; including surgical management if appropriate and utilising both VATS and open strategies.

Full competence in operative management of complex cases, including lung reduction surgery, to be developed in the post CCT period

13. Disorders of the Pericardium

The assessment and management of patients with disorders of the pericardium and pericardial cavity; including surgical management if appropriate and utilising both VATS and open strategies

14. Disorders of the Mediastinum

The assessment and management of patients with mediastinal tumours and masses; including surgical management if appropriate and utilising both VATS and open strategies

15. Disorders of the Airway
The assessment and management of patients with disorders of the major airways. Including operative management in suitable cases.

Full competence in operative management of complex cases, including tracheal resection, to be developed in the post CCT period.
3. Initial Stage

Four point scales

What the 4 point scale means for Knowledge

1. Knows of
2. Knows basic concepts
3. Knows generally
4. Knows both specifically and broadly

What the 4 point scales mean for Clinical Skills and Technical Skills and Procedures

1. Has observed
2. Can do with assistance
3. Can do whole but may need assistance
4. Competent to do whole without assistance, including managing complications
3.1 Overview

Initial Phase of training (ST1 & ST2)

The initial phase of training will consist of an indicative period of two years where trainees will work through four modules. 'Generic Surgical Skills and Knowledge - All Specialties' is a mandatory module, which is common across all the surgical specialties. Depending on local circumstances the following modules will be available:

- Critical Care and Post Operative Management
- Cardiac Surgery
- Thoracic Surgery
- Cardiology
- Thoracic Medicine
- Vascular Surgery
- Generic Surgical Skills and Knowledge - All specialties

The content for the specialty specific modules is defined in detail in the syllabus. The aims and levels of competence to be attained at this stage are defined for each module.

The purposes of the initial stage are for the trainee:

- To acquire experience in the management of a post surgical patient on the critical care, high dependency and post operative wards and to be able to manage, with appropriate supervision, such a patient.
- To gain experience in aspects of the management of a cardiac surgical patient. This includes operative management as appropriate and with supervision.
- To gain experience in the evaluation and management of a patient undergoing thoracic surgery. This includes operative management with supervision where appropriate.
- To gain experience in the practical applications of cardiopulmonary bypass, myocardial protection and circulatory support. To understand the science and technology that underpins these disciplines.

During this stage the trainee will be gain competence to the defined level in a number of technical skills and procedures for example:

- The use of the defibrillator
- The use of the intra aortic balloon pump
- Echocardiography including TOE
- Arterial and central venous cannulation
- Cannulation and institution of cardiopulmonary bypass
- Weaning from bypass and decannulation
- Femoral cannulation and decannulation
- Pulmonary artery catheterisation
- Intra aortic balloon pump insertion, timing and management
- Tracheostomy
- Fibreoptic, rigid and flexible bronchoscopy
- Chest aspiration, chest drain insertion, chest drain management
- Saphenous vein harvest
- Median sternotomy
- Mammary/radial artery harvest
- Preparation for, and management of, cardiopulmonary bypass
- Proximal aortovenous and distal coronary anastamosis
- Heart valve replacement
- Surgical re-exploration for bleeding or tamponade
• Perform and repair thoracic incisions, including lateral, anterior, muscle sparing and VATS incisions
• Endoscopic and surgical techniques used in lung biopsy
• Surgery for benign and malignant conditions of the lungs, including uncomplicated lobectomy for lung cancer, wedge resection and metastasectomy
• Intraoperative diagnosis and staging
• Open operation for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy
• VATS procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy
• Open and VATS procedures for empyema, including techniques for decortication
• Median sternotomy open and close

Those trainees following an academic pathway will be expected to achieve the same level of competence at the end of ST2 as trainees undertaking a 'Surgery in general – cardiothoracic programme'.

**ST1 Placement in Cardiothoracic Surgery**

**Purposes**

The purposes of the cardiothoracic surgery placement are to enable the trainee to:

1. Acquire experience in the management of a post surgical patient on the critical care, high dependency and post operative wards.
2. Gain experience in the evaluation and management of a patient undergoing cardiac surgery.

During the placement it is expected that the trainee will cover the following areas (further detail is to be found in the syllabus):

**Knowledge**

• Knowledge of the basic sciences underpinning the cardiovascular and respiratory systems
• Familiarity with the clinical features and management of the following commonly occurring cardiothoracic conditions:
  o coronary artery disease
  o valvular heart disease
  o lung cancer
  o pneumothorax
• Understanding of the principles and consequences of cardiopulmonary bypass

**Clinical Skills**

• Clinical assessment and management of the preoperative, postoperative and critically ill patient
• Analysis and interpretation of investigations, including specific diagnostic tests.
• Critical care management including recognition, evaluation and treatment of haemodynamic and ventilatory abnormalities.
• Familiarity with the management of multi-organ failure
• The management of chest trauma (ATLS)

**Technical Skills**

Practical Skills
• Chest drain insertion and management
• Central venous, arterial and pulmonary artery cannulation
• Tracheal intubation

Operative skills

• Basic surgical skills – dissection, suturing, knots etc
• Saphenous vein harvest (CL3)
• Median Sternotomy (CL2)
• Perform and repair thoracic incisions (CL2)
• rigid and flexible bronchoscopy (CL2)
• Develop the ability to function as a competent assistant at commonly performed cardiothoracic operations including CABG, valve replacement, lung resection and VATS procedures
### 3.2 Conditions

**Generic Surgical Skills and Knowledge- All Specialties**

<table>
<thead>
<tr>
<th>Basic sciences</th>
<th><strong>Objective</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Underpinning basic science knowledge appropriate for the practice of surgery.</em></td>
</tr>
<tr>
<td><strong>Applied anatomy:</strong></td>
<td>Knowledge of anatomy appropriate for surgery</td>
</tr>
<tr>
<td><strong>Physiology:</strong></td>
<td>Knowledge of physiology relevant to surgical practice</td>
</tr>
<tr>
<td><strong>Pathology:</strong></td>
<td>Knowledge of pathological principles underlying system specific pathology</td>
</tr>
<tr>
<td><strong>Microbiology:</strong></td>
<td>Knowledge of microbiology relevant to surgical practice</td>
</tr>
<tr>
<td><strong>Radiology:</strong></td>
<td>Knowledge of diagnostic and interventional radiology</td>
</tr>
</tbody>
</table>

#### Knowledge

- **Applied anatomy:**
  - 4 Development, organs and structures, surface and imaging anatomy of thorax, abdomen, pelvis, perineum, limbs, neck as appropriate for surgical operations

- **Physiology:**
  - 4 Homeostasis
  - 3 Thermoregulation
  - 3 Metabolic pathways
  - 4 Blood loss
  - 4 Sepsis
  - 4 Fluid balance and fluid replacement therapy
  - 3 Metabolic abnormalities

- **Pathology:**
  - 4 Inflammation
  - 4 Wound healing
  - 4 Cellular injury
  - 4 Vascular disorders
  - 4 Disorders of growth, differentiation and morphogenesis
  - 4 Tumours
  - 3 Surgical immunology
  - 3 Surgical haematology

- **Microbiology:**
  - 4 Surgically important microorganisms
  - 4 Sources of infection
  - 4 Asepsis and antisepsis
  - 4 Sterilisation
  - 4 Antibiotics
  - 4 High risk patient management

- **Radiology:**
  - 3 Principles of diagnostic and interventional radiology

#### Clinical Skills

**No content**

#### Technical Skills

**No content**
### Basic surgical skills

#### Objective

*Acquisition of basic surgical skills in instrument and tissue handling.*

*Incision of skin and subcutaneous tissue: Ability to incise superficial tissues accurately with suitable instruments.*

*Closure of skin and subcutaneous tissue: Ability to close superficial tissues accurately.*

*Knot tying: Ability to tie secure knots.*

*Haemostasis: Ability to achieve haemostasis of superficial vessels.*

*Tissue retraction: Use of suitable methods of retraction.*

*Use of drains: Knowledge of when to use a drain and which to choose.*

*Tissue handling: Ability to handle tissues gently with appropriate instruments.*

*Skill as assistant: Ability to assist helpfully, even when the operation is not familiar.*

#### Knowledge

- **Incision of skin and subcutaneous tissue:**
  - 4 Langer's lines
  - 4 Healing mechanism
  - 4 Choice of instrument
  - 4 Safe practice
  - 4 Basic Surgical Skills course

- **Closure of skin and subcutaneous tissue:**
  - 4 Options for closure
  - 4 Suture and needle choice
  - 4 Safe practice

- **Knot tying:**
  - 4 Choice of material

- **Haemostasis:**
  - 4 Techniques

- **Tissue retraction:**
  - 4 Choice of instruments

- **Use of drains:**
  - 4 Indications
  - 4 Types
  - 4 Management/removal

- **Tissue handling:**
  - 4 Choice of instruments

#### Clinical Skills

*Incision of skin and subcutaneous tissue:*
4 Ability to use scalpel, diathermy and scissors

Closure of skin and subcutaneous tissue:
4 Accurate and tension free apposition of wound edges

Knot tying:
4 Single handed
4 Double handed
4 Instrument
4 Superficial
4 Deep

Haemostasis:
4 Control of bleeding vessel (superficial)
4 Diathermy
4 Suture ligation
4 Tie ligation
4 Clip application

Tissue retraction:
4 Tissue forceps
4 Placement of wound retractors

Use of drains:
4 Insertion
4 Fixation
4 Removal

Tissue handling:
4 Appropriate application of instruments and respect for tissues

Skill as assistant:
4 Anticipation of needs of surgeon when assisting

Technical Skills
No content

Professional Skills
No content

The Assessment and Management of the Surgical Patient

Objective
Ability to assess the patient and manage the patient, and propose surgical or non-surgical management.

Knowledge
No content

Clinical Skills
3 Surgical history and examination (elective and emergency)
3 Construct a differential diagnosis
3 Plan investigations
3 Clinical decision making
3 Case work up and evaluation; risk management
3 Active participation in MDTs
3 Taking consent for intermediate level intervention; emergency and elective
3 Written clinical communication skills
3 Interactive clinical communication skills: patients
3 Interactive clinical communication skills: colleagues
### Technical Skills
No content

### Professional Skills
No content

### Perioperative care

<table>
<thead>
<tr>
<th><strong>Objective</strong></th>
<th><strong>Ability to manage patient care in the perioperative period.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preoperative assessment and management:</strong></td>
<td><strong>Ability to assess the patient adequately prior to operation and manage any preoperative problems appropriately.</strong></td>
</tr>
<tr>
<td><strong>Intraoperative care:</strong></td>
<td><strong>Ability to conduct safe surgery in the operating theatre environment.</strong></td>
</tr>
<tr>
<td><strong>Postoperative care:</strong></td>
<td><strong>Ability to care for the patient in the postoperative period.</strong></td>
</tr>
</tbody>
</table>

#### Blood Products: Appropriate use of blood products.

#### Antibiotics: Appropriate use of antibiotics.

### Knowledge

#### Preoperative assessment and management:
- 4 Cardiorespiratory physiology
- 3 Diabetes mellitus
- 3 Renal failure
- 4 Pathophysiology of blood loss
- 4 Pathophysiology of sepsis
- 4 Risk factors for surgery and scoring systems
- 3 Principles of day surgery

#### Intraoperative care:
- 4 Safety in theatre
- 4 Sharps safety
- 4 Diathermy, laser use
- 4 Infection risks
- 3 Radiation use and risks
- 4 Tourniquets
- 3 Principles of local, regional and general anaesthesia

#### Postoperative care:
- 4 Cardiorespiratory physiology
- 3 Diabetes mellitus
- 3 Renal failure
- 4 Pathophysiology of blood loss
- 4 Pathophysiology of sepsis
- 4 Complications specific to particular operation
- 2 Critical care

#### Blood Products:
- 4 Components of blood
- 4 Alternatives to use of blood products

#### Antibiotics:
- 4 Common pathogens in surgical patients
- 4 Antibiotic sensitivities
- 4 Antibiotic side-effects
- 4 Principles of prophylaxis and treatment

### Clinical Skills
**Preoperative assessment and management:**
- 4 History and examination
- 4 Interpretation of preop investigations
- 3 Management of comorbidity
- 4 Resuscitation

**Intraoperative care:**
- 4 Safe conduct of intraoperative care

**Postoperative care:**
- 4 Assessment of patient’s condition
- 4 Postoperative analgesia
- 4 Fluid and electrolyte management
- 4 Monitoring of postoperative patient
- 4 Detection of impending organ failure
- 4 Initial management of organ failure
- 4 Use of MDT meetings

**Blood Products:**
- 4 Appropriate use of blood products
- 4 Management of the complications of blood product transfusion

**Antibiotics:**
- 4 Appropriate prescription of antibiotics

**Technical Skills**
**No content**

**Professional Skills**

**Preoperative assessment and management:**
- 0 Communication with patient and relatives
- 0 Liaison with physicians and ITU staff

**Intraoperative care:**
- 0 Communication with other staff members

**Postoperative care:**
- 0 Communication with patient and relatives
- 0 Liaison with physicians and ITU staff

**Blood Products:**
- 0 Communication with patient and relatives

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### Assessment of multiple injured patients including children

**Objective**

*Safely assess the multiply injured patient.*

**Knowledge**
- 3 Anatomy
- 3 Pathogenesis of shock
- 1 Differences In Children

**Clinical Skills**
- 4 History and examination
- 3 Investigation
- 4 Resuscitation and early management according to ATLS and APLS guidelines
3 Referral to appropriate surgical subspecialties

**Technical Skills**
3 Central venous line insertion
3 Chest drain insertion
2 Diagnostic peritoneal lavage

**Professional Skills**
No content

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**Bleeding diathesis**

**Objective**
Understand, Recognise and Manage bleeding diathesis in the surgical patient.

*Diagnosis:* Diagnose possible bleeding diathesis in the surgical patient.

*Treatment:* Manage bleeding diathesis in the surgical patient.

**Knowledge**

*Diagnosis:*
3 Mechanism of haemostasis
3 Pathology of impaired haemostasis e.g. haemophilia, liver disease, massive haemorrhage

*Treatment:*
3 Understands use of blood products

**Clinical Skills**

*Diagnosis:*
4 Recognition of conditions likely to lead to the diathesis
3 Recognition of abnormal bleeding during surgery

*Treatment:*
3 Avoidance by correct surgical techniques
3 Corrective measures, e.g. warming, packing

**Technical Skills**
No content

**Professional Skills**

*Diagnosis:*
0 Communication with laboratory staff

*Treatment:*
0 Communication with anaesthetist, theatre team and laboratory staff

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**Venous thrombosis + embolism**

**Objective**
Understanding of practice in the prevention and management of Venous thrombosis and Embolism.

*Coagulation:* Understanding of the physiology and pathophysiology of coagulation.

*Diagnosis:* Able to arrange basic investigation of patients with suspected venous thrombosis and embolism.

*Treatment:* Ability to initiate treatment of venous thrombosis and embolism.

*Prophylaxis:* Use of common methods of prophylaxis against venous thrombosis and embolism.

**Knowledge**
Coagulation:

2 Clotting mechanism (Virchow Triad)
2 Effect of surgery and trauma on coagulation
2 Tests for thrombophilia and other disorders of coagulation

Diagnosis:

2 Methods of investigation for suspected thromboembolic disease

Treatment:

4 Anticoagulation, heparin and warfarin
2 Role of V/Q scanning, CT angiography and thrombolysis
2 Place of pulmonary embolectomy

Prophylaxis:

3 Knowledge of methods of prevention, mechanical and pharmacological

**Clinical Skills**

Coagulation:

4 Recognition of patients at risk

Diagnosis:

3 Awareness of symptoms and signs associated with pulmonary embolism and DVT
2 Role of duplex scanning, venography and d-dimer measurement

Treatment:

3 Initiate and monitor treatment

Prophylaxis:

4 Awareness at all times of the importance of prophylaxis

**Technical Skills**

No content

**Professional Skills**

Coagulation:

0 Protocol management

Diagnosis:

0 Ability to organise and time appropriate investigation

Treatment:

0 Prioritisation of investigation and treatment
0 Patient counselling

Prophylaxis:

0 Able to implement in the team setting the culture of prophylaxis

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**Nutrition**

**Objective**

Recognise the need for artificial nutritional support and arrange enteral nutrition.

**Knowledge**

3 Effects of malnutrition, both excess and depletion
3 Methods of screening and assessment
Clinical Skills
3 Arrange access to suitable artificial nutritional support, preferably via a nutrition team:
   Dietary supplements
2 Arrange access to suitable artificial nutritional support, preferably via a nutrition team:
   Enteral nutrition
1 Arrange access to suitable artificial nutritional support, preferably via a nutrition team:
   Parenteral nutrition

Technical Skills
No content

Professional Skills
No content

Academic activity

Objective
An introduction to research methodology and to teaching others.

Research: Ability to perform a simple research study and present the results.

Teaching: Ability to teach small groups such as medical students.

Knowledge
Research:

2 Research methodology

Teaching:

2 Teaching methods

Clinical Skills
Research:

2 Ability to analyse published evidence

Teaching:

3 Ability to teach small groups

Technical Skills
No content

Professional Skills
No content

Management of the dying patient

Objective
Ability to manage the dying patient appropriately.

Palliative Care: Good management of the dying patient in consultation with the palliative care team.

Principles of organ donation: Knowledge of the principles of organ donation.

Knowledge
Palliative Care:

3 Care of the terminally ill
4 Analgesia
3 Antiemetics
3 Laxatives

Principles of organ donation:

3 Circumstances in which consideration of organ donation is appropriate
3 Principles of brain death
3 Understanding the role of the coroner and the certification of death

**Clinical Skills**

Palliative Care:

3 Symptom control in the terminally ill patient

**Technical Skills**

No content

**Professional Skills**

Palliative Care:

- Communication with the patient and relatives
- Liaison with the palliative care team

Principles of organ donation:

- Communication with relatives
- Liaison with the transplant team
- Learn to cope with crisis and mortality

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### Endocrine and Metabolic Disorders

**Objective**

- To identify, investigate and manage surgical patients with common metabolic disorders
- To identify, investigate and manage surgical patients with Thyrotoxicosis
- To identify, investigate and manage surgical patients with Hypothyroidism
- To identify, investigate and manage surgical patients with Hypercalcaemia
- Knowledge of the significance of corticosteroid therapy in patient care
- To identify, investigate and manage surgical patients with diabetes mellitus
- To identify, investigate and manage surgical patients with Hyponatraemia

**Knowledge**

Thyrotoxicosis
- 4 Pathophysiology of thyroid hormone excess and associated risks from surgery

Hypothyroidism
- 4 Pathophysiology of thyroid hormone deficiency and associated risks from surgery

Hypercalcaemia
- 3 Causes and effects of hypercalcaemia

Cortico-steroid therapy
- 4 Complications
- 4 Steroid insufficiency

Diabetes Mellitus
- 4 Complications

Hyponatraemia
- 4 Pathophysiology of fluid and electrolyte balance
- 4 Causes of hyponatraemia

**Clinical Skills**

Thyrotoxicosis
- 4 History and examination
- 3 Investigation of thyrotoxicosis

Hypothyroidism
- 4 History and examination
- 4 Investigation

Hypercalcaemia
- 3 Investigation of hypercalcaemia
- 3 Treatment of hypercalcaemia
### Cortico-steroid therapy
4 Peri-operative management of patients on steroid therapy

### Diabetes Mellitus
4 Peri-operative management of diabetic patients

### Hyponatraemia
4 Treatment

#### Technical Skills
No content

#### Professional Skills
Liaise with endocrinologists
Liaise with diabetic team

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### Child Protection

#### Objective

#### Knowledge
4 Working knowledge of Trust and ACPC Child Protection Procedures
4 Basic understanding of child protection law
4 Understanding of Children's rights
4 Working knowledge of types and categories of child maltreatment, presentations, signs and other features (primarily physical, emotional, sexual, neglect, professional)
4 Understanding of one personal role, responsibilities and appropriate referral patterns in child protection
4 Understanding of the challenges of working in partnership with children and families

#### Clinical Skills
Ability to:
4 recognise the possibility of abuse or maltreatment
4 recognise limitations of own knowledge and experience and seek appropriate expert advice
4 urgently consult immediate senior in surgery to enable referral to paediatricians
4 keep appropriate written documentation relating to child protection matters
4 Communicate effectively with those involved with child protection, including children and their families

#### Technical Skills
No content

#### Professional Skills
No content
Module 1

**Critical care and postoperative management**

**Objective**

To acquire experience in the management of a post surgical patient on the critical care, high dependency and post operative wards. To be able to manage, with appropriate supervision, such a patient.

**Knowledge**

**BASIC KNOWLEDGE**

Physiology

- 2 Haemodynamics: physiology and measurement
- 2 Cardiac arrhythmia
- 2 Haemostasis, thrombosis and bleeding
- 2 Acid base balance
- 2 Pulmonary physiology, ventilation and gas exchange
- 2 Metabolic response to trauma and surgery
- 2 GIT, renal and hepatic physiology
- 2 Nutrition
- 2 Temperature regulation

Anatomy

- 2 Heart, pericardium and great vessels
- 2 Mediastinum, thoracic inlet and neck
- 2 Tracheobronchial tree and lungs
- 2 Chest wall and diaphragm

Pathology

- 2 Inflammation and wound healing
- 2 Myocardial infarction and complications
- 2 Endocarditis
- 2 Pericarditis
- 2 Systemic Inflammatory Response Syndrome
- 2 Bronchopulmonary infection
- 2 ARDS

Pharmacology

- 2 Drugs used in the treatment of hypertension, heart failure and angina
- 2 Inotropes, vasodilators and vasoconstrictors
- 2 Anti-arrhythmic drugs
- 2 Haemostatic drugs
- 2 Antiplatelet, anticoagulant and thrombolytic drugs
- 2 Analgesics
- 2 Antibiotics
- 2 Anaesthetic agents, local and general

Microbiology

- 2 Organisms involved in cardiorespiratory infection
- 2 Antimicrobial treatment and policies

**CLINICAL KNOWLEDGE**

- 2 Cardiopulmonary resuscitation
2 Management of cardiac surgical patient
2 Management of thoracic surgical patient
2 Treatment of cardiac arrhythmia
2 Management of complications of surgery
2 Blood transfusion and blood products
2 Wound infection and sternal disruption
2 Neuropsychological consequences of surgery and critical care

Clinical Skills
3 History and examination of the postoperative and critically ill patient
3 Analysis and interpretation of post operative and critical care charts and documentation

General management of surgical patient:
3 Routine haematology and biochemical investigations
2 Chest radiograph and ECG
2 Management of fluid balance and circulating volume
2 Pain control
2 Wound management
2 Management of surgical drains
2 Antimicrobial policy and prescribing
2 Management of postoperative haemorrhage
3 Cardiopulmonary resuscitation (ALS)
2 Management of complications of surgery
3 Blood transfusion and blood products including safe usage of blood
2 Wound infection and sternal disruption

Recognition, evaluation and treatment of haemodynamic abnormalities:
2 Evaluation and interpretation of haemodynamic data
2 Interpretation of ECG
2 Use of anti-arrhythmic drugs
2 Recognition, evaluation and treatment of cardiac arrhythmias
2 Understanding and use of cardiac pacing

Recognition, evaluation and treatment of ventilatory abnormalities:
2 Interpretation of blood gas results
2 Airway management
2 Understanding of ventilatory techniques and methods
2 Understanding of anaesthetic drugs and methods

Recognition, evaluation and treatment of multiorgan dysfunction:
2 Renal dysfunction and support
2 GIT dysfunction, feeding and nutrition
2 Recognition and evaluation of cerebral and neuropsychological problems

Technical Skills
Recognition, evaluation and treatment of haemodynamic abnormalities:
2 Use of defibrillator
2 Practical use of inotropes and vasoactive drugs
2 Use of intra aortic balloon pump
1 Echocardiography including TOE

Practical Skills:
3 Arterial cannulation
3 Central venous cannulation
2 Pulmonary artery catheterisation
1 Intra aortic balloon pump insertion
1 Intra aortic balloon pump timing and management
1. Tracheostomy
2. Fibreoptic bronchoscopy
3. Chest aspiration
3. Chest drain insertion
2. Chest drain management

**Professional Skills**

No content
Module 2

Cardiac Surgery

Objective
To gain experience in aspects of the management of a cardiac surgical patient. This includes operative management as appropriate and with supervision.

Knowledge
BASIC KNOWLEDGE

Physiology
2 Myocardial cellular physiology
2 Haemodynamics; physiology and measurement
2 Electrophysiology, including conduction disorders
2 Haemostasis, thrombosis and bleeding
2 Acid base balance
2 Pulmonary physiology, ventilation and gas exchange
2 Metabolic response to trauma
2 Vascular biology and reactivity

Anatomy
2 Heart, pericardium and great vessels
2 Coronary anatomy and variants
2 Coronary angiography
2 Anatomy of the peripheral vascular system and vascular conduits

Pathology
2 Inflammation and wound healing
2 Atheroma, medial necrosis and arteritis
2 Myocardial infarction and complications
2 Systemic Inflammatory Response Syndrome

Pharmacology
2 Drugs used in the treatment of hypertension, heart failure and angina
2 Anti-arrhythmic drugs
2 Haemostatic drugs
2 Antiplatelet, anticoagulant and thrombolytic drugs
2 Analgesics
2 Antibiotics
2 Anaesthetic agents, local and general

Microbiology
2 Organisms involved in cardiorespiratory infection
2 Organisms involved in wound infection
2 Antibiotic usage and prophylaxis
2 Antisepsis

CLINICAL KNOWLEDGE

General
2 Diagnosis, investigation and treatment of heart disease
2 Risk assessment and stratification
2 Cardiopulmonary resuscitation
2 Cardiac arrhythmias
<table>
<thead>
<tr>
<th>2 Complications of surgery</th>
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<tbody>
<tr>
<td>2 Renal dysfunction</td>
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<tr>
<td>2 Multiorgan failure</td>
</tr>
<tr>
<td>2 Cardiac rehabilitation</td>
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<tr>
<td>2 Blood transfusion and blood products</td>
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<tr>
<td>2 Wound infection and sternal disruption</td>
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Specific

| 2 Diagnosis investigation and assessment of IHD |
| 2 Operative treatment - Off pump and on pump surgery |
| 2 Results of surgery – survival, graft patency, recurrence |
| 2 Role of PCI and non operative treatment |
| 2 Management of cardiovascular risk factors |
| 2 Diagnosis investigation and assessment of valvular heart disease |
| 2 Timing of surgical intervention in valve disease |
| 2 Options for operative management of hear valve disease including: |
| 2 Valve replacement/repair (mechanical, biological stented and stentless grafts, homografts and autografts) |
| 2 Valve design: materials, configuration and biomechanics. |
| 2 Results of surgery – survival, valve thrombosis, endocarditis, bleeding. |
| 2 Interpretation of survival and follow up data |
| 2 Cardiac performance and long term functional status |
| 2 Surgery for conduction problems |
| 2 Surgical treatment of arrhythmias |

**Clinical Skills**

| 3 History and examination of the cardiovascular system including conduit, drug history, identification of co morbidity and risk assessment |

Data interpretation:

| 3 Routine haematology and biochemical investigations |
| 3 Interpretation of haemodynamic data |
| 2 Chest radiograph |
| 2 ECG including exercise ECG |
| 2 Coronary angiography |
| 2 Cardiac catheterisation data |
| 1 Echocardiography including 2D, Doppler and TOE and stress echo |
| 1 Nuclear cardiology |

Patient Management:

| 4 Cardiopulmonary resuscitation |
| 3 Diagnosis and treatment of cardiac arrhythmias |
| 2 Management of post cardiac surgical patient |
| 2 Management of complications of surgery |
| 2 Cardiac rehabilitation |
| 3 Blood transfusion and blood products, including safe use of blood |
| 2 Wound infection and sternal disruption |
| 1 Valve selection |
| 2 Anticoagulation management including complications. |

**Technical Skills**

Operative Management:

| 3 Saphenous vein harvest |
| 2 Median Sternotomy |
| 1 Mammary/radial artery harvest |
| 1 Preparation for and management of cardiopulmonary bypass |
| 1 Proximal aortovenous anastomosis |
| 1 Distal coronary anastomosis |
| 1 Heart Valve replacement |
1 Surgical re-exploration for bleeding or tamponade

Professional Skills
No content
Module 3

**Thoracic Surgery**

**Objective**
To gain experience in the evaluation and management of a patient undergoing thoracic surgery. Includes operative management with supervision where appropriate.

**Knowledge**

**BASIC KNOWLEDGE**

**Physiology**
- Pulmonary physiology, ventilation and gas exchange
- Haemostasis, thrombosis and bleeding
- Acid base balance
- Metabolic response to trauma
- Digestive, renal and hepatic physiology
- Nutrition

**Anatomy**
- Tracheobronchial tree and lungs
- Thoracic inlet, neck and mediastinum
- Oesophagus and upper GI tract
- Chest wall and diaphragm

**Pathology**
- Inflammation and wound healing
- Bronchopulmonary infections
- ARDS
- Emphysema
- Pulmonary fibrosis
- Pulmonary manifestations of systemic disease
- Systemic manifestations of pulmonary disease
- Benign and malignant tumours of trachea, bronchus and lung parenchyma
- Oesophagitis, columnar-lined oesophageal stricture
- Oesophageal motility disorders
- Malignant and benign tumours of the oesophagus and stomach
- Malignant and benign tumours of the pleura and chest wall, mediastinum and thyroid

**Pharmacology**
- Bronchodilators
- H2 antagonists and proton pump inhibitors
- Haemostatic drugs
- Analgesics
- Antibiotics
- Anaesthetic agents, local and general

**Microbiology**
- Organisms involved in respiratory infection including TB
- Organisms involved in wound infection
- Antibiotic usage and prophylaxis
- Antiseptic
- Management of intra pleural sepsis

**CLINICAL KNOWLEDGE**
Thoracic Incisions

2 Types of incisions and appropriate use, including lateral, anterior, muscle sparing and video-assisted approaches.

Sternotomy

2 Analgesia including pharmacology, effectiveness, side effects and use in combination regimens
2 Post-operative analgesia, including epidural, PCAS and paravertebral catheter techniques.

Bronchoscopy

2 The anaesthetic, airway and ventilatory management during rigid and flexible bronchoscopy

Mediastinal exploration

2 Endoscopic, radiological and surgical approaches used to evaluate and diagnose mediastinal disease of benign, infective, primary and malignant aetiology.
2 Equipment for mediastinal exploration
2 Benign and malignant tumours of trachea, bronchus and lung parenchyma
2 Epidemiology, presentation, diagnosis, staging (pre-operative, intraoperative and pathological) and treatment of lung cancer and lung metastases.
2 Adjuvant and multimodality treatment
2 Results of treating thoracic malignancy by surgery, medical or oncological techniques, including multimodality management.
2 Survival, recurrence rates and relapse patterns after surgical treatment and the investigation and management of relapse.
2 Knowledge of palliative care techniques.
2 Inflammatory, infective and malignant disease of the visceral and parietal pleura.
2 Pneumothorax, pleural effusion, empyema and haemothorax
2 Conditions of adjacent organs that affect the pleura
2 Medical and surgical management of pleural disease, including radiological, open and VATS techniques.

Clinical Skills

3 System specific and general history and examination, including drug history, identification of comorbidity and functional status.

Data interpretation:

3 Routine haematology and biochemical investigations
2 Chest radiograph and ECG
2 CT, including contrast enhanced CT
2 MRI
2 Respiratory function tests
2 Ventilation/perfusion scan
2 Blood gases
1 Oesophageal function tests and contrast studies

Patient Management:

3 Cardiopulmonary resuscitation
2 Diagnosis, investigation and treatment of pulmonary oesophageal and other thoracic conditions
2 Risk assessment, stratification and management
2 Management of post thoracic surgical patient
2 Management of complications of surgery
2 Treatment of cardiac arrhythmias
2 Pain control
2 Wound infection and disruption
2 Blood transfusion and blood products
2 Physiotherapy and rehabilitation
2 Palliative care

**Technical Skills**

**Practical Skills:**

1 Fibreoptic bronchoscopy
3 Chest aspiration
3 Chest drain insertion
2 Chest drain management

**Operative Management:**

2 Correct positioning of patient for thoracic surgery
2 Perform and repair thoracic incisions, including lateral, anterior, muscle sparing and VATS incisions
2 Perform rigid and flexible bronchoscopy
2 Take appropriate specimens for bacteriology, cytology and histology
1 Endoscopic and surgical techniques used in lung biopsy
1 Surgery for benign and malignant conditions of the lungs, including uncomplicated lobectomy for lung cancer, wedge resection and metastasectomy
1 Intraoperative diagnosis and staging
2 Open operation for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy
1 VATS procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy
1 Open and VATS procedures for empyema, including techniques for decortication.

**Professional Skills**

No content
# Module 4

## Cardiopulmonary bypass, myocardial protection and circulatory support

### Objective

To gain experience in the practical applications of cardiopulmonary bypass, myocardial protection and circulatory support. To understand the science and technology that underpins these disciplines.

### Knowledge

**BASIC KNOWLEDGE**

- **Physiology**
  - 2 Haemodynamics: physiology and measurement
  - 2 Cardiac arrhythmias
  - 2 Haemostasis, thrombosis and bleeding
  - 2 Acid base balance
  - 2 Pulmonary physiology, ventilation and gas exchange
  - 2 Metabolic response to trauma and surgery
  - 2 GIT, renal and hepatic physiology
  - 2 Temperature regulation
  - 2 Myocardial cellular physiology
  - 2 Myocardial function and dysfunction
  - 2 Haemodynamics and arrhythmias
  - 2 Scientific foundations of myocardial preservation
  - 2 Physiology of the balloon pump

- **Anatomy**
  - 2 Heart, pericardium and great vessels
  - 2 Mediastinum, thoracic inlet and neck
  - 2 Chest wall and diaphragm
  - 2 Femoral triangle and peripheral vascular system

- **Pathology**
  - 2 Inflammation and wound healing
  - 2 Systemic Inflammatory Response Syndrome
  - 2 ARDS

- **Pharmacology**
  - 2 Drugs used in the treatment of hypertension, heart failure and angina
  - 2 Inotropes, vasodilators and vasoconstrictors
  - 2 Anti-arrhythmic drugs
  - 2 Haemostatic drugs
  - 2 Antiplatelet, anticoagulant and thrombolytic drugs
  - 2 Analgesics
  - 2 Antibiotics
  - 2 Anaesthetic agents, local and general

- **Microbiology**
  - 2 Organisms involved in cardiorespiratory infection
  - 2 Antimicrobial treatment and policies

**SPECIFIC KNOWLEDGE**

- 2 Principles and practice of CPB
- 2 Relevant equipment and technology and its application
2 Monitoring during CPB
2 Inflammatory and pathophysiological response to bypass
2 Pulsatile and non pulsatile flow
2 Effect of CPB on pharmacokinetics
2 Priming fluids and haemodilution
2 Acid base balance – pH and alpha stat
2 Neuropsychological consequences of CPB
2 Cell salvage and blood conservation
2 Principles and practice of myocardial preservation
2 Cardioplegia solutions and delivery modes.
2 Non-cardioplegic techniques of preservation
2 Mechanical circulatory support in the preoperative, perioperative and postoperative periods
2 Intra aortic balloon pump – indications for use, patient selection and complications
2 Understanding of relevant equipment and technology
2 Ventricular assist devices – indications for use, patient selection and complications

Clinical Skills
Patient Management:

2 Practical Knowledge of the Principles and practice of CPB
2 Relevant equipment and technology and its application
2 Monitoring during CPB
1 Myocardial management throughout the perioperative period
2 Patient selection for mechanical circulatory support
1 Insertion and positioning of the intra aortic balloon pump
1 Management of the balloon pump including timing and trouble shooting
1 Care of the patient with intra aortic balloon pump, including recognition and management of complications

Technical Skills
Operative Management:

2 Median sternotomy open and close
1 Cannulation and institution of cardiopulmonary bypass
1 Safe conduct of CPB – problem solving and troubleshooting
1 Weaning from bypass and decannulation
2 Femoral cannulation and decannulation

Professional Skills
No content
4. Intermediate (I) Stage

Four point scales

What the 4 point scale means for Knowledge

1. Knows of
2. Knows basic concepts
3. Knows generally
4. Knows both specifically and broadly

What the 4 point scale means for Clinical Skills and Technical Skills and Procedures

1. Has observed
2. Can do with assistance
3. Can do whole but may need assistance
4. Competent to do whole without assistance, including managing complications
4.1 Overview

Intermediate (I) Phase of training (ST3 & ST4)

The intermediate (I) phase of training will consist of an indicative period of two years. These two years should in turn consist of four modules, each of 6 months. Trainees will be expected to have completed at least one module in cardiac surgery and one module in thoracic surgery by the end of this phase.

The purpose of this stage is to acquire and develop experience and competence in the generality of cardiothoracic surgery.

The curriculum for each of the modules is defined (see syllabus). Aims and levels of competence to be attained within each module by the end of this stage are identified.

Intermediate (1) modules:

- Critical Care and Postoperative Management
- Cardiopulmonary Bypass
- Myocardial Protection
- Circulatory Support
- Ischaemic Heart Disease
- Heart Valve Disease
- Aortoarterial Disease
- Cardiothoracic Trauma
- General Management of a Patient Undergoing Thoracic Surgery
- Neoplasms of the Lung
- Disorders of the Pleura
- Disorders of the Chest Wall
- Disorders of the Diaphragm
- Emphysema and Bullae
- Disorders of the Pericardium
- Disorders of the Mediastinum
- Disorders of the Airway
- Congenital Heart Disease
- Intrathoracic transplantation and surgery for heart failure
- Management of Benign Oesophageal Disorders
- Management of Oesophageal Neoplasia
4.2 Conditions

Critical Care and Postoperative Management

**Objective**
To be able to manage a post surgical patient on the critical care, high dependency and post operative wards. To work as part of a multiprofessional, multidisciplinary team in the management of a patient requiring complex critical care. Competence in the management of uncomplicated situations should be achieved during this period. Management of complicated or difficult situations will require appropriate supervision and guidance.

**Knowledge**
BASIC KNOWLEDGE

**Physiology**

4 Haemodynamics: physiology and measurement
4 Cardiac arrhythmia
4 Haemostasis, thrombosis and bleeding
4 Acid base balance
4 Pulmonary physiology, ventilation and gas exchange
4 Metabolic response to trauma and surgery

4 GIT, renal and hepatic physiology

4 Nutrition

4 Temperature regulation

**Anatomy**

4 Heart, pericardium and great vessels
4 Mediastinum, thoracic inlet and neck
4 Tracheobronchial tree and lungs
4 Chest wall and diaphragm

**Pathology**

4 Inflammation and wound healing
4 Myocardial infarction and complications
4 Endocarditis
4 Pericarditis

4 Systemic Inflammatory Response Syndrome
4 Bronchopulmonary infection

4 ARDS

**Pharmacology**

4 Drugs used in the treatment of hypertension, heart failure and angina
4 Inotropes, vasodilators and vasoconstrictors
4 Anti-arrhythmic drugs
4 Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general
Microbiology
4 Organisms involved in cardiorespiratory infection
4 Antimicrobial treatment and policies

CLINICAL KNOWLEDGE
3 Cardiopulmonary resuscitation
3 Management of cardiac surgical patient
3 Management of thoracic surgical patient
3 Treatment of cardiac arrhythmia
3 Management of complications of surgery
3 Blood transfusion and blood products
3 Wound infection and sternal disruption
3 Neuropsychological consequences of surgery and critical care

Clinical Skills

HISTORY AND EXAMINATION
4 History and examination of the postoperative and critically ill patient

DATA INTERPRETATION
4 Analysis and interpretation of post operative and critical care charts and documentation
4 Routine haematology and biochemical investigations
3 Chest radiograph and ECG
3 Echocardiography including TOE

PATIENT MANAGEMENT
General management of surgical patient
3 Management of fluid balance and circulating volume
3 Pain control
### 3 Wound management

- Management of surgical drains
- Antimicrobial policy and prescribing
- Management of postoperative haemorrhage
- Cardiopulmonary resuscitation (ALS)
- Management of complications of surgery
- Blood transfusion and blood products
- Wound infection and sternal disruption

Recognition, evaluation and treatment of haemodynamic abnormalities

- Evaluation and interpretation of haemodynamic data
- Practical use of inotropes and vasoactive drugs
- Use of intra aortic balloon pump

Recognition, evaluation and treatment of cardiac arrhythmias

- Interpretation of ECG
- Use of anti-arrhythmic drugs
- Use of defibrillator

Understanding and use of cardiac pacing

Recognition, evaluation and treatment of ventilatory abnormalities (level as indicated)

- Interpretation of blood gas results

Airway management

Understanding of ventilatory techniques and methods

Understanding of anaesthetic drugs and methods

Recognition, evaluation and treatment of multiorgan dysfunction (level as indicated)

- Renal dysfunction and support
- GIT dysfunction, feeding and nutrition

Recognition and evaluation of cerebral and neuropsychological problems

### Technical Skills

**PRACTICAL SKILLS**

- Arterial cannulation
- Central venous cannulation
- Pulmonary artery catheterisation
3 Intra aortic balloon pump insertion
3 Intra aortic balloon pump timing and management
2 Tracheostomy
2 Fibreoptic bronchoscopy
4 Chest aspiration
4 Chest drain insertion
3 Chest drain management

OPERATIVE MANAGEMENT

2 Surgical re-exploration for bleeding or tamponade

Professional Skills
Clinical decision making
Understands patients needs in critical care and postoperative environment
Communicates with patient and relatives effectively and sympathetically
Team skills: collaborates with intensivists, nurses and other colleagues.
Recognises own abilities and limitations
Demonstrates ability to prioritise and manage service
Time management and personal skills
Demonstrates ability to access knowledge and shows willingness to learn
Understands research methods and has ability to analyse scientific publications

Research/academic activities
Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support

Cardiopulmonary Bypass

Cardiopulmonary Bypass

**Objective**

To manage with supervision the clinical and technical aspects of cardiopulmonary bypass.

**Knowledge**

BASIC KNOWLEDGE

Physiology

3 Haemodynamics: physiology and measurement
3 Cardiac arrhythmias
3 Haemostasis, thrombosis and bleeding
3 Acid base balance
3 Pulmonary physiology, ventilation and gas exchange
3 Metabolic response to trauma and surgery
3 GIT, renal and hepatic physiology
3 Temperature regulation

Anatomy

3 Heart, pericardium and great vessels
3 Mediastinum, thoracic inlet and neck
3 Chest wall and diaphragm
3 Femoral triangle and peripheral vascular system

Pathology

3 Inflammation and wound healing
3 Systemic Inflammatory Response Syndrome
3 ARDS

Pharmacology

3 Drugs used in the treatment of hypertension, heart failure and angina
3 Inotropes, vasodilators and vasoconstrictors
3 Anti-arrhythmic drugs
3 Haemostatic drugs
3 Antiplatelet, anticoagulant and thrombolytic drugs
3 Analgesics
3 Antibiotics
3 Anaesthetic agents, local and general

Microbiology

3 Organisms involved in cardiorespiratory infection
3 Antimicrobial treatment and policies

SPECIFIC KNOWLEDGE

3 Principles and practice of CPB
3 Relevant equipment and technology and its application
3 Monitoring during CPB
3 Inflammatory and pathophysiological response to bypass
3 Pulsatile and non pulsatile flow
3 Effect of CPB on pharmacokinetics
3 Priming fluids and haemodilution
3 Acid base balance ? pH and alpha stat
3 Neuropsychological consequences of CPB
3 Cell salvage and blood conservation

**Clinical Skills**

**Technical Skills**

**OPERATIVE MANAGEMENT**

3 Median sternotomy open and close
3 Cannulation and institution of cardiopulmonary bypass
3 Safe conduct of CPB ? problem solving and troubleshooting
3 Weaning from bypass and decannulation
3 Femoral cannulation and decannulation
1 Repeat sternotomy, with pericardial dissection, cardiac mobilisation and cannulation

**Professional Skills**

Clinical decision making
Team skills: collaborates with perfusionists, anaesthetists and other colleagues.
Recognises own abilities and limitations
Time management and personal skills
Demonstrates ability to prioritise and manage service
Demonstrates ability to access knowledge and shows willingness to learn
Understands research methods and has ability to analyse scientific publications

Research/academic activities
Myocardial Protection

**Objective**
To manage with supervision the clinical and technical aspects of intraoperative myocardial protection.

**Knowledge**

**BASIC KNOWLEDGE**

- Myocardial cellular physiology
- Myocardial function and dysfunction
- Haemodynamics and arrhythmias
- Coronary arterial and venous anatomy

**SPECIFIC KNOWLEDGE**

- Scientific foundations of myocardial preservation
- Principles and practice of myocardial preservation
- Cardioplegia solutions and delivery modes.
- Non-cardioplegic techniques of preservation

**Clinical Skills**

**PATIENT MANAGEMENT**

- Myocardial management throughout the perioperative period
- Ability to adapt preservation technique to clinical situation

**Technical Skills**

**OPERATIVE MANAGEMENT**

- Relevant cannulation techniques and appropriate delivery of cardioplegia

**Professional Skills**

Clinical decision making

- Recognises own abilities and limitations
- Time management and personal skills
- Demonstrates ability to access knowledge and shows willingness to learn
- Understands research methods and has ability to analyse scientific publications

Research/academic activities
Circulatory Support

Objective
To manage with supervision the clinical and technical aspects of circulatory support.

Knowledge
BASIC KNOWLEDGE

3 Haemodynamics: physiology and measurement
3 Cardiac arrhythmias
3 Haemostasis, thrombosis and bleeding
3 Anatomy of the femoral triangle and peripheral vascular system
3 Inotropes, vasodilators and vasoconstrictors
3 Anti-arrhythmic drugs
3 Haemostatic drugs
3 Antiplatelet, anticoagulant and thrombolytic drugs

SPECIFIC KNOWLEDGE

3 Mechanical circulatory support in the preoperative, perioperative and postoperative periods
3 Intra aortic balloon pump - indications for use, patient selection and complications
3 Physiology of the balloon pump
2 Understanding of relevant equipment and technology
2 Ventricular assist devices - indications for use, patient selection and complications

Clinical Skills
PATIENT MANAGEMENT

2 Patient selection for mechanical circulatory support

3 Insertion and positioning of the intra aortic balloon pump

3 Management of the balloon pump including timing and trouble shooting

2 Care of the patient with intra aortic balloon pump, including recognition and management of complications

Technical Skills
No content

Professional Skills
Clinical decision making

Team skills: collaborates with perfusionists, anaesthetists and other colleagues.

Recognises own abilities and limitations

Demonstrates ability to prioritise and manage service

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Ischaemic Heart Disease

Ischaemic Heart Disease

Objective
To evaluate and manage with appropriate supervision the surgical aspects of a patient with ischaemic heart disease including the complications of ischaemic heart disease.

Knowledge
BASIC KNOWLEDGE

Physiology
3 Myocardial cellular physiology
3 Haemodynamics; physiology and measurement
3 Electrophysiology, including conduction disorders
3 Haemostasis, thrombosis and bleeding
3 Acid base balance
3 Pulmonary physiology, ventilation and gas exchange
3 Metabolic response to trauma
3 Vascular biology and reactivity

Anatomy
3 Heart, pericardium and great vessels
3 Coronary anatomy and variants
3 Coronary angiography
3 Anatomy of the peripheral vascular system and vascular conduits

Pathology
3 Inflammation and wound healing
3 Atheroma, medial necrosis and arteritis
3 Intimal hyperplasia and graft atherosclerosis
3 Myocardial infarction and complications
3 Systemic Inflammatory Response Syndrome

Pharmacology
3 Drugs used in the treatment of hypertension, heart failure and angina
3 Anti-arrhythmic drugs
3 Haemostatic drugs
3 Antiplatelet, anticoagulant and thrombolytic drugs
3 Analgesics
3 Antibiotics
3 Anaesthetic agents, local and general

Microbiology
3 Organisms involved in cardiorespiratory infection
3 Organisms involved in wound infection
3 Antibiotic usage and prophylaxis
3 Antisepsis

CLINICAL KNOWLEDGE

General
3 Diagnosis, investigation and treatment of heart disease
3 Risk assessment and stratification
3 Cardiopulmonary resuscitation
3 Cardiac arrhythmias
3 Complications of surgery
3 Renal dysfunction
3 Multiorgan failure
3 Cardiac rehabilitation
3 Blood transfusion and blood products
3 Wound infection and sternal disruption

Specific

3 Diagnosis investigation and assessment of IHD
3 Operative treatment - Off pump and on pump surgery
3 Results of surgery - survival, graft patency, recurrence
3 Arterial revascularisation
3 Redo coronary artery surgery
3 Role of PCI and non operative treatment
3 Management of cardiovascular risk factors
3 Complications of myocardial infarction and ischaemic heart disease
3 VSD, mitral regurgitation, aneurysm.

**Clinical Skills**

**HISTORY AND EXAMINATION**

4 Cardiovascular system and general history and examination including conduit, drug history, identification of comorbidity and risk assessment

**DATA INTERPRETATION**

4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
3 Chest radiograph
3 ECG including exercise ECG
3 Coronary Angiography
3 Cardiac Catheterisation data
2 Echocardiography including 2D, Doppler and TOE and stress echo
2 Nuclear cardiology

**PATIENT MANAGEMENT**

4 Cardiopulmonary resuscitation
3 Diagnosis and treatment of cardiac arrhythmias
3 Management of post cardiac surgical patient
3 Management of complications of surgery
3 Cardiac rehabilitation
3 Blood transfusion and blood products
2 Wound infection and sternal disruption

**Technical Skills**

**OPERATIVE MANAGEMENT**
Saphenous vein harvest (4)
Mammary artery/radial artery harvest (3)
Preparation for and management of cardiopulmonary bypass (3)
Proximal coronary anastamosis (3)
Distal coronary anastamosis (2)

**Professional Skills**
Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk/benefit with the patient. Is able to obtain consent from patient

Collaborates with colleagues and has good team skills

Demonstrates ability to prioritise and manage service

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
# Heart Valve Disease

## Objective

To evaluate and manage, with appropriate supervision, a patient with both uncomplicated heart valve disease, including operative management.

## Knowledge

### BASIC KNOWLEDGE

**Physiology**

1. Cardiovascular physiology including valve physiology and haemodynamics
2. Electrophysiology, including conduction disorders
3. Haemostasis, thrombosis and bleeding
4. Acid base balance
5. Pulmonary physiology, ventilation and gas exchange
6. Metabolic response to trauma

**Anatomy**

1. Cardiac chambers and valves, pericardium and great vessels
2. Anatomy of the conduction system

**Pathology**

1. Pathophysiology of valve incompetence and stenosis.
2. Consequences of valve disease on cardiac function and morphology
3. Pathophysiology of mixed valve disease and combined valve pathology (eg aortic and mitral)
4. Combined valvular and ischaemic heart disease
5. Atrial fibrillation and other arrhythmias

**Pharmacology**

1. Drugs used in the treatment of hypertension, heart failure and angina
2. Anti-arrhythmic drugs
3. Haemostatic drugs
4. Antiplatelet, anticoagulant and thrombolytic drugs
5. Analgesics
6. Antibiotics
7. Anaesthetic agents, local and general

**Microbiology**

1. Organisms involved in cardio respiratory infection
2. Organisms involved in wound infection
3. Antibiotic usage and prophylaxis
4. Antiseptics
5. Endocarditis and prosthetic valve endocarditis

### CLINICAL KNOWLEDGE

**General knowledge**

1. Cardiopulmonary resuscitation
2. Care of the cardiac surgical patient
3. Complications of surgery
4. Risk assessment and stratification
5. Management of cardiovascular risk factors
Specific Knowledge

3 Diagnosis investigation and assessment of valvular heart disease
3 Timing of surgical intervention in valve disease
3 Options for operative management including:
   Valve replacement/repair (mechanical, biological stented and stentless grafts, homografts and autografts)
3 Valve design: materials, configuration and biomechanics.
3 Results of surgery – survival, valve thrombosis, endocarditis, bleeding.
3 Interpretation of survival and follow up data
3 Cardiac performance and long term functional status
3 Surgery for conduction problems
3 Surgical treatment of arrhythmias

Clinical Skills
HISTORY AND EXAMINATION

4 Cardiovascular system and general history and examination including drug history, identification of co morbidity and risk assessment

DATA INTERPRETATION

4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
3 Chest radiograph
3 ECG interpretation including exercise ECG
3 Coronary angiography
3 Cardiac catheterisation data including left and right heart data
3 Echocardiography (thoracic and transoesophageal) including 2D, Doppler and stress echo
2 Nuclear cardiology

PATIENT MANAGEMENT

4 Cardiopulmonary resuscitation
3 Diagnosis and treatment of cardiac arrhythmias
3 Management of post cardiac surgical patient
3 Management of complications of surgery
3 Cardiac rehabilitation
3 Blood transfusion and blood products
2 Wound infection and sternal disruption
2 Non operative management of endocarditis
3 Valve selection
3 Anticoagulation management including complications.

Technical Skills
OPERATIVE MANAGEMENT

2 Isolated, uncomplicated aortic valve replacement (stented biological or mechanical)
2 Isolated uncomplicated mitral valve replacement
1 Tricuspid valve surgery
1 Combined valve and graft surgery
1 Surgical strategies for managing the small aortic root
1 Aortic root surgery including stentless valves, and root replacement
1 Redo Valve surgery
1 Valve surgery for endocarditis
2 Techniques for surgical ablation of arrhythmias
1 Mitral valve repair
1 Alternative surgical approaches to valve surgery including thoracotomy, transseptal approaches, and minimal access surgery

Professional Skills
Clinical decision making
Ability to communicate with patient and relatives
Understands consent process and can discuss risk /benefit with patient and relatives
Collaborates with colleagues and has good team skills
Demonstrates ability to prioritise and manage service
Demonstrates ability to access knowledge and to learn
Understands research methods and has ability to analyse scientific publications
Recognises own abilities and limitations
Time management and effective personal skills

Academic/research activities
## Aortovascular Disease

### Objective

To evaluate and manage uncomplicated surgical aspects of a patient with aortovascular disease, including operative management where appropriate and up to the defined competence. This module provides intermediate training in a complex subspeciality.

### Knowledge

**BASIC KNOWLEDGE**

**Physiology**

- Vascular biology and reactivity
- Haemodynamics; physiology and measurement
- Rheology and arterial pressure regulation
- Haemostasis, thrombosis and bleeding
- Physiology of transfusion therapy
- Principles of surgical infectious disease
- Acid base balance
- Metabolic response to trauma
- Pathophysiology and of hypothermia including the effects upon
  - haemoglobin, metabolic rate and pH with their management

**Anatomy**

- Heart, pericardium and great vessels
- Anatomy of the peripheral vascular system
- Blood supply of the spinal cord

**Pathology**

- Inflammation and wound healing
- Atheroma, medial necrosis and arthritis
- Inherited disorders of vascular biology
- Systemic Inflammatory Response Syndrome

**Pharmacology**

- Drugs used in the treatment of hypertension, heart failure and angina
- Anti-arrhythmic drugs
- Haemostatic drugs
- Antiplatelet, anticoagulant and thrombolytic drugs
- Anti-emetics
- Analgesics
- Antibiotics
- Anaesthetic agents, local and general

**Microbiology**

- Organisms involved in cardiorespiratory infection
- Organisms involved in wound infection
- Antibiotic usage and prophylaxis
- Antisepsis

**CLINICAL KNOWLEDGE**

**General**

- Risk assessment
### Clinical Skills

#### HISTORY AND EXAMINATION

4 Cardiovascular system and general history and examination including assessment of preoperative complications, drug history, identification of co-morbidity and risk assessment

#### DATA INTERPRETATION

4 Routine haematology and biochemical investigations

4 Interpretation of haemodynamic data

3 Chest radiograph

3 ECG including exercise ECG

3 Coronary Angiography

3 Aortography

3 Cardiac Catheterisation data

3 Echocardiography including 2D, doppler and TOE and stress echo

2 CT scanning

2 MRI scanning

#### PATIENT MANAGEMENT

4 Cardiopulmonary resuscitation

3 Diagnosis and treatment of cardiac arrhythmias

3 Management of post cardiac surgical patient

3 Management of complications of surgery

3 Cardiac rehabilitation
3 Blood transfusion and blood products

2 Wound infection and sternal disruption

**Technical Skills**

**OPERATIVE MANAGEMENT**

2 Intraoperative monitoring

1 Spinal cord protection

1 Preparation for and management of cardiopulmonary bypass, including alternative, non-bypass strategies for descending aortic surgery

1 Hypothermic strategies including HCA, RCP and SACP

3 Femoral cannulation

1 Surgery for acute dissection of the ascending aorta

1 Aortic root replacement for chronic aortic root disease

1 Complex aortic surgery including arch surgery, descending aortic and thoraco-abdominal aortic surgery

**Professional Skills**

Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk /benefit with the patient. Is able to obtain consent from patient

Collaborates with colleagues and has good team skills

Demonstrates ability to prioritise and manage service

Effective time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Recognises own abilities and limitations

Understands research methods and has ability to analyse scientific publications

Research/academic activities
## Cardiothoracic Trauma

### Objective

*To evaluate and manage, including surgical management where appropriate, and as part of a multidisciplinary team, a patient with thoracic trauma.*

### Knowledge

#### BASIC KNOWLEDGE

- Anatomy of the lungs, heart, chest wall, diaphragm and oesophagus
- Anatomy of the larynx, trachea and bronchial tree
- Physiology of breathing and its control
- Physiology of the heart and circulation

#### GENERAL TRAUMA MANAGEMENT

- Principles of trauma management (as defined by ATLS)
- Principles of emergency resuscitation following cardiac arrest

#### SPECIFIC KNOWLEDGE

- The mechanism and patterns of injury associated with blunt, penetrating, blast and deceleration injuries to the chest
- The post-ATLS, definitive care of blunt, penetrating and deceleration injuries to the chest.
- The indications and use of appropriate investigations in thoracic trauma management
- Pain relief in chest trauma, including epidural anaesthesia.
- Indications for immediate, urgent and delayed thoracotomy in trauma

### Clinical Skills

#### GENERAL TRAUMA MANAGEMENT (ATLS)

- Assessment and management of airway, breathing and circulation
- Maintenance of an adequate airway and respiratory support
- Protection of the cervical spine
- Circulatory resuscitation
- Establishment of appropriate monitoring
- Assessment and management of pain and anxiety

#### CARDIOTHORACIC TRAUMA MANAGEMENT

- Examination and assessment of the of the chest, including respiratory cardiovascular and circulatory systems
- Recognition and management of immediately life threatening situations: obstructed
airway, tension pneumothorax, massive haemothorax, open chest wound, flail chest and cardiac tamponade

3 Recognition and management of potentially life threatening situations: lung contusion, bronchial rupture, blunt cardiac injury, intrathoracic bleeding, oesophageal injury, simple pneumothorax and major vascular injury

3 Recognition of potentially life threatening penetrating injuries to the chest and abdomen

3 Interpretation of chest x-ray, ECG, arterial blood gases and echocardiography

3 Detection and treatment of cardiac arrhythmias

2 Management of the widened mediastinum including appropriate investigations and multidisciplinary consultation

**Technical Skills**

**PRACTICAL SKILLS**

4 Establish an emergency airway (surgical and non-surgical)

4 Insertion and management of thoracic drains

4 Establish adequate venous access and monitoring.

3 Pericardiocentesis and subxiphoid pericardial window for tamponade

**OPERATIVE MANAGEMENT OF THORACIC TRAUMA**

2 Subxiphoid pericardial window for tamponade

3 Postero-lateral, thoracotomy, antero lateral thoracotomy and thoraco-laparotomy

2 Bilateral Anterior Thoracotomy

3 Median sternotomy and closure

2 Repair of cardiac injuries

1 Repair of pulmonary and bronchial injuries

2 Management of the complications of chest trauma including retained haemothorax and empyema

1 Repair of oesophageal injuries

1 Repair of aortic transection

**Professional Skills**

Clinical decision making

Communication skills

Team skills; collaborates with other surgical disciplines and members of the multidisciplinary team.

Communicates with patient and relatives

Breaking bad news

Demonstrates ability to access knowledge and show willingness to learn
Recognises own abilities and limitations

Demonstrates ability to manage and prioritise service

Ability to understand research method and understand scientific publications
**General Management of a Patient Undergoing Thoracic Surgery**

**Objective**
*To be competent in the evaluation and management of a patient undergoing thoracic surgery including operative management, with appropriate supervision. The knowledge and clinical skills are common to all thoracic surgical conditions, and should be read in conjunction with the curriculum for specific surgical conditions.*

**Knowledge**

### BASIC KNOWLEDGE

**Physiology**
- Pulmonary physiology, ventilation and gas exchange
- Haemostasis, thrombosis and bleeding
- Acid base balance
- Metabolic response to trauma
- Digestive, renal and hepatic physiology
- Nutrition

**Anatomy**
- Tracheobronchial tree and lungs
- Thoracic inlet, neck and mediastinum
- Oesophagus and upper GI tract
- Chest wall and diaphragm

**Pathology**
- Inflammation and wound healing
- Bronchopulmonary infections
- ARDS
- Emphysema
- Pulmonary fibrosis
- Pulmonary manifestations of systemic disease
- Systemic manifestations of pulmonary disease
- Benign and malignant tumours of trachea, bronchus and lung parenchyma
- Oesophagitis, columnar-lined oesophagus stricture
- Oesophageal motility disorders
- Malignant and benign tumours of the oesophagus and stomach
- Malignant and benign tumours of the pleura and chest wall, mediastinum and thyroid

**Pharmacology**
- Bronchodilators
- H2 antagonists and proton pump inhibitors
- Haemostatic drugs
- Analgesics
- Antibiotics
- Anaesthetic agents, local and general

**Microbiology**
- Organisms involved in respiratory infection including TB
- Organisms involved in wound infection
- Antibiotic usage and prophylaxis
- Antiseptics
- Management of intra pleural sepsis
CLINICAL KNOWLEDGE

Thoracic Incisions

3 Types of incisions and appropriate use, including lateral, anterior, muscle sparing and video-assisted approaches.

Sternotomy

3 Difficult access and improving exposure.
3 Early and late complications of thoracic incisions
3 Analgesia including pharmacology, effectiveness, side effects and use in combination regimens
3 Post-operative analgesia, including epidural, PCAS and paravertebral catheter techniques.

Bronchoscopy

3 The role of rigid and flexible bronchoscopy in the investigation of airway and pulmonary disease.
3 The anaesthetic, airway and ventilatory management during rigid and flexible bronchoscopy

Mediastinal exploration

3 Endoscopic, radiological and surgical approaches used to evaluate and diagnose mediastinal disease of benign, infective, primary and malignant aetiology.
3 Equipment for mediastinal exploration
3 Relevant imaging techniques, and influence on surgical approach.

Clinical Skills

HISTORY AND EXAMINATION

4 System specific and general history and examination, including drug history, identification of comorbidity and functional status.

DATA INTERPRETATION

4 Routine haematology and biochemical investigations
3 Chest radiograph and ECG
2 CT, including contrast enhanced CT
2 Interpretation of imaging of the mediastinum.
2 MRI and PET
3 Respiratory function tests
2 Ventilation/perfusion scan
4 Blood gases
2 Oesophageal function tests and contrast studies
PATIENT MANAGEMENT

General

4 Cardiopulmonary resuscitation

3 Risk assessment, stratification and management

3 Management of patients making an uncomplicated or complicated recovery from thoracic operations.

3 Post-operative management of pain control, respiratory failure, sputum retention, haemodynamic instability and low urine output.

3 Treatment of cardiac arrhythmias

3 Pain control

2 Wound infection and disruption

3 Blood transfusion and blood products

2 Physiotherapy and rehabilitation

2 Palliative care

Technical Skills

PRACTICAL SKILLS

4 Arterial cannulation

4 Central venous cannulation

4 Pulmonary artery catheterisation

3 Tracheostomy

3 Fibreoptic bronchoscopy

4 Chest aspiration

4 Chest drain insertion

3 Chest drain management

OPERATIVE MANAGEMENT

Thoracic Incisions

3 Correct positioning of patient for thoracic surgery

3 Perform and repair thoracic incisions, including lateral, anterior, muscle sparing and VATS incisions.

2 Difficult access and improving exposure

3 Perform and close sternotomy incision

Bronchoscopy
3 Diagnostic bronchoscopy including biopsy - rigid and flexible.
3 Equipment, instrumentation and preparation
3 Perform rigid and flexible bronchoscopy
3 Airway and ventilatory management
3 Recognise normal and abnormal anatomy.
2 Identify common pathologies and the surgical relevance of the findings.
2 Take appropriate specimens for bacteriology, cytology and histology.
2 Management of moderate bleeding and other common complications.
3 To appropriately supervise the care of patients recovering from bronchoscopy.
2 Post-operative bronchoscopy: indications and procedure

2 Tracheostomy and minitracheostomy
1 Bronchoscopy in situations where there is unfavourable anatomy or complex pathology and to deal with complications.

Mediastinal Exploration
3 Assembly of relevant equipment for mediastinal exploration
2 Surgical evaluation of the mediastinum using cervical, anterior and VATS approaches.
2 Mediastinal biopsy

**Professional Skills**

Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk /benefit with the patient

Collaborates with colleagues and has good team skills

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Neoplasms of the Lung

Objective
To assess and manage a patient with a neoplasm of the lung, including operative management and with appropriate supervision. Appreciation of the multidisciplinary, multimodality approach to the management of the condition.

Knowledge
GENERAL KNOWLEDGE
As for thoracic surgery ? general

SPECIFIC KNOWLEDGE
3 Benign and malignant tumours of trachea, bronchus and lung parenchyma
3 Epidemiology, presentation, diagnosis, staging (pre-operative, intraoperative and pathological) and treatment of lung cancer and lung metastases.
3 Neoadjuvant and adjuvant treatment of lung cancer
3 Results of treating thoracic malignancy by surgery, medical or oncological techniques, including multimodality management.
3 Survival, recurrence rates and relapse patterns after surgical treatment and the investigation and management of relapse.
3 Knowledge of palliative care techniques.
3 Treatment of post-operative complications of pulmonary resection such as empyema and broncho-pleural fistula.
3 Role of repeat surgery in recurrent and second primary malignancies of the lung.
3 Medical and surgical options to deal with recurrent or problematic complications of pulmonary resection.

Clinical Skills
PATIENT MANAGEMENT
As for thoracic surgery ? general
4 Clinical history and examination
3 Interpretation of laboratory, physiological and imaging techniques.
2 Interpretation of endoscopic findings.
3 Patient selection with assessment of function and risk.

Technical Skills
OPERATIVE MANAGEMENT
2 Bronchosscopic assessment including biopsy
2 Endoscopic and surgical techniques of lung biopsy.
2 Mediastinal assessment and biopsy
2 Intraoperative diagnosis and staging
1 Endoscopic management of tumours using laser and stenting
2 Surgery for benign and malignant conditions of the lungs, including uncomplicated lobectomy for lung cancer, wedge resection and metastasectomy.
2 Segmentectomy and lobectomy for benign and malignant disease.
1 Redo operations for repeat resections of lung metastases.
1 Advanced resections for lung cancer, including sleeve lobectomy, pneumonectomy and extended resections involving chest wall and diaphragm.
1 Repeat resections for benign and malignant conditions of the lung, including completion pneumonectomy
1 Management of post-operative complications such as empyema and broncho-pleural fistula.

**Professional Skills**
Clinical decision-making.
Ability to communicate with patient and relatives.
Understands consent process and can discuss risk /benefit with the patient.
Collaborates with colleagues and has good team skills in multimodality care.
Demonstrates ability to access knowledge and shows willingness to learn.
Recognises own abilities and limitations.
Cancer and bereavement counselling.
Delivering bad news.
Understands research methods and has ability to analyse scientific publications

Research/academic activities
# Disorders of the Pleura

**Objective**

To evaluate and manage surgical conditions of the pleura and the pleural space, including operative management and with appropriate supervision.

**Knowledge**

**GENERAL KNOWLEDGE**

As for thoracic surgery – general

**SPECIFIC KNOWLEDGE**

3 Anatomy and physiology of the pleura

3 Inflammatory, infective and malignant disease of the visceral and parietal pleura.

3 Pneumothorax

3 Pleural effusion

3 Empyema

3 Mesothelioma

3 Haemothorax

3 Chylothorax

3 Conditions of adjacent organs that affect the pleura

3 Medical and surgical management of pleural disease, including radiological, open and VATS techniques.

3 Techniques to deal with failures of primary treatment.

3 Advanced techniques for pleural space obliteration such as thoracoplasty and soft-tissue transfer

**Clinical Skills**

**PATIENT MANAGEMENT**

As for thoracic surgery – general

3 Interpretation of imaging of the pleura

4 Chest drains: insertion, management, removal and treatment of complications.

3 Management of patients making uncomplicated and complicated recovery from pleural interventions.

**Technical Skills**

**OPERATIVE MANAGEMENT**

3 Open procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy

2 VATS procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy

1 Open and VATS procedures for empyema, including techniques for decortication.
1. Open and VATS procedures in complex cases.

2. Advanced techniques of pleural space obliteration.

**Professional Skills**

- Clinical decision-making.
- Ability to communicate with patient and relatives.
- Understands consent process and can discuss risk/benefit with the patient.
- Collaborates with colleagues and has good team skills.
- Recognises own abilities and limitations
- Time management and personal skills
- Demonstrates ability to access knowledge and shows willingness to learn
- Understands research methods and has ability to analyse scientific publications

**Research/academic activities**
## Disorders of the Chest Wall

**Objective**

To assess and manage a patient with abnormality or disease affecting the chest wall, including surgical management where appropriate and with appropriate supervision.

**Knowledge**

### GENERAL KNOWLEDGE

As for thoracic surgery ? general

### SPECIFIC KNOWLEDGE

3 Anatomy of the chest wall

3 Congenital, inflammatory, infective and neoplastic conditions that can affect the components of the chest wall.

3 Clinical, laboratory and imaging techniques used in the evaluation of chest wall pathology.

3 Techniques used in the diagnosis of chest wall disease, including aspiration and core biopsy, and incision and excision biopsy.

3 Pectus deformities: aetiology, physiological and psychological consequences. Surgical options for correction.

3 Techniques used to resect the sternum and chest wall, physiological and cosmetic sequelae.

3 Prosthetic materials used in chest wall surgery

3 The role of repeat surgery to deal with recurrent conditions and the complications of previous surgery.

3 Techniques of complex chest wall reconstruction involving thoracoplasty or soft-tissue reconstruction

**Clinical Skills**

### PATIENT MANAGEMENT

As for thoracic surgery ? general

4 Clinical history and examination

3 Interpretation of laboratory, physiological and imaging techniques.

3 Patient selection with assessment of function and risk.

**Technical Skills**

### OPERATIVE MANAGEMENT

3 Chest wall biopsy and choice of appropriate technique.
<table>
<thead>
<tr>
<th>Professional Skills</th>
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</thead>
<tbody>
<tr>
<td>Clinical decision-making.</td>
</tr>
<tr>
<td>Ability to communicate with patient and relatives.</td>
</tr>
<tr>
<td>Understands consent process and can discuss risk /benefit with the patient.</td>
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<tr>
<td>Collaborates with colleagues and has good team skills.</td>
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<tr>
<td>Demonstrates ability to access knowledge and shows willingness to learn.</td>
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<tr>
<td>Recognises own abilities and limitations.</td>
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<tr>
<td>Effective time management and personal skills</td>
</tr>
</tbody>
</table>
Disorders of the Diaphragm

Objective
To assess and manage a patient with disease or abnormality of the diaphragm, including surgical management where appropriate, and with appropriate supervision.

Knowledge
GENERAL KNOWLEDGE

As for thoracic surgery – general

SPECIFIC KNOWLEDGE
3 Anatomy and physiology of the diaphragm.
3 Pathology of the diaphragm.
3 Clinical, physiological and imaging techniques in the assessment of diaphragmatic abnormalities.
3 Physiological consequences of diaphragmatic herniation or paresis.
3 Surgical techniques used to biopsy and resect diaphragmatic tumours.
3 Situations in which replacement of the diaphragm is required, the materials used and their value and limitations.
3 Complications of diaphragmatic resection and their management.
3 Techniques used to electrically pace the diaphragm, and the conditions in which such treatment is appropriate.

Clinical Skills
PATIENT MANAGEMENT

As for thoracic surgery – general

Specific Skills
4 Clinical history and examination
3 Interpretation of laboratory, physiological and imaging techniques.
3 Patient selection with assessment of function and risk.
3 Management of patients making an uncomplicated or complicated recovery from diaphragmatic resection.

Technical Skills
OPERATIVE MANAGEMENT

1 Resection of the diaphragm, and adjacent structures, including appropriate selection and insertion of prosthetic materials
1 Complications of diaphragmatic resection.
1 Phrenic nerve pacing.

Professional Skills
Clinical decision-making.
Ability to communicate with patient and relatives.
Understands consent process and can discuss risk /benefit with the patient.
Collaborates with colleagues and has good team skills.
Recognises own abilities and limitations
Time management and personal skills
Demonstrates ability to access knowledge and shows willingness to learn
Understands research methods and has ability to analyse scientific publications

Research/academic activities
Emphysema and Bullae

Objective
To fully assess and manage a patient with emphysema and bullae, including surgical management where appropriate, and with appropriate supervision.

Knowledge
GENERAL KNOWLEDGE
As for thoracic surgery – general
SPECIFIC KNOWLEDGE
3 Aetiology, pathology and physiology of chronic obstructive airways disease (COPD)
3 Epidemiology and public health issues
3 Smoking cessation measures.
3 Clinical, laboratory, physiological and imaging techniques.
3 Medical and surgical management of COPD and its complications
3 Selection criteria and pre-operative preparation
3 Surgical techniques used in the treatment of emphysema and bullae and the results of surgical treatment including relevant clinical trials.
3 Lung volume reduction surgery: techniques, complications and management of complications.
3 Experimental and developmental techniques in lung volume reduction surgery

Clinical Skills
PATIENT MANAGEMENT
As for thoracic surgery – general
4 Clinical history and examination
3 Interpretation of laboratory, physiological and imaging techniques.
3 Patient selection with assessment of function and risk.
3 Postoperative management of patients making an uncomplicated recovery from surgery for emphysema or the complications of such diseases.
3 Management of patients following lung volume reduction surgery.

Technical Skills
OPERATIVE MANAGEMENT
2 Procedures to deal with secondary pneumothorax and bullae by open techniques.
2 Procedures to deal with secondary pneumothorax and bullae by VATS techniques.
1 Lung volume reduction surgery, unilaterally and bilaterally, using open and VATS techniques.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk/benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills

Understands research methods and has ability to analyse scientific publications

**Research/academic activities**
## Disorders of the Pericardium

### Objective
To fully assess and manage a patient with disease of the pericardium or pericardial space, including surgical management where appropriate, and with appropriate supervision.

### Knowledge

**GENERAL KNOWLEDGE**

As for thoracic surgery – general

**SPECIFIC KNOWLEDGE**

3 Anatomy of the pericardium.

3 Pathology of the pericardium.

3 Pathophysiological consequences of pericardial constriction and tamponade.

3 Clinical, echocardiographic and imaging techniques used to detect pericardial disease and assess its consequences.

3 Techniques for pericardial drainage using guided needle aspiration

3 Surgical drainage by sub-xiphoid, thoracotomy or VATS approaches.

3 Surgical techniques for pericardiectomy.

3 Materials used for pericardial replacement, their value and limitations and the situations in which used.

3 Post-operative complications following resection of the pericardium and its prosthetic replacement.

### Clinical Skills

**PATIENT MANAGEMENT**

As for thoracic surgery – general

4 Clinical history and examination

3 Interpretation of laboratory, physiological and imaging techniques, including echocardiography.

3 Recognition and assessment of pericardial tamponade and constriction.

3 Techniques for pericardial drainage using guided needle aspiration

3 Recognition of pericardial herniation and cardiac strangulation.

3 Patient selection with assessment of function and risk.

3 Management of patients making an uncomplicated or complicated recovery from pericardial surgery.

### Technical Skills
OPERATIVE MANAGEMENT

3 Uncomplicated pericardial fenestration procedures

2 Pericardial fenestration in complex cases.

2 Pericardiectomy for relief of constriction

2 Resection of the pericardium and replacement, in appropriate situations, with prosthetic materials.

1 Competence in dealing with the complications of pericardial resection and replacement.

Professional Skills

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk/benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills.

Understands research methods and has ability to analyse scientific publications.

Research/academic activities
### Disorders of the Mediastinum

<table>
<thead>
<tr>
<th><strong>Disorders of the Mediastinum</strong></th>
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<tbody>
<tr>
<td><strong>Objective</strong></td>
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<tr>
<td>To fully assess and manage a patient with benign and malignant disease of the mediastinum, including surgical management where appropriate, and with appropriate supervision.</td>
</tr>
<tr>
<td><strong>Knowledge</strong></td>
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<tr>
<td>GENERAL KNOWLEDGE</td>
</tr>
<tr>
<td>As for thoracic surgery – general</td>
</tr>
<tr>
<td>SPECIFIC KNOWLEDGE</td>
</tr>
<tr>
<td>3 Anatomy of the mediastinum</td>
</tr>
<tr>
<td>3 Congenital, benign, infective and malignant (primary and secondary) conditions of the mediastinum.</td>
</tr>
<tr>
<td>3 Systemic conditions associated with the mediastinum.</td>
</tr>
<tr>
<td>3 Clinical, laboratory, electromyographic and imaging techniques used in the diagnosis and assessment of patients with mediastinal disease</td>
</tr>
<tr>
<td>3 Myasthenia gravis: medical, surgical and perioperative management</td>
</tr>
<tr>
<td>3 Staging of thymoma and grading of myasthenia</td>
</tr>
<tr>
<td>3 Benign and malignant conditions, which do not require surgical biopsy or resection.</td>
</tr>
<tr>
<td>3 Oncological treatment of malignant diseases of the mediastinum, including multidisciplinary care.</td>
</tr>
<tr>
<td>3 Surgical techniques for the treatment of myasthenia gravis, mediastinal cysts and tumours, complications and results.</td>
</tr>
<tr>
<td>3 Retrosternal goitre and its management</td>
</tr>
<tr>
<td><strong>Clinical Skills</strong></td>
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<tr>
<td>PATIENT MANAGEMENT</td>
</tr>
<tr>
<td>As for thoracic surgery – general</td>
</tr>
<tr>
<td>4 Clinical history and examination</td>
</tr>
<tr>
<td>3 Interpretation of laboratory, physiological and imaging techniques.</td>
</tr>
<tr>
<td>3 Patient selection with assessment of function and risk.</td>
</tr>
<tr>
<td>3 Postoperative management of patients including recognition and management of postoperative complications .</td>
</tr>
<tr>
<td><strong>Technical Skills</strong></td>
</tr>
<tr>
<td>OPERATIVE MANAGEMENT</td>
</tr>
<tr>
<td>3 Selection of appropriate routes for biopsy and excision of mediastinal tumours and cysts.</td>
</tr>
</tbody>
</table>
3 Biopsy of mediastinal masses.

2 Excision of the thymus for myasthenia gravis.

2 Resection of mediastinal cysts and tumours masses.

1 Resection of mediastinal cysts and tumours, including extended resections involving adjacent structures.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills.

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
**Disorders of the Airway**

<table>
<thead>
<tr>
<th>Disorders of the Airway</th>
<th>Objective</th>
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<tbody>
<tr>
<td><strong>Objective</strong></td>
<td><em>To assess and manage a patient with disease of the major airways, including surgical management where appropriate, and with appropriate supervision.</em></td>
</tr>
</tbody>
</table>

**Knowledge**

**GENERAL KNOWLEDGE**

As for thoracic surgery – general

**SPECIFIC KNOWLEDGE**

3 Anatomy of the larynx, trachea and bronchus.

3 Physiology of the normal airway.

3 Pathophysiology of disease and its effects on lung function.

3 Endoscopic appearances in health and disease.

3 Congenital, inflammatory, infective, benign and neoplastic diseases of the airways.

3 Symptoms, signs of airway disease.

3 Clinical, physiological and imaging tests undertaken to diagnose and assess airway disease.

3 Techniques for surgical resection of the trachea.

3 Bronchoplastic procedures and the limitations of these techniques.

3 Medical and oncological treatments available to deal with airway diseases.

3 Endoscopic techniques used to deal with benign and malignant conditions, including disobliteration and stenting.

3 Presentation, investigation and management of anastamotic complications following airway surgery.

3 Presentation, evaluation and treatment of fistulae in the aerodigestive tract, due to benign, malignant and iatrogenic causes.

3 Role of open and endoscopic procedures in dealing with problems.

**Clinical Skills**

**PATIENT MANAGEMENT**

As for thoracic surgery – general

4 Clinical history and examination

3 Interpretation of laboratory, physiological and imaging techniques.

3 Recognition, diagnosis and assessment of airway obstruction.

3 Patient selection with assessment of function and risk.
Post-operative care of patients making an uncomplicated recovery from major airway surgery.

Post-operative care of patients making a complicated recovery from airway surgery.

**Technical Skills**

**OPERATIVE MANAGEMENT**

2 Endoscopic assessment of a patient with airways disease

1 Sleeve resection of the trachea for simple benign conditions, including appropriate anastamotic techniques.

1 Sleeve resection of the main bronchi, including lobectomy where appropriate, for malignant disease, including appropriate anastamotic techniques.

1 Techniques for the relief of major airways obstruction including stenting.

1 Airway resection for tumours and complex benign conditions, and techniques for airway reconstruction, anastamosis and laryngeal release.

1 Repeat resections for recurrence and the complications of prior resection.

1 Management of fistulae in the aerodigestive tract by surgical and endoscopic techniques.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk/benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills

Understands research methods and has ability to analyse scientific publications

Research/academic activities
## Congenital Heart Disease

### Objective

To understand and gain experience in some of the aspects of children and adults with heart disease, including operative management where appropriate. This module is intended for a trainee to gain initial exposure to this subspecialty either as part of general cardiothoracic training or as an introduction to further advanced training in this area.

### Knowledge

**BASIC KNOWLEDGE**

**Physiology**

- 2 Relevant general physiology of childhood
- 2 Fetal circulation and circulatory changes at birth
- 2 Haemodynamics; physiology and measurement including shunt calculations
- 2 Physiology of pulmonary vasculature
- 2 Myocardial cellular physiology in immature myocardium
- 3 Electrophysiology, including conduction disorders
- 3 Haemostasis, thrombosis and bleeding
- 3 Acid base balance
- 3 Pulmonary physiology, ventilation and gas exchange
- 3 Metabolic response to trauma
- 3 Vascular biology and reactivity
- 3 Physiology of Cardiopulmonary Bypass including low flow and circulatory arrest.
- 3 Ph and alpha stat CPB management

**Anatomy**

- 2 Embryology of the heart
- 3 Anatomy of the heart, pericardium and great vessels
- 3 Pulmonary anatomy
- 3 Coronary anatomy and variants
- 3 Anatomy of the peripheral vascular system and vascular conduits including aortopulmonary shunts
- 2 Sequential cardiac analysis and terminology of cardiac malformations

**Pathology**

- 3 Inflammation and wound healing
- 3 Systemic Inflammatory Response Syndrome
| 3 Effect of growth and pregnancy |
| Pharmacology |
| 2 Drugs used in the treatment of congenital heart disease |
| 3 Inotropes |
| 3 Anti-arrhythmic drugs |
| 3 Haemostatic drugs |
| 3 Antiplatelet, anticoagulant and thrombolytic drugs |
| 3 Analgesics |
| 3 Antibiotics |
| 3 Anaesthetic agents, local and general |
| 3 Hypotensive agents (systemic and pulmonary). |
| Microbiology |
| 3 Organisms involved in cardiorespiratory infection |
| 3 Organisms involved in wound infection |
| 3 Antibiotic usage and prophylaxis |
| 3 Antisepsis |
| CLINICAL KNOWLEDGE |
| General |
| 2 Diagnosis, investigation and treatment of congenital heart disease |
| 2 Results of surgery ? survival, common complications and management. |
| 2 Late complications of surgery for congenital heart disease |
| 2 Role of interventional cardiology. |
| 2 Role of mechanical assist (IABP, VAD and ECMO) |
| 2 Indications for referral for transplantation |
| 2 Risk assessment and stratification |
| 3 Cardiopulmonary resuscitation |
| 3 Cardiac arrhythmias |
| 3 Renal dysfunction |
| 3 Multiorgan failure |
| 2 Cardiac rehabilitation |
| 3 Blood transfusion and blood products |
3 Wound infection and sternal disruption

3 Types of cardiac prosthesis and indications for use

Specific Knowledge

The anatomy, pathophysiology natural history and management of the following conditions or procedures
3 Patent ductus arteriosus
3 Atrial septal defect
3 Ventricular septal defect
3 Coarctation
3 PA banding and shunts
2 Transposition of the great arteries ? switch procedure
2 Tetralogy of Fallot/Pulmonary atresia plus VSD
2 Fontan procedure
1 Rastelli procedure
1 Hypoplastic left heart
1 Norwood procedure
1 Truncus arteriosus
1 Double outlet right ventricle
1 Pulmonary atresia plus VSD and MAPCAs
1 Pulmonary atresia and intact septum
2 Single ventricle
2 Partial and complete atroventricular septal defects
2 Aortic valve disease including Ross procedure
2 Mitral valve disease
2 Tricuspid valve disease including Ebsteins abnormality
2 Extra cardiac conduits
1 Interrupted aortic arch
2 Total anomalous pulmonary venous drainage
2 Extra Corporeal Membrane Oxygenation
2 Transplantation

Clinical Skills

HISTORY AND EXAMINATION

2 Cardiovascular system and general history and examination of child or adult with congenital heart disease

DATA INTERPRETATION

3 Routine haematology and biochemical investigations
3 Chest radiograph and ECG

2 Cardiac catheterisation data including interpretation of haemodynamic data, shunt and resistance calculations

2 Echocardiography in congenital heart disease, including 2D, doppler and TOE

PATIENT MANAGEMENT

2 Principles of paediatric intensive care
2 Management of adults and children following congenital heart surgery
2 Management of complications of surgery
3 Cardiopulmonary resuscitation

3 Diagnosis and treatment of cardiac arrhythmias
3 Blood transfusion and blood products

3 Wound infection and sternal disruption

**Technical Skills**

OPERATIVE MANAGEMENT

2 Sternotomy - open and close

2 Thoracotomy - open and close

2 Preparation for and management of cardiopulmonary bypass including partial bypass

1 Approaches for ECMO, cannulation and management.

Surgical management of the following common uncomplicated conditions:
(level 1 - a higher level of operative competence is not required during this module)

- Patent ductus arteriosus
- Atrial septal defect
- Ventricular septal defect
- Coarctation
- PA banding and shunts

**Professional Skills**

Clinical decision making

Ability to communicate with patient, parents and relatives

Understands consent process for children and can discuss risk /benefit with the patient or the parents

Collaborates with colleagues and has good team skills

Demonstrates ability to prioritise and manage service

Effective time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Recognises own abilities and limitations

Understands research methods and has ability to analyse scientific publications

Research/ academic activities

Recognition and application of child protection and handling issues and relevant legislation
Intrathoracic transplantation and surgery for heart failure

### Objective

To be able to evaluate and manage, with appropriate supervision, some of the aspects of patients with heart failure, including operative management where appropriate. This module is intended for a trainee to gain initial exposure to this subspeciality either as part of general cardiothoracic training or as an introduction to further advanced training in this area.

### Knowledge

**BASIC KNOWLEDGE**

**Pathophysiology**

3 Haemodynamics of heart failure.

3 Molecular mechanisms underlying heart failure.

3 Haemodynamics of cardiac constriction.

3 Mechanisms and outcomes of respiratory failure.

3 Causes of cardiac failure.

3 Causes of respiratory failure.

**Immunology**

3 Major and minor histocompatibility antigen systems.

3 Mechanisms of immune activation and pathological consequences for transplanted organs.

**Pharmacology**

3 Modes of action of commonly used drugs in heart failure:

**CLINICAL KNOWLEDGE**

4 Resynchronisation therapy: techniques and indications

4 Indications for, contraindications to and assessment for heart transplantation.

4 Indications for, contraindications to and assessment for lung and heart/lung transplantation.

4 Criteria for brain stem death, management of the brain-dead donor, criteria for matching donor and recipient.

4 Management of patients after intrathoracic organ transplantation, including complications

4 Results of heart transplantation, lung transplantation and non-transplant interventions for heart failure.

**Clinical Skills**

**HISTORY AND EXAMINATION**

4 Cardiovascular system and general history and examination including conduit, drug
history, identification of comorbidity and risk assessment

DATA INTERPRETATION
4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
4 Chest radiograph
4 ECG including exercise ECG
4 Coronary angiography
4 Cardiac catheterisation data
3 Echocardiography including 2D, Doppler and TOE and stress echo
3 Nuclear cardiology

PATIENT MANAGEMENT
4 Cardiopulmonary resuscitation
3 Management of brain-dead donor
4 Diagnosis and treatment of cardiac arrhythmias
3 4 Management of post cardiac surgical patient
3 Management of complications of surgery
3 Cardiac rehabilitation
4 Blood transfusion and blood products
3 Wound infection and sternal disruption

Technical Skills
OPERATIVE MANAGEMENT

Transplantation
2 Donor Retrieval
1 Implantation of heart
1 Implantation of lung and heart/lung
Surgery for heart failure
2 Surgical revascularisation for ischaemic cardiomyopathy
1 Ventricular reverse remodelling surgery
1 Mitral valve repair for cardiac failure
1 Implantation of extracorporeal VAD
1 Implantation of intracorporeal VAD

Professional Skills
Clinical decision making
Ability to communicate with patient and relatives, including breaking bad news
Understands consent process and can discuss risk /benefit with the patient
Collaborates with colleagues and has good team skills
Demonstrates ability to prioritise and manage service
Effective time management and personal skills
Demonstrates ability to access knowledge and shows willingness to learn
Recognises own abilities and limitations
Understands research methods and has ability to analyse scientific publications
Research/academic activities
### Disorders of the Oesophagus

#### Management of Benign Oesophageal Disorders

**Objective**

To evaluate and manage surgical aspects of benign oesophageal disorders. This module is intended for a trainee to gain initial exposure to this subspeciality either as part of general cardiothoracic training or as an introduction to further advanced training in this area.

**Knowledge**

**BASIC KNOWLEDGE**

**Physiology**

3. Gastric and oesophageal cellular physiology
3. Mechanical and cellular defence mechanisms in oesophagus
3. Oesophageal mucosal injury and modulation
3. Effects of acid pepsin and biliary reflux
3. Oesophago-gastric physiology and assessment including pH monitoring
3. Oesophageal motility measurement in achalasia, diffuse spasm and non-specific motility syndromes

**Anatomy**

3. Embryology of the foregut.
3. The oesophagus and its anatomical relationships from cricopharyngeus to cardia, including details of blood supply and lymphatic drainage.
3. Anatomy of the stomach, including its anatomical relationships, blood supply and lymphatic drainage.
3. Anatomy of the colon, including its anatomical relationships, blood supply and lymphatic drainage.

**Pathology**

3. Inflammation and wound healing.
3. The inflammation, metaplasia, dysplasia cancer sequence.
3. Neurological deficits / aetiology of oesophageal dysmotility disorders.
3. Para-oesophageal hernias

**Pharmacology**

3. Drugs used in the treatment of gastro-oesophageal reflux disorder and oesophageal dysmotility.

**Microbiology**

3. The role of Helicobacter Pylori in gastritis and gastrooesophageal reflux disorder.
3 The rationale of bacterial eradication treatment

CLINICAL KNOWLEDGE

4 Diagnosis, investigation and treatment of benign oesophageal disorders.
4 Radiology, endoscopy, 24 hour pH monitoring and oesophageal function tests.
4 Risk assessment and stratification.
4 Open, laparoscopic and thoracoscopic surgery of the oesophagus.
4 Relative merits of conservative and operative treatment.
4 Alternative management of achalasia including dilatation and botox injection.
4 The indications for surgery in paraoesophageal hernia.

Clinical Skills

HISTORY AND EXAMINATION

4 General and specific history and examination including previous surgery, drug history, identification of comorbidity and risk assessment

DATA INTERPRETATION

4 Routine haematology and biochemical investigation
3 Interpretation of oesophageal motility and pH monitoring data
4 Chest radiograph and contrast imaging
4 Cardio-pulmonary assessment including exercise tests

PATIENT MANAGEMENT

3 Management of post thoracotomy or laparotomy surgical patient
3 Management of complications of surgery
3 Diagnosis and management of oesophageal perforation or anastomotic leak.
4 Blood transfusion and blood products
3 Wound infection and wound disruption

Technical Skills

OPERATIVE MANAGEMENT

2 Oesophago-gastro-duodenoscopy.
2 Rigid oesophagoscopy
2 Oesophageal dilatation
2 Open and laparoscopic fundoplication and cardiomyotomy
2 Mobilisation of oesophagus, stomach and colon
1 Oesophageal anastomosis

**Professional Skills**
Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk /benefit with the patient. Is able to obtain consent from patient

Collaborates with colleagues and has good team skills

Takes full part in multidisciplinary team meetings

Demonstrates ability to prioritise and manage service

Effective time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Recognises own abilities and limitations

Research/academic activities

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**Management of Oesophageal Neoplasia**

**Objective**
To evaluate and manage aspects of a patient with oesophageal neoplasia, including operative intervention where appropriate. This module is intended for a trainee to gain initial exposure to this subspeciality either as part of general cardiothoracic training or as an introduction to further advanced training in this area.

**Knowledge**

**BASIC KNOWLEDGE**

Physiology

3 Gastric and oesophageal cellular physiology

3 Mechanical and cellular defence mechanisms in oesophagus

3 Oesophageal mucosal injury and modulation

3 Effects of acid pepsin and biliary reflux

Anatomy

3 The oesophagus and its anatomical relationships from cricopharyngeus to cardia including details of blood supply and lymphatic drainage.

3 Anatomy of the stomach, including its anatomical relationships, blood supply and lymphatic drainage.

3 Anatomy of the colon, including its blood supply and its anatomical relationships

3 Pathology

3 Inflammation and wound healing.
3 Oesophageal injury response and variations in response.
3 The aetiology and epidemiology of oesophageal cancer
3 Metaplasia-dysplasia sequence.

Pharmacology
3 Adjuvant and neoadjuvant chemotherapy.

Microbiology
3 The role of Helicobacter Pylori in gastritis and gastroesophageal reflux disorder.
3 The rationale of bacterial eradication treatment

CLINICAL KNOWLEDGE
4 Diagnosis, investigation and treatment of oesophageal disorders.
4 Radiology, endoscopy and oesophageal function tests.
4 Risk assessment and stratification.
4 Diagnostic tests, including contrast oesophageal imaging, CT Scanning, abdominal ultrasonography, endoscopic ultrasonography and PET scanning.
4 Treatment options and outcomes of treatment
4 Oesophageal resection
4 Palliative procedures
4 Other therapies including radiotherapy, laser, stent and photodynamic therapy
4 Screening and prevention.

Clinical Skills

HISTORY AND EXAMINATION
4 General and specific history and examination including previous surgery, drug history, and identification of comorbidity and risk assessment.

DATA INTERPRETATION
4 Routine haematology and biochemical investigations
3 Interpretation of Chest radiograph, contrast swallow and CT Scan
4 Cardio-pulmonary assessment including exercise tests.

PATIENT MANAGEMENT
3 Management of post thoracotomy or laparotomy surgical patient.
3 Management of complications of surgery
4 Blood transfusion and blood products
3 Wound infection and wound disruption
2 Diagnosis and management of oesophageal perforation or anastomotic leak.
<table>
<thead>
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<td>2. Oesophago-gastro-duodenoscopy</td>
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<td>2. Assessment by thoracoscopy laparoscopy and mediastinoscopy</td>
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<td>2. Rigid oesophagoscopy and bronchoscopy</td>
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<td>2. Oesophageal dilatation and stent placement</td>
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<td>2. Mobilisation of oesophagus, stomach and colon</td>
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<tr>
<td>1. Oesophageal resection</td>
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<td>1. Oesophageal reconstruction including interposition techniques</td>
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<td>Research/academic activities</td>
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5. Intermediate (II) Stage

Four point scales

What the 4 point scale means for Knowledge

1. Knows of
2. Knows basic concepts
3. Knows generally
4. Knows both specifically and broadly

What the 4 point scales means for Clinical Skills and Technical Skills and Procedures

5. Has observed
6. Can do with assistance
7. Can do whole but may need assistance
8. Competent to do whole without assistance, including managing complications
5.1 Overview

Intermediate (II) Phase of training (ST5 & ST6)

The intermediate (II) phase of training will consist of an indicative period of two years. These two years should in turn consist of four modules, each of 6 months. By the end of this phase trainees will be expected to have completed at least one year in cardiac surgery and one year in thoracic surgery.

Whilst the emphasis remains on gaining experience and competence in the generality of cardiothoracic surgery, trainees may be starting to develop subspecialty interests and undertaking modules relevant to this.

The curriculum for each of the modules is defined (see syllabus). Aims and levels of competence to be attained within each module by the end of this stage are identified.

Intermediate (II) modules:

- Critical Care and Postoperative Management
- Cardiopulmonary Bypass
- Myocardial Protection
- Circulatory Support
- Ischaemic Heart Disease
- Heart Valve Disease
- Aortovascular Disease
- Cardiothoracic Trauma
- General Management of a Patient Undergoing Thoracic Surgery
- Neoplasms of the Lung
- Disorders of the Pleura
- Disorders of the Chest Wall
- Disorders of the Diaphragm
- Emphysema and Bullae
- Disorders of the Pericardium
- Disorders of the Mediastinum
- Disorders of the Airway
- Congenital Heart Disease
- Intrathoracic transplantation and surgery for heart failure
- Management of Benign Oesophageal Disorders
- Management of Oesophageal Neoplasia
5.2 Conditions

Critical Care and Postoperative Management

<table>
<thead>
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<tr>
<td>To be able to manage a post surgical patient on the critical care, high dependency and post operative wards. To work as part of a multiprofessional, multidisciplinary team in the management of a patient requiring complex critical care</td>
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Knowledge

BASIC KNOWLEDGE

Physiology

- Haemodynamics: physiology and measurement
- Cardiac arrhythmia
- Haemostasis, thrombosis and bleeding
- Acid base balance
- Pulmonary physiology, ventilation and gas exchange
- Metabolic response to trauma and surgery
- GIT, renal and hepatic physiology
- Nutrition
- Temperature regulation

Anatomy

- Heart, pericardium and great vessels
- Mediastinum, thoracic inlet and neck
- Tracheobronchial tree and lungs
- Chest wall and diaphragm

Pathology

- Inflammation and wound healing
- Myocardial infarction and complications
- Endocarditis
- Pericarditis
- Systemic Inflammatory Response Syndrome
- Bronchopulmonary infection
- ARDS

Pharmacology
4 Drugs used in the treatment of hypertension, heart failure and angina
4 Inotropes, vasodilators and vasoconstrictors
4 Anti-arrhythmic drugs
4 Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general
Microbiology
4 Organisms involved in cardiorespiratory infection
4 Antimicrobial treatment and policies

CLINICAL KNOWLEDGE

4 Cardiopulmonary resuscitation
4 Management of cardiac surgical patient
4 Management of thoracic surgical patient
4 Treatment of cardiac arrhythmia
4 Management of complications of surgery
4 Blood transfusion and blood products
4 Wound infection and sternal disruption
4 Neuropsychological consequences of surgery and critical care

Clinical Skills

HISTORY AND EXAMINATION

4 History and examination of the postoperative and critically ill patient

DATA INTERPRETATION

4 Analysis and interpretation of post operative and critical care charts and documentation
4 Routine haematology and biochemical investigations
4 Chest radiograph and ECG
3 Echocardiography including TOE

PATIENT MANAGEMENT

General management of surgical patient
4 Management of fluid balance and circulating volume
4 Pain control
4 Wound management
4 Management of surgical drains
4 Antimicrobial policy and prescribing
4 Management of postoperative haemorrhage
4 Cardiopulmonary resuscitation (ALS)
4 Management of complications of surgery
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Recognition, evaluation and treatment of haemodynamic abnormalities

4 Evaluation and interpretation of haemodynamic data
4 Practical use of inotropes and vasoactive drugs
4 Use of intra aortic balloon pump

Recognition, evaluation and treatment of cardiac arrhythmias
4 Interpretation of ECG
4 Use of anti-arrhythmic drugs
4 Use of defibrillator
4 Understanding and use of cardiac pacing

Recognition, evaluation and treatment of ventilatory abnormalities
4 Interpretation of blood gas results
4 Airway management
3 Understanding of ventilatory techniques and methods
3 Understanding of anaesthetic drugs and methods

Recognition, evaluation and treatment of multiorgan dysfunction
3 Renal dysfunction and support
3 GIT dysfunction, feeding and nutrition
3 Recognition and evaluation of cerebral and neuropsychological problems
**Technical Skills**

**PRACTICAL SKILLS**

4 Arterial cannulation
4 Central venous cannulation
4 Pulmonary artery catheterisation
4 Intra aortic balloon pump insertion
4 Intra aortic balloon pump timing and management
4 Tracheostomy
4 Fibreoptic bronchoscopy
4 Chest aspiration
4 Chest drain insertion
4 Chest drain management

**OPERATIVE MANAGEMENT**

4 Surgical re-exploration for bleeding or tamponade

**Professional Skills**

**Clinical decision making**

Understands patients needs in critical care and postoperative environment

Communicates with patient and relatives effectively and sympathetically

Team skills: collaborates with intensivists, nurses and other colleagues.

Recognises own abilities and limitations

Demonstrates ability to prioritise and manage service

**Time management and personal skills**

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support

Cardiopulmonary Bypass

**Objective**

To manage the clinical and technical aspects of cardiopulmonary bypass. During this module competence in the management of uncomplicated situations is obtained. Management of complex or difficult situations may require further training and supervision.

**Knowledge**

BASIC KNOWLEDGE

**Physiology**

4 Haemodynamics: physiology and measurement
4 Cardiac arrhythmias
4 Haemostasis, thrombosis and bleeding
4 Acid base balance
4 Pulmonary physiology, ventilation and gas exchange
4 Metabolic response to trauma and surgery
4 GIT, renal and hepatic physiology
4 Temperature regulation

**Anatomy**

4 Heart, pericardium and great vessels
4 Mediastinum, thoracic inlet and neck
4 Chest wall and diaphragm
4 Femoral triangle and peripheral vascular system

**Pathology**

4 Inflammation and wound healing
4 Systemic Inflammatory Response Syndrome
4 ARDS

**Pharmacology**

4 Drugs used in the treatment of hypertension, heart failure and angina
4 Inotropes, vasodilators and vasoconstrictors
4 Anti-arrhythmic drugs
4 Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general
Microbiology
4 Organisms involved in cardiorespiratory infection

4 Antimicrobial treatment and policies

SPECIFIC KNOWLEDGE
4 Principles and practice of CPB
4 Relevant equipment and technology and its application
4 Monitoring during CPB
4 Inflammatory and pathophysiological response to bypass
4 Pulsatile and non pulsatile flow
4 Effect of CPB on pharmacokinetics
4 Priming fluids and haemodilution
4 Acid base balance – pH and alpha stat
4 Neuropsychological consequences of CPB

4 Cell salvage and blood conservation

Clinical Skills
No content

Technical Skills
OPERATIVE MANAGEMENT

4 Median sternotomy open and close

4 Cannulation and institution of cardiopulmonary bypass

4 Safe conduct of CPB – problem solving and troubleshooting

4 Weaning from bypass and decannulation

4 Femoral cannulation and decannulation

3 Repeat sternotomy, with pericardial dissection, cardiac mobilisation and cannulation

Professional Skills
Clinical decision making

Team skills: collaborates with perfusionists, anaesthetists and other colleagues.

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to prioritise and manage service

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
**Myocardial Protection**

**Objective**
To manage the clinical and technical aspects of intraoperative myocardial protection. Competence in the management of routine situations will be obtained in this module. Management of complex or difficult situations will require further training and supervision.

**Knowledge**

**BASIC KNOWLEDGE**

4 Myocardial cellular physiology
4 Myocardial function and dysfunction
4 Haemodynamics and arrhythmias
4 Coronary arterial and venous anatomy

**SPECIFIC KNOWLEDGE**

4 Scientific foundations of myocardial preservation
4 Principles and practice of myocardial preservation
4 Cardioplegia solutions and delivery modes.
4 Non-cardioplegic techniques of preservation

**Clinical Skills**

**PATIENT MANAGEMENT**

4 Myocardial management throughout the perioperative period
3 Ability to adapt preservation technique to clinical situation

**Technical Skills**

**OPERATIVE MANAGEMENT**

3 Relevant cannulation techniques and appropriate delivery of cardioplegia

**Professional Skills**

Clinical decision making
Recognises own abilities and limitations
Time management and personal skills
Demonstrates ability to access knowledge and shows willingness to learn
Understands research methods and has ability to analyse scientific publications

Research/academic activities
## Circulatory Support

### Objective

To manage the clinical and technical aspects of cardiopulmonary bypass, myocardial protection and circulatory support. Competence in the management of routine situations will be obtained in this module. Management of complex or difficult situations will require further training and supervision.

### Knowledge

**BASIC KNOWLEDGE**

4 Haemodynamics: physiology and measurement
4 Cardiac arrhythmias
4 Haemostasis, thrombosis and bleeding
4 Anatomy of the femoral triangle and peripheral vascular system
4 Inotropes, vasodilators and vasoconstrictors
4 Anti-arrhythmic drugs
4 Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs

**SPECIFIC KNOWLEDGE**

4 Mechanical circulatory support in the preoperative, perioperative and postoperative periods
4 Intra aortic balloon pump: indications for use, patient selection and complications
4 Physiology of the balloon pump
3 Understanding of relevant equipment and technology
3 Ventricular assist devices: indications for use, patient selection and complications

### Clinical Skills

**PATIENT MANAGEMENT**

4 Patient selection for mechanical circulatory support
4 Insertion and positioning of the intra aortic balloon pump
4 Management of the balloon pump including timing and trouble shooting
4 Care of the patient with intra aortic balloon pump, including recognition and management of complications

### Technical Skills

No content

### Professional Skills

Clinical decision making

Team skills: collaborates with perfusionists, anaesthetists and other colleagues.

Recognises own abilities and limitations

Demonstrates ability to prioritise and manage service

Time management and personal skills
Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
# Ischaemic Heart Disease

**Objective**

To evaluate and manage the surgical aspects of a patient with ischaemic heart disease including the complications of ischaemic heart disease. Competence in the management of routine and uncomplicated situations will obtained in this module. Management of complex or difficult situations will require further training or supervision.

**Knowledge**

**BASIC KNOWLEDGE**

**Physiology**
- 4 Myocardial cellular physiology
- 4 Haemodynamics; physiology and measurement
- 4 Electrophysiology, including conduction disorders
- 4 Haemostasis, thrombosis and bleeding
- 4 Acid base balance
- 4 Pulmonary physiology, ventilation and gas exchange
- 4 Metabolic response to trauma
- 4 Vascular biology and reactivity

**Anatomy**
- 4 Heart, pericardium and great vessels
- 4 Coronary anatomy and variants
- 4 Coronary angiography
- 4 Anatomy of the peripheral vascular system and vascular conduits

**Pathology**
- 4 Inflammation and wound healing
- 4 Atheroma, medial necrosis and arteritis
- 4 Intimal hyperplasia and graft atherosclerosis
- 4 Myocardial infarction and complications
- 4 Systemic Inflammatory Response Syndrome

**Pharmacology**
- 4 Drugs used in the treatment of hypertension, heart failure and angina
- 4 Anti-arrhythmic drugs
- 4 Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general

Microbiology
4 Organisms involved in cardiorespiratory infection
4 Organisms involved in wound infection
4 Antibiotic usage and prophylaxis
4 Antisepsis

CLINICAL KNOWLEDGE

General
4 Diagnosis, investigation and treatment of heart disease
4 Risk assessment and stratification
4 Cardiopulmonary resuscitation
4 Cardiac arrhythmias
4 Complications of surgery
4 Renal dysfunction
4 Multiorgan failure
4 Cardiac rehabilitation
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Specific
4 Diagnosis investigation and assessment of IHD
4 Operative treatment - Off pump and on pump surgery
4 Results of surgery ? survival, graft patency, recurrence
4 Arterial revascularisation
4 Redo coronary artery surgery
4 Role of PCI and non operative treatment
4 Management of cardiovascular risk factors
4 Complications of myocardial infarction and ischaemic heart disease VSD, mitral regurgitation, aneurysm.

Clinical Skills

HISTORY AND EXAMINATION
4 Cardiovascular system and general history and examination including conduit, drug history, identification of comorbidity and risk assessment

DATA INTERPRETATION
4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
4 Chest radiograph
4 ECG including exercise ECG
4 Coronary Angiography
4 Cardiac Catheterisation data
4 Echocardiography including 2D, Doppler and TOE and stress echo
4 Nuclear cardiology

PATIENT MANAGEMENT
4 Cardiopulmonary resuscitation
4 Diagnosis and treatment of cardiac arrhythmias
4 Management of post cardiac surgical patient
4 Management of complications of surgery
4 Cardiac rehabilitation
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Technical Skills

OPERATIVE MANAGEMENT
4 Isolated, first time coronary artery surgery
(May include both off pump and on pump options and arterial revascularisation strategies)
2 Repeat coronary artery surgery
2 Complications of ischaemic heart disease including post infarction VSD, mitral regurgitation and left ventricular aneurysm

Professional Skills
Clinical decision making
Ability to communicate with patient and relatives
Understands consent process and can discuss risk /benefit with the patient. Is able to obtain consent from patient
Collaborates with colleagues and has good team skills

Demonstrates ability to prioritise and manage service

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Heart Valve Disease

**Objective**

To evaluate and manage a patient with heart valve disease, including operative management. Competence in the management of uncomplicated cases will be achieved by the end of this module. Management of complex or difficult situations will require further training and supervision.

**Knowledge**

**BASIC KNOWLEDGE**

**Physiology**

4 Cardiovascular physiology including valve physiology and haemodynamics

4 Electrophysiology, including conduction disorders

4 Haemostasis, thrombosis and bleeding

4 Acid base balance

4 Pulmonary physiology, ventilation and gas exchange

4 Metabolic response to trauma

**Anatomy**

4 Cardiac chambers and valves, pericardium and great vessels

4 Anatomy of the conduction system

**Pathology**

4 Pathophysiology of valve incompetence and stenosis.

4 Consequences of valve disease on cardiac function and morphology

4 Pathophysiology of mixed valve disease and combined valve pathology (eg aortic and mitral)

4 Combined valvular and ischaemic heart disease

4 Atrial fibrillation and other arrhythmias

**Pharmacology**

4 Drugs used in the treatment of hypertension, heart failure and angina

4 Anti-arrhythmic drugs

4 Haemostatic drugs

4 Antiplatelet, anticoagulant and thrombolytic drugs

4 Analgesics

4 Antibiotics

4 Anaesthetic agents, local and general
Microbiology
4 Organisms involved in cardio respiratory infection
4 Organisms involved in wound infection
4 Antibiotic usage and prophylaxis
4 Antisepsis
4 Endocarditis and prosthetic valve endocarditis

CLINICAL KNOWLEDGE
General knowledge
4 Cardiopulmonary resuscitation
4 Care of the cardiac surgical patient
4 Complications of surgery
4 Risk assessment and stratification
4 Management of cardiovascular risk factors
Specific Knowledge
4 Diagnosis investigation and assessment of valvular heart disease
4 Timing of surgical intervention in valve disease
4 Options for operative management including: Valve replacement/repair (mechanical, biological stented and stentless grafts, homografts and autografts)
4 Valve design: materials, configuration and biomechanics.
4 Results of surgery ? survival, valve thrombosis, endocarditis, bleeding.
4 Interpretation of survival and follow up data
4 Cardiac performance and long term functional status
4 Surgery for conduction problems
4 Surgical treatment of arrhythmias

Clinical Skills

HISTORY AND EXAMINATION
4 Cardiovascular system and general history and examination including drug history, identification of co morbidity and risk assessment

DATA INTERPRETATION
4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
4 Chest radiograph
4 ECG interpretation including exercise ECG
4 Coronary angiography
4 Cardiac catheterisation data including left and right heart data
3 Echocardiography (thoracic and transoesophageal) including 2D, Doppler and stress echo
3 Nuclear cardiology

PATIENT MANAGEMENT
4 Cardiopulmonary resuscitation
4 Diagnosis and treatment of cardiac arrhythmias
4 Management of post cardiac surgical patient
4 Management of complications of surgery
4 Cardiac rehabilitation
4 Blood transfusion and blood products
4 Wound infection and sternal disruption
4 Non operative management of endocarditis
4 Valve selection
4 Anticoagulation management including complications.

Technical Skills
OPERATIVE MANAGEMENT
2 Tricuspid valve surgery
1 Surgical strategies for managing the small aortic root
1 Aortic root surgery including stentless valves, and root replacement
1 Redo Valve surgery
1 Valve surgery for endocarditis
1 Mitral valve repair
1 Alternative surgical approaches to valve surgery including thoracotomy, transseptal approaches, and minimal access surgery
2 Combined valve and graft surgery
2 Techniques for surgical ablation of arrhythmias
4 Isolated, uncomplicated aortic valve replacement (stented biological or mechanical)
4 Isolated uncomplicated mitral valve replacement

Professional Skills
Clinical decision making
Ability to communicate with patient and relatives

Understands consent process and can discuss risk /benefit with patient and relatives

Collaborates with colleagues and has good team skills

Demonstrates ability to prioritise and manage service

Demonstrates ability to access knowledge and to learn

Understands research methods and has ability to analyse scientific publications

Recognises own abilities and limitations

Time management and effective personal skills

Academic/research activities
# Aortovascular Disease

## Objective
To evaluate and manage uncomplicated surgical aspects of a patient with aortovascular disease, including operative management where appropriate and up to the defined competence. This module provides intermediate training in a complex subspeciality.

## Knowledge

### BASIC KNOWLEDGE

**Physiology**

1. Vascular biology and reactivity
2. Haemodynamics; physiology and measurement
3. Rheology and arterial pressure regulation
4. Haemostasis, thrombosis and bleeding
5. Physiology of transfusion therapy
6. Principles of surgical infectious disease
7. Acid base balance
8. Metabolic response to trauma
9. Pathophysiology and of hypothermia including the effects upon haemoglobin, metabolic rate and pH with their management

**Anatomy**

1. Heart, pericardium and great vessels
2. Anatomy of the peripheral vascular system
3. Blood supply of the spinal cord

**Pathology**

1. Inflammation and wound healing
2. Atheroma, medial necrosis and arthritis
3. Inherited disorders of vascular biology
4. Systemic Inflammatory Response Syndrome

**Pharmacology**

1. Drugs used in the treatment of hypertension, heart failure and angina
2. Anti-arrhythmic drugs
3. Haemostatic drugs
4. Antiplatelet, anticoagulant and thrombolytic drugs
4 Anti-emetics
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general

Microbiology
4 Organisms involved in cardiorespiratory infection
4 Organisms involved in wound infection
4 Antibiotic usage and prophylaxis
4 Antisepsis

CLINICAL KNOWLEDGE
General
4 Risk assessment
4 Cardiopulmonary resuscitation
4 Cardiac arrhythmias
4 Complications of surgery
4 Renal dysfunction
4 Multiorgan failure
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Specific
4 Natural history of aortic disease
4 Diagnosis, investigation and assessment of aortic disease
4 Knowledge of operative treatment including spinal cord and cerebral preservation strategies
  • Type A dissection
  • Type B dissection
  • Traumatic aortic rupture
  • Thoraco-abdominal aneurysm
4 Results of surgery – survival, complication rates
4 Non-surgical management including the role of endovascular stenting
4 Management of cardiovascular and non-cardiovascular risk factors

Clinical Skills

HISTORY AND EXAMINATION
4 Cardiovascular system and general history and examination including assessment of preoperative complications, drug history, identification of co-morbidity and risk assessment
DATA INTERPRETATION
4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
4 Chest radiograph
4 ECG including exercise ECG
4 Coronary Angiography
4 Aortography
4 Cardiac Catheterisation data
4 Echocardiography including 2D, doppler and TOE and stress echo
4 CT scanning
4 MRI scanning

PATIENT MANAGEMENT
4 Cardiopulmonary resuscitation
4 Diagnosis and treatment of cardiac arrhythmias
4 Management of post cardiac surgical patient
4 Management of complications of surgery
4 Cardiac rehabilitation
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Technical Skills
OPERATIVE MANAGEMENT
3 Intraoperative monitoring
2 Spinal cord protection
2 Preparation for and management of cardiopulmonary bypass, including alternative, non-bypass strategies for descending aortic surgery
2 Hypothermic strategies including HCA, RCP and SACP
3 Femoral cannulation
1 Surgery for acute dissection of the ascending aorta
2 Aortic root replacement for chronic aortic root disease
1 Complex aortic surgery including arch surgery, descending aortic and thoraco-abdominal aortic surgery
**Professional Skills**

Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk /benefit with the patient. Is able to obtain consent from patient

Collaborates with colleagues and has good team skills

Demonstrates ability to prioritise and manage service

Effective time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Recognises own abilities and limitations

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Cardiothoracic Trauma

Objective
To evaluate and manage as part of a multidisciplinary team, a patient with thoracic trauma. To include appropriate surgical management

Knowledge
BASIC KNOWLEDGE
4 Anatomy of the lungs, heart, chest wall, diaphragm and oesophagus
4 Anatomy of the larynx, trachea and bronchial tree
4 Physiology of breathing and its control
4 Physiology of the heart and circulation

GENERAL TRAUMA MANAGEMENT
4 Principles of trauma management (as defined by ATLS)
4 Principles of emergency resuscitation following cardiac arrest

SPECIFIC KNOWLEDGE
4 The mechanism and patterns of injury associated with blunt, penetrating and deceleration injuries to the chest
4 The post-ATLS, definitive care of blunt, penetrating and deceleration injuries to the chest.
4 The indications and use of appropriate investigations in thoracic trauma management
4 Pain relief in chest trauma, including epidural anaesthesia.
4 Indications for immediate, urgent and delayed thoracotomy in trauma

Clinical Skills
GENERAL TRAUMA MANAGEMENT (ATLS)
4 Assessment and management of airway, breathing and circulation
4 Maintenance of an adequate airway and respiratory support
4 Protection of the cervical spine
4 Circulatory resuscitation
4 Establishment of appropriate monitoring
4 Assessment and management of pain and anxiety

CARDIOTHORACIC TRAUMA MANAGEMENT
4 Examination and assessment of the of the chest, including respiratory cardiovascular and circulatory systems
4 Recognition and management of immediately life threatening situations: obstructed
airway, tension pneumothorax, massive haemothorax, open chest wound, flail chest and cardiac tamponade

4 Recognition and management of potentially life threatening situations: lung contusion, bronchial rupture, blunt cardiac injury, intrathoracic bleeding, oesophageal injury, simple pneumothorax and major vascular injury

4 Recognition of potentially life threatening penetrating injuries to the chest and abdomen

4 Interpretation of chest x-ray, ECG, arterial blood gases and echocardiography

4 Detection and treatment of cardiac arrhythmias

4 Management of the widened mediastinum including appropriate investigations and multidisciplinary consultation

**Technical Skills**

**PRACTICAL SKILLS**

4 Establish an emergency airway (surgical and non-surgical)

4 Insertion and management of thoracic drains

4 Establish adequate venous access and monitoring.

4 Pericardiocentesis and subxiphoid pericardial window for tamponade

**OPERATIVE MANAGEMENT OF THORACIC TRAUMA**

3 Subxiphoid pericardial window for tamponade

4 Postero-lateral, thoracotomy, antero lateral thoracotomy and thoraco-laparotomy

3 Bilateral Anterior Thoracotomy

4 Median sternotomy and closure

3 Repair of cardiac injuries

3 Repair of pulmonary and bronchial injuries

3 Management of the complications of chest trauma including retained haemothorax and empyema

2 Repair of oesophageal injuries

1 Repair of aortic transection

**Professional Skills**

Clinical decision making

Communication skills

Team skills; collaborates with other surgical disciplines and members of the multidisciplinary team.

Communicates with patient and relatives

Breaking bad news

Demonstrates ability to access knowledge and show willingness to learn
Recognises own abilities and limitations

Demonstrates ability to manage and prioritise service

Ability to understand research method and understand scientific publications
General Management of a Patient Undergoing Thoracic Surgery

Objective
To be competent in the evaluation and management of a patient undergoing thoracic surgery. The knowledge and clinical skills are common to all thoracic surgical conditions, and should be read in conjunction with the curriculum for specific surgical conditions.

Knowledge
BASIC KNOWLEDGE

Physiology
4 Pulmonary physiology, ventilation and gas exchange
4 Haemostasis, thrombosis and bleeding
4 Acid base balance
4 Metabolic response to trauma
4 Digestive, renal and hepatic physiology
4 Nutrition

Anatomy
4 Tracheobronchial tree and lungs
4 Thoracic inlet, neck and mediastinum
4 Oesophagus and upper GI tract
4 Chest wall and diaphragm

Pathology
4 Inflammation and wound healing
4 Bronchopulmonary infections
4 ARDS
4 Emphysema
4 Pulmonary fibrosis
4 Pulmonary manifestations of systemic disease
4 Systemic manifestations of pulmonary disease
4 Benign and malignant tumours of trachea, bronchus and lung parenchyma
4 Oesophagitis, columnar-lined oesophagus stricture
4 Oesophageal motility disorders
4 Malignant and benign tumours of the oesophagus and stomach
4 Malignant and benign tumours of the pleura and chest wall, mediastinum and thyroid

Pharmacology
4 Bronchodilators
4 H2 antagonists and proton pump inhibitors
4 Haemostatic drugs
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general

Microbiology
4 Organisms involved in respiratory infection including TB
4 Organisms involved in wound infection
4 Antibiotic usage and prophylaxis
4 Antisepsis
4 Management of intra pleural sepsis

CLINICAL KNOWLEDGE

Thoracic Incisions
4 Types of incisions and appropriate use, including lateral, anterior, muscle sparing and video-assisted approaches.

Sternotomy
4 Difficult access and improving exposure.
4 Early and late complications of thoracic incisions
4 Analgesia including pharmacology, effectiveness, side effects and use in combination regimens
4 Post-operative analgesia, including epidural, PCAS and paravertebral catheter techniques.

Bronchoscopy
4 The role of rigid and flexible bronchoscopy in the investigation of airway and pulmonary disease.
4 The anaesthetic, airway and ventilatory management during rigid and flexible bronchoscopy

Mediastinal exploration
4 Endoscopic, radiological and surgical approaches used to evaluate and diagnose mediastinal disease of benign, infective, primary and malignant aetiology.
4 Equipment for mediastinal exploration
4 Relevant imaging techniques, and influence on surgical approach.

**Clinical Skills**

**HISTORY AND EXAMINATION**

4 System specific and general history and examination, including drug history, identification of comorbidity and functional status.

**DATA INTERPRETATION**

4 Routine haematology and biochemical investigations
4 Chest radiograph and ECG
3 CT, including contrast enhanced CT
3 Interpretation of imaging of the mediastinum.
3 MRI and PET
4 Respiratory function tests
3 Ventilation/perfusion scan
4 Blood gases
3 Oesophageal function tests and contrast studies

**PATIENT MANAGEMENT**

General
4 Cardiopulmonary resuscitation
4 Risk assessment, stratification and management
4 Management of patients making an uncomplicated or complicated recovery from thoracic operations.
4 Post-operative management of pain control, respiratory failure, sputum retention, haemodynamic instability and low urine output.
4 Treatment of cardiac arrhythmias
4 Pain control
3 Wound infection and disruption
4 Blood transfusion and blood products
4 Physiotherapy and rehabilitation
2 Palliative care

**Technical Skills**

**PRACTICAL SKILLS**
4 Arterial cannulation
4 Central venous cannulation
4 Pulmonary artery catheterisation
4 Tracheostomy
4 Fibreoptic bronchoscopy
4 Chest aspiration
4 Chest drain insertion
4 Chest drain management

OPERATIVE MANAGEMENT

Thoracic Incisions
4 Correct positioning of patient for thoracic surgery
4 Perform and repair thoracic incisions, including lateral, anterior, muscle sparing and VATS incisions.
3 Difficult access and improving exposure
4 Perform and close sternotomy incision

Bronchoscopy
4 Diagnostic bronchoscopy including biopsy - rigid and flexible.
4 Equipment, instrumentation and preparation
4 Perform rigid and flexible bronchoscopy
4 Airway and ventilatory management
4 Recognise normal and abnormal anatomy.
4 Identify common pathologies and the surgical relevance of the findings.
4 Take appropriate specimens for bacteriology, cytology and histology.
4 Management of moderate bleeding and other common complications.
4 To appropriately supervise the care of patients recovering from bronchoscopy.
4 Post-operative bronchoscopy: indications and procedure

4 Tracheostomy and minitracheostomy
3 Bronchoscopy in situations where there is unfavourable anatomy or complex pathology and to deal with complications.

Mediastinal Exploration
4 Assembly of relevant equipment for mediastinal exploration
4 Surgical evaluation of the mediastinum using cervical, anterior and VATS approaches.

4 Mediastinal biopsy

**Professional Skills**

Clinical decision making

- Ability to communicate with patient and relatives
- Understands consent process and can discuss risk/benefit with the patient
- Collaborates with colleagues and has good team skills
- Recognises own abilities and limitations
- Time management and personal skills
- Demonstrates ability to access knowledge and shows willingness to learn
- Understands research methods and has ability to analyse scientific publications

**Research/academic activities**
## Neoplasms of the Lung

### Objective

To fully assess and manage an uncomplicated patient with a neoplasm of the lung, including operative management where appropriate. Appreciation of the multidisciplinary, multimodality approach to the management of the condition.

### Knowledge

**GENERAL KNOWLEDGE**

- As for thoracic surgery ? general

**SPECIFIC KNOWLEDGE**

- 4 Benign and malignant tumours of trachea, bronchus and lung parenchyma
- 4 Epidemiology, presentation, diagnosis, staging (pre-operative, intraoperative and pathological) and treatment of lung cancer and lung metastases.
- 4 Neoadjuvant and adjuvant treatment of lung cancer
- 4 Results of treating thoracic malignancy by surgery, medical or oncological techniques, including multimodality management.
- 4 Survival, recurrence rates and relapse patterns after surgical treatment and the investigation and management of relapse.
- 4 Knowledge of palliative care techniques.
- 4 Treatment of post-operative complications of pulmonary resection such as empyema and broncho-pleural fistula.
- 4 Role of repeat surgery in recurrent and second primary malignancies of the lung.
- 4 Medical and surgical options to deal with recurrent or problematic complications of pulmonary resection.

### Clinical Skills

**PATIENT MANAGEMENT**

- As for thoracic surgery ? general
- 4 Clinical history and examination
- 4 Interpretation of laboratory, physiological and imaging techniques.
- 4 Interpretation of endoscopic findings.
- 4 Patient selection with assessment of function and risk.

### Technical Skills

**OPERATIVE MANAGEMENT**

- 4 Bronchoscopic assessment including biopsy
- 4 Endoscopic and surgical techniques of lung biopsy.
- 4 Mediastinal assessment and biopsy
2 Endoscopic management of tumours using laser and stenting

4 Intraoperative diagnosis and staging

4 Surgery for benign and malignant conditions of the lungs, including uncomplicated lobectomy for lung cancer, wedge resection and metastasectomy.

4 Segmentectomy and lobectomy for benign and malignant disease.

2 Redo operations for repeat resections of lung metastases.

2 Advanced resections for lung cancer, including sleeve lobectomy, pneumonectomy and extended resections involving chest wall and diaphragm.

2 Repeat resections for benign and malignant conditions of the lung, including completion pneumonectomy

2 Management of post-operative complications such as empyema and broncho-pleural fistula.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills in multimodality care.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Cancer and bereavement counselling.

Delivering bad news.

Understands research methods and has ability to analyse scientific publications

Research/academic activities
### Disorders of the Pleura

<table>
<thead>
<tr>
<th>Disorders of the Pleura</th>
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<tbody>
<tr>
<td><strong>Objective</strong></td>
</tr>
<tr>
<td>To fully evaluate and manage uncomplicated surgical conditions of the pleura and the pleural space</td>
</tr>
<tr>
<td><strong>Knowledge</strong></td>
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<tr>
<td>GENERAL KNOWLEDGE</td>
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<tr>
<td>As for thoracic surgery – general</td>
</tr>
<tr>
<td>SPECIFIC KNOWLEDGE</td>
</tr>
<tr>
<td>4 Anatomy and physiology of the pleura</td>
</tr>
<tr>
<td>4 Inflammatory, infective and malignant disease of the visceral and parietal pleura.</td>
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<tr>
<td>4 Pneumothorax</td>
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<td>4 Pleural effusion</td>
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<tr>
<td>4 Empyema</td>
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<tr>
<td>4 Mesothelioma</td>
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<td>4 Haemothorax</td>
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<td>4 Chylothorax</td>
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<td>4 Conditions of adjacent organs that affect the pleura</td>
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<tr>
<td>4 Medical and surgical management of pleural disease, including radiological, open and VATS techniques.</td>
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<td>4 Techniques to deal with failures of primary treatment.</td>
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<td>4 Advanced techniques for pleural space obliteration such as thoracoplasty and soft-tissue transfer</td>
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<tr>
<td><strong>Clinical Skills</strong></td>
</tr>
<tr>
<td>PATIENT MANAGEMENT</td>
</tr>
<tr>
<td>As for thoracic surgery – general</td>
</tr>
<tr>
<td>4 Interpretation of imaging of the pleura</td>
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<td>4 Chest drains: insertion, management, removal and treatment of complications.</td>
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<tr>
<td>4 Management of patients making uncomplicated and complicated recovery from pleural interventions.</td>
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<tr>
<td><strong>Technical Skills</strong></td>
</tr>
<tr>
<td>OPERATIVE MANAGEMENT</td>
</tr>
<tr>
<td>4 Open procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy</td>
</tr>
<tr>
<td>4 VATS procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy</td>
</tr>
<tr>
<td>3 Open and VATS procedures for empyema, including techniques for decortication.</td>
</tr>
</tbody>
</table>
2 Open and VATS procedures in complex cases.

1 Advanced techniques of pleural space obliteration, with appropriate specialist assistance.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills.

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Disorders of the Chest Wall

Objective
To assess and manage a patient with abnormality or disease affecting the chest wall, including surgical management where appropriate.

Knowledge
GENERAL KNOWLEDGE
As for thoracic surgery – general

SPECIFIC KNOWLEDGE
4 Anatomy of the chest wall
4 Congenital, inflammatory, infective and neoplastic conditions that can affect the components of the chest wall.
4 Clinical, laboratory and imaging techniques used in the evaluation of chest wall pathology.
4 Techniques used in the diagnosis of chest wall disease, including aspiration and core biopsy, and incision and excision biopsy.
4 Pectus deformities: aetiology, physiological and psychological consequences. Surgical options for correction.
4 Techniques used to resect the sternum and chest wall, physiological and cosmetic sequelae.
4 Prosthetic materials used in chest wall surgery
4 The role of repeat surgery to deal with recurrent conditions and the complications of previous surgery.
4 Techniques of complex chest wall reconstruction involving thoracoplasty or soft-tissue reconstruction

Clinical Skills
PATIENT MANAGEMENT
As for thoracic surgery – general

4 Clinical history and examination
4 Interpretation of laboratory, physiological and imaging techniques.
4 Patient selection with assessment of function and risk.

Technical Skills
OPERATIVE MANAGEMENT
4 Chest wall biopsy and choice of appropriate technique.
4 Needle biopsy by aspiration or core techniques and the siting of open surgical biopsy.

4 Open and excision biopsy and resection of the chest wall for benign and malignant conditions.

3 Chest wall resection in combination with resection of the underlying lung.

3 Selection and insertion of prosthetic materials, and selection of cases in which such materials are required

3 Pectus correction, by both open and minimally-invasive techniques, including post-operative care and complications

2 Surgery for the complications of chest wall resection, and repeat surgery to resect recurrent chest wall conditions.

1 Complex chest wall reconstruction with thoracoplasty and, with appropriate specialist support, soft tissue reconstruction.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills
Disorders of the Diaphragm

**Objective**
To assess and manage a patient with disease or abnormality of the diaphragm, including surgical management where appropriate.

**Knowledge**

**GENERAL KNOWLEDGE**
As for thoracic surgery – general

**SPECIFIC KNOWLEDGE**
4 Anatomy and physiology of the diaphragm.
4 Pathology of the diaphragm.
4 Clinical, physiological and imaging techniques in the assessment of diaphragmatic abnormalities.
4 Physiological consequences of diaphragmatic herniation or paresis.
4 Surgical techniques used to biopsy and resect diaphragmatic tumours.
4 Situations in which replacement of the diaphragm is required, the materials used and their value and limitations.
4 Complications of diaphragmatic resection and their management.
4 Techniques used to electrically pace the diaphragm, and the conditions in which such treatment is appropriate.

**Clinical Skills**

**PATIENT MANAGEMENT**
As for thoracic surgery – general
Specific Skills
4 Clinical history and examination
4 Interpretation of laboratory, physiological and imaging techniques.
4 Patient selection with assessment of function and risk.
4 Management of patients making an uncomplicated or complicated recovery from diaphragmatic resection.

**Technical Skills**

**OPERATIVE MANAGEMENT**
2 Resection of the diaphragm, and adjacent structures, including appropriate selection and insertion of prosthetic materials
2 Complications of diaphragmatic resection.
2. Phrenic nerve pacing.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk/benefit with the patient.

Collaborates with colleagues and has good team skills.

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Emphysema and Bullae

Objective
To fully assess and manage a patient with emphysema and bullae, including surgical management where appropriate.

Knowledge
GENERAL KNOWLEDGE

As for thoracic surgery – general

SPECIFIC KNOWLEDGE

4 Aetiology, pathology and physiology of chronic obstructive airways disease (COPD)

4 Epidemiology and public health issues

4 Smoking cessation measures.

4 Clinical, laboratory, physiological and imaging techniques.

4 Medical and surgical management of COPD and its complications

4 Selection criteria and pre-operative preparation

4 Surgical techniques used in the treatment of emphysema and bullae and the results of surgical treatment including relevant clinical trials.

4 Lung volume reduction surgery: techniques, complications and management of complications.

4 Experimental and developmental techniques in lung volume reduction surgery

Clinical Skills
PATIENT MANAGEMENT

As for thoracic surgery – general

4 Clinical history and examination

4 Interpretation of laboratory, physiological and imaging techniques.

4 Patient selection with assessment of function and risk.

4 Postoperative management of patients making an uncomplicated recovery from surgery for emphysema or the complications of such diseases.

3 Management of patients following lung volume reduction surgery.

Technical Skills
OPERATIVE MANAGEMENT

4 Procedures to deal with secondary pneumothorax and bullae by open techniques.

4 Procedures to deal with secondary pneumothorax and bullae by VATS techniques.
Lung volume reduction surgery, unilaterally and bilaterally, using open and VATS techniques.

**Professional Skills**
Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk/benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Disorders of the Pericardium

**Objective**
To fully assess and manage a patient with disease of the pericardium or pericardial space, including surgical management where appropriate.

**Knowledge**

**GENERAL KNOWLEDGE**

As for thoracic surgery – general

**SPECIFIC KNOWLEDGE**

4 Anatomy of the pericardium.

4 Pathology of the pericardium.

4 Pathophysiological consequences of pericardial constriction and tamponade.

4 Clinical, echocardiographic and imaging techniques used to detect pericardial disease and assess its consequences.

4 Techniques for pericardial drainage using guided needle aspiration

4 Surgical drainage by sub-xiphoid, thoracotomy or VATS approaches.

4 Surgical techniques for pericardiectomy.

4 Materials used for pericardial replacement, their value and limitations and the situations in which used.

4 Post-operative complications following resection of the pericardium and its prosthetic replacement.

**Clinical Skills**

**PATIENT MANAGEMENT**

As for thoracic surgery – general

4 Clinical history and examination

3 Interpretation of laboratory, physiological and imaging techniques, including echocardiography.

4 Recognition and assessment of pericardial tamponade and constriction.

4 Techniques for pericardial drainage using guided needle aspiration

4 Recognition of pericardial herniation and cardiac strangulation.

4 Patient selection with assessment of function and risk.

4 Management of patients making an uncomplicated or complicated recovery from pericardial surgery.

**Technical Skills**
OPERATIVE MANAGEMENT

4 Uncomplicated pericardial fenestration procedures

3 Pericardial fenestration in complex cases.

3 Pericardiectomy for relief of constriction

3 Resection of the pericardium and replacement, in appropriate situations, with prosthetic materials.

3 Competence in dealing with the complications of pericardial resection and replacement.

Professional Skills

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills

Understands research methods and has ability to analyse scientific publications

Research/academic activities
# Disorders of the Mediastinum

**Objective**
To fully assess and manage a patient with benign and malignant disease of the mediastinum, including surgical management where appropriate.

**Knowledge**

**GENERAL KNOWLEDGE**
As for thoracic surgery – general

**SPECIFIC KNOWLEDGE**

1. Anatomy of the mediastinum
2. Congenital, benign, infective and malignant (primary and secondary) conditions of the mediastinum.
3. Systemic conditions associated with the mediastinum.
4. Clinical, laboratory, electromyographic and imaging techniques used in the diagnosis and assessment of patients with mediastinal disease
5. Myasthenia gravis: medical, surgical and perioperative management
6. Staging of thymoma and grading of myasthenia
7. Benign and malignant conditions, which do not require surgical biopsy or resection.
8. Oncological treatment of malignant diseases of the mediastinum, including multidisciplinary care.
10. Retrosternal goitre and its management

**Clinical Skills**

**PATIENT MANAGEMENT**
As for thoracic surgery – general

1. Clinical history and examination
2. Interpretation of laboratory, physiological and imaging techniques.
4. Postoperative management of patients including recognition and management of post-operative complications.

**Technical Skills**

**OPERATIVE MANAGEMENT**

4. Selection of appropriate routes for biopsy and excision of mediastinal tumours and cysts.
4 Biopsy of mediastinal masses.

4 Excision of the thymus for myasthenia gravis.

4 Resection of mediastinal cysts and tumours.

3 Resection of mediastinal cysts and tumours, including extended resections involving adjacent structures.

**Professional Skills**

Clinical decision-making.

- Ability to communicate with patient and relatives.
- Understands consent process and can discuss risk /benefit with the patient.
- Collaborates with colleagues and has good team skills.
- Recognises own abilities and limitations.
- Time management and personal skills.
- Demonstrates ability to access knowledge and shows willingness to learn.
- Understands research methods and has ability to analyse scientific publications.

**Research/academic activities**
## Disorders of the Airway

**Objective**
To assess and manage a patient with disease of the major airways, including surgical management where appropriate.

**Knowledge**

<table>
<thead>
<tr>
<th>GENERAL KNOWLEDGE</th>
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<tbody>
<tr>
<td>As for thoracic surgery – general</td>
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</table>

<table>
<thead>
<tr>
<th>SPECIFIC KNOWLEDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Anatomy of the larynx, trachea and bronchus.</td>
</tr>
<tr>
<td>4 Physiology of the normal airway.</td>
</tr>
<tr>
<td>4 Pathophysiology of disease and its effects on lung function.</td>
</tr>
<tr>
<td>4 Endoscopic appearances in health and disease.</td>
</tr>
<tr>
<td>4 Congenital, inflammatory, infective, benign and neoplastic diseases of the airways.</td>
</tr>
<tr>
<td>4 Symptoms, signs of airway disease.</td>
</tr>
<tr>
<td>4 Clinical, physiological and imaging tests undertaken to diagnose and assess airway disease.</td>
</tr>
<tr>
<td>4 Techniques for surgical resection of the trachea.</td>
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<tr>
<td>4 Bronchoplastic procedures and the limitations of these techniques.</td>
</tr>
<tr>
<td>4 Medical and oncological treatments available to deal with airway diseases.</td>
</tr>
<tr>
<td>4 Endoscopic techniques used to deal with benign and malignant conditions, including disobliteration and stenting.</td>
</tr>
<tr>
<td>4 Presentation, investigation and management of anastamotic complications following airway surgery.</td>
</tr>
<tr>
<td>4 Presentation, evaluation and treatment of fistulae in the aerodigestive tract, due to benign, malignant and iatrogenic causes.</td>
</tr>
<tr>
<td>4 Role of open and endoscopic procedures in dealing with problems.</td>
</tr>
</tbody>
</table>

**Clinical Skills**

<table>
<thead>
<tr>
<th>PATIENT MANAGEMENT</th>
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<tbody>
<tr>
<td>As for thoracic surgery – general</td>
</tr>
<tr>
<td>4 Clinical history and examination</td>
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<tr>
<td>3 Interpretation of laboratory, physiological and imaging techniques.</td>
</tr>
<tr>
<td>4 Recognition, diagnosis and assessment of airway obstruction.</td>
</tr>
<tr>
<td>4 Patient selection with assessment of function and risk.</td>
</tr>
</tbody>
</table>
4 Post-operative care of patients making an uncomplicated recovery from major airway surgery.

4 Post-operative care of patients making a complicated recovery from airway surgery.

**Technical Skills**

**OPERATIVE MANAGEMENT**

3 Endoscopic assessment of a patient with airways disease

2 Sleeve resection of the trachea for simple benign conditions, including appropriate anastamotic techniques.

2 Sleeve resection of the main bronchi, including lobectomy where appropriate, for malignant disease, including appropriate anastamotic techniques.

2 Techniques for the relief of major airways obstruction including stenting.

1 Airway resection for tumours and complex benign conditions, and techniques for airway reconstruction, anastamosis and laryngeal release.

1 Repeat resections for recurrence and the complications of prior resection.

1 Management of fistulae in the aerodigestive tract by surgical and endoscopic techniques.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk/benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills

Understands research methods and has ability to analyse scientific publications

Research/academic activities
## Congenital Heart Disease

**Objective**

*To be able to evaluate and manage, with appropriate supervision, some of the aspects of children and adults with heart disease, including operative management where appropriate. This module is intended for a trainee to gain initial exposure to this subspeciality either as part of general cardiothoracic training or as an introduction to further advanced training in this area.*

**Knowledge**

**BASIC KNOWLEDGE**

**Physiology**

3 Relevant general physiology of childhood

3 Fetal circulation and circulatory changes at birth

3 Haemodynamics; physiology and measurement including shunt calculations

3 Physiology of pulmonary vasculature

3 Myocardial cellular physiology in immature myocardium

3 Electrophysiology, including conduction disorders

3 Haemostasis, thrombosis and bleeding

3 Acid base balance

3 Pulmonary physiology, ventilation and gas exchange

3 Metabolic response to trauma

3 Vascular biology and reactivity

3 Physiology of Cardiopulmonary Bypass including low flow and circulatory arrest.

3 Ph and alpha stat CPB management

**Anatomy**

3 Embryology of the heart

3 Anatomy of the heart, pericardium and great vessels

3 Pulmonary anatomy

3 Coronary anatomy and variants

3 Anatomy of the peripheral vascular system and vascular conduits including aortopulmonary shunts

3 Sequential cardiac analysis and terminology of cardiac malformations

**Pathology**

3 Inflammation and wound healing
3 Systemic Inflammatory Response Syndrome
3 Effect of growth and pregnancy

Pharmacology
3 Drugs used in the treatment of congenital heart disease
3 Inotropes
3 Anti-arrhythmic drugs
3 Haemostatic drugs
3 Antiplatelet, anticoagulant and thrombolytic drugs
3 Analgesics
3 Antibiotics
3 Anaesthetic agents, local and general
3 Hypotensive agents (systemic and pulmonary).

Microbiology
3 Organisms involved in cardiorespiratory infection
3 Organisms involved in wound infection
3 Antibiotic usage and prophylaxis
3 Antiseptic

CLINICAL KNOWLEDGE
General
3 Diagnosis, investigation and treatment of congenital heart disease
3 Results of surgery – survival, common complications and management.
3 Late complications of surgery for congenital heart disease
3 Role of interventional cardiology.
3 Role of mechanical assist (IABP, VAD and ECMO)
3 Indications for referral for transplantation
3 Risk assessment and stratification
3 Cardiopulmonary resuscitation
3 Cardiac arrhythmias
3 Renal dysfunction
3 Multiorgan failure
3 Cardiac rehabilitation
3 Blood transfusion and blood products
3 Wound infection and sternal disruption

3 Types of cardiac prosthesis and indications for use

Specific Knowledge

The anatomy, pathophysiology, natural history, and management of the following conditions
or procedures

4 Patent ductus arteriosus
4 Atrial septal defect
4 Ventricular septal defect
4 Coarctation
3 PA banding and shunts
3 Transposition of the great arteries – switch procedure
3 Tetralogy of Fallot/Pulmonary atresia plus VSD
2 Fontan procedure
2 Rastelli procedure
2 Hypoplastic heart
2 Norwood procedure
2 Truncus arteriosus
2 Double outlet right ventricle
2 Pulmonary atresia plus VSD and MAPCAs
2 Single ventricle
2 Partial and complete atrioventricular septal defects
2 Valve lesions
2 Extra cardiac conduits
2 Interrupted aortic arch
2 Total anomalous pulmonary venous drainage
2 Extra Corporeal Membrane Oxygenation
2 Transplantation

Clinical Skills

HISTORY AND EXAMINATION

3 Cardiovascular system and general history and examination of child or adult with
congenital heart disease

DATA INTERPRETATION

3 Routine haematology and biochemical investigations
2 Chest radiograph and ECG
2 Cardiac catheterisation data including interpretation of haemodynamic data,
shunt and resistance calculations
2 Echocardiography in congenital heart disease, including 2D, doppler and TOE

PATIENT MANAGEMENT

2 Principles of paediatric intensive care
2 Management of adults and children following congenital heart surgery
2 Management of complications of surgery
3 Cardiopulmonary resuscitation
3 Diagnosis and treatment of cardiac arrhythmias

Blood transfusion and blood products
Technical Skills
OPERATIVE MANAGEMENT

2 Sternotomy – open and close
2 Thoracotomy – open and close
2 Preparation for and management of cardiopulmonary bypass including partial bypass
2 Approaches for ECMO, cannulation and management.

Surgical management of the following common uncomplicated conditions:
(level 1 - a higher level of operative competence is not required during this module)

- Patent ductus arteriosus
- Atrial septal defect
- Ventricular septal defect
- Coarctation
- PA banding and shunts

Professional Skills
Clinical decision making

Ability to communicate with patient, parents and relatives

Understands consent process for children and can discuss risk /benefit with the patient or the parents

Collaborates with colleagues and has good team skills

Demonstrates ability to prioritise and manage service

Effective time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Recognises own abilities and limitations

Understands research methods and has ability to analyse scientific publications

Research/ academic activities

Recognition and application of child protection and handling issues and relevant legislation

(NSPCC course in child protection and handling)
Intrathoracic transplantation and surgery for heart failure

### Objective

To be able to evaluate and manage, with appropriate supervision, some of the aspects of patients with heart failure, including operative management where appropriate. This module is intended for a trainee to gain initial exposure to this subspeciality either as part of general cardiothoracic training or as an introduction to further advanced training in this area.

### Knowledge

#### BASIC KNOWLEDGE

<table>
<thead>
<tr>
<th>Pathophysiology</th>
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<tbody>
<tr>
<td>3 Haemodynamics of heart failure.</td>
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<tr>
<td>3 Molecular mechanisms underlying heart failure.</td>
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<tr>
<td>3 Haemodynamics of cardiac constriction.</td>
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<tr>
<td>3 Mechanisms and outcomes of respiratory failure.</td>
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<tr>
<td>3 Causes of cardiac failure.</td>
<td></td>
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<tr>
<td>3 Causes of respiratory failure.</td>
<td></td>
</tr>
</tbody>
</table>

#### Immunology

| 3 Major and minor histocompatibility antigen systems. |  |
| 3 Mechanisms of immune activation and pathological consequences for transplanted organs. |  |

#### Pharmacology

| 3 Modes of action of commonly used drugs in heart failure: |  |

#### CLINICAL KNOWLEDGE

| 4 Resynchronisation therapy: techniques and indications |  |
| 4 Indications for, contraindications to and assessment for heart transplantation. |  |
| 4 Indications for, contraindications to and assessment for lung and heart/lung transplantation. |  |
| 4 Criteria for brain stem death, management of the brain-dead donor, criteria for matching donor and recipient. |  |
| 4 Management of patients after intrathoracic organ transplantation, including complications |  |
| 4 Results of heart transplantation, lung transplantation and non-transplant interventions for heart failure. |  |

#### Clinical Skills

| HISTORY AND EXAMINATION |  |
| 4 Cardiovascular system and general history and examination including conduit, drug |  |
history, identification of comorbidity and risk assessment

DATA INTERPRETATION

4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
4 Chest radiograph
4 ECG including exercise ECG
4 Coronary angiography
4 Cardiac catheterisation data
3 Echocardiography including 2D, Doppler and TOE and stress echo
3 Nuclear cardiology

PATIENT MANAGEMENT

4 Cardiopulmonary resuscitation
3 Management of brain-dead donor
4 Diagnosis and treatment of cardiac arrhythmias
3 4 Management of post cardiac surgical patient
3 Management of complications of surgery
3 Cardiac rehabilitation
4 Blood transfusion and blood products
3 Wound infection and sternal disruption

Technical Skills

OPERATIVE MANAGEMENT

Transplantation
2 Donor Retrieval
1 Implantation of heart
1 Implantation of lung and heart/lung
Surgery for heart failure
2 Surgical revascularisation for ischaemic cardiomyopathy
1 Ventricular reverse remodelling surgery
1 Mitral valve repair for cardiac failure
1 Implantation of extracorporeal VAD
1 Implantation of intracorporeal VAD

Professional Skills

Clinical decision making
Ability to communicate with patient and relatives, including breaking bad news
Understands consent process and can discuss risk /benefit with the patient
Collaborates with colleagues and has good team skills
Demonstrates ability to prioritise and manage service
Effective time management and personal skills
Demonstrates ability to access knowledge and shows willingness to learn
Recognises own abilities and limitations
Understands research methods and has ability to analyse scientific publications
Research/academic activities
## Disorders of the Oesophagus

### Management of Benign Oesophageal Disorders

**Objective**
To evaluate and manage surgical aspects of benign oesophageal disorders. This module is intended for a trainee to gain initial exposure to this subspeciality either as part of general cardiothoracic training or as an introduction to further advanced training in this area.

**Knowledge**

**BASIC KNOWLEDGE**

**Physiology**

- Gastric and oesophageal cellular physiology
- Mechanical and cellular defence mechanisms in oesophagus
- Oesophageal mucosal injury and modulation
- Effects of acid pepsin and biliary reflux
- Oesophago-gastric physiology and assessment including pH monitoring
- Oesophageal motility measurement in achalasia, diffuse spasm and non-specific motility syndromes

**Anatomy**

- Embryology of the foregut.
- The oesophagus 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 anatomical relationships, blood supply and lymphatic drainage.

**Pathology**

- Inflammation and wound healing.
- Oesophageal injury response and variations in response.
- The inflammation, metaplasia, dysplasia cancer sequence.
- Neurological deficits / aetiology of oesophageal dysmotility disorders.
- Para-oesophageal hernias

**Pharmacology**

- Drugs used in the treatment of gastro-oesophageal reflux disorder and oesophageal dysmotility.

**Microbiology**

- The role of Helicobacter Pylori in gastritis and gastrooesophageal reflux disorder.
3 The rationale of bacterial eradication treatment

CLINICAL KNOWLEDGE

4 Diagnosis, investigation and treatment of benign oesophageal disorders.
4 Radiology, endoscopy, 24 hour pH monitoring and oesophageal function tests.
4 Risk assessment and stratification.
4 Open, laparoscopic and thoracoscopic surgery of the oesophagus.
4 Relative merits of conservative and operative treatment.
4 Alternative management of achalasia including dilatation and botox injection.
4 The indications for surgery in paraoesophageal hernia.

Clinical Skills

HISTORY AND EXAMINATION

4 General and specific history and examination including previous surgery, drug history, identification of comorbidity and risk assessment

DATA INTERPRETATION

4 Routine haematology and biochemical investigation
3 Interpretation of oesophageal motility and pH monitoring data
4 Chest radiograph and contrast imaging
4 Cardio-pulmonary assessment including exercise tests

PATIENT MANAGEMENT

3 Management of post thoracotomy or laparotomy surgical patient
3 Management of complications of surgery
3 Diagnosis and management of oesophageal perforation or anastamotic leak.
4 Blood transfusion and blood products
3 Wound infection and wound disruption

Technical Skills

OPERATIVE MANAGEMENT

2 Oesophago-gastro-duodenoscopy.
2 Rigid oesophagoscopy
2 Oesophageal dilatation
2 Open and laparoscopic fundoplication and cardiomyotomy
2 Mobilisation of oesophagus, stomach and colon
1 Oesophageal anastomosis
### Professional Skills
Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk /benefit with the patient. Is able to obtain consent from patient

Collaborates with colleagues and has good team skills

Takes full part in multidisciplinary team meetings

Demonstrates ability to prioritise and manage service

Effective time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Recognises own abilities and limitations

Research/academic activities

### Management of Oesophageal Neoplasia

#### Objective
*To evaluate and manage aspects of a patient with oesophageal neoplasia, including operative intervention where appropriate. This module is intended for a trainee to gain initial exposure to this subspeciality either as part of general cardiothoracic training or as an introduction to further advanced training in this area.*

#### Knowledge

**BASIC KNOWLEDGE**

**Physiology**

3 Gastric and oesophageal cellular physiology

3 Mechanical and cellular defence mechanisms in oesophagus

3 Oesophageal mucosal injury and modulation

3 Effects of acid pepsin and biliary reflux

**Anatomy**

3 The oesophagus and its anatomical relationships from cricopharyngeus to cardia including details of blood supply and lymphatic drainage.

3 Anatomy of the stomach, including its anatomical relationships, blood supply and lymphatic drainage.

3 Anatomy of the colon, including its blood supply and its anatomical relationships

3 Pathology

3 Inflammation and wound healing.
3 Oesophageal injury response and variations in response.
3 The aetiology and epidemiology of oesophageal cancer
3 Metaplasia-dysplasia sequence.
Pharmacology
3 Adjuvant and neoadjuvant chemotherapy.
Microbiology
3 The role of Helicobacter Pylori in gastritis and gastroesophageal reflux disorder.
3 The rationale of bacterial eradication treatment

CLINICAL KNOWLEDGE
4 Diagnosis, investigation and treatment of oesophageal disorders.
4 Radiology, endoscopy and oesophageal function tests.
4 Risk assessment and stratification.
4 Diagnostic tests, including contrast oesophageal imaging, CT Scanning, abdominal ultrasonography, endoscopic ultrasonography and PET scanning.
4 Treatment options and outcomes of treatment
4 Oesophageal resection
4 Palliative procedures
4 Other therapies including radiotherapy, laser, stent and photodynamic therapy
4 Screening and prevention.

Clinical Skills
HISTORY AND EXAMINATION
4 General and specific history and examination including previous surgery, drug history, and identification of comorbidity and risk assessment.

DATA INTERPRETATION
4 Routine haematology and biochemical investigations
3 Interpretation of Chest radiograph, contrast swallow and CT Scan
4 Cardio-pulmonary assessment including exercise tests.

PATIENT MANAGEMENT
3 Management of post thoracotomy or laparotomy surgical patient.
3 Management of complications of surgery
4 Blood transfusion and blood products
3 Wound infection and wound disruption
2 Diagnosis and management of oesophageal perforation or anastamotic leak.

**Technical Skills**

**OPERATIVE MANAGEMENT**

2 Oesophago-gastro-duodenoscopy

2 Assessment by thoracoscopy laparoscopy and mediastinoscopy

2 Rigid oesophagoscopy and bronchoscopy

2 Oesophageal dilatation and stent placement

2 Mobilisation of oesophagus, stomach and colon

1 Oesophageal resection

1 Oesophageal reconstruction including interposition techniques

**Professional Skills**

Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk/benefit with the patient. Is able to obtain consent from patient

Collaborates with colleagues and has good team skills

Takes part in multidisciplinary team meetings

Demonstrates ability to prioritise and manage service

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
6. Final Stage

Four point scales

What the 4 point scale means for Knowledge

30. Knows of
31. Knows basic concepts
32. Knows generally
33. Knows both specifically and broadly

What the 4 point scale means for Clinical Skills and Technical Skills and Procedures

34. Has observed
35. Can do with assistance
36. Can do whole but may need assistance
37. Competent to do whole without assistance, including managing complications
6.1 Overview

Final Phase of training (ST7 & ST8)

The final phase of training will consist of an indicative period of two years. These two years should in turn consist of four modules, each of 6 months. By the end of this phase trainees will have been successful in the intercollegiate examination. Trainees will have developed sufficient experience and competence in the generality of cardiothoracic surgery to be eligible for the award of a CCT. They may be provided with the opportunity to develop an area of special interest during this period through the selection of appropriate modules.

The curriculum for each of the modules is defined (see syllabus). Aims and levels of competence to be attained within each module by the end of this stage are identified.

The list of specialist index conditions is detailed below. This list defines the requirements for the award of a CCT and in cardiothoracic surgery. All trainees (including those who are developing additional special interests and those who are taking academic pathway) will be required to meet these standards.

- The management of critically ill cardiothoracic surgical patients in the pre and post operative periods.
- The management of a patient undergoing cardiopulmonary bypass
- The management of myocardial protection during cardiac surgery
- The management of a patient requiring circulatory support
- The assessment and management of patients with coronary heart disease, including elective and emergency presentations. To include competence in both primary and secondary procedures, and where appropriate to include off pump and on pump strategies and arterial revascularisation
- The preliminary assessment and initial management of patients with complications of myocardial infarction, including mitral regurgitation, aneurysm and septal defects. To include operative management in appropriate situations. Full competence in operative management of complex cases to be developed in the post CCT period
- The assessment and management of patients with valvular heart disease; including both isolated and combined aortic and mitral valve disease.
- The assessment and management of patients with combined coronary and valvular heart disease, including operative management.
- Full competence in operative management of complex cases including mitral valve repair and secondary procedures to be developed in the post CCT period.
- The preliminary assessment and initial management of patients with acute dissection of the ascending aorta. To include operative management in appropriate situations.
- Full competence in operative management of complex cases to be developed in the post CCT period
- The assessment and management of patients with minor and major cardiothoracic trauma. To include operative management in appropriate situations.
- Full competence in the operative management of complex cases including great vessel injury to be developed in the post CCT period
- Patient selection and determination of suitability for major thoracic surgery and the pre and postoperative management of a thoracic surgical patient.
- The assessment and management of a patient by bronchoscopy including foreign body retrieval
- The assessment and management of a patient by mediastinal exploration
- Competence in performing appropriate thoracic incisions
The assessment and management of lung cancer, including the scientific basis of staging systems and techniques used in the determination of stage and fitness for surgery

An understanding of the role of surgical treatment in the multidisciplinary management of lung cancer and other intrathoracic malignant diseases, including an appreciation of the principles of other treatment modalities and their outcomes

The assessment and management of patients with pleural disease; including pneumothorax and empyema, and including both VATS and open strategies

The assessment and management of patients with chest wall abnormalities, infections and tumours

The assessment and management of patients disorders of the diaphragm, including trauma to the diaphragm

The assessment and management of patients with emphysematous and bullous lung disease; including surgical management if appropriate and utilising both VATS and open strategies.

Full competence in operative management of complex cases, including lung reduction surgery, to be developed in the post CCT period

The assessment and management of patients with disorders of the pericardium and pericardial cavity; including surgical management if appropriate and utilising both VATS and open strategies

The assessment and management of patients with mediastinal tumours and masses; including surgical management if appropriate and utilising both VATS and open strategies

The assessment and management of patients with disorders of the major airways. Including operative management in suitable cases.

Full competence in operative management of complex cases, including tracheal resection, to be developed in the post CCT period

The curriculum is flexible and can accommodate the needs of trainees following an academic pathway. This is achieved by having individualised learning agreements. Academic trainees will be expected to demonstrate that they have achieved all the essential requirements of the CCT, but may choose not to undertake any optional additional training in the final stage. It is however acknowledged that academic trainees will need longer training pathways to achieve the essential competencies.
## 6.2 Conditions

### Critical Care and Postoperative Management

<table>
<thead>
<tr>
<th><strong>Objective</strong></th>
<th>To be able to manage a post surgical patient on the critical care, high dependency and post operative wards. To work as part of a multiprofessional, multidisciplinary team in the management of a patient requiring complex critical care</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td>BASIC KNOWLEDGE</td>
</tr>
<tr>
<td></td>
<td><strong>Physiology</strong></td>
</tr>
<tr>
<td></td>
<td>4 Haemodynamics: physiology and measurement</td>
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<td>4 Cardiac arrhythmia</td>
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<td></td>
<td>4 Haemostasis, thrombosis and bleeding</td>
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<td>4 Acid base balance</td>
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<td>4 Pulmonary physiology, ventilation and gas exchange</td>
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<td>4 Metabolic response to trauma and surgery</td>
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<td>4 GIT, renal and hepatic physiology</td>
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<td>4 Nutrition</td>
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<td>4 Temperature regulation</td>
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<tr>
<td></td>
<td><strong>Anatomy</strong></td>
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<tr>
<td></td>
<td>4 Heart, pericardium and great vessels</td>
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<td>4 Mediastinum, thoracic inlet and neck</td>
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<td></td>
<td>4 Tracheobronchial tree and lungs</td>
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<td>4 Chest wall and diaphragm</td>
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<tr>
<td></td>
<td><strong>Pathology</strong></td>
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<tr>
<td></td>
<td>4 Inflammation and wound healing</td>
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<tr>
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<td>4 Myocardial infarction and complications</td>
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<td>4 Endocarditis</td>
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<td>4 Pericarditis</td>
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<td>4 Systemic Inflammatory Response Syndrome</td>
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<td></td>
<td>4 Bronchopulmonary infection</td>
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<td>4 ARDS</td>
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</tbody>
</table>

**Pharmacology**
4 Drugs used in the treatment of hypertension, heart failure and angina
4 Inotropes, vasodilators and vasoconstrictors
4 Anti-arrhythmic drugs
4 Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general

Microbiology
4 Organisms involved in cardiorespiratory infection
4 Antimicrobial treatment and policies

CLINICAL KNOWLEDGE
4 Cardiopulmonary resuscitation
4 Management of cardiac surgical patient
4 Management of thoracic surgical patient
4 Treatment of cardiac arrhythmia
4 Management of complications of surgery
4 Blood transfusion and blood products
4 Wound infection and sternal disruption
4 Neuropsychological consequences of surgery and critical care

Clinical Skills

HISTORY AND EXAMINATION
4 History and examination of the postoperative and critically ill patient

DATA INTERPRETATION
4 Analysis and interpretation of post operative and critical care charts and documentation
4 Routine haematology and biochemical investigations
4 Chest radiograph and ECG
3 Echocardiography including TOE

PATIENT MANAGEMENT
General management of surgical patient
Management of fluid balance and circulating volume

Pain control

Wound management

Management of surgical drains

Antimicrobial policy and prescribing

Management of postoperative haemorrhage

Cardiopulmonary resuscitation (ALS)

Management of complications of surgery

Blood transfusion and blood products

Wound infection and sternal disruption

Recognition, evaluation and treatment of haemodynamic abnormalities

Evaluation and interpretation of haemodynamic data

Practical use of inotropes and vasoactive drugs

Use of intra aortic balloon pump

Recognition, evaluation and treatment of cardiac arrhythmias

Interpretation of ECG

Use of anti-arrhythmic drugs

Use of defibrillator

Understanding and use of cardiac pacing

Recognition, evaluation and treatment of ventilatory abnormalities

Interpretation of blood gas results

Airway management

Understanding of ventilatory techniques and methods

Understanding of anaesthetic drugs and methods

Recognition, evaluation and treatment of multiorgan dysfunction

Renal dysfunction and support

GIT dysfunction, feeding and nutrition

Recognition and evaluation of cerebral and neuropsychological problems

Technical Skills

PRACTICAL SKILLS

Arterial cannulation
4 Central venous cannulation
4 Pulmonary artery catheterisation
4 Intra aortic balloon pump insertion
4 Intra aortic balloon pump timing and management
4 Tracheostomy
4 Fibreoptic bronchoscopy
4 Chest aspiration
4 Chest drain insertion
4 Chest drain management

OPERATIVE MANAGEMENT

4 Surgical re-exploration for bleeding or tamponade

**Professional Skills**

Clinical decision making

Understands patients needs in critical care and postoperative environment

Communicates with patient and relatives effectively and sympathetically

Team skills: collaborates with intensivists, nurses and other colleagues.

Recognises own abilities and limitations

Demonstrates ability to prioritise and manage service

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support

Cardiopulmonary Bypass

Objective
To manage the clinical and technical aspects of cardiopulmonary bypass, myocardial protection and circulatory support.

Knowledge
BASIC KNOWLEDGE

Physiology
4 Haemodynamics: physiology and measurement
4 Cardiac arrhythmias
4 Haemostasis, thrombosis and bleeding
4 Acid base balance
4 Pulmonary physiology, ventilation and gas exchange
4 Metabolic response to trauma and surgery
4 GIT, renal and hepatic physiology
4 Temperature regulation

Anatomy
4 Heart, pericardium and great vessels
4 Mediastinum, thoracic inlet and neck
4 Chest wall and diaphragm
4 Femoral triangle and peripheral vascular system

Pathology
4 Inflammation and wound healing
4 Systemic Inflammatory Response Syndrome
4 ARDS

Pharmacology
4 Drugs used in the treatment of hypertension, heart failure and angina
4 Inotropes, vasodilators and vasoconstrictors
4 Anti-arrhythmic drugs
4 Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general

Microbiology
4 Organisms involved in cardiorespiratory infection

4 Antimicrobial treatment and policies

SPECIFIC KNOWLEDGE

4 Principles and practice of CPB

4 Relevant equipment and technology and its application

4 Monitoring during CPB

4 Inflammatory and pathophysiological response to bypass

4 Pulsatile and non pulsatile flow

4 Effect of CPB on pharmacokinetics

4 Priming fluids and haemodilution

4 Acid base balance – pH and alpha stat

4 Neuropsychological consequences of CPB

4 Cell salvage and blood conservation

Clinical Skills

No content

Technical Skills

OPERATIVE MANAGEMENT

4 Median sternotomy open and close

4 Cannulation and institution of cardiopulmonary bypass

4 Safe conduct of CPB – problem solving and troubleshooting

4 Weaning from bypass and decannulation

4 Femoral cannulation and decannulation

4 Repeat sternotomy, with pericardial dissection, cardiac mobilisation and cannulation

Professional Skills

Clinical decision making

Team skills: collaborates with perfusionists, anaesthetists and other colleagues.

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to prioritise and manage service

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities

Myocardial Protection
**Objective**

*To manage the clinical and technical aspects of cardiopulmonary bypass, myocardial protection and circulatory support.*

**Knowledge**

**BASIC KNOWLEDGE**

4 Myocardial cellular physiology  
4 Myocardial function and dysfunction  
4 Haemodynamics and arrhythmias  
4 Coronary arterial and venous anatomy

**SPECIFIC KNOWLEDGE**

4 Scientific foundations of myocardial preservation  
4 Principles and practice of myocardial preservation  
4 Cardioplegia solutions and delivery modes.  
4 Non-cardioplegic techniques of preservation

**Clinical Skills**

**PATIENT MANAGEMENT**

4 Myocardial management throughout the perioperative period  
4 Ability to adapt preservation technique to clinical situation

**Technical Skills**

**OPERATIVE MANAGEMENT**

4 Relevant cannulation techniques and appropriate delivery of cardioplegia

**Professional Skills**

Clinical decision making  
Recognises own abilities and limitations  
Time management and personal skills  
Demonstrates ability to access knowledge and shows willingness to learn  
Understands research methods and has ability to analyse scientific publications

Research/academic activities

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**Circulatory Support**

**Objective**

*To manage the clinical and technical aspects of cardiopulmonary bypass, myocardial protection and circulatory support.*

**Knowledge**

**BASIC KNOWLEDGE**
4 Haemodynamics: physiology and measurement
4 Cardiac arrhythmias
4 Haemostasis, thrombosis and bleeding
4 Anatomy of the femoral triangle and peripheral vascular system
4 Inotropes, vasodilators and vasoconstrictors
4 Anti-arrhythmic drugs
4 Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs

SPECIFIC KNOWLEDGE
4 Mechanical circulatory support in the preoperative, perioperative and postoperative periods
4 Intra aortic balloon pump – indications for use, patient selection and complications
4 Physiology of the balloon pump
4 Understanding of relevant equipment and technology
4 Ventricular assist devices – indications for use, patient selection and complications

Clinical Skills
PATIENT MANAGEMENT
4 Patient selection for mechanical circulatory support
4 Insertion and positioning of the intra aortic balloon pump
4 Management of the balloon pump including timing and trouble shooting
4 Care of the patient with intra aortic balloon pump, including recognition and management of complications

Technical Skills
No content

Professional Skills
Clinical decision making
Team skills: collaborates with perfusionists, anaesthetists and other colleagues.
Recognises own abilities and limitations
Demonstrates ability to prioritise and manage service
Time management and personal skills
Demonstrates ability to access knowledge and shows willingness to learn
Understands research methods and has ability to analyse scientific publications
Research/academic activities
**Ischaemic Heart Disease**

<table>
<thead>
<tr>
<th>Objective</th>
<th>To evaluate and manage all the surgical aspects of a patient with ischaemic heart disease including the complications of ischaemic heart disease.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>BASIC KNOWLEDGE</td>
</tr>
<tr>
<td>Physiology</td>
<td>4 Myocardial cellular physiology</td>
</tr>
<tr>
<td></td>
<td>4 Haemodynamics; physiology and measurement</td>
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<tr>
<td></td>
<td>4 Electrophysiology, including conduction disorders</td>
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<tr>
<td></td>
<td>4 Haemostasis, thrombosis and bleeding</td>
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<tr>
<td></td>
<td>4 Acid base balance</td>
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<tr>
<td></td>
<td>4 Pulmonary physiology, ventilation and gas exchange</td>
</tr>
<tr>
<td></td>
<td>4 Metabolic response to trauma</td>
</tr>
<tr>
<td></td>
<td>4 Vascular biology and reactivity</td>
</tr>
<tr>
<td>Anatomy</td>
<td>4 Heart, pericardium and great vessels</td>
</tr>
<tr>
<td></td>
<td>4 Coronary anatomy and variants</td>
</tr>
<tr>
<td></td>
<td>4 Coronary angiography</td>
</tr>
<tr>
<td></td>
<td>4 Anatomy of the peripheral vascular system and vascular conduits</td>
</tr>
<tr>
<td>Pathology</td>
<td>4 Inflammation and wound healing</td>
</tr>
<tr>
<td></td>
<td>4 Atheroma, medial necrosis and arteritis</td>
</tr>
<tr>
<td></td>
<td>4 Intimal hyperplasia and graft atherosclerosis</td>
</tr>
<tr>
<td></td>
<td>4 Myocardial infarction and complications</td>
</tr>
<tr>
<td></td>
<td>4 Systemic Inflammatory Response Syndrome</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>4 Drugs used in the treatment of hypertension, heart failure and angina</td>
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<tr>
<td></td>
<td>4 Anti-arrhythmic drugs</td>
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<tr>
<td></td>
<td>4 Haemostatic drugs</td>
</tr>
<tr>
<td></td>
<td>4 Antiplatelet, anticoagulant and thrombolytic drugs</td>
</tr>
</tbody>
</table>
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general

Microbiology
4 Organisms involved in cardiorespiratory infection
4 Organisms involved in wound infection
4 Antibiotic usage and prophylaxis
4 Antisepsis

CLINICAL KNOWLEDGE

General
4 Diagnosis, investigation and treatment of heart disease
4 Risk assessment and stratification
4 Cardiopulmonary resuscitation
4 Cardiac arrhythmias
4 Complications of surgery
4 Renal dysfunction
4 Multiorgan failure
4 Cardiac rehabilitation
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Specific
4 Diagnosis investigation and assessment of IHD
4 Operative treatment - Off pump and on pump surgery
4 Results of surgery ? survival, graft patency, recurrence
4 Arterial revascularisation
4 Redo coronary artery surgery
4 Role of PCI and non operative treatment
4 Management of cardiovascular risk factors
4 Complications of myocardial infarction and ischaemic heart disease VSD, mitral regurgitation, aneurysm.

Clinical Skills
HISTORY AND EXAMINATION

4 Cardiovascular system and general history and examination including conduit, drug
DATA INTERPRETATION

4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
4 Chest radiograph
4 ECG including exercise ECG
4 Coronary Angiography
4 Cardiac Catheterisation data
4 Echocardiography including 2D, Doppler and TOE and stress echo
4 Nuclear cardiology

PATIENT MANAGEMENT

4 Cardiopulmonary resuscitation
4 Diagnosis and treatment of cardiac arrhythmias
4 Management of post cardiac surgical patient
4 Management of complications of surgery
4 Cardiac rehabilitation
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Technical Skills

OPERATIVE MANAGEMENT

4 Isolated, first time coronary artery surgery
(May include both off pump and on pump options and arterial revascularisation strategies)
4 Repeat coronary artery surgery
3 Complications of ischaemic heart disease including post infarction VSD, mitral regurgitation and left ventricular aneurysm

Professional Skills

Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk /benefit with the patient. Is able to obtain consent from patient

Collaborates with colleagues and has good team skills
<table>
<thead>
<tr>
<th>Demonstrates ability to prioritise and manage service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognises own abilities and limitations</td>
</tr>
<tr>
<td>Time management and personal skills</td>
</tr>
<tr>
<td>Demonstrates ability to access knowledge and shows willingness to learn</td>
</tr>
<tr>
<td>Understands research methods and has ability to analyse scientific publications</td>
</tr>
<tr>
<td>Research/academic activities</td>
</tr>
</tbody>
</table>
Heart Valve Disease

Objective
To evaluate and manage a patient with both uncomplicated and complicated heart valve disease, including operative management.

Knowledge
BASIC KNOWLEDGE

Physiology
4 Cardiovascular physiology including valve physiology and haemodynamics
4 Electrophysiology, including conduction disorders
4 Haemostasis, thrombosis and bleeding
4 Acid base balance
4 Pulmonary physiology, ventilation and gas exchange
4 Metabolic response to trauma

Anatomy
4 Cardiac chambers and valves, pericardium and great vessels
4 Anatomy of the conduction system

Pathology
4 Pathophysiology of valve incompetence and stenosis.
4 Consequences of valve disease on cardiac function and morphology
4 Pathophysiology of mixed valve disease and combined valve pathology (eg aortic and mitral)
4 Combined valvular and ischaemic heart disease
4 Atrial fibrillation and other arrhythmias

Pharmacology
4 Drugs used in the treatment of hypertension, heart failure and angina
4 Anti-arrhythmic drugs
4 Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general

Microbiology
4 Organisms involved in cardio respiratory infection
4 Organisms involved in wound infection
4 Antibiotic usage and prophylaxis
4 Antisepsis
4 Endocarditis and prosthetic valve endocarditis

CLINICAL KNOWLEDGE
General knowledge
4 Cardiopulmonary resuscitation
4 Care of the cardiac surgical patient
4 Complications of surgery
4 Risk assessment and stratification
4 Management of cardiovascular risk factors

Specific Knowledge
4 Diagnosis investigation and assessment of valvular heart disease
4 Timing of surgical intervention in valve disease
4 Options for operative management including: Valve replacement/repair (mechanical, biological stented and stentless grafts, homografts and autografts)
4 Valve design: materials, configuration and biomechanics.
4 Results of surgery – survival, valve thrombosis, endocarditis, bleeding.
4 Interpretation of survival and follow up data
4 Cardiac performance and long term functional status
4 Surgery for conduction problems
4 Surgical treatment of arrhythmias

Clinical Skills

HISTORY AND EXAMINATION
4 Cardiovascular system and general history and examination including drug history, identification of co morbidity and risk assessment

DATA INTERPRETATION
4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
4 Chest radiograph
4 ECG interpretation including exercise ECG
4 Coronary angiography
4 Cardiac catheterisation data including left and right heart data
4 Echocardiography (thoracic and transoesophageal) including 2D, Doppler and stress echo
4 Nuclear cardiology

PATIENT MANAGEMENT
4 Cardiopulmonary resuscitation
4 Diagnosis and treatment of cardiac arrhythmias
4 Management of post cardiac surgical patient
4 Management of complications of surgery
4 Cardiac rehabilitation
4 Blood transfusion and blood products
4 Wound infection and sternal disruption
4 Non operative management of endocarditis
4 Valve selection
4 Anticoagulation management including complications.

**Technical Skills**

OPERATIVE MANAGEMENT
4 Isolated, uncomplicated aortic valve replacement (stented biological or mechanical)
4 Isolated uncomplicated mitral valve replacement
4 Tricuspid valve surgery
4 Combined valve and graft surgery
4 Surgical strategies for managing the small aortic root
4 Aortic root surgery including stentless valves, and root replacement
4 Redo Valve surgery
4 Valve surgery for endocarditis
4 Techniques for surgical ablation of arrhythmias
3 Mitral valve repair
3 Alternative surgical approaches to valve surgery including thoracotomy, transseptal approaches, and minimal access surgery

**Professional Skills**

Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk/benefit with patient and relatives
Collaborates with colleagues and has good team skills
Demonstrates ability to prioritise and manage service
Demonstrates ability to access knowledge and to learn
Understands research methods and has ability to analyse scientific publications
Recognises own abilities and limitations
Time management and effective personal skills

Academic/research activities
Aortovascular Disease

Objective
To evaluate and manage uncomplicated surgical aspects of a patient with aortovascular disease, including operative management where appropriate and up to the defined competence. This level of competence is that required of a consultant cardiothoracic surgeon and is defined in the list of key conditions. It is expected that full competence in all aspects of aortovascular surgery would only be obtained in the post CCT period by those with a sub speciality interest.

Knowledge
BASIC KNOWLEDGE

Physiology
- Vascular biology and reactivity
- Haemodynamics; physiology and measurement
- Rheology and arterial pressure regulation
- Haemostasis, thrombosis and bleeding
- Physiology of transfusion therapy
- Principles of surgical infectious disease
- Acid base balance
- Metabolic response to trauma
- Pathophysiology and of hypothermia including the effects upon haemoglobin, metabolic rate and pH with their management

Anatomy
- Heart, pericardium and great vessels
- Anatomy of the peripheral vascular system
- Blood supply of the spinal cord

Pathology
- Inflammation and wound healing
- Atheroma, medial necrosis and arthritis
- Inherited disorders of vascular biology
- Systemic Inflammatory Response Syndrome
- Pharmacology
- Drugs used in the treatment of hypertension, heart failure and angina
- Anti-arrhythmic drugs
- Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs
4 Anti-emetics
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general

Microbiology
4 Organisms involved in cardiorespiratory infection
4 Organisms involved in wound infection
4 Antibiotic usage and prophylaxis
4 Antisepsis

CLINICAL KNOWLEDGE

General
4 Risk assessment
4 Cardiopulmonary resuscitation
4 Cardiac arrhythmias
4 Complications of surgery
4 Renal dysfunction
4 Multiorgan failure
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Specific
4 Natural history of aortic disease
4 Diagnosis, investigation and assessment of aortic disease
4 Knowledge of operative treatment including spinal cord and cerebral preservation strategies
  • Type A dissection
  • Type B dissection
  • Traumatic aortic rupture
  • Thoraco-abdominal aneurysm
4 Results of surgery – survival, complication rates
4 Non-surgical management including the role of endovascular stenting
4 Management of cardiovascular and non-cardiovascular risk factors

Clinical Skills
HISTORY AND EXAMINATION
4 Cardiovascular system and general history and examination including assessment of preoperative complications, drug history, identification of co-morbidity and risk assessment

DATA INTERPRETATION

4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
4 Chest radiograph
4 ECG including exercise ECG
4 Coronary Angiography
4 Aortography
4 Cardiac Catheterisation data
4 Echocardiography including 2D, doppler and TOE and stress echo
4 CT scanning
4 MRI scanning

PATIENT MANAGEMENT

4 Cardiopulmonary resuscitation
4 Diagnosis and treatment of cardiac arrhythmias
4 Management of post cardiac surgical patient
4 Management of complications of surgery
4 Cardiac rehabilitation
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Technical Skills

OPERATIVE MANAGEMENT

4 Intraoperative monitoring
4 Spinal cord protection
4 Preparation for and management of cardiopulmonary bypass, including alternative, non-bypass strategies for descending aortic surgery
4 Hypothermic strategies including HCA, RCP and SACP
4 Femoral cannulation
3 Surgery for acute dissection of the ascending aorta
3 Aortic root replacement for chronic aortic root disease
2 Complex aortic surgery including arch surgery, descending aortic and thoraco-abdominal
Professional Skills

Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk/benefit with the patient. Is able to obtain consent from patient

Collaborates with colleagues and has good team skills

Demonstrates ability to prioritise and manage service

Effective time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Recognises own abilities and limitations

Understands research methods and has ability to analyse scientific publications

Research/academic activities
# Cardiothoracic Trauma

**Objective**

To evaluate and manage, including surgical management where appropriate, and as part of a multidisciplinary team, a patient with thoracic trauma. Competence in operative management of thoracic trauma is required of all CCT holders in cardiothoracic surgery. All trainees should maintain their ATLS certification and senior trainees are encouraged to become ATLS instructors.

**Knowledge**

**BASIC KNOWLEDGE**

- Anatomy of the lungs, heart, chest wall, diaphragm and oesophagus
- Anatomy of the larynx, trachea and bronchial tree
- Physiology of breathing and its control
- Physiology of the heart and circulation

**GENERAL TRAUMA MANAGEMENT**

- Principles of trauma management (as defined by ATLS)
- Principles of emergency resuscitation following cardiac arrest

**SPECIFIC KNOWLEDGE**

- The mechanism and patterns of injury associated with blunt, penetrating and deceleration injuries to the chest
- The post-ATLS, definitive care of blunt, penetrating and deceleration injuries to the chest.
- The indications and use of appropriate investigations in thoracic trauma management
- Pain relief in chest trauma, including epidural anaesthesia.
- Indications for immediate, urgent and delayed thoracotomy in trauma

**Clinical Skills**

**GENERAL TRAUMA MANAGEMENT (ATLS)**

- Assessment and management of airway, breathing and circulation
- Maintenance of an adequate airway and respiratory support
- Protection of the cervical spine
- Circulatory resuscitation
- Establishment of appropriate monitoring
- Assessment and management of pain and anxiety

**CARDIOTHORACIC TRAUMA MANAGEMENT**

- Examination and assessment of the of the chest, including respiratory cardiovascular and
circulatory systems

4 Recognition and management of immediately life threatening situations: obstructed airway, tension pneumothorax, massive haemothorax, open chest wound, flail chest and cardiac tamponade

4 Recognition and management of potentially life threatening situations: lung contusion, bronchial rupture, blunt cardiac injury, intrathoracic bleeding, oesophageal injury, simple pneumothorax and major vascular injury

4 Recognition of potentially life threatening penetrating injuries to the chest and abdomen

4 Interpretation of chest x-ray, ECG, arterial blood gases and echocardiography

4 Detection and treatment of cardiac arrhythmias

4 Management of the widened mediastinum including appropriate investigations and multidisciplinary consultation

Technical Skills
PRACTICAL SKILLS

4 Establish an emergency airway (surgical and non-surgical)

4 Insertion and management of thoracic drains

4 Establish adequate venous access and monitoring.

4 Pericardiocentesis and subxiphoid pericardial window for tamponade

OPERATIVE MANAGEMENT OF THORACIC TRAUMA

4 Subxiphoid pericardial window for tamponade

4 Postero-lateral, thoracotomy, antero lateral thoracotomy and thoraco-laparotomy

4 Bilateral Anterior Thoracotomy

4 Median sternotomy and closure

4 Repair of cardiac injuries

4 Repair of pulmonary and bronchial injuries

4 Management of the complications of chest trauma including retained haemothorax and empyema

3 Repair of oesophageal injuries

3 Repair of aortic transection

Professional Skills
Clinical decision making

Communication skills

Team skills; collaborates with other surgical disciplines and members of the multidisciplinary team.

Communicates with patient and relatives

Breaking bad news
Demonstrates ability to access knowledge and show willingness to learn

Recognises own abilities and limitations

Demonstrates ability to manage and prioritise service

Ability to understand research method and understand scientific publications
## General Management of a Patient Undergoing Thoracic Surgery

### Objective

To be fully competent in the evaluation and management of a patient undergoing thoracic surgery. The knowledge and clinical skills are common to all thoracic surgical conditions, and should be read in conjunction with the curriculum for specific surgical conditions.

### Knowledge

**BASIC KNOWLEDGE**

**Physiology**
- Pulmonary physiology, ventilation and gas exchange
- Haemostasis, thrombosis and bleeding
- Acid base balance
- Metabolic response to trauma
- Digestive, renal and hepatic physiology
- Nutrition

**Anatomy**
- Tracheobronchial tree and lungs
- Thoracic inlet, neck and mediastinum
- Oesophagus and upper GI tract
- Chest wall and diaphragm

**Pathology**
- Inflammation and wound healing
- Bronchopulmonary infections
- ARDS
- Emphysema
- Pulmonary fibrosis
- Pulmonary manifestations of systemic disease
- Systemic manifestations of pulmonary disease
- Benign and malignant tumours of trachea, bronchus and lung parenchyma
- Oesophagitis, columnar-lined oesophagus stricture
- Oesophageal motility disorders
- Malignant and benign tumours of the oesophagus and stomach
4 Malignant and benign tumours of the pleura and chest wall, mediastinum and thyroid

Pharmacology
4 Bronchodilators
4 H2 antagonists and proton pump inhibitors
4 Haemostatic drugs
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general

Microbiology
4 Organisms involved in respiratory infection including TB
4 Organisms involved in wound infection
4 Antibiotic usage and prophylaxis
4 Antisepsis
4 Management of intra pleural sepsis

CLINICAL KNOWLEDGE
Thoracic Incisions
4 Types of incisions and appropriate use, including lateral, anterior, muscle sparing and video-assisted approaches.

Sternalotomy
4 Difficult access and improving exposure.
4 Early and late complications of thoracic incisions
4 Analgesia including pharmacology, effectiveness, side effects and use in combination regimens
4 Post-operative analgesia, including epidural, PCAS and paravertebral catheter techniques.

Bronchoscopy
4 The role of rigid and flexible bronchoscopy in the investigation of airway and pulmonary disease.
4 The anaesthetic, airway and ventilatory management during rigid and flexible bronchoscopy

Mediastinal exploration
4 Endoscopic, radiological and surgical approaches used to evaluate and diagnose mediastinal disease of benign, infective, primary and malignant aetiology.
4 Equipment for mediastinal exploration
4 Relevant imaging techniques, and influence on surgical approach.
Clinical Skills

HISTORY AND EXAMINATION

4 System specific and general history and examination, including drug history, identification of comorbidity and functional status.

DATA INTERPRETATION

4 Routine haematology and biochemical investigations
4 Chest radiograph and ECG
4 CT, including contrast enhanced CT
4 Interpretation of imaging of the mediastinum.
4 MRI and PET
4 Respiratory function tests
4 Ventilation/perfusion scan
4 Blood gases
4 Oesophageal function tests and contrast studies

PATIENT MANAGEMENT

General
4 Cardiopulmonary resuscitation
4 Risk assessment, stratification and management
4 Management of patients making an uncomplicated or complicated recovery from thoracic operations.
4 Post-operative management of pain control, respiratory failure, sputum retention, haemodynamic instability and low urine output.
4 Treatment of cardiac arrhythmias
4 Pain control
4 Wound infection and disruption
4 Blood transfusion and blood products
4 Physiotherapy and rehabilitation
3 Palliative care

Technical Skills

PRACTICAL SKILLS

4 Arterial cannulation
4 Central venous cannulation
4 Pulmonary artery catheterisation
4 Tracheostomy
4 Fibreoptic bronchoscopy
4 Chest aspiration
4 Chest drain insertion
4 Chest drain management

OPERATIVE MANAGEMENT

Thoracic Incisions
4 Correct positioning of patient for thoracic surgery
4 Perform and repair thoracic incisions, including lateral, anterior, muscle sparing and VATS incisions.
4 Difficult access and improving exposure
4 Perform and close sternotomy incision

Bronchoscopy
4 Diagnostic bronchoscopy including biopsy - rigid and flexible.
4 Equipment, instrumentation and preparation
4 Perform rigid and flexible bronchoscopy
4 Airway and ventilatory management
4 Recognise normal and abnormal anatomy.
4 Identify common pathologies and the surgical relevance of the findings.
4 Take appropriate specimens for bacteriology, cytology and histology.
4 Management of moderate bleeding and other common complications.
4 To appropriately supervise the care of patients recovering from bronchoscopy.
4 Post-operative bronchoscopy: indications and procedure

4 Tracheostomy and minitracheostomy

Mediastinal Exploration
4 Assembly of relevant equipment for mediastinal exploration
4 Surgical evaluation of the mediastinum using cervical, anterior and VATS approaches.
4 Mediastinal biopsy

Professional Skills
Clinical decision making

Ability to communicate with patient and relatives

Understands consent process and can discuss risk /benefit with the patient

Collaborates with colleagues and has good team skills

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Neoplasms of the Lung

Objective
To fully assess and manage a patient with a neoplasm of the lung, including operative management where appropriate and including complicated situations. Appreciation of the multidisciplinary, multimodality approach to the management of the condition.

Knowledge
GENERAL KNOWLEDGE
As for thoracic surgery - general

SPECIFIC KNOWLEDGE
4 Benign and malignant tumours of trachea, bronchus and lung parenchyma
4 Epidemiology, presentation, diagnosis, staging (pre-operative, intraoperative and pathological) and treatment of lung cancer and lung metastases.
4 Neoadjuvant and adjuvant treatment of lung cancer
4 Results of treating thoracic malignancy by surgery, medical or oncological techniques, including multimodality management.
4 Survival, recurrence rates and relapse patterns after surgical treatment and the investigation and management of relapse.
4 Knowledge of palliative care techniques.
4 Treatment of post-operative complications of pulmonary resection such as empyema and broncho-pleural fistula.
4 Role of repeat surgery in recurrent and second primary malignancies of the lung.
4 Medical and surgical options to deal with recurrent or problematic complications of pulmonary resection.

Clinical Skills
PATIENT MANAGEMENT
As for thoracic surgery - general
4 Clinical history and examination
4 Interpretation of laboratory, physiological and imaging techniques.
4 Interpretation of endoscopic findings.
4 Patient selection with assessment of function and risk.

Technical Skills
OPERATIVE MANAGEMENT
4 Bronchoscopic assessment including biopsy
4 Endoscopic and surgical techniques of lung biopsy.
4 Mediastinal assessment and biopsy
3 Endoscopic management of tumours using laser and stenting

4 Intraoperative diagnosis and staging

4 Surgery for benign and malignant conditions of the lungs, including uncomplicated lobectomy for lung cancer, wedge resection and metastasectomy.

4 Segmentectomy and lobectomy for benign and malignant disease.

4 Redo operations for repeat resections of lung metastases.

3 Advanced resections for lung cancer, including sleeve lobectomy, pneumonectomy and extended resections involving chest wall and diaphragm.

3 Repeat resections for benign and malignant conditions of the lung, including completion pneumonectomy

3 Management of post-operative complications such as empyema and broncho-pleural fistula.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills in multimodality care.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Cancer and bereavement counselling.

Delivering bad news.

Understands research methods and has ability to analyse scientific publications

Research/academic activities
# Disorders of the Pleura

<table>
<thead>
<tr>
<th><strong>Disorders of the Pleura</strong></th>
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<tbody>
<tr>
<td><strong>Objective</strong></td>
</tr>
<tr>
<td><em>To fully evaluate and manage surgical conditions of the pleura and the pleural space, including complicated situations.</em></td>
</tr>
<tr>
<td><strong>Knowledge</strong></td>
</tr>
<tr>
<td><strong>GENERAL KNOWLEDGE</strong></td>
</tr>
<tr>
<td>As for thoracic surgery – general</td>
</tr>
<tr>
<td><strong>SPECIFIC KNOWLEDGE</strong></td>
</tr>
<tr>
<td>4 Anatomy and physiology of the pleura</td>
</tr>
<tr>
<td>4 Inflammatory, infective and malignant disease of the visceral and parietal pleura.</td>
</tr>
<tr>
<td>4 Pneumothorax</td>
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<td>4 Pleural effusion</td>
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<tr>
<td>4 Empyema</td>
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<td>4 Mesothelioma</td>
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<td>4 Haemothorax</td>
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<td>4 Chylothorax</td>
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<tr>
<td>4 Conditions of adjacent organs that affect the pleura</td>
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<tr>
<td>4 Medical and surgical management of pleural disease, including radiological, open and VATS techniques.</td>
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<tr>
<td>4 Techniques to deal with failures of primary treatment.</td>
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<tr>
<td>4 Advanced techniques for pleural space obliteration such as thoracoplasty and soft-tissue transfer</td>
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<tr>
<td><strong>Clinical Skills</strong></td>
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<tr>
<td><strong>PATIENT MANAGEMENT</strong></td>
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<tr>
<td>As for thoracic surgery – general</td>
</tr>
<tr>
<td>4 Interpretation of imaging of the pleura</td>
</tr>
<tr>
<td>4 Chest drains: insertion, management, removal and treatment of complications.</td>
</tr>
<tr>
<td>4 Management of patients making uncomplicated and complicated recovery from pleural interventions.</td>
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<tr>
<td><strong>Technical Skills</strong></td>
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<tr>
<td><strong>OPERATIVE MANAGEMENT</strong></td>
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<tr>
<td>4 Open procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemorthorax including drainage, biopsy, pleurodesis and pleurectomy</td>
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<tr>
<td>4 VATS procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemorthorax including drainage, biopsy, pleurodesis and pleurectomy</td>
</tr>
<tr>
<td>4 Open and VATS procedures for empyema, including techniques for decortication.</td>
</tr>
</tbody>
</table>
3 Open and VATS procedures in complex cases.

3 Advanced techniques of pleural space obliteration, with appropriate specialist assistance.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills.

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
### Disorders of the Chest Wall

<table>
<thead>
<tr>
<th>Disorders of the Chest Wall</th>
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<tbody>
<tr>
<td><strong>Objective</strong></td>
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<tr>
<td>To assess and manage a patient with abnormality or disease affecting the chest wall, including surgical management where appropriate, and including complex cases.</td>
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<table>
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<tr>
<th>Knowledge</th>
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<tr>
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</tr>
<tr>
<td>As for thoracic surgery – general</td>
</tr>
<tr>
<td>SPECIFIC KNOWLEDGE</td>
</tr>
<tr>
<td>4 Anatomy of the chest wall</td>
</tr>
<tr>
<td>4 Congenital, inflammatory, infective and neoplastic conditions that can affect the components of the chest wall.</td>
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<tr>
<td>4 Clinical, laboratory and imaging techniques used in the evaluation of chest wall pathology.</td>
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<tr>
<td>4 Techniques used in the diagnosis of chest wall disease, including aspiration and core biopsy, and incision and excision biopsy.</td>
</tr>
<tr>
<td>4 Pectus deformities: aetiology, physiological and psychological consequences. Surgical options for correction.</td>
</tr>
<tr>
<td>4 Techniques used to resect the sternum and chest wall, physiological and cosmetic sequelae.</td>
</tr>
<tr>
<td>4 Prosthetic materials used in chest wall surgery</td>
</tr>
<tr>
<td>4 The role of repeat surgery to deal with recurrent conditions and the complications of previous surgery.</td>
</tr>
<tr>
<td>4 Techniques of complex chest wall reconstruction involving thoracoplasty or soft-tissue reconstruction</td>
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<tr>
<td>As for thoracic surgery – general</td>
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<tr>
<td>4 Clinical history and examination</td>
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<tr>
<td>4 Interpretation of laboratory, physiological and imaging techniques.</td>
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<tr>
<td>4 Patient selection with assessment of function and risk.</td>
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<tbody>
<tr>
<td>OPERATIVE MANAGEMENT</td>
</tr>
<tr>
<td>4 Chest wall biopsy and choice of appropriate technique.</td>
</tr>
<tr>
<td>4 Needle biopsy by aspiration or core techniques and the siting of open surgical biopsy.</td>
</tr>
<tr>
<td>4 Open and excision biopsy and resection of the chest wall for benign and malignant</td>
</tr>
</tbody>
</table>
conditions.

4 Chest wall resection in combination with resection of the underlying lung.

4 Selection and insertion of prosthetic materials, and selection of cases in which such materials are required.

4 Pectus correction, by both open and minimally-invasive techniques, including post-operative care and complications.

4 Surgery for the complications of chest wall resection, and repeat surgery to resect recurrent chest wall conditions.

3 Complex chest wall reconstruction with thoracoplasty and, with appropriate specialist support, soft tissue reconstruction.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk/benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills.
## Disorders of the Diaphragm

### Objective
To assess and manage a patient with disease or abnormality of the diaphragm, including surgical management where appropriate, and including complicated cases.

### Knowledge

#### GENERAL KNOWLEDGE
As for thoracic surgery – general

#### SPECIFIC KNOWLEDGE
(Knowledge to level 4)

- Anatomy and physiology of the diaphragm.
- Pathology of the diaphragm.
- Clinical, physiological and imaging techniques in the assessment of diaphragmatic abnormalities.
- Physiological consequences of diaphragmatic herniation or paresis.
- Surgical techniques used to biopsy and resect diaphragmatic tumours.
- Situations in which replacement of the diaphragm is required, the materials used and their value and limitations.
- Complications of diaphragmatic resection and their management.
- Techniques used to electrically pace the diaphragm, and the conditions in which such treatment is appropriate.

### Clinical Skills

#### PATIENT MANAGEMENT
As for thoracic surgery – general

#### Specific Skills

- Clinical history and examination
- Interpretation of laboratory, physiological and imaging techniques.
- Patient selection with assessment of function and risk.
- Management of patients making an uncomplicated or complicated recovery from diaphragmatic resection.

### Technical Skills

#### OPERATIVE MANAGEMENT

- Resection of the diaphragm, and adjacent structures, including appropriate selection and insertion of prosthetic materials
4 Complications of diaphragmatic resection.

4 Phrenic nerve pacing.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills.

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Research/academic activities
# Emphysema and Bullae

## Objective
To fully assess and manage a patient with emphysema and bullae, including surgical management where appropriate, and including complicated cases.

## Knowledge

### GENERAL KNOWLEDGE

As for thoracic surgery – general

### SPECIFIC KNOWLEDGE

- 4 Aetiology, pathology and physiology of chronic obstructive airways disease (COPD)
- 4 Epidemiology and public health issues
- 4 Smoking cessation measures.
- 4 Clinical, laboratory, physiological and imaging techniques.
- 4 Medical and surgical management of COPD and its complications
- 4 Selection criteria and pre-operative preparation
- 4 Surgical techniques used in the treatment of emphysema and bullae and the results of surgical treatment including relevant clinical trials.
- 4 Lung volume reduction surgery: techniques, complications and management of complications.
- 4 Experimental and developmental techniques in lung volume reduction surgery

## Clinical Skills

### PATIENT MANAGEMENT

As for thoracic surgery – general

- 4 Clinical history and examination
- 4 Interpretation of laboratory, physiological and imaging techniques.
- 4 Patient selection with assessment of function and risk.
- 4 Postoperative management of patients making an uncomplicated recovery from surgery for emphysema or the complications of such diseases.
- 4 Management of patients following lung volume reduction surgery.

## Technical Skills

### OPERATIVE MANAGEMENT

- 4 Procedures to deal with secondary pneumothorax and bullae by open techniques.
- 4 Procedures to deal with secondary pneumothorax and bullae by VATS techniques.
3 Lung volume reduction surgery, unilaterally and bilaterally, using open and VATS techniques.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Disorders of the Pericardium

**Objective**
To fully assess and manage a patient with disease of the pericardium or pericardial space, including surgical management where appropriate, and including complicated cases.

**Knowledge**

- **GENERAL KNOWLEDGE**
  - As for thoracic surgery – general

- **SPECIFIC KNOWLEDGE**
  - 4 Anatomy of the pericardium.
  - 4 Pathology of the pericardium.
  - 4 Pathophysiological consequences of pericardial constriction and tamponade.
  - 4 Clinical, echocardiographic and imaging techniques used to detect pericardial disease and assess its consequences.
  - 4 Techniques for pericardial drainage using guided needle aspiration
  - 4 Surgical drainage by sub-xiphoid, thoracotomy or VATS approaches.
  - 4 Surgical techniques for pericardiectomy.
  - 4 Materials used for pericardial replacement, their value and limitations and the situations in which used.
  - 4 Post-operative complications following resection of the pericardium and its prosthetic replacement.

**Clinical Skills**

- **PATIENT MANAGEMENT**
  - As for thoracic surgery – general
  - 4 Clinical history and examination
  - 4 Interpretation of laboratory, physiological and imaging techniques, including echocardiography.
  - 4 Recognition and assessment of pericardial tamponade and constriction.
  - 4 Techniques for pericardial drainage using guided needle aspiration
  - 4 Recognition of pericardial herniation and cardiac strangulation.
  - 4 Patient selection with assessment of function and risk.
  - 4 Management of patients making an uncomplicated or complicated recovery from pericardial surgery.

**Technical Skills**

- **OPERATIVE MANAGEMENT**
  - 4 Uncomplicated pericardial fenestration procedures
4 Pericardial fenestration in complex cases.

4 Pericardiectomy for relief of constriction

4 Resection of the pericardium and replacement, in appropriate situations, with prosthetic materials.

4 Competence in dealing with the complications of pericardial resection and replacement.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Disorders of the Mediastinum

**Objective**
To fully assess and manage a patient with benign and malignant disease of the mediastinum, including surgical management where appropriate, and including complicated cases.

**Knowledge**

**GENERAL KNOWLEDGE**
As for thoracic surgery – general

**SPECIFIC KNOWLEDGE**

4 Anatomy of the mediastinum

4 Congenital, benign, infective and malignant (primary and secondary) conditions of the mediastinum.

4 Systemic conditions associated with the mediastinum.

4 Clinical, laboratory, electromyographic and imaging techniques used in the diagnosis and assessment of patients with mediastinal disease

4 Myasthenia gravis: medical, surgical and perioperative management

4 Staging of thymoma and grading of myasthenia

4 Benign and malignant conditions, which do not require surgical biopsy or resection.

4 Oncological treatment of malignant diseases of the mediastinum, including multidisciplinary care.

4 Surgical techniques for the treatment of myasthenia gravis, mediastinal cysts and tumours, complications and results.

4 Retrosternal goitre and its management

**Clinical Skills**

**PATIENT MANAGEMENT**
As for thoracic surgery – general

4 Clinical history and examination

4 Interpretation of laboratory, physiological and imaging techniques.

4 Patient selection with assessment of function and risk.

4 Postoperative management of patients including recognition and management of post-operative complications.

**Technical Skills**

**OPERATIVE MANAGEMENT**

4 Selection of appropriate routes for biopsy and excision of mediastinal tumours and cysts.
4 Biopsy of mediastinal masses.
4 Excision of the thymus for myasthenia gravis.
4 Resection of mediastinal cysts and tumours masses.
4 Resection of mediastinal cysts and tumours, including extended resections involving adjacent structures.

**Professional Skills**

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk/benefit with the patient.

Collaborates with colleagues and has good team skills.

Recognises own abilities and limitations

Time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

**Research/academic activities**
Disorders of the Airway

Objective
To assess and manage a patient with disease of the major airways, including surgical management where appropriate, and including complicated cases.

Knowledge
GENERAL KNOWLEDGE

As for thoracic surgery – general

SPECIFIC KNOWLEDGE

4 Anatomy of the larynx, trachea and bronchus.
4 Physiology of the normal airway.
4 Pathophysiology of disease and its effects on lung function.
4 Endoscopic appearances in health and disease.
4 Congenital, inflammatory, infective, benign and neoplastic diseases of the airways.
4 Symptoms, signs of airway disease.
4 Clinical, physiological and imaging tests undertaken to diagnose and assess airway disease.
4 Techniques for surgical resection of the trachea.
4 Bronchoplastic procedures and the limitations of these techniques.
4 Medical and oncological treatments available to deal with airway diseases.
4 Endoscopic techniques used to deal with benign and malignant conditions, including disobliteration and stenting.
4 Presentation, investigation and management of anastamotic complications following airway surgery.
4 Presentation, evaluation and treatment of fistulae in the aerodigestive tract, due to benign, malignant and iatrogenic causes.
4 Role of open and endoscopic procedures in dealing with problems.

Clinical Skills
PATIENT MANAGEMENT

As for thoracic surgery – general
4 Clinical history and examination
4 Interpretation of laboratory, physiological and imaging techniques.
4 Recognition, diagnosis and assessment of airway obstruction.
4 Patient selection with assessment of function and risk.
4 Post-operative care of patients making an uncomplicated recovery from major airway
surgery.

4 Post-operative care of patients making a complicated recovery from airway surgery.

Technical Skills

OPERATIVE MANAGEMENT

4 Endoscopic assessment of a patient with airways disease

4 Sleeve resection of the trachea for simple benign conditions, including appropriate anastamotic techniques.

4 Sleeve resection of the main bronchi, including lobectomy where appropriate, for malignant disease, including appropriate anastomotic techniques.

4 Techniques for the relief of major airways obstruction including stenting.

3 Airway resection for tumours and complex benign conditions, and techniques for airway reconstruction, anastomosis and laryngeal release.

3 Repeat resections for recurrence and the complications of prior resection.

3 Management of fistulae in the aerodigestive tract by surgical and endoscopic techniques.

Professional Skills

Clinical decision-making.

Ability to communicate with patient and relatives.

Understands consent process and can discuss risk /benefit with the patient.

Collaborates with colleagues and has good team skills.

Demonstrates ability to access knowledge and shows willingness to learn.

Recognises own abilities and limitations.

Effective time management and personal skills

Understands research methods and has ability to analyse scientific publications

Research/academic activities
Congenital Heart Disease

Objective
This module is aimed at the trainee who has completed training in the generality of cardiothoracic surgery and wishes to specialise in congenital heart disease. Following completion of this module the trainee will be fully competent in the clinical and operative management of uncomplicated congenital heart disease. It is expected that subsequent professional development in the post CCT period will provide competence in all aspects of congenital heart disease, including complex problems.

Knowledge
BASIC KNOWLEDGE

Physiology
4 Relevant general physiology of childhood
4 Fetal circulation and circulatory changes at birth
4 Haemodynamics; physiology and measurement including shunt calculations
4 Physiology of pulmonary vasculature
4 Myocardial cellular physiology in immature myocardium
4 Electrophysiology, including conduction disorders
4 Haemostasis, thrombosis and bleeding
4 Acid base balance
4 Pulmonary physiology, ventilation and gas exchange
4 Metabolic response to trauma
4 Vascular biology and reactivity
4 Physiology of Cardiopulmonary Bypass including low flow and circulatory arrest.
4 Ph and alpha stat CPB management

Anatomy
4 Embryology of the heart
4 Anatomy of the heart, pericardium and great vessels
4 Pulmonary anatomy
4 Coronary anatomy and variants
4 Anatomy of the peripheral vascular system and vascular conduits including aortopulmonary shunts
4 Sequential cardiac analysis and terminology of cardiac malformations

Pathology
4 Inflammation and wound healing
4 Systemic Inflammatory Response Syndrome
4 Effect of growth and pregnancy
Pharmacology
4 Drugs used in the treatment of congenital heart disease
4 Inotropes
4 Anti-arrhythmic drugs
4 Haemostatic drugs
4 Antiplatelet, anticoagulant and thrombolytic drugs
4 Analgesics
4 Antibiotics
4 Anaesthetic agents, local and general
4 Hypotensive agents (systemic and pulmonary).
Microbiology
4 Organisms involved in cardiorespiratory infection
4 Organisms involved in wound infection
4 Antibiotic usage and prophylaxis
4 Antiseptis
CLINICAL KNOWLEDGE
General
4 Diagnosis, investigation and treatment of congenital heart disease
4 Results of surgery - common complications and management.
4 Late complications of surgery for congenital heart disease
4 Role of interventional cardiology.
4 Role of mechanical assist (IABP, VAD and ECMO)
4 Indications for referral for transplantation
4 Risk assessment and stratification
4 Cardiopulmonary resuscitation
4 Cardiac arrhythmias
4 Renal dysfunction
4 Multiorgan failure
4 Cardiac rehabilitation
4 Blood transfusion and blood products

4 Wound infection and sternal disruption

4 Types of cardiac prosthesis and indications for use

Specific Knowledge

The anatomy, pathophysiology natural history and management of the following conditions or procedures

4 Patent ductus arteriosus
4 Aortopulmonary window
4 Atrial septal defect
4 Ventricular septal defect
4 Coarctation
4 PA banding
4 Aortopulmonary and venous shunts
4 Transposition of the great arteries - switch procedure
3 Congenitally corrected TGA
4 Single ventricle/univentricular heart
4 Tetralogy of Fallot/Pulmonary atresia plus VSD
4 Pulmonary atresia and intact septum
4 Hypoplastic left heart and Norwood procedure
4 Truncus arteriosus
4 Double outlet right ventricle
4 Pulmonary atresia plus VSD and MAPCAs
4 Partial and complete atroventricular septal defects
4 Anomalies of the pulmonary venous drainage (partial and total)
4 Anomalies of systemic venous drainage
4 Congenital aortic valve disease (including supra-valve stenosis)
4 LV outflow tract obstruction
4 Sinus of valsalva aneurysm
4 Congenital mitral valve disease
4 Congenital tricuspid valve disease (including Ebsteins abnormality)
4 Anomalies of the coronary arteries (including ALCAPA)
4 Vascular rings
3 Cardiac tumours
4 Pericardial disease
4 Extra cardiac conduits
4 Interrupted aortic arch
4 Extra Corporeal Membrane Oxygenation and VAD
4 Transplantation for congenital heart disease

Clinical Skills

HISTORY AND EXAMINATION

4 Cardiovascular system and general history and examination of child or adult with congenital heart disease

DATA INTERPRETATION

4 Routine haematology and biochemical investigations

4 Chest radiograph and ECG

3 Cardiac catheterisation data including interpretation of haemodynamic data, shunt and resistance calculations

3 Echocardiography in congenital heart disease, including 2D, doppler and TOE

PATIENT MANAGEMENT
4 Principles of paediatric intensive care
4 Management of adults and children following congenital heart surgery
4 Management of complications of surgery
4 Cardiopulmonary resuscitation
4 Diagnosis and treatment of cardiac arrhythmias
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Technical Skills
OPERATIVE MANAGEMENT

4 Sternotomy - open and close, including resternotomy
4 Thoracotomy - open and close
4 Preparation for and management of cardiopulmonary bypass including partial bypass
4 Approaches for ECMO, cannulation and management.

Surgical management of the following common uncomplicated conditions:
4 Patent ductus arteriosus
4 Atrial septal defect
4 Ventricular septal defect
4 Coarctation
3 Aortopulmonary window
4 Vascular ring
4 Aortopulmonary and venous shunts
4 PA banding

Surgical management of the following conditions requiring advanced procedures:
3 Partial atrioventricular septal defect
2 Aortic and mitral valve surgery including Ross procedure
3 Open aortic valvotomy
3 Open pulmonary valvotomy
2 Tricuspid valve surgery including Ebsteins
2 Tetralogy of Fallot/Pulmonary atresia plus VSD
2 Fontan procedures
2 Extra cardiac conduits and their replacement
2 Complete atrioventricular septal defect

Surgical management of the following conditions requiring complex procedures:
1 Interrupted aortic arch
1 Total anomalous pulmonary venous drainage
1 Transposition of the great arteries (switch procedure)
1 Rastelli procedure
1 Norwood procedure
1 Truncus arteriosus repair
1 Double outlet right ventricle
1 Pulmonary atresia plus VSD and MAPCAs

**Professional Skills**

Clinical decision making

Ability to communicate with patient, parents and relatives

Understands consent process for children and can discuss risk /benefit with the patient or the parents

Collaborates with colleagues and has good team skills

Demonstrates ability to prioritise and manage service

Effective time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Recognises own abilities and limitations

Understands research methods and has ability to analyse scientific publications

Research/ academic activities

Recognition and application of child protection and handling issues and relevant legislation
Intrathoracic transplantation and surgery for heart failure

**Objective**
To be able to evaluate and manage patients with heart failure, including operative management where appropriate. This module is intended to be completed by the trainee who has developed a specific interest in this subspecialty, with a view to becoming a specialist transplant/heart failure surgeon.

**Knowledge**

**BASIC KNOWLEDGE**

Pathophysiology

4 Haemodynamics of heart failure.

4 Molecular mechanisms underlying heart failure.

4 Haemodynamics of cardiac constriction.

4 Mechanisms and outcomes of respiratory failure.

4 Causes of cardiac failure.

4 Causes of respiratory failure.

Immunology

4 Major and minor histocompatibility antigen systems.

4 Mechanisms of immune activation and pathological consequences for transplanted organs.

Pharmacology

4 Modes of action of commonly used drugs in heart failure:

**CLINICAL KNOWLEDGE**

4 Resynchronisation therapy: techniques and indications

4 Indications for, contraindications to and assessment for heart transplantation.

4 Indications for, contraindications to and assessment for lung and heart/lung transplantation.

4 Criteria for brain stem death, management of the brain-dead donor, criteria for matching donor and recipient.

4 Management of patients after intrathoracic organ transplantation, including complications

4 Results of heart transplantation, lung transplantation and non-transplant interventions for heart failure.

**Clinical Skills**

**HISTORY AND EXAMINATION**

4 Cardiovascular system and general history and examination including conduit, drug history, identification of comorbidity and risk assessment
DATA INTERPRETATION
4 Routine haematology and biochemical investigations
4 Interpretation of haemodynamic data
4 Chest radiograph
4 ECG including exercise ECG
4 Coronary angiography
4 Cardiac catheterisation data
4 Echocardiography including 2D, Doppler and TOE and stress echo
4 Nuclear cardiology

PATIENT MANAGEMENT
4 Cardiopulmonary resuscitation
4 Management of brain-dead donor
4 Diagnosis and treatment of cardiac arrhythmias
4 Management of post cardiac surgical patient
4 Management of complications of surgery
4 Cardiac rehabilitation
4 Blood transfusion and blood products
4 Wound infection and sternal disruption

Technical Skills

OPERATIVE MANAGEMENT

Transplantation
4 Donor Retrieval
4 Implantation of heart
4 Implantation of lung and heart/lung

Surgery for heart failure
4 Surgical revascularisation for ischaemic cardiomyopathy
4 Ventricular reverse remodelling surgery
4 Mitral valve repair for cardiac failure
4 Implantation of extracorporeal VAD
4 Implantation of intracorporeal VAD

Professional Skills
Clinical decision making
Ability to communicate with patient and relatives, including breaking bad news
Understands consent process and can discuss risk /benefit with the patient
Collaborates with colleagues and has good team skills
Demonstrates ability to prioritise and manage service
Effective time management and personal skills
Demonstrates ability to access knowledge and shows willingness to learn
Recognises own abilities and limitations
Understands research methods and has ability to analyse scientific publications
Research/academic activities
## Disorders of the Oesophagus

### Management of Benign Oesophageal Disorders

**Objective**

To evaluate and manage all the surgical aspects of benign oesophageal disorders including the complications of benign oesophageal disorders. This module is intended to be completed by trainees with a subspecialty interest in oesophageal surgery.

**Knowledge**

**BASIC KNOWLEDGE**

**Physiology**

- Gastric and oesophageal cellular physiology
- Mechanical and cellular defence mechanisms in oesophagus
- Oesophageal mucosal injury and modulation
- Effects of acid pepsin and biliary reflux
- Oesphago-gastric physiology and assessment including pH monitoring
- Oesophageal motility measurement in achalasia, diffuse spasm and non-specific motility syndromes

**Anatomy**

- Embryology of the foregut.
- The oesophagus 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 anatomical relationships, blood supply and lymphatic drainage.

**Pathology**

- Inflammation and wound healing.
- Oesophageal injury response and variations in response.
- The inflammation, metaplasia, dysplasia cancer sequence.
- Neurological deficits / aetiology of oesophageal dysmotility disorders.
- Para-oesophageal hernias

**Pharmacology**

- Drugs used in the treatment of gastro-oesophageal reflux disorder and oesophageal dysmotility.

**Microbiology**

- The role of Helicobacter Pylori in gastritis and gastrooesophageal reflux disorder.
4 The rationale of bacterial eradication treatment

CLINICAL KNOWLEDGE

4 Diagnosis, investigation and treatment of benign oesophageal disorders.
4 Radiology, endoscopy, 24 hour pH monitoring and oesophageal function tests.
4 Risk assessment and stratification.
4 Open, laparoscopic and thoracoscopic surgery of the oesophagus.
4 Relative merits of conservative and operative treatment.
4 Alternative management of achalasia including dilatation and botox injection.
4 The indications for surgery in paraoesophageal hernia.
4 Endoscopic dilatation techniques

Clinical Skills

HISTORY AND EXAMINATION

4 General and specific history and examination including previous surgery, drug history, identification of comorbidity and risk assessment

DATA INTERPRETATION

4 Routine haematology and biochemical investigation
4 Interpretation of oesophageal motility and pH monitoring data
4 Chest radiograph and contrast imaging
4 Cardio-pulmonary assessment including exercise tests

PATIENT MANAGEMENT

4 Management of post thoracotomy or laparotomy surgical patient
4 Management of complications of surgery
4 Diagnosis and management of oesophageal perforation or anastamotic leak.
4 Blood transfusion and blood products
4 Wound infection and wound disruption

Technical Skills

OPERATIVE MANAGEMENT

4 Oesophago-gastro-duodenoscopy.
4 Rigid oesophagoscopy
4 Oesophageal dilatation
4 Open and laparoscopic fundoplication and cardiomyotomy
4 Mobilisation of oesophagus, stomach and colon
4 Oesophageal anastomosis

**Professional Skills**

**Clinical decision making**

Ability to communicate with patient and relatives

Understands consent process and can discuss risk /benefit with the patient. Is able to obtain consent from patient

Collaborates with colleagues and has good team skills

Takes full part in multidisciplinary team meetings

Demonstrates ability to prioritise and manage service

Effective time management and personal skills

Demonstrates ability to access knowledge and shows willingness to learn

Understands research methods and has ability to analyse scientific publications

Recognises own abilities and limitations

**Research/academic activities**

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**Management of Oesophageal Neoplasia**

**Objective**

To evaluate and manage all the aspects of a patient with oesophageal neoplasia, including operative intervention where appropriate. This module is intended to be completed by trainees with a subspeciality interest in oesophageal surgery.

**Knowledge**

**BASIC KNOWLEDGE**

**Physiology**

4 Gastric and oesophageal cellular physiology

4 Mechanical and cellular defence mechanisms in oesophagus

4 Oesophageal mucosal injury and modulation

4 Effects of acid pepsin and biliary reflux

**Anatomy**

4 The oesophagus and its anatomical relationships from cricopharyngeus to cardia including details of blood supply and lymphatic drainage.

4 Anatomy of the stomach, including its anatomical relationships, blood supply and lymphatic drainage.

4 Anatomy of the colon, including its blood supply and its anatomical relationships
Pathology

4 Inflammation and wound healing.
4 Oesophageal injury response and variations in response.
4 The aetiology and epidemiology of oesophageal cancer
4 Metaplasia-dysplasia sequence.

Pharmacology

4 Adjuvant and neoadjuvant chemotherapy.

Microbiology

4 The role of Helicobacter Pylori in gastritis and gastroesophageal reflux disorder.
4 The rationale of bacterial eradication treatment

CLINICAL KNOWLEDGE

4 Diagnosis, investigation and treatment of oesophageal disorders.
4 Radiology, endoscopy and oesophageal function tests.
4 Risk assessment and stratification.
4 Diagnostic tests, including contrast oesophageal imaging, CT Scanning, abdominal ultrasonography, endoscopic ultrasonography and PET scanning.
4 Treatment options and outcomes of treatment
4 Oesophageal resection
4 Palliative procedures
4 Other therapies including radiotherapy, laser, stent and photodynamic therapy
4 Screening and prevention.

Clinical Skills

HISTORY AND EXAMINATION

4 General and specific history and examination including previous surgery, drug history, and identification of comorbidity and risk assessment.

DATA INTERPRETATION

4 Routine haematology and biochemical investigations
4 Interpretation of Chest radiograph, contrast swallow and CT Scan
4 Cardio-pulmonary assessment including exercise tests.

PATIENT MANAGEMENT

4 Management of post thoracotomy or laparotomy surgical patient.
4 Management of complications of surgery
4 Blood transfusion and blood products
4 Wound infection and wound disruption
4 Diagnosis and management of oesophageal perforation or anastamotic leak.

Technical Skills
OPERATIVE MANAGEMENT
4 Oesophago-gastro-duodenoscopy
4 Assessment by thoracoscopy laparoscopy and mediastinoscopy
4 Rigid oesophagoscopy and bronchoscopy
4 Oesophageal dilatation and stent placement
4 Mobilisation of oesophagus, stomach and colon
4 Oesophageal resection
4 Oesophageal reconstruction including interpostion techniques

Professional Skills
Clinical decision making
Ability to communicate with patient and relatives
Understands consent process and can discuss risk /benefit with the patient. Is able to obtain consent from patient
Collaborates with colleagues and has good team skills
Takes part in multidisciplinary team meetings
Demonstrates ability to prioritise and manage service
Recognises own abilities and limitations
Time management and personal skills
Demonstrates ability to access knowledge and shows willingness to learn
Understands research methods and has ability to analyse scientific publications
Research/academic activities
7. Professional and Generic Skills

7.1. Initial

Professional Competencies to be acquired during the initial stage of surgical training.

Medical Expert (Good Clinical Care; Maintaining Good Medical Practice)

The specialty specific knowledge, clinical skills and technical skills and procedures relating to symptoms and conditions that a trainee will encounter during this stage of training are listed separately. The competencies listed below are generic competencies, which underpin the specialty specific competencies.

Skills

- Elicits a history that is relevant, concise, accurate and appropriate to the patient’s problem

Behaviour

- Demonstrates effective consultation skills in presenting well documented assessments and recommendations in written and/or verbal form in response to a request from another healthcare provider
- Demonstrates the attitudes and the skills necessary to retrieve and implement the information necessary to provide healthcare services to patients in meeting the needs and expectations of the community
- Demonstrates insight into his/her limitations by self assessment

Communicator (Good Clinical Care; Maintaining Good Medical Practice)

70. Effective doctor/patient communication

Objective

To establish a doctor/patient relationship characterised by understanding, trust, respect, empathy and confidentiality

Skills

- Able to gather information regarding the patient’s beliefs, concerns and expectations about the condition and consider the influence of factors such as the patient’s age, gender, ethnic, cultural and socio-economic background and spiritual values on that illness
- Able to elicit information regarding the beliefs, concerns and expectations of patients with regard to their presenting conditions.
- Able to evaluate factors such as the patient’s age, gender, ethnic, cultural, socio-economic and spiritual values and the impact that these may have on the management of that patient and condition.
- Able to deliver information to the patient and family humanely and in a way that is understandable, encourages discussion and promotes the patient’s participation in decision making to the level appropriate for the situation.
• Able to work with patients who present significant communication challenges such as anger or confusion, or an ethno-cultural background different from the doctor’s own.

71. **Communication with Colleagues**

**Objective**

To appreciate the importance of co-operation with other healthcare professionals involved in patient care and to ensure that the roles of these professionals are clear, consistent, understood by all involved, and that, appropriate and timely information is delivered to patients and their families.

**Skills**

• Able to communicate effectively with colleagues within and outside of the team
• Able to evaluate the roles and responsibilities of individuals within the clinical team and to ensure that these are understood by all concerned in the context of individual and general patient care.

**Collaborator (Good Clinical Care; Working with Colleagues)**

**Objective**

To achieve competence in the formulation and implementation of appropriate care plans in the clinical situation, in collaboration with members of an interdisciplinary team, incorporating assessment, investigation, treatment and continuing care.

**Skills**

• To achieve a goal related to patient care, a research problem, an educational activity or an administrative responsibility by using the expertise and being aware of the limitations of all members of an interdisciplinary team

**Manager (Working with Colleagues; Probity)**

**Objective**

be able to work effectively as a member of a team or a partnership and to accomplish tasks whether one is a team leader or a team member

**Health Advocate (Good Clinical Care; Probity)**

**Objective**

To demonstrate an understanding of determinants of health and public policy in relation to individual patients by identifying the patient’s status with respect to one or more determinants of health (i.e. unemployment)

**Skills**

• Adapts the assessment and management accordingly (i.e. the medical history to the patients social circumstances); and
• Assesses the patient’s ability to access various services in the health and social system and offer appropriate assistance.
1. **Clinical**

   **Objective**

   To demonstrate a rigorous approach to clinical problem solving

   **Skills**

   - Can pose a clinical question
   - Recognises and identifies gaps in knowledge and expertise around a clinical question
   - Formulates a plan to fill the gap by:
     - conducting an appropriate literature search based upon a clinical question
     - assimilating and critically appraise the literature
     - developing a system to store and retrieve relevant literature
     - consulting others (physicians and other healthcare professionals) in a collegiate manner
   - Proposes a solution to the clinical question
   - Implements the solution in practice. Evaluate the outcome and reassess the solution (re-enter the loop at c-i or c-ii)
   - Identifies practice areas for research

2. **Education and Teaching**

   **Objective**

   Can demonstrate an understanding of, and the ability to apply, the principles of adult education, with respect to oneself and others

   **Skills**

   - Uses his/her understanding of preferred learning methods in dealing with students, trainees and colleagues

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### Professional (Relationships with Patients; Probity)

1. **Discipline-Based Objectives**

   **Objective**

   Displays attitudes commonly accepted as essential to Professionalism

   **Skills**

   - Use appropriate strategies to maintain and advance professional competence
   - Continually evaluates one’s abilities, knowledge and skills and know one’s limitations of professional competence

2. **Personal Professional Boundary Objectives**

   **Objective**

   To balance personal and professional roles and responsibilities and to demonstrate ways of attempting to resolve conflicts and role strain
Skills

- Adopts specific strategies to heighten personal and professional awareness and explore and resolve interpersonal difficulties in professional relationships

3. Ethics and Professional Bodies

Objective

To recognise, analyse and know how to deal with unprofessional behaviours in clinical practice, taking into account local and national regulations

Knowledge

- Knows and understand the professional, legal and ethical codes of the General Medical Council and any other codes to which the physician is bound

Skills

- Recognises, analyses and attempts to resolve in clinical practice ethical issues such as truth telling, consent, advanced directives, confidentiality, end-of-life care, conflict of interest, resource allocation, research ethics etc
- Understands and is able to apply relevant legislation that relates to the health care system in order to guide one’s clinical practice
- Recognises, analyses and knows how to deal with unprofessional behaviours in clinical practice, taking into account local and national regulations
7.2. Intermediate

Professional Competencies to be acquired during the intermediate stage of surgical training. (New competencies are in bold)

<table>
<thead>
<tr>
<th>Medical Expert (Good Clinical Care; Maintaining Good Medical Practice)</th>
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<tbody>
<tr>
<td>The specialty specific knowledge, clinical skills and technical skills and procedures relating to symptoms and conditions that a trainee will encounter during this stage of training are listed separately. The competencies listed below are generic competencies, which underpin the specialty specific competencies.</td>
</tr>
</tbody>
</table>

Skills

- Elicits a history that is relevant, concise, accurate and appropriate to the patient’s problem

Behaviour

- Demonstrates effective consultation skills in presenting well documented assessments and recommendations in written and/or verbal form in response to a request from another healthcare provider
- Demonstrates the attitudes and the skills necessary to retrieve and implement the information necessary to provide healthcare services to patients in meeting the needs and expectations of the community
- Demonstrates insight into his/her limitations by self assessment

<table>
<thead>
<tr>
<th>Communicator (Good Clinical Care; Maintaining Good Medical Practice)</th>
</tr>
</thead>
</table>

1. Effective doctor/patient communication

Objective

To establish a doctor/patient relationship characterised by understanding, trust, respect, empathy and confidentiality

Skills

- Able to gather information regarding the patient’s beliefs, concerns and expectations about the condition and consider the influence of factors such as the patient’s age, gender, ethnic, cultural and socio-economic background and spiritual values on that illness
- Able to elicit information regarding the beliefs, concerns and expectations of patients with regard to their presenting conditions.
- Able to evaluate factors such as the patient’s age, gender, ethnic, cultural, socio-economic and spiritual values and the impact that these may have on the management of that patient and condition.
- Able to deliver information to the patient and family humanely and in a way that is understandable, encourages discussion and promotes the patient’s participation in decision making to the level appropriate for the situation.
- Able to work with patients who present significant communication challenges such as anger or confusion, or an ethno-cultural background different from the doctor’s own.

2. Communication with Colleagues

Objective
To appreciate the importance of co-operation with other healthcare professionals involved in patient care and to ensure that the roles of these professionals are clear, consistent, understood by all involved, and that, appropriate and timely information is delivered to patients and their families.

**Skills**

- Able to communicate effectively with colleagues within and outside of the team
- Able to evaluate the roles and responsibilities of individuals within the clinical team and to ensure that these are understood by all concerned in the context of individual and general patient care.

### Collaborator (Good Clinical Care; Working with Colleagues)

**Objective**

To achieve competence in the formulation and implementation of appropriate care plans in the clinical situation, in collaboration with members of an interdisciplinary team, following assessment, investigation, treatment and continuing care.

**Skills**

- To achieve a goal related to patient care, a research problem, an educational activity or an administrative responsibility by using the expertise and being aware of the limitations of all members of an interdisciplinary team

### Manager (Working with Colleagues; Probity)

**Objective**

To be able to work effectively as a member of a team or a partnership and to accomplish tasks whether one is a team leader or a team member.

### Health Advocate (Good Clinical Care; Probity)

**Objective**

To demonstrate an understanding of determinants of health and public policy in relation to individual patients by identifying the patient’s status with respect to one or more determinants of health (i.e. unemployment)

**Knowledge**

- Demonstrates an understanding of determinants of health and public policy in relation to:
  - Practice populations by work with specialty society and other organizations in identifying current “at risk” groups within a given specialty practice and applying the available knowledge about prevention to “at risk” groups within the practice; and contributing “group data” for better understanding of health problems within the population
  - General Population by describing in broad terms the key issues currently under debate regarding changes in the National Health System, indicating how these might affect societal health care outcomes and advocating to decrease the burden of illness (at a community or societal level) of a condition or problem relevant to
his/her specialty society, community based advocacy group, or other public education bodies, or private organizations

- Demonstrates an understanding of the determinants of health by identifying the most important determinants of health (i.e. poverty, unemployment, early childhood education, social support systems), being familiar with underlying research evidence, and applying this understanding to common problems and conditions in the trainees specialty
- Demonstrates an understanding of public health policy by describing how public policy is developed; identifying current policies that affect health, either positively or negatively (i.e. communicable diseases, tobacco, substance abuse); and citing examples of how policy was changed as a result of actions by physicians

**Skills**

- Adapts the assessment and management accordingly (i.e. the medical history to the patients social circumstances); and
- Assesses the patient’s ability to access various services in the health and social system and offer appropriate assistance.

**Scholar (Maintaining Good Medical Practice; Teaching and Training, Appraising and Assessing; Probity)**

1. **Clinical**

   **Objective**

   To demonstrate a rigorous approach to clinical problem solving

   **Skills**

   - Can pose a clinical question
   - Recognises and identifies gaps in knowledge and expertise around a clinical question
   - Formulates a plan to fill the gap by:
     - conducting an appropriate literature search based upon a clinical question
     - assimilating and critically appraise the literature
     - developing a system to store and retrieve relevant literature
     - consulting others (physicians and other healthcare professionals) in a collegiate manner
   - Proposes a solution to the clinical question
   - Implements the solution in practice. Evaluate the outcome and reassess the solution (re-enter the loop at c-i or c-ii)
   - Identifies practice areas for research

2. **Education and Teaching**

   **Objective**

   Can demonstrate an understanding of, and the ability to apply, the principles of adult education, with respect to oneself and others.

   **To be able to develop and deliver a teaching module or unit and supporting lecture notes for an undergraduate or peer teaching session.**

   **Skills**
Uses his/her understanding of preferred learning methods in dealing with students, trainees and colleagues

Plans educational activities which clearly set out aims and intended learning outcomes

Prepares appropriate teaching materials which meet learners’ needs

Behaviours

Shows a commitment to teaching and learning

3. Research

Objective

To demonstrate a rigorous approach to research through: a successful application to the ethics committee; or a successfully completing a formal audit application; or presenting to a local mortality and morbidity meeting; or presenting to a national meeting.

Skills

To be able to pose a research question (clinical, basic or population health)

Develops a proposal to solve the research question:
- Conduct an appropriate literature search on the research question
- Identify, consult and collaborate with appropriate content experts to conduct the research
- Propose the methodological approach to solve the question

Carries out the research outlined in the proposal

Defends and disseminates the results of the research

Identifies areas for further research that flow from the results

1. Discipline-Based Objectives

Objective

Displays attitudes commonly accepted as essential to professionalism

Skills

Use appropriate strategies to maintain and advance professional competence

Continually evaluates one’s abilities, knowledge and skills and know one’s limitations of professional competence

2. Personal Professional Boundary Objectives

Objective

To balance personal and professional roles and responsibilities and to demonstrate ways of attempting to resolve conflicts and role strain

Skills
3. **Ethics and Professional Bodies**

**Objective**

To recognise, analyse and know how to deal with unprofessional behaviours in clinical practice, taking into account local and national regulations.

**Knowledge**

- Knows and understands the professional, legal and ethical codes of the General Medical Council and any other codes to which the physician is bound.

**Skills**

- Recognises, analyses and attempts to resolve in clinical practice ethical issues such as truth telling, consent, advanced directives, confidentiality, end-of-life care, conflict of interest, resource allocation, research ethics etc.
- Understands and is able to apply relevant legislation that relates to the health care system in order to guide one’s clinical practice.
- Recognises, analyses and knows how to deal with unprofessional behaviours in clinical practice, taking into account local and national regulations.
7.3. Final

Professional Competencies to be acquired during the final stage of surgical training. (New competencies are in bold)

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</tbody>
</table>

Skills

- Elicits a history that is relevant, concise, accurate and appropriate to the patient’s problem

Behaviour

- Demonstrates effective consultation skills in presenting well documented assessments and recommendations in written and/or verbal form in response to a request from another healthcare provider
- Demonstrates the attitudes and the skills necessary to retrieve and implement the information necessary to provide healthcare services to patients in meeting the needs and expectations of the community
- Demonstrates insight into his/her limitations by self assessment
- **Demonstrates medical expertise in situations other than those involving direct patient care**

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<tr>
<td><strong>1. Effective doctor/patient communication</strong></td>
</tr>
<tr>
<td><strong>Objective</strong></td>
</tr>
<tr>
<td>To establish a doctor/patient relationship characterised by understanding, trust, respect, empathy and confidentiality</td>
</tr>
</tbody>
</table>

Skills

- Able to gather information regarding the patient’s beliefs, concerns and expectations about the condition and consider the influence of factors such as the patient’s age, gender, ethnic, cultural and socio-economic background and spiritual values on that illness
- Able to elicit information regarding the beliefs, concerns and expectations of patients with regard to their presenting conditions.
- Able to evaluate factors such as the patient’s age, gender, ethnic, cultural, socio-economic and spiritual values and the impact that these may have on the management of that patient and condition.
- Able to deliver information to the patient and family humanely and in a way that is understandable, encourages discussion and promotes the patient’s participation in decision making to the level appropriate for the situation.
- Able to work with patients who present significant communication challenges such as anger or confusion, or an ethno-cultural background different from the doctor’s own.

2. **Communication with Colleagues**
**Objective**

To appreciate the importance of co-operation with other healthcare professionals involved in patient care and to ensure that the roles of these professionals are clear, consistent, understood by all involved, and that appropriate and timely information is delivered to patients and their families.

**Skills**

- Communicates effectively with colleagues within and outside of the team
- Evaluates the roles and responsibilities of individuals within the clinical team and to ensure that these are understood by all concerned in the context of individual and general patient care.

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**Collaborator (Good Clinical Care; Working with Colleagues)**

**Objective**

To achieve competence in the formulation and implementation of appropriate care plans in the clinical situation, in collaboration with members of an interdisciplinary team, following assessment, investigation, treatment and continuing care.

**To understand how healthcare governance influences patient care, research and educational activities at a local, regional and national level**

**Skills**

- To achieve a goal related to patient care, a research problem, an educational activity or an administrative responsibility by using the expertise and being aware of the limitations of all members of an interdisciplinary team
- **Ability to accept, consider and respect the opinion of others team members, while contributing specialty-specific expertise him/herself in an interdisciplinary team meeting**
- **Ability to communicate with members of an interdisciplinary team in the resolution of conflicts, provide feedback, and where appropriate, assume a leadership role**

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**Manager (Working with Colleagues; Probity)**

**Objectives**

To be able to work effectively as a member of a team or a partnership and to accomplish tasks whether one is a team leader or a team member.

**To make clinical decisions and judgments based upon sound evidence for the benefit of individuals and the population served.**

**Skills**

- **Is able to function effectively in a healthcare organization from individual clinical practice to organisations at the local, regional and national level**
- **Through understanding the structure, financing, and operation of the NHS and its facilities, is able to function effectively within it playing an active role in its change**
- **Ability to access and apply a broad base of information to the care of patients in community care, hospital and other healthcare settings**
• Uses population based approaches to healthcare services and recognises their implication for medical practice
• Uses planning, budgeting, evaluation to maximise the outcomes of a patient care

**Health Advocate (Good Clinical Care; Probity)**

**Objective**

To demonstrate an understanding of determinants of health and public policy in relation to individual patients by identifying the patient’s status with respect to one or more determinants of health (i.e. unemployment)

**Skills**

• Adapts the assessment and management accordingly (i.e. the medical history to the patient's social circumstances); and
• Assesses the patient’s ability to access various services in the health and social system and offer appropriate assistance.

---

**Scholar (Maintaining Good Medical Practice; Teaching and Training, Appraising and Assessing; Probity)**

1. **Clinical**

   **Objective**

   To demonstrate a rigorous approach to clinical problem solving

   **Skills**

   • Can pose a clinical question
   • Recognises and identifies gaps in knowledge and expertise around a clinical question
   • Formulates a plan to fill the gap by:
     ▪ conducting an appropriate literature search based upon a clinical question
     ▪ assimilating and critically appraise the literature
     ▪ developing a system to store and retrieve relevant literature
     ▪ consulting others (physicians and other healthcare professionals) in a collegiate manner
   • Proposes a solution to the clinical question
   • Implements the solution in practice. Evaluate the outcome and reassess the solution (re-enter the loop at c-i or c-ii)
   • Identifies practice areas for research

2. **Education and Teaching**

   **Objective**

   Can demonstrate an understanding of, and the ability to apply, the principles of adult education, with respect to oneself and others.

   To develop and deliver a teaching module or unit and supporting lecture notes for an undergraduate or peer teaching session.

   **To supervise and mentor learners (trainees) in a work setting.**
To teach trainees in a work setting

**Skills**

- Uses his/her understanding of preferred learning methods in dealing with students, trainees and colleagues
- Plans educational activities which clearly set out aims and intended learning outcomes
- Prepares appropriate teaching materials which meet learners’ needs
- **Provides effective feedback to learners**
- **Optimises opportunistic teaching and learning in**
  - Operating theatre
  - Bedside
  - Outpatients
- Can highlight ways in which their clinical teaching might be improved
- Able to evaluate the use of reflective practice, learning agreements, portfolios and journals
- Uses different methods of assessment appropriate to what is being assessed e.g. knowledge, skills, judgment and professionalism
- Can differentiate between appraisal and assessment

**Behaviours**

- Shows a commitment to teaching and learning
- **Shows a willingness to supervise the work of less experienced colleagues**
- Shows sensitivity to the needs of learner and responds appropriately.

3. Research

**Objective**

To demonstrate a rigorous approach to research through: the publication of a paper in a peer review journal; or participation in a systematic review with defined outcomes; publishing guidance at trust, regional, specialty or national level.

**Skills**

- To be able to pose a research question (clinical, basic or population health)
- Develops a proposal to solve the research question:
  - Conduct an appropriate literature search on the research question
  - Identify, consult and collaborate with appropriate content experts to conduct the research
  - Propose the methodological approach to solve the question
- Carries out the research outlined in the proposal
- Defends and disseminate the results of the research
- Identifies areas for further research that flow from the results

Professional (Relationships with Patients; Probity)

1. **Discipline-Based Objectives**

**Objective**

Displays attitudes commonly accepted as essential to professionalism

**Skills**
• Use appropriate strategies to maintain and advance professional competence
• Continually evaluates one’s abilities, knowledge and skills and know one’s limitations of professional competence

2. **Personal Professional Boundary Objectives**

*Objective*

To balance personal and professional roles and responsibilities and to demonstrate ways of attempting to resolve conflicts and role strain

*Skills*

• Adopts specific strategies to heighten personal and professional awareness and explore and resolve interpersonal difficulties in professional relationships

3. **Ethics and Professional Bodies**

*Objective*

To recognise, analyse and know how to deal with unprofessional behaviours in clinical practice, taking into account local and national regulations

*Knowledge*

• Knows and understand the professional, legal and ethical codes of the General Medical Council and any other codes to which the physician is bound

*Skills*

• Recognises, analyses and attempts to resolve in clinical practice ethical issues such as truth telling, consent, advanced directives, confidentiality, end-of-life care, conflict of interest, resource allocation, research ethics etc
• Understands and is able to apply relevant legislation that relates to the health care system in order to guide one’s clinical practice
• Recognises, analyses and knows how to deal with unprofessional behaviours in clinical practice, taking into account local and national regulations