Curriculum for Cardiothoracic Surgery

(including Congenital Cardiac Surgery Sub-specialty)

August 2012

Contents

Curriculum Overview

IN THIS SECTION...

Curriculum Overview

Introduction

The intercollegiate surgical curriculum provides the framework for systematic training from completion of the foundation years through to consultant level in the UK. It achieves this through a syllabus that lays down the standards of specialty-based knowledge, clinical judgement, technical and operative skills and professional skills and behaviour, which must be acquired at each stage in order to progress. The curriculum is web based and is accessed through www.iscp.ac.uk. The website contains the most up to date version of the curriculum and each of the nine surgical specialty syllabuses. The nine specialities include Cardiothoracic Surgery, General Surgery, Neurosurgery, Oral and Maxillofacial surgery (OMFS), Otolaryngology (ENT), Paediatric surgery, Plastic surgery, Trauma and Orthopaedic Surgery (T&O) and Urology. They all share many aspects of the early years of surgical training in common, but naturally become increasingly singular as training in each discipline becomes more advanced. Each syllabus will emphasise the commonalities and elucidate in detail the requirements for training in the different specialities.

Doctors who will become surgical trainees

After graduating from medical school doctors immediately move onto a mandatory two-year foundation programme in clinical practice. During their final year of medical school students are encouraged to identify the area of medicine they wish to pursue into specialist training. During the Foundation programme, the recently qualified doctor is under close supervision whilst gaining a wide range of clinical experience during his/her first opportunity to practise medicine and whilst attaining a range of defined competencies. Entry into surgery is in open competition and requires applicants to understand, and provide evidence for, their suitability to become members of the surgical profession.

Selection into a surgical discipline

The responsibility for setting the standards for surgery rests with the Royal Colleges of Surgeons which operate through the Joint Committee on Surgical Training (JCST) and its nine Specialty Advisory Committees (SACs). Each SAC has developed the person specifications for selection into their specialty and the person specification for entry to ST1/CT1 in any discipline. Postgraduate Medical Deaneries and their Schools of Surgery are responsible for running training programmes and for the recruitment and selection at all levels of pre-CCT training.

The critical selection points for surgical training are at initial entry either directly into the chosen discipline (ST1) or into a generic training period referred to in this document as core (CT1). Those who enter core training are then selected into the discipline of their choice after two core years and join the speciality programme at a key competency point (ST3) after which stage transfer from one discipline to another would prove highly unusual.

Selection takes place via selection centres run either by individual Deaneries and Schools or in clusters arranged either by specialty or by locality. Some of these clusters aim for a national selection process for the whole of a discipline (for example, Urology, Cardiothoracic surgery and Neurosurgery) and others through practical problems posed by size and volume to regionally orientated groups (for example General and Trauma and Orthopaedic surgery). The development of selection centres is part of ongoing work and evaluation.

Those who are selected into training programmes will then have to achieve agreed milestones in terms of College examinations and the Annual Review of Competence Progression (ARCP).

Guidance about the recruitment process, application dates and deadlines and links to national person specifications by specialty are available from the Modernising Medical Careers website.

Educational Principles of the Curriculum

The provision of excellent care for the surgical patient, delivered safely, is at the heart of the curriculum.

The aims of the curriculum are to ensure the highest standards of surgical practice in the UK by delivering high quality surgical training and to provide a programme of training from the completion of the foundation years through to the completion of specialist surgical training, culminating in the award of a CCT. The curriculum was founded on the following key principles that support the achievement of these aims:

- A common format and similar framework across all the specialties within surgery.
- Systematic progression from the end of the foundation years through to the exit from surgical specialist training.
- Curriculum standards that are underpinned by robust assessment processes, both of which conform to the standards specified by the GMC.
- Regulation of progression through training by the achievement of outcomes that are specified within the specialty curricula. These outcomes are competence-based rather than time-based.
- Delivery of the curriculum by surgeons who are appropriately qualified to deliver surgical training.
- Formulation and delivery of surgical care by surgeons working in a multidisciplinary environment.
- Collaboration with those charged with delivering health services and training at all levels.

The curriculum is broad based and blueprinted to the Good Medical Practice framework to ensure that surgeons completing the training programme are more than just technical experts.

Equality and diversity are integral to the rationale of the curriculum and underpin the professional behaviour and leadership skills syllabus. The ISCP encourages a diverse surgical workforce and therefore encourages policies and practices that:

- Ensure every individual is treated with dignity and respect irrespective of their age, disability, gender, religion, sex, sexual orientation and ethnic, national or racial origins;
- Promote equal opportunities and diversity in training and the development of a workplace environment in which colleagues, patients and their carers are treated fairly and are free from harassment and discrimination.

It is expected that these values will be realised through each individual hospital trust's equality and diversity management policies and procedures. This principle also underlies the Professional Behaviour and Leadership syllabus.

Who Should Use the Curriculum?

This version of the curriculum will apply to all trainees entering surgical training at CT1/ST1 level from August 2010 onwards. Trainees entering surgical training prior to that date will continue to use the curriculum that was in place at the time that they entered surgical training, although all surgical trainees will be given the opportunity to switch to the new curriculum. Trainees appointed into training programmes prior to 31 December 2006 (UK Calman system) will also be encouraged to use the new curriculum.

The curriculum is appropriate for trainees preparing to practice as consultant surgeons in the UK. It guides and supports training for a Certificate of Completion of Training (CCT) in a surgical specialty. The curriculum enables trainees to develop as generalists within their chosen surgical specialty, to be able to deliver an on-call emergency service; and to deliver more specialised services to a defined level.

Doctors applying for a Certificate of Eligibility for Specialist Registration (CESR) via Article 14(4) on or from 1 August 2010 will be required to demonstrate that they meet the standards required for a CCT as set out in the curriculum. Doctors applying for a CESR before that date will be required to demonstrate that they meet the standards set for a CCT according to the version of the curriculum that was current at the time of their application.

Components of the Curriculum

The surgical curriculum has been designed around four broad areas, which are common to all the surgical specialties:

- **Syllabus** - what trainees are expected to know, and be able to do, in the various stages of their training
- **Teaching and learning** - how the content is communicated and developed, how trainees are supervised
- **Assessment** - how the attainment of outcomes are measured/judged, feedback to support learning
- **Training systems and resources** - how the educational programme is organised, recorded and quality assured

In order to promote high quality, safe care of surgical patients, the curriculum specifies the parameters of knowledge, clinical skills, technical skills, professional behaviour and leadership skills that are considered necessary to ensure patient safety throughout the training process and specifically at the end of training. The curriculum therefore provides the framework for surgeons to develop their skills and judgement and a commitment to lifelong learning in line with the service they provide.

Length of training

A similar framework of stages and levels is used by all the specialties. Trainees progress through the curriculum by demonstrating competence to the required standard for the stage of training. Within this framework each specialty has defined its structure and indicative length of training. The individual specialty syllabuses provide details of how the curriculum is shaped to the stages of training.

In general terms, by the end of training, surgeons have to demonstrate:

- Theoretical and practical knowledge related to surgery in general and to their specialty practice;
- Technical and operative skills;
- Clinical skills and judgement
- Generic professional and leadership skills;
- An understanding of the values that underpin the profession of surgery and the responsibilities that come with being a member of the profession;
- The special attributes needed to be a surgeon;
- A commitment to their ongoing personal and professional development and practice using reflective practice and other educational processes;
- An understanding and respect for the multi-professional nature of healthcare and their role in it; and
- An understanding of the responsibilities of being an employee of an NHS trust, hospital and/or a private practitioner.

In the final stage of training, when the trainee has attained the knowledge and skills required for the essential aspects of the curriculum in their chosen speciality, there will be the opportunity to extend his/her skills and competences in one or two specific fields. The final stage of the syllabus covers the major areas of specialised practice. The syllabuses are intended to allow the CCT holder to develop a particular area of clinical interest and expertise prior to appointment to a consultant post. Some will require further post CCT training in order to achieve the competences necessary for some of the rarer complex procedures. In some specialties, interface posts provide this training in complex areas pre CCT.

Educational Framework

The educational framework is built on three key foundations that are interlinked:

- Stages in the development of competent practice
- Standards in the areas of specialty-based knowledge, clinical judgement, technical and operative skills, and professional behaviour and leadership
- Framework for Appraisal, Feedback and Assessment

Stages of training

The modular surgical curriculum framework has been designed to define stages in the development of competent surgical practice, with each stage underpinned by explicit outcome standards. This provides a means of charting progress through the various stages of surgical training in the domains of specialty-based knowledge, clinical and technical skills and professional behaviour and leadership (including judgement).

Each surgical specialty has adapted this approach to reflect their training pathway. Therefore, although the educational concept is the same for all specialties the composition of the stages will differ.

The Initial stage reflects the early years of surgical training and the need for surgeons to gain competence in a range of knowledge and skills many of which will not be specialty specific. A syllabus, which is common to all the surgical specialties (the common component of the syllabus, which is founded in the applied surgical sciences) has been written for this stage. This is supplemented by the topics from the appropriate surgical specialty syllabus as defined in each training programme (the specialty specific component of the syllabus).

During the intermediate and final stages the scope of specialty practice increases with the expansion in case mix and case load and this is accompanied by the need for greater depth of knowledge and increasing skills and judgement. The content is therefore based on progression, increasing in both depth and complexity through to the completion of CCT.

Standards of training

Surgeons need to be able to perform in differing conditions and circumstances, respond to the unpredictable, and make decisions under pressure, frequently in the absence of all the desirable data. They use professional judgement, insight and leadership in everyday practice; working within multi-professional teams. Their conduct is guided by professional values and standards against which they are judged. These values and standards are laid down in the General Medical Council's Good Medical Practice and Good Surgical Practice.

The Professional Behaviour and Leadership Skills syllabus is mapped to the Leadership framework as laid out by the Academy of Medical Royal Colleges and the Framework for Appraisal and Assessment derived from Good Medical Practice. The Professional Behaviour and Leadership skills section of the syllabus is common to all surgical specialties and is based on Good Medical Practice.

The syllabus lays down the standards of specialty-based knowledge, clinical judgement, technical and operative skills and professional skills and behaviour that must be acquired at each stage in order to progress. The syllabus comprises the following components:

- Specialty overview outlines which describe the following:
    - Details of the specialty as it practised in the UK
    - The scope of practice within the specialty
    - The key topics that a trainee will cover by the end of training
    - An overview of how, in general terms, training is shaped

- Key topics that all trainees will cover by CCT and will be able to manage independently, including complications. These are also referred to as essential topics.

- Index procedures that refer to some of the more commonly performed clinical interventions and operations in the specialty. They represent evidence of technical competence across the whole range of specialty procedures in supervised settings, ensuring the required elements of specialty practice are acquired and adequately assessed. Direct Observations of Procedural Skills (DOPS) and Procedure-based Assessments (PBAs) assess trainees carrying out index procedures (whole procedures or specific sections) to evidence learning.

- The stages of training, which comprise a number of topics to be completed during a notional period of training. Within each stage there is the syllabus content which contains the specialty topics that must be covered. Each of these topics includes one or more learning objectives and the level of performance / competence to be achieved at completion in the domains of:
    - Specialty-based knowledge
    - Clinical skills and judgement
    - Technical and operative skills

Standards for depth of knowledge during early years surgical training

In the early years of training, the appropriate depth and level of knowledge required can be found in exemplar texts tabulated below. We expect trainees to have mastery at the depth within the texts and to be able to make use of that knowledge in the context of surgical practice defined in the core surgical component of the curriculum above.

The curriculum requires a professional approach from surgical trainees who will be expected to have a deep understanding of the subjects, to the minimum standard laid out below. It is expected that trainees will read beyond the texts below and to make critical use, where appropriate of original literature and peer scrutinised review articles in the related scientific and clinical literature such that they can aspire to an excellent standard in surgical practice.

The texts are not recommended as the sole source within their subject matter and there are alternative textbooks and web information which may better suit an individual's learning style. Over time it will be important for associated curriculum management systems to provide an expanded and critically reviewed list of supporting educational material.

Topic	Possible textbooks or other educational sources

Anatomy	Last's Anatomy: Regional and Applied (MRCS Study Guides)by R.J. Last and Chummy S Netter's Atlas of Human Anatomy 4th Edition Saunders-Elsevier ISBN-13-978-1-4160-3385-1
Physiology	Ganong's Review of Medical Physiology, 23rd Edition (Lange Basic Science)
Pathology	Robbins Basic Pathology:by Vinay Kumar MBBS MD FRCPath, Abul K. Abbas MBBS, Nelson Fausto MD, and Richard Mitchell MD PhD
Pharmacology	Principles and Practice of Surgery:by O. James Garden MB ChB MD FRCS(Glasgow) FRCS(Edinburgh) FRCP (Edinburgh) FRACS(Hon) FRCSC(Hon) Professor, Andrew W. Bradbury BSc MBChB MD MBA FRCSEd Professor, John L. R. Forsythe MD FRCS(Ed) FRCS, and Rowan W Parks
Microbiology	Bailey and Love's Short Practice of Surgery 25th Edition by Norman S. Williams (Editor), Christopher J.K. Bulstrode (Editor), P. Ronan O'Connell (Editor) Principles and Practice of Surgery:by O. James Garden MB ChB MD FRCS(Glasgow) FRCS(Edinburgh) FRCP (Edinburgh) FRACS(Hon) FRCSC(Hon) Professor
Radiology	Bailey and Love's Short Practice of Surgery 25th Edition by Norman S. Williams (Editor), Christopher J.K. Bulstrode (Editor), P. Ronan O'Connell (Editor) Principles and Practice of Surgery:by O. James Garden MB ChB MD FRCS(Glasgow) FRCS(Edinburgh) FRCP (Edinburgh) FRACS(Hon) FRCSC(Hon) Professor, Andrew W. Bradbury BSc MBChB MD MBA FRCSEd Professor, John L. R. Forsythe MD FRCS(Ed) FRCS, and Rowan W Parks
Common surgical conditions	Bailey and Love's Short Practice of Surgery 25th Edition by Norman S. Williams (Editor), Christopher J.K. Bulstrode (Editor), P. Ronan O'Connell (Editor) Principles and Practice of Surgery:by O. James Garden MB ChB MD FRCS(Glasgow) FRCS(Edinburgh) FRCP (Edinburgh) FRACS(Hon) FRCSC(Hon) Professor, Andrew W. Bradbury BSc MBChB MD MBA FRCSEd Professor, John L. R. Forsythe MD FRCS(Ed) FRCS, and Rowan W Parks
Surgical skills	Bailey and Love's Short Practice of Surgery 25th Edition by Norman S. Williams (Editor), Christopher J.K. Bulstrode (Editor), P. Ronan O'Connell (Editor) Basic surgical skills course andcurriculum ATLS course CCrISP course
Peri-operative care including critical care	Principles and Practice of Surgery:by O. James Garden MB ChB MD FRCS(Glasgow) FRCS(Edinburgh) FRCP (Edinburgh) FRACS(Hon) FRCSC(Hon) Professor, Andrew W. Bradbury BSc MBChB MD MBA FRCSEd Professor, John L. R. Forsythe MD FRCS(Ed) FRCS, and Rowan W Parks Bailey and Love's Short Practice of Surgery 25th Edition by Norman S. Williams (Editor), Christopher J.K. Bulstrode (Editor), P. Ronan O'Connell (Editor) Principles and Practice of Surgery:by O. James Garden MB ChB MD FRCS(Glasgow) FRCS(Edinburgh) FRCP (Edinburgh) FRACS(Hon) FRCSC(Hon) Professor, Andrew W. Bradbury BSc MBChB MD MBA FRCSEd Professor, John L. R. Forsythe MD FRCS(Ed) FRCS, and Rowan W Parks
Surgical care of children	Bailey and Love's Short Practice of Surgery 25th Edition by Norman S. Williams (Editor), Christopher J.K. Bulstrode (Editor), P. Ronan O'Connell (Editor) Jones Clinical Paediatric Surgery Diagnosis and Management Editors JM Hutson, M O'Brien, AA Woodward, SW Beasley

	6th Edition 2008 Melbourne Blackwell Paediatric Surgery: Essentials of Paediatric urology by D Thomas, A Rickwood, P Duffy
Care of the dying	Principles and Practice of Surgery:by O. James Garden MB ChB MD FRCS(Glasgow) FRCS(Edinburgh) FRCP (Edinburgh) FRACS(Hon) FRCSC(Hon) Professor, Andrew W. Bradbury BSc MBChB MD MBA FRCSEd Professor, John L. R. Forsythe MD FRCS(Ed) FRCS, and Rowan W Parks Bailey and Love's Short Practice of Surgery 25th Edition by Norman S. Williams (Editor), Christopher J.K. Bulstrode (Editor), P. Ronan O'Connell (Editor)
Organ transplantation	Principles and Practice of Surgery:by O. James Garden MB ChB MD FRCS(Glasgow) FRCS(Edinburgh) FRCP (Edinburgh) FRACS(Hon) FRCSC(Hon) Professor, Andrew W. Bradbury BSc MBChB MD MBA FRCSEd Professor, John L. R. Forsythe MD FRCS(Ed) FRCS, and Rowan W Parks Bailey and Love's Short Practice of Surgery 25th Edition by Norman S. Williams (Editor), Christopher J.K. Bulstrode (Editor), P. Ronan O'Connell (Editor)

In addition to these standard texts, sample MRCS MCQ examination questions are also available at www.intercollegiatemrcs.org.uk, which will demonstrate the level of knowledge required to be able to successfully pass the MRCS examination.

Standards for depth of knowledge during intermediate and final years surgical training

In the intermediate and final stages of surgical training the following methodology is used to define the relevant depth of knowledge required of the surgical trainee. Each topic within a stage has a competence level ascribed to it for knowledge ranging from 1 to 4 which indicates the depth of knowledge required:

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

Standards for clinical and technical skills

The practical application of knowledge is evidenced through clinical and technical skills. Each topic within a stage has a competence level ascribed to it in the areas of clinical and technical skills ranging from 1 to 4:

1. Has observed

Exit descriptor; at this level the trainee:

- Has adequate knowledge of the steps through direct observation.
- Demonstrates that he/she can handle instruments relevant to the procedure appropriately and safely.
- Can perform some parts of the procedure with reasonable fluency.

2. Can do with assistance

Exit descriptor; at this level the trainee:

- Knows all the steps - and the reasons that lie behind the methodology.
- Can carry out a straightforward procedure fluently from start to finish.
- Knows and demonstrates when to call for assistance/advice from the supervisor (knows personal limitations).

3. Can do whole but may need assistance

Exit descriptor; at this level the trainee:

- Can adapt to well known variations in the procedure encountered, without direct input from the trainer.
- Recognises and makes a correct assessment of common problems that are encountered.
- Is able to deal with most of the common problems.
- Knows and demonstrates when he/she needs help.
- Requires advice rather than help that requires the trainer to scrub.

4. Competent to do without assistance, including complications

Exit descriptor, at this level the trainee:

- With regard to the common clinical situations in the specialty, can deal with straightforward and difficult cases to a satisfactory level and without the requirement for external input.
- Is at the the level at which one would expect a UK consultant surgeon to function.
- Is capable of supervising trainees.

The explicit standards form the basis for:

- Specifying the syllabus content;
- Organising workplace (on-the-job) training in terms of appropriate case mix and case load;
- Providing the basis for identifying relevant teaching and learning opportunities that are needed to support trainees' development at each particular stage of progress; and
- Informing competence-based assessment to provide evidence of what trainees know and can do.

Standards for the professional skills and leadership syllabus

The methodology used to define the standards for this component of the syllabus is through a series of descriptors that indicate the sorts of activities that trainees should be able to successfully undertake at two specific time points, namely the end of "early years" training (i.e. entry into ST3, or ST4 in Neurosurgery) and the end of surgical training (i.e. CCT).

The Framework for Appraisal, Feedback and Assessment

The curriculum is consistent with the four Good Medical Practice domains contained in the GMC's Framework for Appraisal and Assessment:

- Knowledge skills and performance
- Safety and quality
- Communication, partnership and teamworking
- Maintaining trust

The knowledge, skills and performance aspects are primarily found within the specialty specific syllabus. All domains are reflected within the professional behaviour and leadership syllabus, which also reflect the Academy's common competence and leadership competence frameworks.

The purpose and structure of the training programme

The curriculum is competence based. It focuses on the trainee's ability to demonstrate the knowledge, skills and professional behaviours that they have acquired in their training (specified in the syllabus) through observable behaviours. Since it is competence based, it is not time-defined and accordingly it allows these competences to be acquired in different time frames according to variables such as the structure of the programme and the ability of the trainee. Any time points used are therefore merely indicative.

There are certain milestones or competence points which allow trainees to benchmark their progress:

- Entry to surgical training - CT1 (or ST1 for those specialties or localities with run through programmes)
- Entry to entirely specialised training - ST3*
- Exit at CCT

*** A critical competence point is ST3 at which point, in practice, trainees will make a clear commitment to one of the nine SAC defined disciplines of surgery.**

Within the early years of training (defined as that period which is prior to entry into ST3), much of the content is common across all the surgical specialties. During this period, trainees will acquire the competences that are common to all surgical trainees (defined as common competences) together with a limited range of competences that are relevant to their chosen surgical specialty (defined as specialty specific competences).

- Those who have made a definitive choice of their desired surgical specialty, and who have been able to enter a "run-through" training programme, will be able to focus upon achieving the common competences and the specialty specific competences for their chosen specialty.

- Those who have not yet made a definitive choice of their desired surgical specialty will obtain a range of extra competences in a variety of surgical specialties, while at the same time sampling those specialties, before focussing on the chosen specialty prior to entry into ST3.

It is self evident that this latter route will usually take longer than the more direct route where the trainee is either in a specialty (e.g. Neurosurgery or T&O) or a locality (e.g. Scotland) which offers run-through training.

For those not in run-through programmes, within the early years, the trainee is not committed to a specific surgical specialty and can enter any of the relevant specialties at ST3 level provided they a) meet their educational milestones in the common surgical component of the curriculum and b) satisfy all the speciality requirements for entry in the specialty of their choice. The different training schemes offered by the Postgraduate Deaneries meet different educational needs and permit trainees to make earlier or later final career choices based on ability and preference.

It is essential that trainees must achieve both common and specialty specific competence to be eligible to compete at the ST3 specialist entry competence level. In the early years (initial stage), the common core component reflects the level of competence that all surgeons must demonstrate, while specialty-specific competence reflects the early competences relevant to an individual specialty. In particular the MRCS examination is a mandatory requirement to enter higher specialty training in any discipline, irrespective of candidates reaching all other educational requirements. Otolaryngology trainees are required to pass the MRCS(ENT) examination or the MRCS and the DO-HNS examination

Following entry into higher specialty training (which for those who have undergone training in core programmes will follow on from a second selection process), the trainee will typically undergo a period of training in the broad specialty and at the higher levels begin to develop an area of specialist interest, to allow some degree of sub-specialisation in his or her subsequent career.

Early Years Surgical Training

The purposes of early years (i.e. the initial stage) training are:-

1. To provide a broad based initial training in surgery with attainment of knowledge, skills and professional behaviours relevant to the practice of surgery in any specialist surgical discipline. This is defined within the common component of the syllabus (which is also the syllabus of the MRCS).

2. In addition it will provide early speciality training such that trainees can demonstrate that they have the knowledge, skills and professional behaviours to enter higher specialty training in a surgical specialty. The speciality element in the early years is not tested in the MRCS but through workplace-based assessments (WPBA) in the first instance, and subsequently through the Intercollegiate Specialty FRCS examinations, which are taken towards the end of specialty training.

Additionally trainees will be continuously assessed on the contents of the common component and their speciality specific slots through WPBA and structured reports from Assigned Educational Supervisors which in turn contribute to the Annual Review of Competence Progression (ARCP); this includes the level of competence expected of all doctors including surgeons to meet their obligations under Good Medical Practice (GMP) in order to remain licensed to practice.

Trainees who gain entry to higher specialty training despite some remediable and identified gaps in their speciality specific curriculum competences must ensure these are dealt with expeditiously during ST3. All these gaps must be addressed by the time of a ST3 ARCP as part of their overall permission to progress to ST4. They must be specifically addressed through local learning agreements with educational supervisors. Trainees with identified gaps must be accountable to the training programme directors whom in turn must address this as part of their report to the ARCP process.

Intermediate and Final Years Specialty Training

The purposes of the intermediate and final years training are:

1. To provide higher specialty training in the specialty with attainment of knowledge, skills and professional behaviours relevant to the practice in the specialty. This is defined within the specialty specific component of the early years syllabus and the intermediate and final stages of the syllabus (and is also the syllabus of the FRCS).

2. Competence to manage patients presenting either acutely or electively with a range of symptoms and conditions as specified in the syllabus (and the syllabus of the FRCS).

3. Competence to manage an additional range of elective and emergency conditions by virtue of appropriate training and assessment opportunities obtained during training as specified by sub-specialty components of the final stage syllabus. This is tested either by the FRCS and/or by WPBA.

4. Professional competences as specified in the syllabus and Good Medical Practice documents General Medical Council of the UK, respectively.

The Training Pathway

From the trainee's perspective, he or she will be able to undertake surgical training via differing routes depending on which training scheme they choose or are selected for, within a School of Surgery in one of the Postgraduate Deaneries in the United Kingdom.

1. Run through training

For those trainees who are certain of their specialty choice, and who choose to enter "run through" training, competitive entry into ST1 will be possible with run through training in their chosen specialty to CCT, where this is offered by the specialty. Such a route still demands that in addition to speciality specific competence, the level of competence common to all surgeons is attained before entering ST3 (ST4 in Neurosurgery) and these will be assessed through the MRCS, WPBAs and satisfactory ARCPs. This route is currently available in some specialties (Neurosurgery and Trauma and Orthopaedic surgery) and in some localities (e.g. Scotland).

2. De coupled training

This route is currently available in General Surgery, Cardiothoracic surgery, Oral and Maxillofacial surgery, Otolaryngology, Paediatric surgery, Plastic surgery, Trauma and Orthopaedic surgery and Urology.

For those trainees who are either uncertain of their chosen specialty, who are unable to gain entry to run-through training, or choose a specialty that does not offer the run through route, a period of "Core" surgical training will be necessary. This period of training is designated CT1 and CT2. During this period they will attain the common surgical knowledge and skills and generic professional behaviours, while sampling a number of surgical specialties. It will be necessary in addition to attaining common competences to ensure that trainees complete their speciality specific competences to make them eligible to enter ST3 in their chosen speciality. They will then seek to enter specialty training at the entry ST3 level by competitive entry. Open competition will test trainees against SAC defined competences for an entry ST3 trainee.

This model has a number of possible variants. Core training might sample several specialties, without any particular specialty focus. In such cases some speciality top up training may be needed later on in order to reach speciality entry ST3 level. Another variant would organise core training along a theme which supports progression to a specific specialty. In these situations many trainees may pass straight from CT2 to ST3 in their chosen discipline if selected. In practice, core surgical training will run over an indicative timescale of 2 years (CT1-2).

3. Academic training

Some early years trainees may wish to pursue an academic surgical career and will devote a significant proportion of their time to additional academic pursuits including research and teaching. For the majority this will lead (later in specialised training) to a period of time in dedicated research, resulting in the award of a higher degree in a scientific area related to their chosen specialty. For others who wish to revert to full time clinical training, this will also be possible, providing that the relevant clinical competences are achieved.

General information on academic pathways can be found using the following links: www.nccrcd.nhs.uk and www.mmc.nhs.uk/pdf/Gold Guide 2010 Fourth Edition v07.pdf

The JCST is keen to support academic careers within surgery and has ensured that the surgical curriculum is flexible enough to accommodate an academic pathway. The curriculum specifies that each individual trainee's training is planned and recorded through the learning agreement.

Academic Clinical Fellows (ACFs) are generally expected to achieve the same level of clinical competence as other surgical trainees within the same timeframe. In order to progress through training pathways the ACF, in addition to demonstrating competence in clinical aspects, will generally be required to have obtained a funded Research Training Fellowship in order to undertake a PhD or MD, which they will complete during an out of programme period.

Some trainees during their period of full-time research may want to carry out some clinics or on call, if they and their academic supervisor feel that it is in their best interests. On successful completion of a PhD or MD the ACF will either return to their clinical programme, apply for an Academic Clinical Lecturer (ACL) or Clinician Scientist post.

Academic trainees will need to satisfactorily complete all the essential elements of their specialty syllabus in order to be awarded a CCT. It is acknowledged that most Clinical Academics will almost certainly take somewhat longer in training to achieve competence at CCT level than trainees taking a clinical pathway; however they will be supported fully and treated as individuals with their personal progress being matched to their learning agreement.

Moving from one discipline of surgery to another

In the early years it is possible that a trainee who had started to develop a portfolio consistent with a particular specialist discipline might wish to move to another. One of the strengths of the flexible early years programme is that it will be possible, depending on the local circumstances to make such changes with an identification of suitable educational competences that may be transferred. This is strictly conditional on a trainee achieving the educational milestones so far agreed for them. Moving from one discipline to another because of the need to remediate in the original discipline would not normally be permitted. All common requirements, for example, possession of the MRCS would be transferable. Those leaving ENT however could not use the DO-HNS examination as equivalent to the MRCS examination and those wishing to enter ENT (and already have the MRCS) would be required to sit the Part 2 DO-HNS examination.

Those wishing to enter Neurosurgery from core surgical training posts would have to return to ST1 in Neurosurgery to gain competencies in Neurology and Neuro-intensive care, but will be expected to leapfrog intervening years before entering ST3/4. Entry into ST3 Neurosurgery, although currently available, is expected to be phased out within the next eighteen months.

In order to be eligible to move from one discipline to another the following conditions therefore apply:-

1. Achieve a satisfactory outcome in ARCPs up to that point including all relevant WPBAs.

2. Fulfil the minimum period in the new speciality of choice in order to progress to ST3 in that discipline (ST4 in Neurosurgery).

3. Obtain the new position through open competition in the annual selection round.

4. Pass the MRCS (or DO-HNS) examination

The process in practice would be subject to local negotiations between heads of training and designated training supervisors and the trainee making the request. If the decision to change theme in core programmes occurs early then the effective increase in training time may be minimal. If the decision occurs later or during run through then more time spent in the early years is almost inevitable. The progression to ST3 is in essence competence rather than time dependant. Those spending longer having made a change may be subject to limitations on any subsequent period required for remediation, although this ultimately would be a Deanery decision.

Completion of training

Successful completion of the programme will result in a Certificate of Completion of Training (CCT) and placement on the GMC's Specialist Register. This will indicate that the surgeon has reached the required standards of competence to practice as a consultant surgeon in the UK. These standards are set by the SACs and the Royal Colleges of Surgeons and translate into the ability to manage a significant proportion of the elective work within the specialty and to undertake the primary management of emergencies. It is anticipated that where additional, well-recognised specialist skills are required by the service, these will be gained by the completion of additional modules before the completion of training and the award of the specialty CCT.

Doctors who wish to join the specialist register and have not followed a full PMETB approved training programme leading to a CCT but who may have gained the same level of skills and knowledge as CCT

holders can apply under Article 14(4) of The General and Specialist Medical Practice Order for a Certificate confirming Eligibility for Specialist Registration (CESR).

The CCT holder on the specialist register as a surgeon, in common with all practising surgeons, will be expected to maintain his/her professional development in line with Good Surgical Practice and Good Medical Practice for the purpose of revalidation.

Quality Assurance of the Curriculum

The Quality Assurance Framework of the ISCP provides a vehicle for quality enhancement of the curriculum. It is used to monitor the effectiveness of the curriculum by gathering evidence on the experience of those delivering and undertaking it.

The main areas of the framework are:

- Standards for postgraduate surgical education;
- The surgical trainee experience survey;
- Annual monitoring;
- Deanery/SAC Reviews.

Standards for Postgraduate Surgical Education

The foundations of the framework are the standards for postgraduate surgical education, established by the SACs and built on the GMC's generic standards for postgraduate medical education. GMC Generic standards for training

These standards, specific to surgical disciplines, together with the indicative evidence requirements and judgements of specialists in the surgical disciplines provide a form of peer-assessment that can provide authoritative judgements on the quality of learning experiences for trainees. It is important to ensure that trainees' experience of the curriculum forms a major part of the approach to quality assurance and this will be undertaken by means of a sophisticated survey of trainee views.

One of the key determinants of the quality of a curriculum is the quality of those delivering it, and it is important that quality of training is evidenced. The GMC has produced its standards for trainers which are being developed into curriculum standards for surgical trainers to help confirm that Assigned Educational Supervisors and Clinical Supervisors meet these standards through ISCP website registration.

Surgical Trainee Experience Survey

This online survey is focussed on surgical training standards and trainees experience of the curriculum. Moreover, it enables analysis of individual surgical specialties and the extent to which the curriculum and standards for specialties are maintained at specific levels of training. It will produce comparative evidence at a number of levels, for example:

- Schools of surgery level, to allow cross-deanery benchmarking as specified by JACSTAG
- Inter-specialty level within Schools of Surgery, for internal benchmarking
- Specialty level within Schools of Surgery
- Specialty level nationally, for SACs, and importantly,
- Post level within specialties

The survey remains, however, an opinion survey and is a single source of evidence which must be triangulated. This is achieved, initially, through reports from Programme Directors and SAC members' participation in ARCP processes and will in future seek other quantitative measures, such as measures of surgical experience through logbooks.

Annual Monitoring

The annual monitoring process, carried out by the deanery/school of surgery, is an important reporting process that allows the programme(s) to periodically evaluate their delivery, operation and outcomes. The

process is one of evidence based self-evaluation, utilising feedback from a range of key stakeholders that will result in ongoing action plans.

The process requires critical evaluation of main areas of activity and it is intended that these would correspond to the standards for postgraduate surgical education, which in turn reflect GMC generic domains. The findings of the surgical trainee experience survey and ARCP outcomes are crucial qualitative measures of trainee perceptions and performance. These are supplemented by the programme directors' critical account of all the significant aspects of training.

Deanery/SAC Reviews

It is anticipated that where evidence from trainee evaluation and/or annual monitoring indicates specific concerns about the quality of training the deanery, with necessary specialist support provided by the SAC, may initiate a review process. This process will be proportionate to the nature of the concern and may utilise a documentary analysis and/or visits, in line with the Joint Academy and COPMeD Specialty Training Advisory Group (JACSTAG) recommendations.

The Syllabus

Overview and objectives of the Cardiothoracic Surgery Curriculum

Cardiothoracic Surgery is the speciality 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 tend to focus and develop expertise in more complex areas of special interest. These include:

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

The Society for Cardiothoracic Surgery in Great Britain and Ireland represents the professional interests of the speciality 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 http://www.ctsnet.org/.

Tim Graham - SAC Chair
Steve Livesey - SAC Content Editor

The Purposes of Training in the Specialty of Cardiothoracic Surgery

The purpose 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 in the UK.

This includes:

- Competence in the management of patients presenting with a range of symptoms and elective conditions as specified in the core syllabus for the specialty of cardiothoracic surgery.
- Competence to manage an additional range of elective and emergency conditions by virtue of appropriate training and assessment opportunities obtained during training.
- Professional competences as specified in the syllabus and derived from the framework of Good Medical Practice of the General Medical Council of the UK, respectively.

The Training Pathway in the Specialty of Cardiothoracic Surgery

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 standards and the delivery of training are overseen by the Specialist Advisory Committee (SAC) in Cardiothoracic Surgery. The SAC has a consultant member nominated by the trainees (the Cardiothoracic Dean) who is 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 competences within each of these areas, at each stage of training.

Within each module, the levels of competence are further defined in the following domains:

Knowledge: e.g. basic scientific knowledge; clinical knowledge

Clinical skills: e.g. history, examination, data interpretation, patient management

Technical skills and procedures: e.g. technical procedures, operative management

Professional behaviour and leadership skills: transferable or generic, professional skills expected of all surgeons

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 solely by the number of years in training or by the numbers of procedures performed. The competence levels are defined for each key stage. The programme is therefore now described in terms of **initial, intermediate I and II, and final** phases.

Upon successful completion 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 topics.

Special Interest Training

Some trainees may wish to develop a particular special interest in the latter stages of their training and to develop expertise and competence in these areas, beyond those normally expected at CCT.

These areas of special interest for cardiothoracic surgery are described in the syllabus. 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 during the post CCT period.

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. PDA, 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 the 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.

Academic Surgery

Academic surgery provides an exciting and challenging career for those who wish to combine clinical surgery with a major commitment to research and undergraduate teaching.

- Trainees interested in this career pathway will, in addition to completing clinical training in general cardiothoracic surgery acquire a high level of competency in research.
- Previously, the majority of trainees in cardiothoracic surgery completed a higher degree before embarking on formal training in the specialty – whilst this may no longer be the norm, those considering an academic career should consider applying principally to those units where there is a Chair in Cardiothoracic Surgery.

The Scope and Standards of Cardiothoracic Surgical Practice at CCT

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
- Aorto-vascular Disease
- Intrathoracic Transplantation and Surgery for Heart Failure
- Congenital Heart Disease
- Cardiothoracic Trauma
- Thoracic Surgery – General
- 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
- Benign Oesophageal Disease
- Malignant Oesophageal Disease

The specific requirements of each of these areas of practice are explained in depth in each topic within the syllabus.

The Configuration and Delivery of Cardiothoracic Surgical Services

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 surgeon performing approximately 200 major operations each year.

Entry into cardiothoracic surgery is currently extremely competitive and is currently by a process of national selection at ST3. The national selection currently occurs once per year.There was a moratorium on new trainees entering the specialty but this was lifted in 2006 as the requirement for future specialists in cardiothoracic surgery became clear.

Future Trends in Cardiothoracic Surgery

There are many influences on the type of work undertaken by cardiothoracic surgeons.

In cardiac surgery the predominant disease that we deal with is coronary artery disease. Although many more patients are now treated by percutaneous intervention than by cardiac surgery, the increasing age of the population has maintained the requirement for many patients to have surgical revascularisation – often for increasingly complex disease.

Changing demographics and downward pressure on waiting times are also increasing the demand for surgery for valvular heart disease.

In thoracic surgery there is some evidence that too few resections for lung cancer are being performed in the UK when compared to similar countries; this, combined with an increasing trend for the management of all patients suffering from lung cancer to be discussed at multi-disciplinary meetings, is increasing the need for surgeons who specialise in thoracic surgery.

Key Topics

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, ventricular 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

Core Surgical Training Modules
Initial Stage 2010

Initial Stage Overview

The purpose of the initial stage (early years) (CT1 - 3) is to allow the trainee to develop the basic and fundamental surgical skills common to all surgical specialties, together with a few surgical skills relevant to Plastic Surgery.

The outcome of early years training is to achieve the competences required of surgeons entering ST3. These competences include:

- Competence in the management of patients presenting with a range of symptoms and elective and emergency conditions as specified in the core syllabus for surgery.
- Competence in the management of patients presenting with an additional range of elective and emergency conditions, as specified by the Plastic Surgery specialty component of the early years syllabus.
- Professional competences as specified in the syllabus and derived from Good Medical Practice documents of General Medical Council of the UK

By the end of CT2/3, trainees, (including those following an academic pathway), will have acquired to the defined level:

- Generic skills to allow team working and management of Plastic Surgery patients
- The ability to perform as a member of the team caring for surgical patients
- The ability to receive patients as emergencies and review patients in clinics and initiate management and diagnostic processes based on a reasonable differential diagnosis
- The ability to manage the perioperative care of their patients and recognise common complications and either be able to deal with them or know to whom to refer
- To be safe and useful assistant in the operating room
- To perform some simple procedures under minimal supervision and perform more complex procedures under direct supervision

In addition they will have attained the knowledge, skills and behaviour as defined in the following (common) modules of the syllabus:

Module 1: Basic Science Knowledge relevant to surgical practice (These can all be contextualised within the list of presenting symptoms and conditions outlined in module 2)

- Anatomy
- Physiology
- Pharmacology - in particular safe prescribing
- Pathological principles underlying system specific pathology
- Microbiology
- Diagnostic and interventional radiology

Module 2: Common surgical conditions

- To assess and initiate investigation and management of common surgical conditions which may confront any patient whilst under the care of surgeons, irrespective of their speciality.
- To have sufficient understanding of these conditions so as to know what and to whom to refer in a way that an insightful discussion may take place with colleagues whom will be involved in the definitive management of these conditions.
- This defines the scope and depth of the topics in the generality of clinical surgery required of any surgeon irrespective of their ST3 defined speciality

Module 3 Basic surgical skills

- To prepare oneself for surgery
- To safely administer appropriate local anaesthetic agents
- To handle surgical instruments safely
- To handle tissues safely
- To incise and close superficial tissues accurately
- To tie secure knots
- To safely use surgical diathermy
- To achieve haemostasis of superficial vessels.
- To use a suitable surgical drain appropriately.
- To assist helpfully, even when the operation is not familiar.
- To understand the principles of anastomosis

- To understand the principles of endoscopy including laparoscopy

Module 4: The principles of assessment and management of the surgical patient
- To assess the surgical patient
- To elicit a history that is relevant, concise, accurate and appropriate to the patient's problem
- To produce timely, complete and legible clinical records.
- To assess the patient adequately prior to operation and manage any pre-operative problems appropriately.
- To propose and initiate surgical or non-surgical management as appropriate.
- To take informed consent for straightforward cases.

Module 5: Peri-operative care of the surgical patient
- To manage patient care in the peri-operative period.
- To assess and manage preoperative risk.
- To take part in the conduct of safe surgery in the operating theatre environment.
- To assess and manage bleeding including the use of blood products.
- To care for the patient in the post-operative period including the assessment of common complications.
- To assess, plan and manage post-operative fluid balance
- To assess and plan perioperative nutritional management.

Module 6: Assessment and early treatment of the patient with trauma
- To safely assess the multiply injured patient.
- To safely assess and initiate management of patients with
- traumatic skin and soft tissue injury
- chest trauma
- a head injury
- a spinal cord injury
- abdominal and urogenital trauma
- vascular trauma
- a single or multiple fractures or dislocations
- burns

Module 7: Surgical care of the paediatric patient
- To assess and manage children with surgical problems, understanding the similarities and differences from adult surgical patients.
- To understand common issues of child protection and to take action as appropriate.

Module 8: Management of the dying patient
- To manage the dying patient appropriately.
- To understand consent and ethical issues in patients certified DNAR (do not attempt resuscitation)
- To manage the dying patient in consultation with the palliative care team.

Module 9: Organ and tissue transplantation
- To understand the principles of organ and tissue transplantation.
- To assess brain stem death and understand its relevance to continued life support and organ donation.

Module 10: Professional behaviour
- To provide good clinical care
- To be a good communicator
- To teach and to train
- To keep up to date and know how to analyse data
- To understand and manage people and resources within the health environment
- To promote good Health
- To understand the ethical and legal obligations of a surgeon

Initial Stage Topics

Module 1	Basic sciences
Objective	• To acquire and demonstrate underpinning basic science knowledge appropriate for the practice of surgery, including:- • Applied anatomy: Knowledge of anatomy appropriate for surgery • Physiology: Knowledge of physiology relevant to surgical practice • Pharmacology: Knowledge of pharmacology relevant to surgical practice centred around safe prescribing of common drugs • Pathology: Knowledge of pathological principles underlying system specific pathology • Microbiology: Knowledge of microbiology relevant to surgical practice Imaging: • Knowledge of the principles, strengths and weaknesses of various diagnostic and interventional imaging methods
Knowledge	Applied anatomy: • Development and embryology • Gross and microscopic anatomy of the organs and other structures • Surface anatomy • Imaging anatomy This will include anatomy of thorax, abdomen, pelvis, perineum, limbs, spine, head and neck as appropriate for surgical operations that the trainee will be involved with during core training (see Module 2). Physiology: General physiological principles including: • Homeostasis • Thermoregulation • Metabolic pathways and abnormalities • Blood loss and hypovolaemic shock • Sepsis and septic shock • Fluid balance and fluid replacement therapy • Acid base balance • Bleeding and coagulation • Nutrition This will include the physiology of specific organ systems relevant to surgical care including the cardiovascular, respiratory, gastrointestinal, urinary, endocrine and neurological systems. Pharmacology: • The pharmacology and safe prescribing of drugs used in the treatment of surgical diseases including analgesics, antibiotics, cardiovascular drugs, antiepileptic, anticoagulants, respiratory drugs, renal drugs, drugs used for the management of endocrine disorders (including diabetes) and local anaesthetics. • The principles of general anaesthesia • The principles of drugs used in the treatment of common malignancies Pathology: General pathological principles including: • Inflammation • Wound healing • Cellular injury • Tissue death including necrosis and apoptosis • Vascular disorders • Disorders of growth, differentiation and morphogenesis • Surgical immunology

	• Surgical haematology • Surgical biochemistry • Pathology of neoplasia • Classification of tumours • Tumour development and growth including metastasis • Principles of staging and grading of cancers • Principles of cancer therapy including surgery, radiotherapy, chemotherapy, immunotherapy and hormone therapy • Principles of cancer registration • Principles of cancer screening • The pathology of specific organ systems relevant to surgical care including cardiovascular pathology, respiratory pathology, gastrointestinal pathology, genitourinary disease, breast, exocrine and endocrine pathology, central and peripheral, neurological systems, skin, lymphoreticular and musculoskeletal systems Microbiology: • Surgically important micro organisms including blood borne viruses • Soft tissue infections including cellulitis, abscesses, necrotising fasciitis, gangrene • Sources of infection • Sepsis and septic shock • Asepsis and antisepsis • Principles of disinfection and sterilisation • Antibiotics including prophylaxis and resistance • Principles of high risk patient management • Hospital acquired infections Imaging: • Principles of diagnostic and interventional imaging including x-rays, ultrasound, CT, MRI. PET, radiounucleotide scanning

Module 2	Common Surgical Conditions	
Objective	This section assumes that trainees have general medical competences consistent with a doctor leaving Foundation in the UK. It also assumes an ongoing commitment to keeping these skills and knowledge up to date as laid out in GMP. It is predicated on the value that surgeons are doctors who carry our surgery and require competence. To demonstrate understanding of the relevant basic scientific principles for each of these surgical conditions and to be able to provide the relevant clinical care as defined in modules assessment and management as defined in Modules 1 and 4.	
Topics	Presenting symptoms or syndromes • Abdominal pain • Abdominal swelling • Change in bowel habit • Gastrointestinal haemorrhage • Rectal bleeding • Dysphagia • Dyspepsia • Jaundice	To include the following conditions • Appendicitis • Gastrointestinal malignancy • Inflammatory bowel disease • Diverticular disease • Intestinal obstruction • Adhesions • Abdominal hernias • Peritonitis • Intestinal perforation • Benign oesophageal disease • Peptic ulcer disease • Benign and malignant hepatic, gall bladder and pancreatic disease • Haemorrhoids and perianal disease • Abdominal wall stomata
	Breast disease • Breast lumps and nipple	To include the following conditions • Benign and malignant breast lumps

	discharge • Acute Breast pain	• Mastitis and breast abscess
	Peripheral vascular disease Presenting symptoms or syndrome • Chronic and acute limb ischaemia • Aneurysmal disease • Transient ischaemic attacks • Varicose veins • Leg ulceration	To include the following conditions • Atherosclerotic arterial disease • Embolic and thrombotic arterial disease • Venous insufficiency • Diabetic ulceration
	Cardiovascular and pulmonary disease	To include the following conditions • Coronary heart disease • Bronchial carcinoma • Obstructive airways disease • Space occupying lesions of the chest • Pulmonary embolus
	Genitourinary disease Presenting symptoms or syndrome • Loin pain • Haematuria • Lower urinary tract symptoms • Urinary retention • Renal failure • Scrotal swellings • Testicular pain	To include the following conditions • Genitourinary malignancy • Urinary calculus disease • Urinary tract infection • Benign prostatic hyperplasia • Obstructive uropathy
	Trauma and orthopaedics Presenting symptoms or syndrome • Traumatic limb and joint pain and deformity • Chronic limb and joint pain and deformity • Back pain	To include the following conditions • Simple fractures and joint dislocations • Fractures around the hip and ankle • Basic principles of Degenerative joint disease • Basic principles of inflammatory joint disease including bone and joint infection • Compartment syndrome • Spinal nerve root entrapment and spinal cord compression • Metastatic bone cancer • Common peripheral neuropathies and nerve injuries
	Disease of the Skin, Head and Neck Presenting symptoms or syndrome • Lumps in the neck • Epistaxis • Upper airway obstructions	To include the following conditions • Benign and malignant skin lesions • Benign and malignant lesions of the mouth and tongue
	Neurology and Neurosurgery Presenting symptoms or syndrome • Headache • Facial pain • Coma	To include the following conditions • Space occupying lesions from bleeding and tumour
	Endocrine Presenting symptoms or syndrome • Lumps in the neck • Acute endocrine crises	To include the following conditions • Thyroid and parathyroid disease • Adrenal gland disease • Diabetes

Module 3	Basic surgical skills

Objective	• Preparation of the surgeon for surgery • Safe administration of appropriate local anaesthetic agents • Acquisition of basic surgical skills in instrument and tissue handling. • Understanding of the formation and healing of surgical wounds • Incise superficial tissues accurately with suitable instruments. • Close superficial tissues accurately. • Tie secure knots. • Safely use surgical diathermy • Achieve haemostasis of superficial vessels. • Use suitable methods of retraction. • Knowledge of when to use a drain and which to choose. • Handle tissues gently with appropriate instruments. • Assist helpfully, even when the operation is not familiar. • Understand the principles of anastomosis • Understand the principles of endoscopy including laparoscopy
Knowledge	Principles of safe surgery • Preparation of the surgeon for surgery • Principles of hand washing, scrubbing and gowning • Immunisation protocols for surgeons and patients Administration of local anaesthesia • Choice of anaesthetic agent • Safe practise Surgical wounds • Classification of surgical wounds • Principles of wound management • Pathophysiology of wound healing • Scars and contractures • Incision of skin and subcutaneous tissue: o Langer's lines o Choice of instrument o Safe practice • Closure of skin and subcutaneous tissue: o Options for closure o Suture and needle choice • Safe practice • Knot tying o Range and choice of material for suture and ligation o Safe application of knots for surgical sutures and ligatures • Haemostasis: o Surgical techniques o Principles of diathermy • Tissue handling and retraction: o Choice of instruments • Biopsy techniques including fine needle aspiration cytology • Use of drains: o Indications o Types o Management/removal • Principles of anastomosis • Principles of surgical endoscopy including laparoscopy
Clinical Skills	4 Preparation of the surgeon for surgery • Effective and safe hand washing, gloving and gowning 4 Preparation of a patient for surgery

	• Creation of a sterile field • Antisepsis • Draping 4 Administration of local anaesthesia • Accurate and safe administration of local anaesthetic agent
Technical Skills and Procedures	4 Preparation of the surgeon for surgery • Effective and safe hand washing, gloving and gowning 4 Administration of local anaesthesia • Accurate and safe administration of local anaesthetic agent 4 Incision of skin and subcutaneous tissue: • Ability to use scalpel, diathermy and scissors 4 Closure of skin and subcutaneous tissue: • Accurate and tension free apposition of wound edges 4 Knot tying: • Single handed • Double handed • Instrument • Superficial • Deep 3 Haemostasis: • Control of bleeding vessel (superficial) • Diathermy • Suture ligation • Tie ligation • Clip application • Transfixion suture 4 Tissue retraction: • Tissue forceps • Placement of wound retractors 3 Use of drains: • Insertion • Fixation • Removal 3 Tissue handling: • Appropriate application of instruments and respect for tissues • Biopsy techniques 4 Skill as assistant: • Anticipation of needs of surgeon when assisting

Module 4	The assessment and management of the surgical patient
Objective	To demonstrate the relevant knowledge, skills and attitudes in assessing the patient and manage the patient, and propose surgical or non-surgical management.
Knowledge	The knowledge relevant to this section will be variable from patient to patient and is covered within the rest of the syllabus – see common surgical conditions in particular (Module 2). As a trainee develops an interest in a particular speciality then the principles of history taking and examination may be increasingly applied in that context.
Clinical Skills	4 Surgical history and examination (elective and emergency) 3 Construct a differential diagnosis

	3 Plan investigations 3 Clinical decision making 3 Team working and planning 3 Case work up and evaluation; risk management 3 Active participation in clinical audit events 3 Appropriate prescribing 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

Module 5	Peri-operative care
Objective	To assess and manage preoperative risk To manage patient care in the peri-operative period To conduct safe surgery in the operating theatre environment To assess and manage bleeding including the use of blood products To care for the patient in the post-operative period including the assessment of common complications To assess, plan and manage post-operative fluid balance To assess and plan perioperative nutritional management
Knowledge	Pre-operative assessment and management: • Cardiorespiratory physiology • Diabetes mellitus and other relevant endocrine disorders • Fluid balance and homeostasis • Renal failure • Pathophysiology of sepsis – prevention and prophylaxis • Thromboprophylaxis • Laboratory testing and imaging • Risk factors for surgery and scoring systems • Pre-medication and other preoperative prescribing • Principles of day surgery Intraoperative care: • Safety in theatre including patient positioning and avoidance of nerve injuries • Sharps safety • Diathermy, laser use • Infection risks • Radiation use and risks • Tourniquet use including indications, effects and complications • Principles of local, regional and general anaesthesia • Principles of invasive and non-invasive monitoring • Prevention of venous thrombosis • Surgery in hepatitis and HIV carriers • Fluid balance and homeostasis Post-operative care: • Post-operative monitoring • Cardiorespiratory physiology • Fluid balance and homeostasis • Diabetes mellitus and other relevant endocrine disorders • Renal failure • Pathophysiology of blood loss • Pathophysiology of sepsis including SIRS and shock • Multi-organ dysfunction syndrome • Post-operative complications in general • Methods of postoperative analgesia To assess and plan nutritional management • Post-operative nutrition

	• Effects of malnutrition, both excess and depletion • Metabolic response to injury • Methods of screening and assessment of nutritional status • Methods of enteral and parenteral nutrition Haemostasis and Blood Products: • Mechanism of haemostasis including the clotting cascade • Pathology of impaired haemostasis e.g. haemophilia, liver disease, massive haemorrhage • Components of blood • Alternatives to use of blood products • Principles of administration of blood products • Patient safety with respect to blood products Coagulation, deep vein thrombosis and embolism: • Clotting mechanism (Virchow Triad) • Effect of surgery and trauma on coagulation • Tests for thrombophilia and other disorders of coagulation • Methods of investigation for suspected thromboembolic disease • Principles of treatment of venous thrombosis and pulmonary embolism including anticoagulation • Role of V/Q scanning, CTpulmonary angiography, D-dimer and thrombolysis • Place of pulmonary embolectomy • Prophylaxis of thromboembolism: • Risk classification and management of DVT • Knowledge of methods of prevention of DVT, mechanical and pharmacological Antibiotics: • Common pathogens in surgical patients • Antibiotic sensitivities • Antibiotic side-effects • Principles of prophylaxis and treatment Metabolic and endocrine disorders in relation to perioperative management • Pathophysiology of thyroid hormone excess and deficiency and associated risks from surgery • Causes and effects of hypercalcaemia and hypocalcaemia • Complications of corticosteroid therapy • Causes and consequences of Steroid insufficiency • Complications of diabetes mellitus • Causes and effects of hyponatraemia • Causes and effects of hyperkalaemia and hypokalaemia
Clinical Skills	3 Pre-operative assessment and management: • History and examination of a patient from a medical and surgical standpoint • Interpretation of pre-operative investigations • Management of co morbidity • Resuscitation • Appropriate preoperative prescribing including premedication 3 Intra-operative care: • Safe conduct of intraoperative care • Correct patient positioning • Avoidance of nerve injuries • Management of sharps injuries • Prevention of diathermy injury • Prevention of venous thrombosis 3 Post-operative care: • Writing of operation records • Assessment and monitoring of patient's condition

	• Post-operative analgesia • Fluid and electrolyte management • Detection of impending organ failure • Initial management of organ failure • Principles and indications for Dialysis • Recognition, prevention and treatment of post-operative complications 3 Haemostasis and Blood Products: • Recognition of conditions likely to lead to the diathesis • Recognition of abnormal bleeding during surgery • Appropriate use of blood products • Management of the complications of blood product transfusion 3 Coagulation, deep vein thrombosis and embolism • Recognition of patients at risk • Awareness and diagnosis of pulmonary embolism and DVT • Role of duplex scanning, venography and d-dimer measurement • Initiate and monitor treatment of venous thrombosis and pulmonary embolism • Initiation of prophylaxis 3 Antibiotics: • Appropriate prescription of antibiotics 3 Assess and plan preoperative nutritional management • Arrange access to suitable artificial nutritional support, preferably via a nutrition team including Dietary supplements, Enteral nutrition and Parenteral nutrition 3 Metabolic and endocrine disorders • History and examination in patients with endocrine and electrolyte disorders • Investigation and management of thyrotoxicosis and hypothyroidism • Investigation and management of hypercalcaemia and hypocalcaemia • Peri-operative management of patients on steroid therapy • Peri-operative management of diabetic patients • Investigation and management of hyponatraemia • Investigation and management of hyperkalaemia and hypokalaemia
Technical Skills and Procedures	2 Central venous line insertion 4 Urethral catheterisation

Module 6	Assessment and management of patients with trauma (including the multiply injured patient)
Objective	Assess and initiate management of patients • Who have sustained chest trauma • who have sustained a head injury • who have sustained a spinal cord injury • who have sustained abdominal and urogenital trauma • who have sustained vascular trauma • who have sustained a single or multiple fractures or dislocations • who have sustained traumatic skin and soft tissue injury • who have sustained burns • Safely assess the multiply injured patient. • Contextualise any combination of the above • Be able to prioritise management in such situation as defined by ATLS, APLS etc
Knowledge	General • Scoring systems for assessment of the injured patient • Major incident triage • Differences In children

	Shock • Pathogenesis of shock • Shock and cardiovascular physiology • Metabolic response to injury • Adult respiratory distress syndrome • Indications for using uncross matched blood Wounds and soft tissue injuries • Gunshot and blast injuries • Stab wounds • Human and animal bites • Nature and mechanism of soft tissue injury • Principles of management of soft tissue injuries • Principles of management of traumatic wounds • Compartment syndrome Burns • Classification of burns • Principle of management of burns Fractures • Classification of fractures • Pathophysiology of fractures • Principles of management of fractures • Complications of fractures • Joint injuries Organ specific trauma • Pathophysiology of thoracic trauma • Pneumothorax • Head injuries including traumatic intracranial haemorrhage and brain injury • Spinal cord injury • Peripheral nerve injuries • Blunt and penetrating abdominal trauma • Including spleen • Vascular injury including iatrogenic injuries and intravascular drug abuse • Crush injury • Principles of management of skin loss including use of skin grafts and skin flaps
Clinical Skills	**General** 4 History and examination 3 Investigation 3 Referral to appropriate surgical subspecialties 4 Resuscitation and early management of patient who has sustained thoracic, head, spinal, abdominal or limb injury according to ATLS and APLS guidelines 4 Resuscitation and early management of the multiply injured patient 3 Specific problems • Management of the unconscious patient • Initial management of skin loss • Initial management of burns • Prevention and early management of the compartment syndrome
Technical Skills and Procedures	2 Central venous line insertion 3 Chest drain insertion 2 Diagnostic peritoneal lavage 4 Urethral catheterisation 2 Suprapubic catheterisation

Module 7	Surgical care of the Paediatric patient
Objective	To assess and manage children with surgical problems, understanding the similarities and differences from adult surgical patients To understand the issues of child protection and to take action as appropriate
Knowledge	• Physiological and metabolic response to injury and surgery • Fluid and electrolyte balance • Thermoregulation Safe prescribing in children • Principles of vascular access in children • Working knowledge of trust and Local Safeguarding Children Boards (LSCBs) and Child Protection Procedures • Basic understanding of child protection law • Understanding of Children's rights • Working knowledge of types and categories of child maltreatment, presentations, signs and other features (primarily physical, emotional, sexual, neglect, professional) • Understanding of one personal role, responsibilities and appropriate referral patterns in child protection • Understanding of the challenges of working in partnership with children and families • Recognise the possibility of abuse or maltreatment • Recognise limitations of own knowledge and experience and seek appropriate expert advice • Urgently consult immediate senior in surgery to enable referral to paediatricians • Keep appropriate written documentation relating to child protection matters • Communicate effectively with those involved with child protection, including children and their families
Clinical Skills	3 History and examination of paediatric surgical patient 3 Assessment of respiratory and cardiovascular status 3 Undertake consent for surgical procedures (appropriate to the level of training) in paediatric Patients

Module 8	Management of the dying patient
Objective	Ability to manage the dying patient appropriately. To understand consent and ethical issues in patients certified DNAR (do not attempt resuscitation) Palliative Care: Good management of the dying patient in consultation with the palliative care team.
Knowledge	Palliative Care: • Care of the terminally ill • Appropriate use of analgesia, anti-emetics and laxatives Principles of organ donation: • Circumstances in which consideration of organ donation is appropriate • Principles of brain death Understanding the role of the coroner and the certification of death
Clinical Skills	3 Palliative Care: • Symptom control in the terminally ill patient 3 Principles of organ donation: • Assessment of brain stem death • Certification of death

Module 9	Organ and Tissue transplantation
Objective	To understand the principles of organ and tissue transplantation
Knowledge	• Principles of transplant immunology including tissue typing, acute, hyperactute and chronic rejection • Principles of immunosuppression • Tissue donation and procurement • Indications for whole organ transplantation

In addition, in the early years of training, trainees must address early years competencies of the Professional Behaviour and Leadership Syllabus.

Specialty-Specific Modules
Initial Stage 2010

Requirement to meet the ST3 in Cardiothoracic Surgery

In order to meet the job specifications of an ST3 trainee an early year's trainee must take a clear role in the cardiothoracic team, managing clinic, cardiac intensive care and ward based patients under supervision, including the management of acute admissions. They will need to be able to take part in an outpatient clinic and see patients themselves with the consultant available for advice.

Therefore in early years training, IN ADDITION to the generic competencies for all surgeons, it is necessary to address the specifics of a developing interest in Cardiothoracic surgery during these years. This means spending 6-12 months in cardiothoracic surgery in a service which gives trainees access to the appropriate learning opportunities. Also by the time a trainee enters ST3 they need to be familiar with the operating room environment both with respect to elective and emergency cases.

Trainees must attend MDT and other Departmental meetings and ward rounds, prepare operating lists (and actually perform some surgery under appropriate supervision. They must manage all patients in a ward environment, preoperatively and post operatively. This includes recognising and initiating the management of common complications and emergencies, over and above those already laid out in the generic curriculum, particularly module 2.

The range of conditions a trainee needs to manage are laid out below and in the depth demonstrated in a text book such as Chikwe J, Beddow E, Glenville B. Cardiothoracic Surgery Oxford University Press 2006.

Early Years training in Cardiothoracic Surgery	
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. To participate under supervision in the operative management of cardiothoracic patients
Knowledge	Basic science relevant to the management of patients with cardiothoracic disease (including anatomy, physiology, pharmacology, pathology and radiology) Principles of management of patients presenting with the common elective and emergency cardiothoracic disease, including post operative and intensive care Specific knowledge relating to the principles of cardiopulmonary bypass and myocardial management and their consequences. Includes an understanding of the relevant equipment and technology
Clinical Skills	History and examination of the post-operative and critically ill patient Analysis and interpretation of post operative and critical care charts and documentation. Recognition, evaluation and treatment of haemodynamic abnormalities: Recognition, evaluation and treatment of ventilatory abnormalities: Recognition, evaluation and treatment of multiorgan dysfunction:
Technical Skills and Procedures	**Practical Skills:** 4 Use of defibrillator 2 Practical use of inotropes and vasoactive drugs 2 Principles of the use of intra aortic balloon pump 1 Echocardiography including TOE 3 Arterial cannulation 2 Central venous cannulation 2 Pulmonary artery catheterisation **Operative Management:** 3 Saphenous vein harvest 2 Median Sternotomy 3 Chest aspiration 3 Chest drain insertion and management

Assessment

The speciality elements of the early years will all be assessed primarily in the workplace and then scrutinised in the Annual Review of Competency Progression. All these documents would be included in a portfolio which would contribute as evidence in subsequent applications to enter ST3.

Specific evidence includes

Assessment type	Subject
DOPS a selection of types and numbers of each type according to learning agreements	Arterial cannulation Central venous cannulation Pulmonary artery catheterisation Saphenous vein harvest Chest aspiration Chest drain insertion and management Median Sternotomy
Case Based Discussion	One per attachment
CEX	Clinical examination of the cardiovascular system Clinical examination of the respiratory system Interpretation of an ECG in a clinical context
PBAs	None at this level
Training Supervisors report	Evidenced by the above WPBAs
ARCP for each specified training interval	As per local Deanery specifications
MRCS	Generic syllabus

Intermediate Stage I
2010

Intermediate Stage Overview

Clinical placements during the intermediate stage (ST3-6) will be purely in Cardiothoracic Surgery. The purpose of the intermediate stage is to allow the trainee to develop further the skills necessary for independent cardiothoracic practice. These will include skills in general cardiothoracic surgery and in emergency cardiothoracic surgery. They will also be an introduction to some specialist areas of Cardiothoracic Surgery.

Entry into ST3

Entry into ST3 will usually involve a competitive selection process. The current person specifications for entry into ST3 in Cardiothoracic Surgery are shown on the Modernising Medical Careers website. The essential components are completion of the common component of the core surgical training programme (as evidenced by successful ARCP, WPBA and completion of the MRCS examination) and completion of the cardiothoracic specific components of the early years training as evidenced by a successful ARCP and completion of the appropriate WPBA.

Intermediate (I) Stage

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 (I) 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

Intermediate Stage I Topics

Topic	**Critical Care and Post-operative Management**
Category	Critical Care and Post-operative Management
Sub-category:	None
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 multi-professional, 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 4Cardiac arrhythmia 4 Haemostasis, thrombosis and bleeding 4 Acid base balance 4 Pulmonary physiology, ventilation and gas exchange 4 Metabolic response to trauma and surgery 4GIT, renal and hepatic physiology 4Nutrition 4Temperature regulation Anatomy 4Heart, pericardium and great vessels 4Mediastinum, thoracic inlet and neck 4Tracheobronchial tree and lungs 4Chest wall and diaphragm Pathology 4Inflammation and wound healing 4Myocardial infarction and complications 4Endocarditis 4Pericarditis 4Systemic Inflammatory Response Syndrome 4Bronchopulmonary infection 4ARDS Pharmacology 4Drugs used in the treatment of hypertension, heart failure and angina 4Inotropes, vasodilators and vasoconstrictors 4Anti-arrhythmic drugs

	4Haemostatic drugs 4Antiplatelet, anticoagulant and thrombolytic drugs 4Analgesics 4Antibiotics 4Anaesthetic agents, local and general Microbiology 4Organisms involved in cardiorespiratory infection 4Antimicrobial 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 3Wound infection and sternal disruption 3 Neuropsychological consequences of surgery and critical care
Clinical Skills	HISTORY AND EXAMINATION 4 History and examination of the post-operative 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 3 Management of surgical drains 3 Antimicrobial policy and prescribing

	3 Management of post-operative haemorrhage 3 Cardiopulmonary resuscitation (ALS) 3 Management of complications of surgery 3 Blood transfusion and blood products 3 Wound infection and sternal disruption Recognition, evaluation and treatment of haemodynamic abnormalities 3 Evaluation and interpretation of haemodynamic data 3 Practical use of inotropes and vasoactive drugs 3 Use of intra aortic balloon pump Recognition, evaluation and treatment of cardiac arrhythmias 3 Interpretation of ECG 3 Use of anti-arrhythmic drugs 3 Use of defibrillator 3 Understanding and use of cardiac pacing Recognition, evaluation and treatment of ventilatory abnormalities (level as indicated) 4Interpretation of blood gas results 3Airway management 2Understanding of ventilatory techniques and methods 2Understanding of anaesthetic drugs and methods Recognition, evaluation and treatment of multiorgan dysfunction (level as indicated) 2Renal dysfunction and support 2GIT dysfunction, feeding and nutrition 2Recognition and evaluation of cerebral and neuropsychological problems
Technical Skills and Procedures	PRACTICAL SKILLS (level as indicated) 4 Arterial cannulation 4Central venous cannulation 4 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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Cardiopulmonary Bypass**
Category	Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support
Sub-category:	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	N/A
Technical Skills and Procedures	OPERATIVE MANAGEMENT 3Median sternotomy open and close 3Cannulation and institution of cardiopulmonary bypass 3 Safe conduct of CPB - problem solving and troubleshooting 3Weaning from bypass and decannulation 2Femoral cannulation and decannulation 1 Repeat sternotomy, with pericardial dissection, cardiac mobilisation and cannulation
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Myocardial Protection**
Category	Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support
Sub-category:	Myocardial Protection
Objective	*To manage with supervision the clinical and technical aspects of intraoperative myocardial protection.*
Knowledge	BASIC KNOWLEDGE 3 Myocardial cellular physiology 3 Myocardial function and dysfunction 3 Haemodynamics and arrhythmias 3 Coronary arterial and venous anatomy SPECIFIC KNOWLEDGE 3 Scientific foundations of myocardial preservation 3 Principles and practice of myocardial preservation 3 Cardioplegia solutions and delivery modes. 3 Non-cardioplegic techniques of preservation
Clinical Skills	PATIENT MANAGEMENT 2 Myocardial management throughout the peri-operative period 2 Ability to adapt preservation technique to clinical situation

Technical Skills and Procedures	OPERATIVE MANAGEMENT 2 Relevant cannulation techniques and appropriate delivery of cardioplegia
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Circulatory Support**
Category	Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support
Sub-category:	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 pre-operative, peri-operative and post-operative 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 and Procedures	N/A
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Ischaemic Heart Disease**
Category	Ischaemic Heart Disease
Sub-category:	None
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 and Procedures	OPERATIVE MANAGEMENT 4 Saphenous vein harvest 3 Mammary artery/radial artery harvest 3 Preparation for and management of cardipulmonary bypass 3 Proximal coronary anastamosis 2 Distal coronary anastamosis
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Heart Valve Disease**
Category	Heart Valve Disease
Sub-category:	None

Objective	*To evaluate and manage, with appropriate supervision, a patient with both uncomplicated heart valve disease, including operative management.*
Knowledge	BASIC KNOWLEDGE Physiology 3 Cardiovascular physiology including valve physiology and haemodynamics 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 Anatomy 3 Cardiac chambers and valves, pericardium and great vessels 3 Anatomy of the conduction system Pathology 3 Pathophysiology of valve incompetence and stenosis. 3 Consequences of valve disease on cardiac function and morphology 3 Pathophysiology of mixed valve disease and combined valve pathology (eg aortic and mitral) 3 Combined valvular and ischaemic heart disease 3 Atrial fibrillation and other arrhythmias 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 cardio respiratory infection 3 Organisms involved in wound infection 3 Antibiotic usage and prophylaxis 3 Antisepsis 3 Endocarditis and prosthetic valve endocarditis CLINICAL KNOWLEDGE General knowledge 3 Cardiopulmonary resuscitation 3 Care of the cardiac surgical patient 3 Complications of surgery 3 Risk assessment and stratification 3 Management of cardiovascular risk factors Specific Knowledge 3 agnosis investigation and assessment of valvular heart disease 3 ming of surgical intervention in valve disease 3 tions 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Aortovascular Disease**
Category	Aortovascular Disease
Sub-category:	None
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 3 Vascular biology and reactivity 3 Haemodynamics; physiology and measurement 3 Rheology and arterial pressure regulation 3 Haemostasis, thrombosis and bleeding 3 Physiology of transfusion therapy 3 Principles of surgical infectious disease 3 Acid base balance 3 Metabolic response to trauma 3 Pathophysiology and of hypothermia including the effects upon 3 haemoglobin, metabolic rate and pH with their management Anatomy 3 Heart, pericardium and great vessels 3 Anatomy of the peripheral vascular system 3 Blood supply of the spinal cord Pathology 3 Inflammation and wound healing 3 Atheroma, medial necrosis and arthritis 3 Inherited disorders of vascular biology 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 Anti-emetics

	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 Risk assessment 3 Cardiopulmonary resuscitation 3 Cardiac arrhythmias 3 Complications of surgery 3 Renal dysfunction 3 Multiorgan failure 3 Blood transfusion and blood products 3 Wound infection and sternal disruption Specific 3 Natural history of aortic disease 3 Diagnosis, investigation and assessment of aortic disease 3 Knowledge of operative treatment including spinal cord and cerebral preservation strategies 3 Type A dissection 3 Type B dissection 3 Traumatic aortic rupture 3 Thoraco-abdominal aneurysm 3 Results of surgery – survival, complication rates 3 Non-surgical management including the role of endovascular stenting 3 Management of cardiovascular and non-cardiovascular risk factors
Clinical Skills	HISTORY AND EXAMINATION 4 Cardiovascular system and general history and examination including assessment of pre-operative 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Cardiothoracic Trauma**
Category	Cardiothoracic Trauma
Sub-category:	None
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 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 3 The mechanism and patterns of injury associated with blunt, penetrating, blast and deceleration injuries to the chest 3 The post-ATLS, definitive care of blunt, penetrating and deceleration injuries to the chest. 3 The indications and use of appropriate investigations in thoracic trauma management 3 Pain relief in chest trauma, including epidural anaesthesia. 3 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 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**General Management of a Patient Undergoing Thoracic Surgery**
Category	General Management of a Patient Undergoing Thoracic Surgery
Sub-category:	None
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 3 Pulmonary physiology, ventilation and gas exchange 3 Haemostasis, thrombosis and bleeding 3 Acid base balance 3 Metabolic response to trauma 3 Digestive, renal and hepatic physiology 3 Nutrition Anatomy 3 Tracheobronchial tree and lungs 3 Thoracic inlet, neck and mediastinum 3 Oesophagus and upper GI tract 3 Chest wall and diaphragm Pathology 3 Inflammation and wound healing

	3 Bronchopulmonary infections 3 ARDS 3 Emphysema 3 Pulmonary fibrosis 3 Pulmonary manifestations of systemic disease 3 Systemic manifestations of pulmonary disease 3 Benign and malignant tumours of trachea, bronchus and lung parenchyma 3 Oesophagitis, columnar-lined oesophagus stricture 3 Oesophageal motility disorders 3 Malignant and benign tumours of the oesophagus and stomach 3 Malignant and benign tumours of the pleura and chest wall, mediastinum and thyroid Pharmacology 3 Bronchodilators 3 H2 antagonists and proton pump inhibitors 3 Haemostatic drugs 3 Analgesics 3 Antibiotics 3 Anaesthetic agents, local and general Microbiology 3 Organisms involved in respiratory infection including TB 3 Organisms involved in wound infection 3 Antibiotic usage and prophylaxis 3 Antisepsis 3 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	Neoplasms of the Lung
Category	Neoplasms of the Lung
Sub-category:	None
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 and Procedures	OPERATIVE MANAGEMENT 2 Bronchoscopic 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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Pleura**
Category	Disorders of the Pleura
Sub-category:	None
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 and Procedures	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. 1 Advanced techniques of pleural space obliteration.
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Chest Wall**
Category	Disorders of the Chest Wall
Sub-category:	None
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 and Procedures	OPERATIVE MANAGEMENT 3 Chest wall biopsy and choice of appropriate technique. 3 Needle biopsy by aspiration or core techniques and the siting of open surgical biopsy. 3 Open and excision biopsy and resection of the chest wall for benign and malignant conditions. 1 Chest wall resection in combination with resection of the underlying lung. 2 Selection and insertion of prosthetic materials, and selection of cases in which such materials are required 1 Pectus correction, by both open and minimally-invasive techniques, including post-operative care and complications 1 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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Diaphragm**
Category	Disorders of the Diaphragm
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Emphysema and Bullae**
Category	Emphysema and Bullae
Sub-category:	None
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 Post-operative 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Pericardium**
Category	Disorders of the Pericardium
Sub-category:	None
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 and Procedures	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. 1Competence in dealing with the complications of pericardial resection and replacement.
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these

	skills

Topic	**Disorders of the Mediastinum**
Category	Disorders of the Mediastinum
Sub-category:	None
Objective	*To fully assess and manage a patient with benign and malignant disease of the mediastinum, including surgical management where appropriate, and with appropriate supervision.*
Knowledge	GENERAL KNOWLEDGE As for thoracic surgery – general SPECIFIC KNOWLEDGE 3 Anatomy of the mediastinum 3 Congenital, benign, infective and malignant (primary and secondary) conditions of the mediastinum. 3 Systemic conditions associated with the mediastinum. 3 Clinical, laboratory, electromyographic and imaging techniques used in the diagnosis and assessment of patients with mediastinal disease 3 Myasthenia gravis: medical, surgical and peri-operative management 3 Staging of thymoma and grading of myasthenia 3 Benign and malignant conditions, which do not require surgical biopsy or resection. 3 Oncological treatment of malignant diseases of the mediastinum, including multidisciplinary care. 3 Surgical techniques for the treatment of myasthenia gravis, mediastinal cysts and tumours, complications and results. 3 Retrosternal goitre and its management
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 Post-operative management of patients including recognition and management of post-operative complications .
Technical Skills and Procedures	OPERATIVE MANAGEMENT 3 Selection of appropriate routes for biopsy and excision of mediastinal tumours and cysts.

	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Airway**
Category	Disorders of the Airway
Sub-category:	None
Objective	*To assess and manage a patient with disease of the major airways, including surgical management where appropriate, and with appropriate supervision.*
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. 3 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 and Procedures	OPERATIVE MANAGEMENT 2 Endoscopic assessement 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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Congenital Heart Disease**
Category	Congenital Heart Disease
Sub-category:	None
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 subspeciality 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 atrioventricular septal defects 2 Aortic valve disease including Ross procedure 2 Mitral valve disease 2 Tricuspid valve disease including Ebstiens 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Intrathoracic transplantation and surgery for heart failure**
Category	Intrathoracic Transplantation and Surgery for Heart Failure
Sub-category:	None
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 Mechanisms and outcomes of respiratory failure. 3 Causes of cardiac failure. 3 Causes of respiratory failure. Immunology 3 Major and minor histocompatability 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 3 Indications for, contraindications to and assessment for heart transplantation. 3 Indications for, contraindications to and assessment for lung and heart/lung transplantation. 3 Indications for ECMO 3 Indications for VAD 3 Criteria for brain stem death, management of the brain-dead donor, criteria for matching donor and recipient. 3 Management of patients after intrathoracic organ transplantation, including complications

	3 Results of heart transplantation, lung transplantation and non-transplant interventions for heart failure. 2 Resynchronisation therapy: techniques and indications
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 3 ECG including exercise ECG 3 Coronary angiography 3 Cardiac catheterisation data 2 Echocardiography including 2D, Doppler and TOE and stress echo 2 MR assessment of ventricular function and viability 2 Nuclear cardiology PATIENT MANAGEMENT 4 Cardiopulmonary resuscitation 3 Management of brain-dead donor 4 Diagnosis and treatment of cardiac arrhythmias 4 Management of post cardiac surgical patient 3 Management of complications of surgery 2 Management of rejection 3 Cardiac rehabilitation 4 Blood transfusion and blood products 3 Wound infection and sternal disruption 3 Diagnosis and treatment of cardiac arrhythmias
Technical Skills and Procedures	OPERATIVE MANAGEMENT Transplantation 2 Donor Retrieval 2 Ex-vivo donor organ management 1 Implantation of heart

	1 Implantation of lung 1 Implantation of heart/lung block Surgery for heart failure 2 Surgical revascularisation for ischaemic cardiomyopathy 1 Ventricular reverse remodelling surgery 1 Mitral valve repair for cardiac failure 2 Cannulation for ECMO 1 Implantation of epicardial electrodes for resynchronisation therapy 1 Implantation of extracorporeal VAD 1 Implantation of intracorporeal VAD
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Management of Benign Oesophageal Disorders**
Category	Disorders of the Oesophagus
Sub-category:	None
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 Oesophageal injury response and variations in response. 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 gastroesophageal 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. 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 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Management of Oesophageal Neoplasia**
Category	Disorders of the Oesophagus
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Intermediate Stage II
2010

Intermediate (II) Stage

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

Click on Workplace Based Assessments to view the assessment forms including DOPS and PBAs

Intermediate Stage II Topics

Topic	**Critical Care and Post-operative Management**
Category	Critical Care and Post-operative Management
Sub-category:	None
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*
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 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 post-operative 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 post-operative 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Cardiopulmonary Bypass**
Category	Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support
Sub-category:	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	N/A
Technical Skills and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Myocardial Protection**
Category	Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support
Sub-category:	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 peri-operative period 3 Ability to adapt preservation technique to clinical situation
Technical Skills and Procedures	OPERATIVE MANAGEMENT 3 Relevant cannulation techniques and appropriate delivery of cardioplegia
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Circulatory Support**
Category	Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support
Sub-category:	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 pre-operative, peri-operative and post-operative 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 and Procedures	N/A
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Ischaemic Heart Disease**
Category	Ischaemic Heart Disease
Sub-category:	None
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 be 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Heart Valve Disease**
Category	Heart Valve Disease
Sub-category:	None
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 genera 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Aortovascular Disease**
Category	Aortovascular Disease
Sub-category:	None
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 4 Vascular biology and reactivity 4 Haemodynamics; physiology and measurement 4 Rheology and arterial pressure regulation 4 Haemostasis, thrombosis and bleeding 4 Physiology of transfusion therapy 4 Principles of surgical infectious disease 4 Acid base balance 4 Metabolic response to trauma 4 Pathophysiology and of hypothermia including the effects upon haemoglobin, metabolic rate and pH with their management Anatomy

	4 Heart, pericardium and great vessels 4 Anatomy of the peripheral vascular system 4 Blood supply of the spinal cord Pathology 4 Inflammation and wound healing 4 Atheroma, medial necrosis and arthritis 4 Inherited disorders of vascular biology 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 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 pre-operative 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Cardiothoracic Trauma**
Category	Cardiothoracic Trauma
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**General Management of a Patient Undergoing Thoracic Surgery**
Category	General Management of a Patient Undergoing Thoracic Surgery
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Neoplasms of the Lung**
Category	Neoplasms of the Lung
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Pleura**
Category	Disorders of the Pleura
Sub-category:	None
Objective	*To fully evaluate and manage uncomplicated surgical conditions of the pleura and the pleural space*
Knowledge	GENERAL KNOWLEDGE As for thoracic surgery – general SPECIFIC KNOWLEDGE 4 Anatomy and physiology of the pleura 4 Inflammatory, infective and malignant disease of the visceral and parietal pleura. 4 Pneumothorax 4 Pleural effusion 4 Empyema 4 Mesothelioma

	4 Haemothorax 4 Chylothorax 4 Conditions of adjacent organs that affect the pleura 4 Medical and surgical management of pleural disease, including radiological, open and VATS techniques. 4 Techniques to deal with failures of primary treatment. 4 Advanced techniques for pleural space obliteration such as thoracoplasty and soft-tissue transfer
Clinical Skills	PATIENT MANAGEMENT As for thoracic surgery – general 4 Interpretation of imaging of the pleura 4 Chest drains: insertion, management, removal and treatment of complications. 4 Management of patients making uncomplicated and complicated recovery from pleural interventions.
Technical Skills and Procedures	OPERATIVE MANAGEMENT 4 Open procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy 4 VATS procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy 3 Open and VATS procedures for empyema, including techniques for decortication. 2 Open and VATS procedures in complex cases. 1 Advanced techniques of pleural space obliteration, with appropriate specialist assistance.
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Chest Wall**
Category	Disorders of the Chest Wall
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Diaphragm**
Category	Disorders of the Diaphragm
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Emphysema and Bullae**
Category	Emphysema and Bullae
Sub-category:	None
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 Post-operative 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 and Procedures	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. 2 Lung volume reduction surgery, unilaterally and bilaterally, using open and VATS techniques.
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Pericardium**
Category	Disorders of the Pericardium
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Mediastinum**
Category	Disorders of the Mediastinum
Sub-category:	None
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 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 peri-operative 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 3 Interpretation of laboratory, physiological and imaging techniques. 4 Patient selection with assessment of function and risk. 4 Post-operative management of patients including recognition and management of post-operative complications .
Technical Skills and Procedures	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. 3 Resection of mediastinal cysts and tumours, including extended resections involving adjacent structures.
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Disorders of the Airway**
Category	Disorders of the Airway
Sub-category:	None
Objective	*To assess and manage a patient with disease of the major airways, including surgical management where appropriate.*
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 3 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	Congenital Heart Disease
Category	Congenital Heart Disease
Sub-category:	None
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 Antisepsis 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 4 Blood transfusion and blood products 3 Wound infection and sternal disruption

Technical Skills and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Intrathoracic transplantation and surgery for heart failure**
Category	Intrathoracic transplantation and surgery for heart failure
Sub-category:	None
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 Mechanisms and outcomes of respiratory failure. 3 Causes of cardiac failure. 3 Causes of respiratory failure. Immunology 3 Major and minor histocompatability 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 3 Indications for, contraindications to and assessment for heart transplantation. 3 Indications for, contraindications to and assessment for lung and heart/lung transplantation. 3 Indications for ECMO 3 Indications for VAD 3 Criteria for brain stem death, management of the brain-dead donor, criteria for matching donor and recipient. 3 Management of patients after intrathoracic organ transplantation, including complications 3 Results of heart transplantation, lung transplantation and non-transplant interventions for heart failure. 2 Resynchronisation therapy: techniques and indications
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 3 ECG including exercise ECG 3 Coronary angiography 3 Cardiac catheterisation data 2 Echocardiography including 2D, Doppler and TOE and stress echo 2 MR assessment of ventricular function and viability 2 Nuclear cardiology PATIENT MANAGEMENT 4 Cardiopulmonary resuscitation 3 Management of brain-dead donor 4 Management of post cardiac surgical patient 3 Management of complications of surgery

	2 Management of rejection 3 Cardiac rehabilitation 4 Blood transfusion and blood products 3 Wound infection and sternal disruption 3 Diagnosis and treatment of cardiac arrhythmias
Technical Skills and Procedures	OPERATIVE MANAGEMENT Transplantation 3 Transvenous myocardial biopsy 2 Donor Retrieval 2 Ex-vivo donor organ management 1 Implantation of heart 1 Implantation of lung 1 Implantation of heart/lung block Surgery for heart failure 2 Surgical revascularisation for ischaemic cardiomyopathy 1 Ventricular reverse remodelling surgery 1 Mitral valve repair for cardiac failure 2 Cannulation for ECMO 1 Implantation of epicardial electrodes for resynchronisation therapy 1 Implantation of extracorporeal VAD 1 Implantation of intracorporeal VAD
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Management of Benign Oesophageal Disorders**
Category	Disorders of the Oesophagus
Sub-category:	None
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 Oesophageal injury response and variations in response. 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 gastroesophageal 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. 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 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 and Procedures	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	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Topic	**Management of Oesophageal Neoplasia**
Category	Disorders of the Oesophagus
Sub-category:	None
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 and Procedures	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 interpostion techniques
Professional Skills	Please see the Professional Skills and Behaviour » Intermediate section for these skills

Final Stage
2010

Final Stage

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.

Final Stage Topics

Topic	**Critical Care and Post-operative Management**
Category	Critical Care and Post-operative Management
Sub-category:	None
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*
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 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 post-operative 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 post-operative 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 and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Cardiopulmonary Bypass**
Category	Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support
Sub-category:	None
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	N/A
Technical Skills and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Myocardial Protection**
Category	Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support
Sub-category:	None
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 peri-operative period 4 Ability to adapt preservation technique to clinical situation
Technical Skills and Procedures	OPERATIVE MANAGEMENT 4 Relevant cannulation techniques and appropriate delivery of cardioplegia
Professional Skills	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Circulatory Support**
Category	Cardio-pulmonary Bypass, Myocardial Protection and Circulatory Support
Sub-category:	None
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 pre-operative, peri-operative and post-operative 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 and Procedures	N/A
Professional Skills	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Ischaemic Heart Disease**
Category	Ischaemic Heart Disease
Sub-category:	None
Objective	*To evaluate and manage all the surgical aspects of a patient with ischaemic heart disease including the complications of ischaemic heart disease.*
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 and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Heart Valve Disease**
Category	Heart Valve Disease
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Aortovascular Disease**
Category	Aortovascular Disease
Sub-category:	None
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 4 Vascular biology and reactivity 4 Haemodynamics; physiology and measurement 4 Rheology and arterial pressure regulation 4 Haemostasis, thrombosis and bleeding 4 Physiology of transfusion therapy 4 Principles of surgical infectious disease 4 Acid base balance 4 Metabolic response to trauma 4 Pathophysiology and of hypothermia including the effects upon haemoglobin, metabolic rate and pH with their management Anatomy 4 Heart, pericardium and great vessels 4 Anatomy of the peripheral vascular system 4 Blood supply of the spinal cord Pathology 4 Inflammation and wound healing 4 Atheroma, medial necrosis and arthritis 4 Inherited disorders of vascular biology 4 Systemic Inflammatory Response Syndrome 4 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 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 pre-operative 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 and Procedures	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 aortic surgery

Professional Skills	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Cardiothoracic Trauma**
Category	Cardiothoracic Trauma
Sub-category:	None
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 cardiothoraic surgery. All trainees should maintain their ATLS certification and senior trainees are encouraged to become ATLS instructors.*
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 and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**General Management of a Patient Undergoing Thoracic Surgery**
Category	General Management of a Patient Undergoing Thoracic Surgery
Sub-category:	None
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 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

	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 and Procedures	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 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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Neoplasms of the Lung**
Category	Neoplasms of the Lung
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Disorders of the Pleura**
Category	Disorders of the Pleura
Sub-category:	None
Objective	*To fully evaluate and manage surgical conditions of the pleura and the pleural space, including complicated situations.*
Knowledge	GENERAL KNOWLEDGE As for thoracic surgery – general SPECIFIC KNOWLEDGE 4 Anatomy and physiology of the pleura 4 Inflammatory, infective and malignant disease of the visceral and parietal pleura. 4 Pneumothorax 4 Pleural effusion 4 Empyema 4 Mesothelioma 4 Haemothorax 4 Chylothorax 4 Conditions of adjacent organs that affect the pleura 4 Medical and surgical management of pleural disease, including radiological, open and VATS techniques. 4 Techniques to deal with failures of primary treatment. 4 Advanced techniques for pleural space obliteration such as thoracoplasty and soft-tissue transfer
Clinical Skills	PATIENT MANAGEMENT As for thoracic surgery – general 4 Interpretation of imaging of the pleura 4 Chest drains: insertion, management, removal and treatment of complications. 4 Management of patients making uncomplicated and complicated recovery from pleural interventions.
Technical Skills and Procedures	OPERATIVE MANAGEMENT 4 Open procedures for uncomplicated pleural problems e.g. pneumothorax, effusion, haemothorax including drainage, biopsy, pleurodesis and pleurectomy 4 VATS procedures for uncomplicated pleural problems e.g. pneumothorax, effusion,

	haemothorax including drainage, biopsy, pleurodesis and pleurectomy 4 Open and VATS procedures for empyema, including techniques for decortication. 3 Open and VATS procedures in complex cases. 3 Advanced techniques of pleural space obliteration, with appropriate specialist assistance.
Professional Skills	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Disorders of the Chest Wall**
Category	Disorders of the Chest Wall
Sub-category:	None
Objective	*To assess and manage a patient with abnormality or disease affecting the chest wall, including surgical management where appropriate, and including complex cases.*
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 and Procedures	OPERAITVE 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. 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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Disorders of the Diaphragm**
Category	Disorders of the Diaphragm
Sub-category:	None
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 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 and Procedures	OPERATIVE MANAGEMENT 4 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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Emphysema and Bullae**
Category	Emphysema and Bullae
Sub-category:	None
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 Post-operative 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 and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Disorders of the Pericardium**
Category	Disorders of the Pericardium
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Disorders of the Mediastinum**
Category	Disorders of the Mediastinum
Sub-category:	None
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 peri-operative 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 Post-operative management of patients including recognition and management of post-operative complications .
Technical Skills and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	Disorders of the Airway
Category	Disorders of the Airway
Sub-category:	None
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 and Procedures	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 anastamotic 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, anastamosis 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	Please see the Professional Skills and Behaviour » Final section for these skills

Note
This topic has been replaced by the Congenital Cardiac Surgery sub-specialty 2012

Congenital Cardiac Surgery has been approved by the GMC as a sub-specialty from August 2012. All trainees beginning the final stage (ST7-ST8) and wishing to specialise in congenital heart disease should use the sub-specialty syllabus. Trainees who are already following the congenital heart disease topic in the final stage are encouraged to seek the support of their Programme Director to switch to the sub-specialty syllabus. The sub-specialty syllabus reflects the learning that was already included in the training programme with an extension of the topic content to clarify requirements and make learning objectives and levels of attainment more explicit.

Topic	**Congenital Heart Disease**
Category	Congenital Heart Disease
Sub-category:	None
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 Antisepsis 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 atrioventricular 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 and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Intrathoracic transplantation and surgery for heart failure**
Category	Intrathoracic transplantation and surgery for heart failure
Sub-category:	None
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 Mechanisms and outcomes of respiratory failure. 4 Causes of cardiac failure. 4 Causes of respiratory failure. Immunology 4 Major and minor histocompatability 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 Indications for ECMO 4 Indictations for VAD 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. 3 Resynchronisation therapy: techniques and indications
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 3 MR assessment of ventricular function and viability 2 Nuclear cardiology PATIENT MANAGEMENT 4 Cardiopulmonary resuscitation 4 Management of brain-dead donor 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 3 Diagnosis and treatment of cardiac arrhythmias
Technical Skills and Procedures	OPERATIVE MANAGEMENT Transplantation 4 Transvenous myocardial biopsy 4 Donor Retrieval 4 Ex-vivo donor organ management 4 Implantation of heart 3 Implantation of lung 3 Implantation of heart/lung block Surgery for heart failure 4 Surgical revascularisation for ischaemic cardiomyopathy 4 Ventricular reverse remodelling surgery 4 Mitral valve repair for cardiac failure

	4 Cannulation for ECMO 4 Implantation of epicardial electrodes for resynchronisation therapy 3 Implantation of extracorporeal VAD 3 Implantation of intracorporeal VAD
Professional Skills	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Management of Benign Oesophageal Disorders**
Category	Disorders of the Oesophagus
Sub-category:	None
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 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 4 Oesophago-gastric physiology and assessment including pH monitoring 4 Oesophageal motility measurement in achalasia, diffuse spasm and non-specific motility syndromes Anatomy 4 Embryology of the foregut. 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 anatomical relationships, blood supply and lymphatic drainage. Pathology 4 Inflammation and wound healing. 4 Oesophageal injury response and variations in response. 4 The inflammation, metaplasia, dysplasia cancer sequence. 4 Neurological deficits / aetiology of oesophageal dysmotility disorders. 4 Para-oesophageal hernias Pharmacology

	4 Drugs used in the treatment of gastro-oesophageal reflux disorder and oesophageal dysmotility. 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 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 and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Topic	**Management of Oesophageal Neoplasia**
Category	Disorders of the Oesophagus
Sub-category:	None
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 and Procedures	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	Please see the Professional Skills and Behaviour » Final section for these skills

Congenital Cardiac Surgery Sub-specialty

Overview of Sub-Specialty training in Congenital Cardiac Surgery

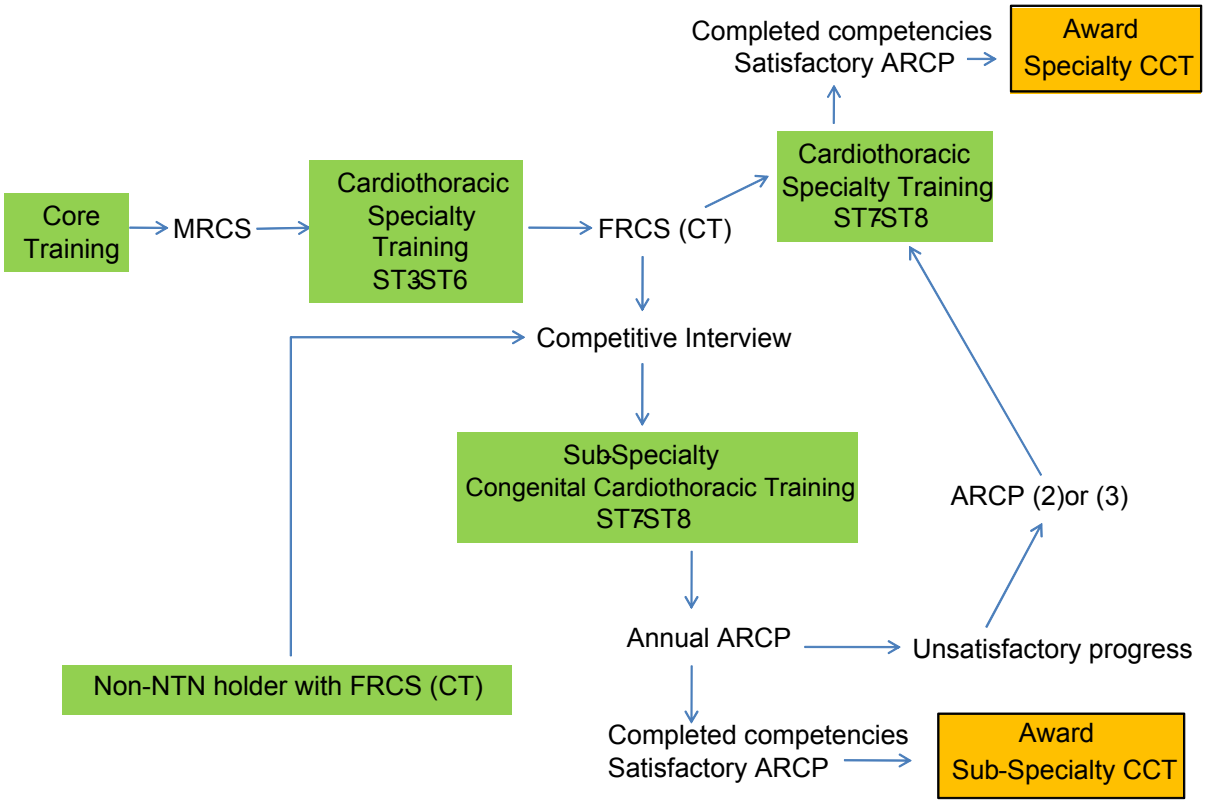
Cardiothoracic training begins at ST3 level, having completed two years of Core Surgical training and obtained the MRCS examination (or equivalent). Trainees then enter generic cardiothoracic training programmes at the intermediate I and then intermediate II levels, covering all aspects of the curriculum in the generality of cardiothoracic surgery.

Trainees are eligible to sit the Intercollegiate Specialty Examination in Cardiothoracic Surgery during the ST6 year and above if they have achieved the necessary competencies as defined by the curriculum. The examination is in the generality of the specialty and trainees are expected to demonstrate a level of knowledge equivalent to that of a day 1 consultant.

The final two years of Cardiothoracic training (ST7-8) are designed to allow trainees to develop areas of special interest. Trainees wishing to pursue a career in congenital cardiac surgery will undertake a two-year sub-specialty training programme. Entry will be by competitive interview and candidates will need to have passed the Intercollegiate Specialty Examination in Cardiothoracic Surgery exam to be eligible.

The curriculum in congenital cardiac surgery covers all aspects of neonatal, infant and paediatric cardiac surgery as well as surgery for adult congenital heart disease. The syllabus covers all emergency and elective conditions as well as transplantation, mechanical circulatory support and hybrid technology. In addition, the syllabus covers a general understanding of specific medical, physiological, technical and legal aspects of working with children.

The curriculum also allows for a degree of flexibity to accommodate technological advances and the changing needs of our patients.



Introduction

Although there are many areas of 'special interest' within the field of cardiothoracic surgery, Congenital Cardiac Surgery is the first to exist as a Sub-Specialty in its own right. This demands a dedicated two-year syllabus that covers all aspects of paediatric and adult congenital cardiac surgery. Successful completion would lead to the award of CCT in Cardiothoracic Surgery *and* in the Sub-Specialty of Congenital Cardiac Surgery.

The main areas covered in the syllabus are:

- Anatomy & Physiology of Congenital Heart Disease
- Patient Assessment & Decision Making
- Professional and Legal issues of working with children and families
- Neonatal Cardiac Surgery
- Infant & Paediatric Cardiac Surgery
- Transplantation & Mechanical Support
- Adult Congenital Heart Surgery
- Tracheal Surgery

The Training Pathway in the Sub- Specialty of Congenital Cardiothoracic Surgery

Entry into the sub-specialty will be by competitive interview at the level of ST7 and dependent on the attainment of the part III exam in the generality of cardiothoracic surgery. Training is also available to post-CCT holders in cardiothoracic surgery who wish to obtain sub-specialist training.

The standards and the delivery of training are overseen by the Specialist Advisory Committee (SAC) in Cardiothoracic Surgery. The SAC has a consultant member nominated by the trainees (the Cardiothoracic Dean) who is 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 congenital cardiothoracic surgeons, who will have the clinical knowledge, the surgical expertise and the professional skills necessary for consultant practice in paediatric and adult congenital cardiac surgery.

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

Within each module, the levels of competence are further defined in the following domains:

- **Knowledge:** e.g. basic scientific knowledge; clinical knowledge
- **Clinical skills:** e.g. history, examination, data interpretation, patient management
- **Technical skills and procedures:** e.g. technical procedures, operative management
- **Professional behaviour and leadership skills:** transferable or generic, professional skills, expected of all surgeons

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 solely by the number of years in training or by the numbers of procedures performed.

Upon successful completion of the programme the Cardiothoracic Trainee will be able to demonstrate competence in all aspects of the management (including operative management) of Congenital Cardiac Surgery.

The Configuration and Delivery of Congenital Cardiothoracic Surgical Services

Congenital Cardiothoracic surgery is concentrated into large regional or teaching hospitals, where there is easy access to all medical and support facilities. There will usually be somewhere between 4 and 5 consultant surgeons in each unit, each unit performing approximately 400 open heart operations each year.

Training programmes will consist of two linked centres that, together, cover the compete syllabus and provide joint assessment of trainees at ARCP. Programmes that do not provide exposure to highly specialised areas such as transplantation and tracheal surgery will incorporate a dedicated module in which the trainee is accommodated in one of the two national centres (GOSH and Freeman Hospital, Newcastle). Programmes will be assessed and accredited by the SAC. The ARCP process will be attended by trainers from both of the contributing institutions as well as by the SAC liaison member for that programme *and* an external congenital surgeon approved by the SAC.

Summary of the Topics 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.

During Sub-Specialty training the trainee will be expected to have reached level 4 across the full range of basic knowledge in Congenital Heart Disease:

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 Antisepsis

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

Management of the Paediatric Patient

Physiological and metabolic response to injury and surgery

- Fluid and electrolyte balance
- Thermoregulation Safe prescribing in children
- Principles of vascular access in children
- Working knowledge of trust and Local Safeguarding Children Boards (LSCBs) and Child Protection

Procedures

- Basic understanding of child protection law
- Understanding of Children's rights
- Working knowledge of types and categories of child maltreatment; presentations, signs and other features (primarily physical, emotional, sexual, neglect, professional)
- Understanding of ones personal role, responsibilities and appropriate referral patterns in child protection
- Understanding of the challenges of working in partnership with children and families
- Recognise the possibility of abuse or maltreatment
- Recognise limitations of own knowledge and experience and seek appropriate expert advice
- Urgently consult immediate senior in surgery to enable referral to paediatricians
- Keep appropriate written documentation relating to child protection matters
- Communicate effectively with those involved with child protection, including children and their families

AREAS OF SPECIALIST KNOWLEDGE AND SKILLS

FETAL CIRCULATION & CHANGES AFTER BIRTH

OBJECTIVE

Understand physiology of fetal circulation, normal values and the clinical relevance to neonatal surgery and preoperative management.

KNOWLEDGE	**ST7**	**ST8**
Physiology of fetal circulation and changes at birth	3	4
Normal values in neonatal life	3	4
Manipulation of neonatal circulation in congenital heart disease	3	4
Diagnosis and Management of Persistent Fetal Circualtion	3	4
CLINICAL SKILLS		
Stabilisation of the newborn with congenital heart disease	3	4
Interpretation of echo findings	3	4
Manipulation of the newborn circulation on the PICU	3	4
Management of Persistent Fetal Circulation	3	4

NEONATAL AND INFANT PHYSIOLOGY

OBJECTIVE

Understand fundamental neonatal physiology and the differences from older children and adults

KNOWLEDGE	**ST7**	**ST8**
Biochemical, Haematological and immunological Characteristics	3	4
Normal circulatory physiology (values, volumes etc)	4	4
Nutritional and thermoregulatory requirements	3	4
Neurodevelopment and brain protection	3	4
Changes in all the above during infancy	3	4
Pharmacology in neonates and infants	3	4
CLINICAL SKILLS		
Interpretation of clinical signs and lab tests	3	4
Stabilisation of the newborn circulation	3	4
Safe prescribing, drug dosing and infusion rates	3	4

PAEDIATRIC INTENSIVE CARE

OBJECTIVE

To have a broad understanding of the differences between paediatric and adult intensive care. Understand the principles of PICU management in congenital heart disease.

KNOWLEDGE	**ST7**	**ST8**
Differences between paediatric and adult intensive care	4	4
Stabilisation of the sick child	3	4
Ventilation of neonates and children	3	4
Invasive and non-invasive monitoring	3	4
Management of fluid balance and nutrition including TPN	3	4
Pharmacology	3	4
Resuscitation of neonates and children	3	4
CLINICAL SKILLS		
Indications and referral to PICU	3	4
Stabilisation of the sick child	3	4
Interpretation of invasive monitoring	3	4
Basic Life Support – neonates and children	3	4
Fluid management, nutrition and prescribing	3	4
Management of parents and families in the PICU	3	4
TECHNICAL SKILLS		
Arterial and central venous access	3	4
Intercostal drainage	4	4
Peritoneal dialysis	3	4
Emergency chest opening post-op	4	4

MORHOLOGY AND SEQUENTIAL SEGMENTAL ANALYSIS

OBJECTIVE

Comprehensive understanding of the morphology of congenital heart disease and the principle of sequential segmental analysis

KNOWLEDGE	**ST7**	**ST8**
Detailed anatomy of the normal heart	3	4
Morphology of congenital heart disease	3	4
Principal of Sequential Segmental Analysis	3	4
Concepts of isomerism, situs and topology	3	4
CLINICAL SKILLS		
Application of morphology and classification in the interpretation of echo, angiography and CT/MRI	3	4

RISK STRATIFICATION AND DATA COLLECTION

OBJECTIVE

Understand risk stratification systems in congenital heart disease, national requirements for data collection, validation and quality assurance.

KNOWLEDGE	**ST7**	**ST8**
Minimum data sets.	3	4
Nationally collected and reported data	3	4
Common risk assessment systems – RACHS and ARISTOTLE	3	4
Problems of risk stratification in congenital heart disease	3	4
Standard setting, quality assurance systems and mechanisms of managing poor performance	3	4
CLINCIAL SKILLS		
Familiarity with data collection systems	3	4
Interpretation of risk	4	4
Interpretation of CUSUM analysis	4	4

ATRIAL SEPTAL DEFECTS

OBJECTIVE

To diagnose, treat and manage atrial septal defects in children, including all aspects of operative repair.

KNOWLEDGE	**ST7**	**ST8**
Anatomy of the atrial septum	4	4
Classification of septal defects and associated lesions	4	4
Physiological implications of septal defects	4	4
Natural history and complications	4	4
Indications for surgical and interventional defect repair	4	4
Current methods for surgical repair including techniques for sinus venous defects, management of bilateral SVC, unroofed SVC and coronary sinus defects. Minimally invasive techniques and alternative surgical incisions and approaches.	3	4
CLINICAL SKILLS		
Diagnose and assess a patient with atrial septal defect	4	4
Interpret echocardiographic and CT/MRI assessment of the anatomy	3	4
Manage postoperative course, recognise and manage common complications	3	4
TECHNICAL SKILLS		
Repair of Secundum ASD	4	4
Repair of Sinus Venosus ASD & correction of Partial Anomalous Pulmonary Venous Drainage	3	4
Repair of Coronary Sinus ASD	3	4
Management of Unroofed Coronary Sinus	2	3
Retrieval of dislodged ASD device	3	4

Note: Management of Primum ASD is covered under 'Atrio-ventricular septal defect'

PATENT DUCTUS ARTERIOSUS

OBJECTIVE

Understand fetal circulation and the physiological consequences of persistent PDA and associated lesions. Understand neonatal and infant management including medical treatment and indications for surgery. Surgical techniques and approaches.

KNOWLEDGE	**ST7**	**ST8**
Anatomy and physiology of PDA	4	4
Medical management including management of the premature newborn	4	4
Indications and timing of surgical closure	4	4
CLINICAL SKILLS		
Diagnose and assess patents with PDA	3	4
Assessment of the premature newborn and definition of failed medical management	3	4
Interpret echo and angiographic findings	3	4
Manage post-operative course and common complications	3	4
TECHNICAL SKILLS		
Ligation of PDA via thoracotomy in premature infants	3	4
Ligation/division of PDA via thoracotomy in older infants	4	4
Ligation of PDA via sternotomy	3	4

COARCTATION AND INTERRUPTED AORTIC ARCH

OBJECTIVE

Understand morphology of coarction, hypoplastic aortic arch, interrupted arch and associated conditions. Physiology of the condition, age at presentation and pre-operative assessment and stabilisation. Management, including role of interventional cardiology and surgical repair techniques.

KNOWLEDGE	**ST7**	**ST8**
Anatomy and physiology of CoA, Hypoplastic aortic arch and Interruption	3	4
Spectrum of presentation and preoperative management and stabilisation	3	4
Associated conditions	3	4
Indications for catheter and surgical intervention	3	4
Surgical techniques	3	4
Management of post-operative course and common complications	3	4
CLINCICAL SKILLS		
Daignose and assess patients with CoA, Hypoplastic arch and Interruption	3	4
Interpret echo, angiographic and CT/MRI findings	3	4
Manage post-operative course and common complications	3	4
TECHNICAL SKILLS		
CoA repair via thoracotmy	3	4
Extended end to end anastomosis	3	4
Subclavian flap repair	3	4
Repair of hypoplastic arch via sternotomy	2	3
Repair of Aortic Interruption	2	3
Repair of CoA in children and adults (interposition graft and patch techniques)	3	4
Late complications of CoA repair (false aneurysm and aorto-bronchial/enteric fistulae)	2	3

AORTIC VALVE DISEASE

OBJECTIVE

Understand morphology and physiology of aortic valve disease in neonates, infants and children. Role of cardiological intervention and surgical repair. Treatment of aortic valve disease including surgical repair and replacement techniques

KNOWLEDGE	**ST7**	**ST8**
Morphology and classification of aortic valve disease	4	4
Spectrum of presentation and clinical assessment	4	4
Associated conditions	3	4
Indications for trans-catheter and surgical intervention	3	4
Range of surgical repair and replacement techniques	3	4
Management of operative course and common complications	3	4
CLINCIAL SKILLS		
Diagnose and assess patients with aortic valve disease	3	4
Interpret echo and angiographic findings	3	4
Assess operative and interventional options and timing of intervention	3	4
Application of surgical techniques	3	4
Management of operative course and common complications	3	4
TECHNICAL SKILLS		
Aortic valvotomy	3	4
Prosthetic aortic valve replacement	3	4
Ross Procedure (pulmonary autograft)	2	3
Aortic valve repair	2	3
Valve Sparing Root Procedure	2	3
Aortic Root Replacement	2	3

SUB-AORTIC STENOSIS

OBJECTIVE

Understand morphological spectrum of Sub-Aortic Stenosis and associated conditions. Indications for intervention and the timing and application of surgical repair.

KNOWLEDGE	**ST7**	**ST8**
Morphology and classification of Sub-Aortic Stenosis	3	4
Spectrum of presentation and indication for intervention	3	4
Application of surgical techniques	3	4
Management of operative course and common complications	3	4
CLINCIAL SKILLS		
Diagnose and assess patients with Sub-Aortic Stenosis	3	4
Interpret echo and angiographic findings	3	4
Application of surgical techniques	3	4
Management of operative course and common complications	3	4
TECHNICAL SKILLS		
Sub-Aortic resection	3	4
Morrow Procedure	3	4
Konno and Ross-Konno techniques	2	3

SUPRA-AORTIC STENOSIS

OBJECTIVE

Understand morphology and spectrum of Supra-Aortic stenosis. Indications and surgical techniques of repair.

KNOWLEDGE	**ST7**	**ST8**
Morphology and physiology of Supra-Aortic Stenosis	3	4
Indications for intervention and surgical techniques	3	4
Management of operative course and common complications	3	4
CLINCIAL SKILLS		
Diagnose and assess patients with Supra-Aortic Stenosis	3	4
Interpret echo and angiographic findings	3	4
Application of surgical techniques	3	4
Management of operative course and common complications	3	4
TECHNICAL SKILLS		
Y-Shaped Patch Repair of Supra-Aortic Stenosis	3	4
Brom Repair (three patch technique)	2	3

CONGENITAL MITRAL VALVE DISEASE

OBJECTIVE

Diagnose and manage the complete range of congenital MV anomalies and dysplasia. Understand assessment and associated lesions. Role and indications for intervention.

KNOWLEDGE	**ST7**	**ST8**
Range of anatomical variants and associated conditions	3	4
Modes and age of presentation	3	4
Assessment and indications for intervention	3	4
Choice of valve repairs and replacements	3	4
Post-operative management and follow-up	3	4
CLINCAL SKILLS		
Diagnose and assess patients Mitral disease	3	4
Interpret echo and angiographic findings	3	4
Management of associated conditions	3	4
Application of surgical repair techniques	3	4
Management of operative course and common complications	3	4
TECHNICAL SKILLS		
Mitral valvotomy	3	4
Supra-mitral membrane resection	2	3
Mitral valve repair techniques	2	3
Mitral valve replacement	3	4

TOTAL ANOMALOUS PULMONARY VENOUS DRAINAGE

OBJECTIVE

Diagnose, manage and treat all forms of TAPVD. Understand principles of assessment and preoperative stabilisation. Indications and Operative techniques of repair.

KNOWLEDGE	**ST7**	**ST8**
Morphological classification and pathophysiology	3	4
Assessment and diagnosis. Associated conditions.	3	4
Pre-operative stabilisation.	3	4
Indications and timing of surgery	3	4
Post-operative management	3	4
Follow-up and late complications	3	4
CLINCICAL SKILLS		
Interpretation of echo and CT/MRI findings	3	4
Pre-operative stabilisation and management	3	4
Choices and timing of surgical repair	3	4
Management of operative course and common complications	3	4
TECHNICAL SKILLS		
Repair of Supra-cardiac TAPVD	3	4
Repair of Cardiac TAPVD	3	4
Repair of Infra-cardiac TAPVD	2	3
Sutureless techniques	2	3
Redo-TAPVD repair	2	3

VENTRICULAR SEPTAL DEFECTS

OBJECTIVE

To diagnose, treat and manage ventricular septal defects in children, including all aspects of operative repair.

KNOWLEDGE	**ST7**	**ST8**
Anatomy of the ventricular septum	4	4
Classification of VSDs and associated lesions	4	4
Physiological implications of VSDs	4	4
Natural History and Complications	4	4
Indications for surgical and interventional repair	4	4
Current methods for repair, materials and surgical approaches, including techniques for multiple VSDs	3	4
CLINICAL SKILLS		
Diagnose and assess patients of different ages with VSD	3	4
Interpret echo and angiographic assessment	3	4
Manage postoperative course, recognise and mange common complications	3	4
TECHNICAL SKILLS		
Repair of Perimembranous VSDs	3	4
Repair of muscular VSDs	3	4
Repair of Doubly-Committed VSDs	3	4
Repair of Multiple VSDs	2	3

ATRIO-VENTRICULAR SEPTAL DEFECTS

OBJECTIVE

To diagnose, treat and manage all variants of Atrioventricular Septal defect (AVSD) including operative techniques.

KNOWLEDGE	**ST7**	**ST8**
Morphological classification and common variants	3	4
Natural history and timing of intervention	3	4
Physiology and associated conditions	3	4
Indications for surgical repair	3	4
Methods of repair, choice of technique and repair materials	3	4
Follow-up and late complications	3	4
CLINICAL SKILLS		
Diagnose and assess patients with all varieties of AVSD	3	4
Interpret echo and angiographic findings	3	4
Manage post-operative course, recognise and manage common complication	3	4
TECHINCAL SKILLS		
Repair of partial AVSD	3	4
Repair of intermediate AVSD	3	4
Repair of Complete AVSD (two-patch technique)	3	3
Repair of Complete AVSD (one-patch technique)	3	3
AV valve repair techniques	3	3

FALLOT'S TETRALOGY

OBJECTIVE

To diagnose, treat and manage all variants of Fallot's Tetralogy including operative techniques and staged approach.

KNOWLEDGE	**ST7**	**ST8**
Morphology and anatomy including common variants	4	4
Natural history and timing of intervention	3	4
Neonatal management of cyanosis	3	4
Physiology and morphological correlates	3	4
Indications for interventional and surgical treatment	3	4
Peri-operative management including restrictive physiology	3	4
Follow-up and late complications	3	4
CLINICAL SKILLS		
Diagnose and assess patients with all varieties of Fallot's tetralogy	3	4
Interpret echo and angiographic findings	3	4
Plan appropriate intervention	3	4
Manage post-operative course, recognise and manage common complications	3	4
TECHNICAL SKILLS		
Blalock-Taussig Shunt and Central shunts	3	4
Repair of Tetralogy of Fallot	3	4
Management of anomalous LAD	2	3
Creation of monocusp valve	3	3

PULMONARY ATRESIA WITH VSD

OBJECTIVE

Understand the morphology and physiology of pulmonary atresia VSD including complex variants with major aorto-pulmonary collaterals (MAPCAs). Management of all aspects of the condition including indications for surgery and operative techniques

KNOLWEDGE	**ST7**	**ST8**
Morphology and associated conditions	3	4
Physiology and pre-operative assessment	3	4
Timing of intervention and early palliation	3	4
Surgical techniques	3	4
Management of post-operative care, recognise and manage complications	3	4
Staged repair and follow-up surveillance	3	4
CLINICAL SKILLS		
Diagnose and assess patients with PA/VSD	3	4
Assess pre-operative investigations including assessment of MAPCAs	2	3
Surgical techniques and perioperative strategies	3	4
Management of post-operative care and common complications#	3	4
TECHNICAL SKILLS		
Palliative shunts	3	4
Direct PA- Aortic shunts (Mee Procedure)	2	3
Surgical repair of PA/VSD	3	3
Unifocalisation of MAPCAs	2	3
Complete repair of PA/VSD/MAPCAs	2	2

PULMONARY ATRESIA WITH INTACT VENTRICULAR SEPTUM

OBJECTIVE

Understand morphology and spectrum of the condition with emphasis on the assessment for biventricular, 1 ½ and Fontan-type repair. Indications and timing of intervention and the techniques of surgical repair and palliation.

KNOWLEGDE	**ST7**	**ST8**
Morphology and spectrum of the condition and the physiological correlates	3	4
Timing of intervention and management strategies	3	4
Management of the newborn and palliative strategies	3	4
Relevance of RV-dependent coronary circulation	3	4
Post-operative management and common complications	3	4
CLINICAL SKILLS		
Diagnose and assess patients with all variants of PA/IVS	3	4
Interpret echo and angiographic findings	3	4
Surgical techniques and operative strategies	3	4
Management of post-operative care and common complications	3	4
TECHNICAL SKILLS		
Shunt procedures	3	4
RV-Overhaul procedure	2	3
1 ½ -type Repair	3	4
Biventricular Repair	3	4

TRANSPOSITION OF THE GREAT ARTERIES

OBJECTIVE

Understand morphology and physiology of common (d-) transposition of the great arteries (TGA) and associated lesions. Management of all aspects of the condition including preoperative stabilisation and techniques for surgical repair.

KNOWLEDGE	**ST7**	**ST8**
Morphology and associated conditions	3	4
Physiology and pre-operative stabilisation	3	4
Timing of intervention and management of late presentation	3	4
Investigation and diagnosis	3	4
Surgical techniques	3	4
Management of post-operative course, recognise and mange complications	3	4
Follow-up and late complications	3	4
CLINICAL SKILLS		
Diagnose and assess patients with all variants of d-TGA	3	4
Interpret echo and angiographic findings	3	4
Surgical techniques and operative strategies	3	4
Management of post-operative care and common complications	3	4
TECHNICAL SKILLS		
Balloon atrial septostomy	2	3
Arterial switch procedure	3	3
Arterial switch and VSD closure	3	3
Arterial switch, VSD and arch repair	2	3
Management of intramural coronaries	2	3

TRANSPOSITION OF THE GREAT ARTERIES WITH VSD AND PULMONARY STENOSIS/ATRESIA

OBJECTIVE

Understand morphology and physiology of TGA/VSD/PS or PA and associated lesions. Management of all aspects of the condition including preoperative stabilisation and techniques for surgical repair.

KNOWLEDGE	**ST7**	**ST8**
Morphology and timing of intervention	3	4
Physiology and pre-operative stabilisation	3	4
Timing of intervention	3	4
Investigation and diagnosis	3	4
Surgical techniques for repair	3	4
Management of post-operative course, recognise and manage complications	3	4
CLINICAL SKILLS		
Diagnose and assess patients with TGA/VSD/PS or PA	3	4
Interpret echo, angiographic and CT/MRI investigations	3	4
Plan operative strategies	3	4
Applications of Surgical techniques	3	4
Manage post-operative course and common complications	3	4
TECHNICAL SKILLS		
Arterial shunts and RV-PA conduits	3	4
Rastelli procedure	2	3
REV procedure	2	3
Nikaidoh Procedure	2	3
Reoperations for conduit replacement	2	3

DOUBLE-OUTLET RIGHT VENTRICLE (DORV)

OBJECTIVE

Understand morphology and physiology of DORV and associated conditions including relationship with spectrum of Fallot's tetralogy. Interpret intra-cardiac anatomy and strategies of surgical repair.

KNOWLEGE	**ST7**	**ST8**
Morphology and spectrum of anatomical sub-types	3	4
Physiology and indication for repair/palliation	3	4
Recognition of morphology inappropriate for biventricular repair	3	4
Timing of intervention	3	4
Surgical techniques for repair	3	4
Management of post-operative course, recognise and manage complications	3	4
CLINCIAL SKILLS		
Diagnose and assess patients with DORV	3	4
Interpret echo, angiographic and CT/MRI investigations	3	4
Applications of Surgical techniques	3	4
Manage post-operative course and common complications	3	4
TECHNICAL SKILLS		
Repair of DORV and DORV/Fallot spectrum	3	3
Trans-ventricular repair with or without conduit	3	3
Kawashima repair	2	3
REV repair	2	3

VASCULAR RINGS

OBJECTIVE

To diagnose, treat and manage all types of vascular ring and recognise associated oesophageal and airway problems.

KNOWLEDGE	**ST7**	**ST8**
Anatomy of vascular rings	4	4
Classification and associated lesions	4	4
Modes of presentation & diagnosis	3	4
Indications & methods for surgical repair	3	4
Management of associated airway problems	3	4
CLINICAL SKILLS		
Diagnosis and assessment	3	4
Interpretation of CT/MRI, Ba swallow, bronchoscopy and angiography	3	4
Manage postoperative course, recognise and manage complications	3	4
TECHNICAL SKILLS		
Division of Double Aortic Arch	3	4
Correction of Pulmonary artery sling	3	3
Aortopexy and tracheopexy procedures	3	4

ARTERIAL SHUNTS

OBJECTIVE

Understand indications and management of all types of systemic-pulmonary artery shunts, including surgical approaches and techniques.

KNOWLEDGE	**ST7**	**ST8**
Types of shunt and surgical approaches	3	4
Choice of size, position and open vs closed	3	4
Understand alternative strategies and the staged nature of managing the underlying condition	3	4
Management of post-operative physiology	3	4
CLINICAL SKILLS		
Indications and decision making	3	4
Interpretation of echo and angiographic findings	3	4
Management of post-operative physiology	3	4
TECHNICAL SKILLS		
Modified Blalock-Taussig Shunt via sternotomy	3	4
Modified Blalock-Taussig Shunt via thoracotomy	3	4
Central shunt	3	4
Taking down shunts at reoperation	3	4

CAVO-PULMONARY SHUNT

OBJECTIVE

Understand indications and management of cavo-pulmonary (Glenn) shunts including surgical approaches and techniques.

KNOWLEDGE	**ST7**	**ST8**
Physiology of the cavo-pulmonary circulation	4	4
Indications and morphological correlates	3	4
Different techniques and surgical strategies	3	4
Management of post-operative physiology	3	4
CLINICAL SKILLS		
Indications and decision making	3	4
Interpretation of echo and angiographic data	3	4
Management of post-operative physiology	3	4
TECHNICAL SKILLS		
Bidirectional Glenn (cavo-pulmonary shunt)	3	4
Bilateral shunts	3	4
Hemi-Fontan	3	4

FONTAN CIRCULATION

OBJECTIVE

Understand physiology of the Fontan circulation, anatomical and haemodynamic indications. Familiarity with surgical variants, bypass techniques, post-operative management and late problems of the Fontan physiology.

KNOWLEDGE	**ST7**	**ST8**
Physiology of the Fontan circulation	4	4
Indications and morphological correlates	3	4
Different techniques and surgical strategies	3	4
Pre-operative assessment	3	4
Post-operative management and common complications	3	4
Physiology of the Fontan state and natural history	3	4
CLINICAL SKILLS		
Indications and decision making	3	4
Interpretation of echo and angiographic data	3	4
Management of post-operative physiology	3	4
Management of early and late complications	3	4
TECHNICAL SKILLS		
Bypass strategies and cannulation	3	4
Extracardiac Total Cavo-Pulmoanry Connection (TCPC)	3	4
Lateral tunnel TCPC	3	4
Conversion Fontan-TCPC	2	3

HYPOPLASTIC LEFT HEART SYNDROME

OBJECTIVE

Diagnose, treat and manage HLHS and its anatomical variants. Understand stabilisation, pre- and post-operative management of the Norwood procedure. Surgical techniques and options.

KNOWLEDGE	**ST7**	**ST8**
Anatomy of HLHS and anatomical variants including borderline left ventricle	3	4
Physiology of post-natal stabilisation	3	4
Pre-operative management	3	4
Role and indications for hybrid procedures	3	4
Post-operative management of the Norwood physiology	3	4
Timing and plan of staged repair and inter-stage monitoring	3	4
CLINCIAL SKILLS		
Assessment of the newborn with HLHS	3	4
Echo interpretation and assessment of borderline LV	3	4
Pre-operative intervention and stabilisation	3	4
Post-operative management, manipulation of the Norwood circulation on PICU and management of common complications	3	4
TECHNICAL SKILLS		
Atrial septectomy	3	4
Classical Norwood Procedure	2	3
Norwood procedure with RV-PA conduit	2	3
Hybrid Norwood Procedure	2	3
Comprehensive stage II Hybrid procedure	2	3

AORTO-PULMONARY WINDOW

OBJECTIVE

Understand morphological classification and underlying physiology. Recognise associated lesions. Clinical management including pre-operative stabilisation and operative techniques of repair.

KNOWLEDGE	**ST7**	**ST8**
Morphological classification and associated conditions	3	4
Physiology and indications for intervention	3	4
Stabilisation of the neonate	3	4
Operative strategy and repair technique	3	4
Management of operative course and common complications	3	4
CLINCIAL SKILLS		
Indications and decision making	3	4
Interpretation of echo and angiographic data	3	4
Management of post-operative physiology	3	4
Management of operative course and common complications	3	4
TECHNICAL SKILLS		
Repair of Aorto-Pulmonary Window	3	4
Management of Associated Lesions	3	3

TRUNCUS ARTERIOSUS

OBJECTIVE

To diagnose, treat and manage the condition, recognise the common morphological variants and associated lesions. Understand concepts and techniques of surgical repair.

KNOWLEDGE	**ST7**	**ST8**
Anatomy of the lesion, Van Praagh and Collis/Edwards classifications	3	4
Pathophysiology and preoperative stabilisation	3	4
Strategies and techniques of surgical repair including choice or use of conduit	3	4
Management of post-operative physiology	3	4
Late management of conduit replacement and the truncal valve.	3	4
CLINICAL SKILLS		
Interpret echo findings	3	4
Preoperative assessment and stabilisation	3	4
Operative techniques and bypass strategies	3	4
TECHNICAL SKILLS		
Bypass Strategy	3	4
Repair of Truncus Arteriosus	2	3
Repair of Truncus/Interruption	2	2
Repair of Truncus/Non-confluent PAs	2	2
Repair of Truncal Valve	2	3

ANOMALOUS LEFT CORONARY ARTERY FROM PULMONARY ARTERY (ALCAPA)

OBJECTIVE

To diagnose, treat and manage the condition. Understand physiology and age at presentation. Techniques and timing of surgical repair.

KNOWLEDGE	**ST7**	**ST8**
Anatomy and common variants	3	4
Physiology and influence on age and mode of presentation	3	4
Pathophysiology and preoperative stabilisation	3	4
Management of post-operative course and common complications	3	4
Late management and follow-up	3	4
CLINCICAL SKILLS		
Interpret echo findings and conformation of diagnosis	3	4
Preoperative assessment and stabilisation	3	4
Use and indications of ECLS	3	4
Application of Operative techniques and cardioplegia strategy	3	4
TECHNICAL SKILLS		
Myocardial protection	3	4
ALCAPA repair by coronary transfer	3	3
Tacheuchi procedure	2	3
Coronary grafting in children	2	3

EXTRA CORPOREAL MEMBRANE OXYGENATION (ECMO)

OBJECTIVE

Understand principles of ECMO, indications and management in neonates and children

KNOWLEDGE	**ST7**	**ST8**
Indications and physiology	3	4
Alternatives to ECMO and conventional PICU management	3	4
Principles of ECMO circuit, components and design	3	4
Options and choice of cannulation	3	4
Differences and Indications of VA and VV ECMO	3	4
Management of the circuit and trouble-shooting	3	4
Management of complications	3	4
Indications and management of weaning	3	4
CLINICAL SKILLS		
Clinical assessment and decision making for VV and VA ECMO	3	4
Choice of cannulation and circuit design	3	4
Management of the neonate and child on ECMO	3	4
Circuit trouble-shooting and daily management	3	4
Indications and Supervision of weaning	3	4
Transport on ECMO	2	3
TECHNICAL SKILLS		
ECMO Specialist training course desirable		
Construction of ECMO circuit	3	4
Cannulation for VV and VA in neonate and child	3	4
Conversion of VV to VA and vice versa	3	4
Open chest cannulation	3	4
Change of Oxygenator	3	4
Decannulation	3	4

EXTRA CORPOREAL LIFE SUPPORT (ECLS)

OBJECTIVE

Understand indications for ECLS, strategies for cannulation and management of the circuit and weaning.

KNOWLEDGE	**ST7**	**ST8**
Indications and physiology	3	4
Difference between failure to separate from bypass and PICU cannulation	3	4
Principles of the ECLS circuit	3	4
Options and choice of cannulation	3	4
Management of the circuit and trouble-shooting	3	4
Management of complications	3	4
Indications and management of weaning	3	4
CLINICAL SKILLS		
Clinical assessment and decision making for ECLS	3	4
Choice of cannulation and circuit design	3	4
Management of the neonate and child on ECLS	3	4
Circuit trouble-shooting and daily management	3	4
Indications and Supervision of weaning	3	4
TECHINICAL SKILLS		
ECMO Specialist training course desirable		
Construction of ECLS circuit	3	4
Cannulation in neonate and child	3	4
Change of Oxygenator	3	4
Decannulation	3	4

MECAHNICAL CIRCUALTORY ASSIST (LVAD/RVAD/BIVAD)

OBJECTIVE

Understand indications for mechanical circulatory assist as a salvage procedure, pre-operative stabilisation and as a bridge to transplantation. Understand principles of commonly used devices and indications for each. Routine management of patients supported by these devices and common complications.

KNOWLEDGE	**ST7**	**ST8**
Basic and applied physiology of ventricular assist	3	4
Varieties and options available for LVAD or BiVAD	3	4
Indications for use of VAD	3	4
Management of patient on VAD and common complications	3	4
Role of bridge to transplant and recovery	3	4
Awareness of new devices and devices under trial	3	3
CLINCIAL SKILLS		
Application of criteria and indications for VAD	3	4
Choice of device and circuit design	3	4
Management of the patient on VAD	3	4
Conversion of LVAD to BiVAD or ECLS	3	4
Device trouble-shooting and management of complications	3	4
Bridging to transplantation and recovery	3	4
TECHNICAL SKILLS		
Implantation of VAD	2	3
Implantation of BiVAD	2	3
Explantation of VAD	2	3

TRANSPLANTATION - Optional Module

By the end of sub-specialty training the trainee will be able to:

- *Apply the principles of heart and lung transplantation in children including indications, assessment, operative procedures and post-operative management including immunosuppression*
- *Describe the specific issues of transplantation in Adults with Congenital Heart Disease (ACHD)*

KNOWLEDGE

	ST7	ST8
Describe		
Indications for heart, lung and heart-lung transplantation	3	4
Assess		
Retrieval and donor assessment	3	4
Manage		
Management and stabilisation of severe heart failure in children	3	4
Selection and listing for transplantation. Pre transplant work-up.	3	4
Operative planning and procedures	3	4
Post-operative management and immunosuppression	3	4
Late complications, chronic rejection and re-transplantation	3	4
Psychological issues in children and adolescents	3	4
MECAHNICAL CIRCUALTORY ASSIST (LVAD/RVAD/BIVAD)		
Role of bridge to transplant and recovery	3	4

Learning opportunities

- Postgraduate teaching and discussion sessions
- Multi-disciplinary meetings
- External conferences and seminars

Sources of evidence
CBD
PBA
Audit / Research / Project

CLINICAL SKILLS

	ST7	ST8
Manage:		
Management and stabilisation of acute and chronic heart failure	3	4
Assessment for listing	3	4
Application of bridging devices	3	4
Immunosuppression protocols and regimens	3	4
Coordination of retrieval and list management	3	4
Post-operative management and common complications	3	4
MECAHNICAL CIRCUALTORY ASSIST (LVAD/RVAD/BIVAD)		
Bridging to transplantation and recovery	3	4

Learning opportunities
- Supervised clinical practice, primarily in a hospital, wards, clinics or theatre.
- Management of specific clinical cases
- Assessment of new patients and review/follow up existing patients

Sources of evidence
PBA
MSF

TECHNICAL SKILLS

	ST7	ST8
Assess		
Retrieval and donor organ assessment	3	4
Manage		
Orthotopic heart transplantation	3	3
Single lung and double-lung transplantation	2	3
Heart-lung transplantation	2	3

Learning opportunities

- Supervised theatre training lists on selected patients covering consent, pre-operative planning and preparation, operative sills and post operative management, adhering to protocols and patient-safety.
- Intensive Care

Sources of evidence

PBA
MSF

* Transplantation is covered in the general syllabus and examination and trainees should already have a strong basic level of knowledge. Further experience in such a super-specialised area is optional rather than mandatory.

TRACHEAL SURGERY

OBJECTIVE

Understand the spectrum of congenital tracheal anomalies and associated conditions. Diagnose and manage each condition. Indications and techniques of repair.

KNOWLEDGE	**ST7**	**ST8**
Morphological classification and associated conditions	3	4
Diagnosis and investigation	3	4
Indications for intervention and surgery	3	4
Pre-operative stabilisation	3	4
Role of bronchoscopy and bronchography	3	4
Choice of operative techniques	3	4
Role of stem-cell technology	3	3
CLINICAL SKILLS		
Interpretation of investigations	3	4
Indication and planning of interventions	3	4
Role of functional assessment and stenting	3	4
Repair of associated lesions	3	4
Post-operative management and common complications	3	4
Long-term follow-up and assessment	3	4
TECHNICAL SKILLS		
Local Resection and anastomosis	2	3
Slide Tracheal Repair	2	3
Patch Repair Techniques and tracheoplasty	2	3
Bronchoplasty	2	3
Reoperations	2	3

PRINCIPLES OF ADULT CONGENITAL HEART DISEASE

OBJECTIVE

Understand the spectrum of conditions in Adult Congenital Heart Disease Surgery and the physiological implications of the residua and sequelae of previous surgery. Understand the issues of multiple redo surgery, implications of surgery in young adults and natural history of underlying conditions.

KNOWLEDGE	**ST7**	**ST8**
Physiology of Congenital Heart Disease presenting in adulthood	3	4
Residua and Sequelae of surgery in childhood	3	4
Investigation of adults with congenital heart disease	3	4
Choice of procedures and conduits/prostheses in young adults	3	4
Role of interventional cardiology	3	4
Indications for surgery	3	4
CLINICAL SKILLS		
Assessment of the young adult	3	4
Interpretation of echo, CT and MRI in congenital heart disease	3	4
Post-operative management in adult intensive care	3	4

PULMONARY VALVE REPLACEMENT

OBJECTIVE

Understand the aetiology of pulmonary regurgitation in adult congenital heart disease. Assessment of the right ventricle, indications for surgery and the timing and choice of valve replacement.

KNOWLEDGE	**ST7**	**ST8**
Physiology of pulmonary regurgitation and sequelae of Fallot repair and pulmonary valvotomy in childhood	3	4
Assessment of the right ventricle and indications for intervention	3	4
Role and indications of percutaneous valve replacement	3	4
Timing of valve replacement and choice of prosthesis	3	4
Management of associated lesions including arrhythmias	3	4
CLINICAL SKILLS		
Assessment of pulmonary regurgitation	3	4
Interpretation of echo and MRI findings	3	4
Use and Interpretation of exercise testing	3	4
Management of post-operative course and common complications	3	4
TECHNICAL SKILLS		
Redo sternotomy with a dilated Right Ventricle	3	4
Pulmonary Valve Replacement	3	4
RVOT patching and placation of the dilated RVOT	3	4
Concomitant Tricuspid Valve Repair	3	3

RIGHT VENTRICLE-PULMONARY ARTERY CONDUIT REPLACEMENT IN THE ADULT

OBJECTIVE

Understand the underlying morphology and indications for original conduit. Assessment of conduit degeneration and indications for replacement. Techniques for replacement and choice of conduit.

KNOWLEDGE	**ST7**	**ST8**
Underlying morphology and conduit type used in childhood	3	4
Assessment of conduit deterioration	3	4
Indications for re-intervention and surgery	3	4
Choice of conduit and procedure	3	4
Management of associated lesions	3	4
Post-operative management and common complications	3	4
CLINICAL SKILLS		
Interpretation of echo, angio and MRI/CT	3	4
Apply indications for surgery and role of catheter intervention	3	4
Assessment of associated conditions	3	4
Choice of conduit	3	4
Management of post-operative course and common complications	3	4
TECHNICAL SKILLLS		
Redo sternotomy and femoral cannulation	3	4
Conduit replacement	3	4
Repair of associated conditions (branch pulmonary artery stenosis)	3	4

ASD CLOSURE IN THE ADULT

OBJECTIVE

Understand assessment of the adult with atrial septal defect, morphological subtypes and indications for surgical and interventional closure. Focus on concomitant arrhythmia management and assessment of the right ventricle and tricuspid valve.

KNOWLEDGE	**ST7**	**ST8**
Morphological classification	3	4
Clinical and physiological assessment	3	4
Indications for surgical and interventional closure	3	4
Associated right heart failure, tricuspid regurgitation and arrhythmias	3	4
Post-operative management and common complications	3	4
CLINICAL SKILLS		
Interpretation of echo, angio and MRI	3	4
Pre-operative assessment	3	4
Operative techniques and choice of patch material	3	4
Management of post-operative course and common complications	3	4
TECHNICAL SKILLS		
Repair of secundum ASD in the adult	4	4
Repair of Sinus Venosus ASD	3	4
Management of Partial Anomalous Pulmonary Venous Drainage	3	4
Repair of Coronary Sinus ASD +/- Unroofed Coronary Sinus	3	4
Repair of Partial AVSD	3	4

FONTAN CONVERSION SURGERY

OBJECTIVE

Understand the history of the Fontan procedure and the late complications of the atrio-pulmonary connection. Patient assessment and indications for conversion to TCPC. Operative technique and importance of arrhythmia management.

KNOWLEDGE	**ST7**	**ST8**
Iterations of the Fontan circulation	4	4
Complications of the APC and indications for conversion	3	4
Operative techniques and arrhythmia management	3	4
Post-operative course and common complications	3	4
CLINICAL SKILLS		
Interpretation of echo, angio and MRI	3	4
Planning operative strategy	3	4
Management of post-operative course	3	4
TECHNICAL SKILLS		
Redo Sternotomy in the Fontan	2	3
Fontan Conversion	2	3
Maze technique and epicardial pacing	2	3

TRANSPLANTATION IN ADULTS WITH CONGENTITAL HEART DISEASE

OPTIONAL MODULE

OBJECTIVE

Understand specific issues of transplantation in ACHD.

KNOWLEDGE	**ST7**	**ST8**
Underlying conditions and physiologies associated with heart failure in ACHD	3	4
Issues of reoperation and antigen load	3	4
Outcomes compared to non-ACHD	3	4
Management of pulmonary hypertension pre and post transplant	3	4
Anatomical considerations in complex conditions	3	4
Psychological issues in transplant in young adults	3	4
CLINCIAL SKILLS		
Assessment of heart failure	3	4
Criteria and indication for listing	3	4
Pre-operative planning	3	4
Management of immunosuppression and pulmonary hypertension	3	4
Post-operative management and common complications	3	4
TECHNICAL SKILLS		
Donor management and retrieval	3	4
Orthotopic Heart transplantation	2	3
Anatomical techniques for abnormal venous anatomy	2	3

Professional Behaviour and Leadership Syllabus

GOOD CLINICAL CARE

Category	Good Clinical Care To include: • History taking • Physical examination • Time management and decision making • Clinical reasoning • Therapeutics and safe prescribing • Patient as a focus of clinical care • Patient safety • Infection control
Objective	To achieve an excellent level of care for the individual patient • To elicit a relevant focused history • To perform focused, relevant and accurate clinical examination • To formulate a diagnostic and therapeutic plan for a patient based upon the clinic findings • To prioritise the diagnostic and therapeutic plan • To communicate a diagnostic and therapeutic plan appropriately To produce timely, complete and legible clinical records to include case-note records, handover notes, and operation notes To prescribe, review and monitor appropriate therapeutic interventions relevant to clinical practice including non – medication based therapeutic and preventative indications To prioritise and organise clinical and clerical duties in order to optimise patient care To make appropriate clinical and clerical decisions in order to optimise the effectiveness of the clinical team resource. To prioritise the patient's agenda encompassing their beliefs, concerns expectations and needs To prioritise and maximise patient safety: • To understand that patient safety depends on o The effective and efficient organisation of care o Health care staff working well together o Safe systems, individual competency and safe practice • To understand the risks of treatments and to discuss these honestly and openly with patients • To systematic ways of assessing and minimising risk • To ensure that all staff are aware of risks and work together to minimise risk To manage and control infection in patients, including: • Controlling the risk of cross-infection • Appropriately managing infection in individual patients • Working appropriately within the wider community to manage the risk posed by communicable diseases
Knowledge	**Patient assessment** • Knows likely causes and risk factors for conditions relevant to mode of presentation • Understands the basis for clinical signs and the relevance of positive and negative physical signs • Recognises constraints and limitations of physical examination • Recognises the role of a chaperone is appropriate or required • Understand health needs of particular populations e.g. ethnic minorities • Recognises the impact of health beliefs, culture and ethnicity in presentations of physical and psychological conditions **Clinical reasoning** • Interpret history and clinical signs to generate hypothesis within context of clinical

	likelihood • Understands the psychological component of disease and illness presentation • Test, refine and verify hypotheses • Develop problem list and action plan • Recognise how to use expert advice, clinical guidelines and algorithms • Recognise and appropriately respond to sources of information accessed by patients • Recognises the need to determine the best value and most effective treatment both for the individual patient and for a patient cohort **Record keeping** • Understands local and national guidelines for the standards of clinical record keeping in all circumstances, including handover • Understanding of the importance of high quality and adequate clinical record keeping and relevance to patient safety and to litigation • Understand the primacy for confidentiality **Time management** • Understand that effective organisation is key to time management • Understand that some tasks are more urgent and/or more important than others • Understand the need to prioritise work according to urgency and importance • Maintains focus on individual patient needs whilst balancing multiple competing pressures • Outline techniques for improving time management **Patient safety** • Outline the features of a safe working environment • Outline the hazards of medical equipment in common use • Understand principles of risk assessment and management • Understanding the components of safe working practice in the personal, clinical and organisational settings • Outline local procedures and protocols for optimal practice e.g. GI bleed protocol, safe prescribing • Understands the investigation of significant events, serious untoward incidents and near misses **Infection control** • Understand the principles of infection control • Understands the principles of preventing infection in high risk groups • Understand the role of Notification of diseases within the UK • Understand the role of the Health Protection Agency and Consultants in Health Protection
Skills	**Patient assessment** • Takes a history from a patient with appropriate use of standardised questionnaires and with appropriate input from other parties including family members, carers and other health professionals • Performs an examination relevant to the presentation and risk factors that is valid, targeted and time efficient and which actively elicits important clinical findings • Give adequate time for patients and carers to express their beliefs ideas, concerns and expectations • Respond to questions honestly and seek advice if unable to answer • Develop a self-management plan with the patient • Encourage patients to voice their preferences and personal choices about their care **Clinical reasoning** • Interpret clinical features, their reliability and relevance to clinical scenarios including recognition of the breadth of presentation of common disorders • Incorporates an understanding of the psychological and social elements of clinical scenarios into decision making through a robust process of clinical reasoning • Recognise critical illness and respond with due urgency • Generate plausible hypothesis(es) following patient assessment • Construct a concise and applicable problem list using available information • Construct an appropriate management plan in conjunction with the patient, carers and

	other members of the clinical team and communicate this effectively to the patient, parents and carers where relevant **Record keeping** • Producing legible, timely and comprehensive clinical notes relevant to the setting • Formulating and implementing care plans appropriate to the clinical situation, in collaboration with members of an interdisciplinary team, incorporating assessment, investigation, treatment and continuing care • Presenting well documented assessments and recommendations in written and/or verbal form **Time management** • Identifies clinical and clerical tasks requiring attention or predicted to arise • Group together tasks when this will be the most effective way of working • Organise, prioritise and manage both team-members and workload effectively and flexibly **Patient safety** • Recognise and practise within limits of own professional competence • Recognise when a patient is not responding to treatment, reassess the situation, and encourage others to do so • Ensure the correct and safe use of medical equipment • Improve patients' and colleagues' understanding of the side effects and contraindications of therapeutic intervention • Sensitively counsel a colleague following a significant untoward event, or near incident, to encourage improvement in practice of individual and unit • Recognise and respond to the manifestations of a patient's deterioration or lack of improvement (symptoms, signs, observations, and laboratory results) and support other members of the team to act similarly **Infection control** • Recognise the potential for infection within patients being cared for • Counsel patients on matters of infection risk, transmission and control • Actively engage in local infection control procedures • Prescribe antibiotics according to local guidelines and work with microbiological services where appropriate • Recognise potential for cross-infection in clinical settings • Practice aseptic technique whenever relevant
Behaviour	• Shows respect and behaves in accordance with Good Medical Practice • Ensures that patient assessment, whilst clinically appropriate considers social, cultural and religious boundaries • Support patient self-management • Recognise the duty of the medical professional to act as patient advocate • Ability to work flexibly and deal with tasks in an effective and efficient fashion • Remain calm in stressful or high pressure situations and adopt a timely, rational approach • Show willingness to discuss intelligibly with a patient the notion and difficulties of prediction of future events, and benefit/risk balance of therapeutic intervention • Show willingness to adapt and adjust approaches according to the beliefs and preferences of the patient and/or carers • Be willing to facilitate patient choice • Demonstrate ability to identify one's own biases and inconsistencies in clinical reasoning • Continue to maintain a high level of safety awareness and consciousness • Encourage feedback from all members of the team on safety issues • Reports serious untoward incidents and near misses and co-operates with the investigation of the same. • Show willingness to take action when concerns are raised about performance of members of the healthcare team, and act appropriately when these concerns are voiced to you by others • Continue to be aware of one's own limitations, and operate within them • Encourage all staff, patients and relatives to observe infection control principles • Recognise the risk of personal ill-health as a risk to patients and colleagues in addition to

	its effect on performance
Examples and descriptors for Core Surgical Training	**Patient assessment** • Obtains, records and presents accurate clinical history and physical examination relevant to the clinical presentation, including an indication of patient's views • Uses and interprets findings adjuncts to basic examination appropriately e.g. internal examination, blood pressure measurement, pulse oximetry, peak flow • Responds honestly and promptly to patient questions • Knows when to refer for senior help • Is respectful to patients by o Introducing self clearly to patients and indicates own place in team o Checks that patients comfortable and willing to be seen o Informs patients about elements of examination and any procedures that the patient will undergo **Clinical reasoning** • In a straightforward clinical case develops a provisional diagnosis and a differential diagnosis on the basis of the clinical evidence, institutes an appropriate investigative and therapeutic plan, seeks appropriate support from others and takes account of the patients wishes **Record keeping** • Is able to format notes in a logical way and writes legibly • Able to write timely, comprehensive, informative letters to patients and to GPs **Time management** • Works systematically through tasks and attempts to prioritise • Discusses the relative importance of tasks with more senior colleagues. • Understands importance of communicating progress with other team members **Patient safety** • Participates in clinical governance processes • Respects and follows local protocols and guidelines • Takes direction from the team members on patient safety • Discusses risks of treatments with patients and is able to help patients make decisions about their treatment • Ensures the safe use of equipment • Acts promptly when patient condition deteriorates • Always escalates concerns promptly **Infection control** • Performs simple clinical procedures whilst maintaining full aseptic precautions • Follows local infection control protocols • Explains infection control protocols to students and to patients and their relatives • Aware of the risks of nosocomial infections.
Examples and descriptors for CCT	**Patient assessment** • Undertakes patient assessment (including history and examination) under difficult circumstances. Examples include: o Limited time available (Emergency situations, Outpatients, ward referral), o Severely ill patients o Angry or distressed patients or relatives • Uses and interprets findings adjuncts to basic examination appropriately e.g. electrocardiography, spirometry, ankle brachial pressure index, fundoscopy, sigmoidoscopy • Recognises and deals with complex situations of communication, accommodates disparate needs and develops strategies to cope • Is sensitive to patients cultural concerns and norms • Is able to explain diagnoses and medical procedures in ways that enable patients understand and make decisions about their own health care. **Clinical reasoning** • In a complex case, develops a provisional diagnosis and a differential diagnosis on the

	basis of the clinical evidence, institutes an appropriate investigative and therapeutic plan, seeks appropriate support from others and takes account of the patients wishes **Record keeping** • Produces comprehensive, focused and informative records which summarise complex cases accurately **Time management** • Organises, prioritises and manages daily work efficiently and effectively • Works with, guides, supervises and supports junior colleagues • Starting to lead and direct the clinical team in effective fashion **Patient safety** • Leads team discussion on risk assessment, risk management, clinical incidents • Works to make organisational changes that will reduce risk and improve safety • Promotes patients safety to more junior colleagues • Recognises and reports untoward or significant events • Undertakes a root cause analysis • Shows support for junior colleagues who are involved in untoward events **Infection control** • Performs complex clinical procedures whilst maintaining full aseptic precautions • Manages complex cases effectively in collaboration with infection control specialists

BEING A GOOD COMMUNICATOR

Category	**Being a good communicator** To include: • Communication with patients • Breaking bad news • Communication with colleagues
Objective	**Communication with patients** • To establish a doctor/patient relationship characterised by understanding, trust, respect, empathy and confidentiality • To communicate effectively by listening to patients, asking for and respecting their views about their health and responding to their concerns and preferences • To cooperate effectively with healthcare professionals involved in patient care • To provide appropriate and timely information to patients and their families **Breaking bad news** • To deliver bad news according to the needs of individual patients **Communication with Colleagues** • To recognise and accept the responsibilities and role of the doctor in relation to other healthcare professionals. • To communicate succinctly and effectively with other professionals as appropriate • To present a clinical case in a clear, succinct and systematic manner
Knowledge	**Communication with patients** • Understands questioning and listening techniques • Understanding that poor communication is a cause of complaints/ litigation **Breaking bad news** • In delivering bad news understand that: o The delivery of bad news affects the relationship with the patient o Patient have different responses to bad news o Bad news is confidential but the patient may wish to be accompanied o Once the news is given, patients are unlikely to take in anything else

	o Breaking bad news can be extremely stressful for both parties o It is important to prepare for breaking bad news **Communication and working with colleagues** • Understand the importance of working with colleagues, in particular: o The roles played by all members of a multi-disciplinary team o The features of good team dynamics o The principles of effective inter-professional collaboration o The principles of confidentiality
Skills	**Communication with patients** • Establish a rapport with the patient and any relevant others (eg carers) • Listen actively and question sensitively to guide the patient and to clarify information • Identify and manage communication barriers, tailoring language to the individual patient and others and using interpreters when indicated • Deliver information compassionately, being alert to and managing their and your emotional response (anxiety, antipathy etc) • Use, and refer patients to appropriate written and other evidence based information sources • Check the patient's understanding, ensuring that all their concerns/questions have been covered • Make accurate contemporaneous records of the discussion • Manage follow-up effectively and safely utilising a variety if methods (eg phone call, email, letter) • Ensure appropriate referral and communications with other healthcare professional resulting from the consultation are made accurately and in a timely manner **Breaking bad news** • Demonstrate to others good practice in breaking bad news • Recognises the impact of the bad news on the patient, carer, supporters, staff members and self • Act with empathy, honesty and sensitivity avoiding undue optimism or pessimism **Communication with colleagues** • Communicate with colleagues accurately, clearly and promptly • Utilise the expertise of the whole multi-disciplinary team • Participate in, and co-ordinate, an effective hospital at night or hospital out of hours team • Communicate effectively with administrative bodies and support organisations • Prevent and resolve conflict and enhance collaboration
Behaviour	**Communication with patients** • Approach the situation with courtesy, empathy, compassion and professionalism • Demonstrate and inclusive and patient centred approach with respect for the diversity of values in patients, carers and colleagues **Breaking bad news** • Behave with respect, honest ant empathy when breaking bad news • Respect the different ways people react to bad news **Communication with colleagues** • Be aware of the importance of, and take part in, multi-disciplinary teamwork, including adoption of a leadership role • Foster an environment that supports open and transparent communication between team members • Ensure confidentiality is maintained during communication with the team • Be prepared to accept additional duties in situations of unavoidable and unpredictable absence of colleagues

Examples and descriptors for Core Surgical Training	• Conducts a simple consultation with due empathy and sensitivity and writes accurate records thereof • Recognises when bad news must be imparted. • Able to break bad news in planned settings following preparatory discussion with seniors • Accepts his/her role in the healthcare team and communicates appropriately with all relevant members thereof
Examples and descriptors for CCT	• Shows mastery of patient communication in all situations, anticipating and managing any difficulties which may occur • Able to break bad news in both unexpected and planned settings • Fully recognises the role of, and communicates appropriately with, all relevant team members • Predicts and manages conflict between members of the healthcare team • Beginning to take leadership role as appropriate, fully respecting the skills, responsibilities and viewpoints of all team members

TEACHING AND TRAINING

Category	**Teaching and Training**
Objective	• To teach to a variety of different audiences in a variety of different ways • To assess the quality of the teaching • To train a variety of different trainees in a variety of different ways • To plan and deliver a training programme with appropriate assessments
Knowledge	• Understand relevant educational theory and principles relevant to medical education • Understand the structure of an effective appraisal interview • Understand the roles to the bodies involved in medical education • Understand learning methods and effective learning objectives and outcomes • Differentiate between appraisal, assessment and performance review • Differentiate between formative and summative assessment • Understand the role, types and use of workplace-based assessments • Understand the appropriate course of action to assist a trainee in difficulty
Skills	• Critically evaluate relevant educational literature • Vary teaching format and stimulus, appropriate to situation and subject • Provide effective feedback and promote reflection • Conduct developmental conversations as appropriate eg: appraisal, supervision, mentoring • Deliver effective lecture, presentation, small group and bed side teaching sessions • Participate in patient education • Lead departmental teaching programmes including journal clubs • Recognise the trainee in difficulty and take appropriate action • Be able to identify and plan learning activities in the workplace
Behaviour	• In discharging educational duties respect the dignity and safety of patients at all times • Recognise the importance of the role of the physician as an educator • Balances the needs of service delivery with education • Demonstrate willingness to teach trainees and other health workers • Demonstrates consideration for learners • Acts to endure equality of opportunity for students, trainees, staff and professional colleagues • Encourage discussions with colleagues in clinical settings to share understanding • Maintains honesty, empathy and objectivity during appraisal and assessment
Examples and descriptors for Core Surgical Training	• Prepares appropriate materials to support teaching episodes • Seeks and interprets simple feedback following teaching • Supervises a medical student, nurse or colleague through a simple procedure • Plans, develops and delivers small group teaching to medical students, nurses or colleagues

Examples and descriptors for CCT	• Performs a workplace based assessment including giving appropriate feedback • Devises a variety of different assessments (eg MCQs, WPBAs) • Appraises a medical student, nurse or colleague • Acts as a mentor to a medical student, nurses or colleague • Plans, develops and delivers educational programmes with clear objectives and outcomes • Plans, develops and delivers an assessment programme to support educational activities

KEEPING UP TO DATE

Category	**Keeping up to date and understanding how to analyse information** **Including** • Ethical research • Evidence and guidelines • Audit • Personal development
Objective	• To understand the results of research as they relate to medical practise • To participate in medical research • To use current best evidence in making decisions about the care of patients • To construct evidence based guidelines and protocols • To complete an audit of clinical practice • At actively seek opportunities for personal development • To participate in continuous professional development activities
Knowledge	• Understands GMC guidance on good practice in research • Understands the principles of research governance • Understands research methodology including qualitative, quantitative, bio-statistical and epidemiological research methods • Understands of the application of statistics as applied to medical practise • Outline sources of research funding • Understands the principles of critical appraisal • Understands levels of evidence and quality of evidence • Understands guideline development together with their roles and limitations • Understands the different methods of obtaining data for audit • Understands the role of audit in improving patient care and risk management • Understands the audit cycle • Understands the working and uses of national and local databases used for audit such as specialty data collection systems, cancer registries etc • To demonstrate knowledge of the importance of best practice, transparency and consistency
Skills	• Develops critical appraisal skills and applies these when reading literature • Devises a simple plan to test a hypothesis • Demonstrates the ability to write a scientific paper • Obtains appropriate ethical research approval • Uses literature databases • Contribute to the construction, review and updating of local (and national) guidelines of good practice using the principles of evidence based medicine • Designs, implements and completes audit cycles • Contribute to local and national audit projects as appropriate • To use a reflective approach to practice with an ability to learn from previous experience • To use assessment, appraisal, complaints and other feedback to discuss and develop an understanding of own development needs
Behaviour	• Follows guidelines on ethical conduct in research and consent for research • Keep up to date with national reviews and guidelines of practice (e.g. NICE) • Aims for best clinical practice at all times, responding to evidence based medicine while recognising the occasional need to practise outside clinical guidelines

	• Recognise the need for audit in clinical practice to promote standard setting and quality assurance • To be prepared to accept responsibility • Show commitment to continuing professional development
Examples and descriptors for Core Surgical Training	• Defines ethical research and demonstrates awareness of GMC guidelines • Differentiates audit and research and understands the different types of research approach e.g. qualitative and quantitative • Knows how to use literature databases • Demonstrates good presentation and writing skills • Participates in departmental or other local journal club • Critically reviews an article to identify the level of evidence • Attends departmental audit meetings • Contributes data to a local or national audit • Identifies a problem and develops standards for a local audit • Describes the audit cycle and take an audit through the first steps • Seeks feedback on performance from clinical supervisor/mentor/patients/carers/service users
Examples and descriptors for CCT	• Demonstrates critical appraisal skills in relation to the published literature • Demonstrates ability to apply for appropriate ethical research approval • Demonstrates knowledge of research organisation and funding sources • Demonstrates ability to write a scientific paper • Leads in a departmental or other local journal club • Contributes to the development of local or national clinical guidelines or protocols • Organise or lead a departmental audit meeting • Lead a complete clinical audit cycle including development of conclusions, the changes needed for improvement, implementation of findings and re-audit to assess the effectiveness of the changes • Seeks opportunity to visit other departments and learn from other professionals

MANAGER

Sub-category:	**Manager** **including** • Self Awareness and self management • Team-working • Leadership • Principles of quality and safety improvement • Management and NHS structure
Objective	**Self awareness and self management** • To recognise and articulate one's own values and principles, appreciating how these may differ from those of others • To identify one's own strengths, limitations and the impact of their behaviour • To identify their own emotions and prejudices and understand how these can affect their judgement and behaviour • To obtain, value and act on feedback from a variety of sources • To manage the impact of emotions on behaviour and actions • To be reliable in fulfilling responsibilities and commitments to a consistently high standard • To ensure that plans and actions are flexible, and take into account the needs and requirements of others • To plan workload and activities to fulfil work requirements and commitments with regard to their own personal health **Team working** • To identify opportunities where working with others can bring added benefits

	• To work well in a variety of different teams and team settings by listening to others, sharing information, seeking the views of others, empathising with others, communicating well, gaining trust, respecting roles and expertise of others, encouraging others, managing differences of opinion, adopting a team approach **Leadership** • To develop the leadership skills necessary to lead teams effectively. These include: • Identification of contexts for change • Application of knowledge and evidence to produce an evidence based challenge to systems and processes • Making decision by integrating values with evidence • Evaluating impact of change and taking corrective action where necessary **Principles of quality and safety improvement** • To recognise the desirability of monitoring performance, learning from mistakes and adopting no blame culture in order to ensure high standards of care and optimise patient safety • To critically evaluate services • To identify where services can be improved • To support and facilitate innovative service improvement **Management and NHS culture** • To organise a task where several competing priorities may be involved • To actively contribute to plans which achieve service goals • To manage resources effectively and safely • To manage people effectively and safely • To manage performance of themselves and others • To understand the structure of the NHS and the management of local healthcare systems in order to be able to participate fully in managing healthcare provision
Knowledge	**Self awareness and self management** • Demonstrate knowledge of ways in which individual behaviours impact on others; • Demonstrate knowledge of personality types, group dynamics, learning styles, leadership styles • Demonstrate knowledge of methods of obtaining feedback from others • Demonstrate knowledge of tools and techniques for managing stress • Demonstrate knowledge of the role and responsibility of occupational health and other support networks • Demonstrate knowledge of the limitations of self professional competence **Team working** • Outline the components of effective collaboration and team working • Demonstrate knowledge of specific techniques and methods that facilitate effective and empathetic communication • Demonstrate knowledge of techniques to facilitate and resolve conflict • Describe the roles and responsibilities of members of the multidisciplinary team • Outline factors adversely affecting a doctor's and team performance and methods to rectify these • Demonstrate knowledge of different leadership styles **Leadership** • Understand the responsibilities of the various Executive Board members and Clinical Directors or leaders • Understand the function and responsibilities of national bodies such as DH, HCC, NICE, NPSA, NCAS; Royal Colleges and Faculties, specialty specific bodies, representative bodies; regulatory bodies; educational and training organisations • Demonstrate knowledge of patient outcome reporting systems within surgery, and the organisation and how these relate to national programmes. • Understand how decisions are made by individuals, teams and the organisation • Understand effective communication strategies within organisations • Demonstrate knowledge of impact mapping of service change, barriers to change, qualitative methods to gather the experience of patients and carers

	Quality and safety improvement
	• Understand the elements of clinical governance and its relevance to clinical care
	• Understands significant event reporting systems relevant to surgery
	• Understands the importance of evidence-based practice in relation to clinical effectiveness
	• Understand risks associated with the surgery including mechanisms to reduce risk
	• Outline the use of patient early warning systems to detect clinical deterioration
	• Keep abreast of national patient safety initiatives including National Patient Safety Agency , NCEPOD reports, NICE guidelines etc
	• Understand quality improvement methodologies including feedback from patients, public and staff
	• Understand the role of audit, research, guidelines and standard setting in improving quality of care
	• Understand methodology of creating solutions for service improvement
	• Understand the implications of change
	
	Management and NHS Structure
	• Understand the guidance given on management and doctors by the GMC
	• Understand the structure of the NHS and its constituent organisation
	• Understand the structure and function of healthcare systems as they apply to surgery
	• Understand the principles of:
	  • Clinical coding
	  • Relevant legislation including Equality and Diversity, Health and Safety, Employment law, European Working Time Regulations
	  • National Service Frameworks
	  • Health regulatory agencies (e.g., NICE, Scottish Government)
	  • NHS Structure and relationships
	  • NHS finance and budgeting
	  • Consultant contract
	  • Commissioning, funding and contracting arrangements
	  • Resource allocation
	  • The role of the independent sector as providers of healthcare
	  • Patient and public involvement processes and role
	  • Understand the principles of recruitment and appointment procedures
	• Understand basic management techniques

Skills	**Self awareness and self management**
	• Demonstrate the ability to maintain and routinely practice critical self awareness, including able to discuss strengths and weaknesses with supervisor, recognising external influences and changing behaviour accordingly
	• Demonstrate the ability to show awareness of and sensitivity to the way in which cultural and religious beliefs affect approaches and decisions, and to respond respectfully
	• Demonstrate the ability to recognise the manifestations of stress on self and others and know where and when to look for support
	• Demonstrate the ability to balance personal and professional roles and responsibilities, prioritise tasks, having realistic expectations of what can be completed by self and others
	
	Team working
	• Preparation of patient lists with clarification of problems and ongoing care plan
	• Detailed hand over between shifts and areas of care
	• Communicate effectively in the resolution of conflict, providing feedback
	• Develop effective working relationships with colleagues within the multidisciplinary team
	• Demonstrate leadership and management in the following areas:
	  o Education and training of junior colleagues and other members of the team
	  o Deteriorating performance of colleagues (e.g. stress, fatigue)
	  o Effective handover of care between shifts and teams
	• Lead and participate in interdisciplinary team meetings
	• Provide appropriate supervision to less experienced colleagues
	• Timely preparation of tasks which need to be completed to a deadline
	
	Leadership

	• Discuss the local, national and UK health priorities and how they impact on the delivery of health care relevant to surgery • Identify trends, future options and strategy relevant to surgery • Compare and benchmark healthcare services • Use a broad range of scientific and policy publications relating to delivering healthcare services • Prepare for meetings by reading agendas, understanding minutes, action points and background research on agenda items • Work collegiately and collaboratively with a wide range of people outside the immediate clinical setting • Evaluate outcomes and re-assess the solutions through research, audit and quality assurance activities • Understand the wider impact of implementing change in healthcare provision and the potential for opportunity costs **Quality and safety improvement** • Adopt strategies to reduce risk e.g. Safe surgery • Contribute to quality improvement processes e.g. o Audit of personal and departmental performance o Errors / discrepancy meetings o Critical incident and near miss reporting o Unit morbidity and mortality meetings o Local and national databases • Maintenance of a personal portfolio of information and evidence • Creatively question existing practise in order to improve service and propose solutions **Management and NHS Structures** • Manage time and resources effectively • Utilise and implement protocols and guidelines • Participate in managerial meetings • Take an active role in promoting the best use of healthcare resources • Work with stakeholders to create and sustain a patient-centred service • Employ new technologies appropriately, including information technology • Conduct an assessment of the community needs for specific health improvement measures
Behaviour	**Self awareness and self management** • To adopt a patient-focused approach to decisions that acknowledges the right, values and strengths of patients and the public • To recognise and show respect for diversity and • differences in others • To be conscientious, able to manage time and delegate • To recognise personal health as an important issue **Team working** • Encourage an open environment to foster and explore concerns and issues about the functioning and safety of team working • Recognise limits of own professional competence and only practise within these. • Recognise and respect the skills and expertise of others • Recognise and respect the request for a second opinion • Recognise the importance of induction for new members of a team • Recognise the importance of prompt and accurate information sharing with Primary Care team following hospital discharge **Leadership** • Demonstrate compliance with national guidelines that influence healthcare provision • Articulate strategic ideas and use effective influencing skills • Understand issues and potential solutions before acting • Appreciate the importance of involving the public and communities in developing health services • Participate in decision making processes beyond the immediate clinical care setting • Demonstrate commitment to implementing proven improvements in clinical practice and

	services • Obtain the evidence base before declaring effectiveness of changes **Quality and safety improvement** • Participate in safety improvement strategies such as critical incident reporting • Develop reflection in order to achieve insight into own professional practice • Demonstrates personal commitment to improve own performance in the light of feedback and assessment • Engage with an open no blame culture • Respond positively to outcomes of audit and quality improvement • Co-operate with changes necessary to improve service quality and safety **Management and NHS Structures** • Recognise the importance of equitable allocation of healthcare resources and of commissioning • Recognise the role of doctors as active participants in healthcare systems • Respond appropriately to health service objectives and targets and take part in the development of services • Recognise the role of patients and carers as active participants in healthcare systems and service planning • Show willingness to improve managerial skills (e.g. management courses) and engage in management of the service
Examples and descriptors for Core Surgical Training	**Self awareness and self management** • Obtains 360° feedback as part of an assessment • Participates in peer learning and explores leadership styles and preferences • Timely completion of written clinical notes • Through feedback discusses and reflects on how a personally emotional situation affected communication with another person • Learns from a session on time management **Team working** • Works well within the multidisciplinary team and recognises when assistance is required from the relevant team member • Invites and encourages feedback from patients • Demonstrates awareness of own contribution to patient safety within a team and is able to outline the roles of other team members. • Keeps records up-to-date and legible and relevant to the safe progress of the patient. • Hands over care in a precise, timely and effective manner • Supervises the process of finalising and submitting operating lists to the theatre suite **Leadership** • Complies with clinical governance requirements of organisation • Presents information to clinical and service managers (eg audit) • Contributes to discussions relating to relevant issues e.g. workload, cover arrangements using clear and concise evidence and information **Quality and safety improvement** • Understands that clinical governance is the over-arching framework that unites a range of quality improvement activities • Participates in local governance processes • Maintains personal portfolio • Engages in clinical audit • Questions current systems and processes **Management and NHS Structures** • Participates in audit to improve a clinical service • Works within corporate governance structures • Demonstrates ability to manage others by teaching and mentoring juniors, medical students and others, delegating work effectively, • Highlights areas of potential waste

Examples and descriptors for CCT	**Self awareness and self management** • Participates in case conferences as part of multidisciplinary and multi agency team • Responds to service pressures in a responsible and considered way • Liaises with colleagues in the planning and implementation of work rotas **Team working** • Discusses problems within a team and provides an analysis and plan for change • Works well in a variety of different teams • Shows the leadership skills necessary to lead the multidisciplinary team • Beginning to leads multidisciplinary team meetings o Promotes contribution from all team members o Fosters an atmosphere of collaboration o Ensures that team functioning is maintained at all times. o Recognises need for optimal team dynamics o Promotes conflict resolution • Recognises situations in which others are better equipped to lead or where delegation is appropriate **Leadership** • Shadows NHS managers • Attends multi-agency conference • Uses and interprets departments performance data and information to debate services • Participates in clinical committee structures within an organisation **Quality and safety improvement** • Able to define key elements of clinical governance • Demonstrates personal and service performance • Designs audit protocols and completes audit cycle • Identifies areas for improvement and initiates improvement projects • Supports and participates in the implementation of change • Leads in review of patient safety issue • Understands change management **Management and NHS Structure** • Can describe in outline the roles of primary care, including general practice, public health, community, mental health, secondary and tertiary care services within healthcare • Participates fully in clinical coding arrangements and other relevant local activities • Can describe the relationship between PCTs/Health Boards, General Practice and Trusts including relationships with local authorities and social services • Participate in team and clinical directorate meetings including discussions around service development • Discuss the most recent guidance from the relevant health regulatory agencies in relation to the surgical specialty • Describe the local structure for health services and how they relate to regional or devolved administration structures • Discusses funding allocation processes from central government in outline and how that might impact on the local health organisation

PROMOTING GOOD HEALTH

Sub-category:	***Promoting good health***
Objective	• To demonstrate an understanding of the determinants of health and public policy in relation to individual patients • To promote supporting people with long term conditions to self-care • To develop the ability to work with individuals and communities to reduce levels of ill health and to remove inequalities in healthcare provision • To promote self care

Knowledge	• Understand guidance documents relevant to the support of self care • Recognises the agencies that can provide care and support out with the hospital • Understand the factors which influence the incidence and prevalence of common conditions including psychological, biological, social, cultural and economic factors • Understand the screening programmes currently available within the UK • Understand the possible positive and negative implications of health promotion activities • Demonstrate knowledge of the determinants of health worldwide and strategies to influence policy relating to health issues • Outline the major causes of global morbidity and mortality and effective, affordable interventions to reduce these
Skills	• Adapts assessment and management accordingly to the patients social circumstances • Assesses patient's ability to access various services in the health and social system and offers appropriate assistance • Ensures appropriate equipment and devices are discussed and where appropriate puts the patient in touch with the relevant agency • Facilitating access to appropriate training and skills to develop the patients' confidence and competence to self care • Identifies opportunities to promote change in lifestyle and to prevent ill health • Counsels patients appropriately on the benefits and risks of screening and health promotion activities
Behaviour	• Recognises the impact of long term conditions on the patient, family and friends • Put patients in touch with the relevant agency including the voluntary sector from where they can access support or equipment relevant to their care • Show willingness to maintain a close working relationship with other members of the multi-disciplinary team, primary and community care • Recognise and respect the role of family, friends and carers in the management of the patient with a long term condition • Encourage where appropriate screening to facilitate early intervention
Examples and descriptors for Core Surgical Training	• Understands that "quality of life" is an important goal of care and that this may have different meanings for each patient • Promotes patient self care and independence • Helps the patient to develop an active understanding of their condition and how they can be involved in self management • Discusses with patients those factors which could influence their health
Examples and descriptors for CCT	• Demonstrates awareness of management of long term conditions • Develops management plans in partnership with the patient that are pertinent to the patients long term condition • Engages with relevant external agencies to promote improving patient care • Support small groups in a simple health promotion activity • Discuss with small groups the factors that have an influence on their health and describe steps they can undertake to address these • Provide information to an individual about a screening programme offering specific guidance in relation to their personal health and circumstances concerning the factors that would affect the risks and benefits of screening to them as an individual.

PROBITY AND ETHICS

Sub-category:	**Probity and Ethics** To include • Acting with integrity • Medical Error • Medical ethics and confidentiality • Medical consent • Legal framework for medical practise
Objective	• To uphold personal, professional ethics and values, taking into account the values of the

	organisation and the culture and beliefs of individuals • To communicate openly, honestly and inclusively • To act as a positive role model in all aspects of communication • To take appropriate action where ethics and values are compromised • To recognise and respond the causes of medical error • To respond appropriately to complaints • To know, understand and apply appropriately the principles, guidance and laws regarding medical ethics and confidentiality as they apply to surgery • To understand the necessity of obtaining valid consent from the patient and how to obtain • To understand the legal framework within which healthcare is provided in the UK • To recognise, analyse and know how to deal with unprofessional behaviours in clinical practice, taking into account local and national regulations • Understand ethical obligations to patients and colleagues • To appreciate an obligation to be aware of personal good health
Knowledge	• Understand local complaints procedure • Recognise factors likely to lead to complaints • Understands the differences between system and individual errors • Outline the principles of an effective apology • Knows and understand the professional, legal and ethical codes of the General Medical Council and any other codes to which the physician is bound • Understands of the principles of medical ethics • Understands the principles of confidentiality • Understands the Data Protection Act and Freedom of Information Act • Understands the principles of Information Governance and the role of the Caldicott Guardian • Understands the legal framework for patient consent in relation to medical practise • Recognises the factors influencing ethical decision making including religion, personal and moral beliefs, cultural practices • Understands the standards of practice defined by the GMC when deciding to withhold or withdraw life-prolonging treatment • Understands the UK legal framework and GMC guidelines for taking and using informed consent for invasive procedures including issues of patient incapacity
Skills	• To recognise, analyse and know how to deal with unprofessional behaviours in clinical practice taking into account local and national regulations • To create open and nondiscriminatory professional working relationships with colleagues awareness of the need to prevent bullying and harassment • Contribute to processes whereby complaints are reviewed and learned from • Explains comprehensibly to the patient the events leading up to a medical error or serious untoward incident, and sources of support for patients and their relatives • Deliver an appropriate apology and explanation relating to error • Use and share information with the highest regard for confidentiality both within the team and in relation to patients • Counsel patients, family, carers and advocates tactfully and effectively when making decisions about resuscitation status, and withholding or withdrawing treatment • Present all information to patients (and carers) in a format they understand, checking understanding and allowing time for reflection on the decision to give consent • Provide a balanced view of all care options • Applies the relevant legislation that relates to the health care system in order to guide one's clinical practice including reporting to the Coroner's/Procurator Officer, the Police or the proper officer of the local authority in relevant circumstances • Ability to prepare appropriate medical legal statements for submission to the Coroner's Court, Procurator Fiscal, Fatal Accident Inquiry and other legal proceedings • Be prepared to present such material in Court
Behaviour	• To demonstrate acceptance of professional regulation • To promote professional attitudes and values • To demonstrate probity and the willingness to be truthful and to admit errors • Adopt behaviour likely to prevent causes for complaints • Deals appropriately with concerned or dissatisfied patients or relatives • Recognise the impact of complaints and medical error on staff, patients, and the National Health Service

	• Contribute to a fair and transparent culture around complaints and errors • Recognise the rights of patients to make a complaint • Identify sources of help and support for patients and yourself when a complaint is made about yourself or a colleague • Show willingness to seek advice of peers, legal bodies, and the GMC in the event of ethical dilemmas over disclosure and confidentiality • Share patient information as appropriate, and taking into account the wishes of the patient • Show willingness to seek the opinion of others when making decisions about resuscitation status, and withholding or withdrawing treatment • Seeks and uses consent from patients for procedures that they are competent to perform while o Respecting the patient's autonomy o Respecting personal, moral or religious beliefs o Not exceeding the scope of authority given by the patient o Not withholding relevant information • Seeks a second opinion, senior opinion, and legal advice in difficult situations of consent or capacity • Show willingness to seek advice from the employer, appropriate legal bodies (including defence societies), and the GMC on medico-legal matters
Examples and descriptors for Core Surgical Training	• Reports and rectifies an error if it occurs • Participates in significant event audits • Participates in ethics discussions and forums • Apologises to patient for any failure as soon as an error is recognised • Understands and describes the local complaints procedure • Recognises need for honesty in management of complaints • Learns from errors • Respect patients' confidentiality and their autonomy • Understand the Data Protection Act and Freedom of Information Act • Consult appropriately, including the patient, before sharing patient information • Participate in decisions about resuscitation status, withholding or withdrawing treatment • Obtains consent for interventions that he/she is competent to undertake • Knows the limits of their own professional capabilities
Examples and descriptors for CCT	• Recognises and responds to both system failure and individual error • Provides timely accurate written responses to complaints when required • Counsels patients on the need for information distribution within members of the immediate healthcare team • Seek patients' consent for disclosure of identifiable information • Discuss with patients with whom they would like information about their health to be shared • Understand the importance the possible need for ethical approval when patient information is to be used for any purpose • Understand the difference between confidentiality and anonymity • Know the process for gaining ethical approval for research • Able to assume a full role in making and implementing decisions about resuscitation status and withholding or withdrawing treatment • Able to support decision making on behalf of those who are not competent to make decisions about their own care • Obtains consent for interventions that he/she is competent to undertake, even when there are communication difficulties • Identifies cases which should be reported to external bodies • Identify situations where medical legal issues may be relevant • Work with external bodies around cases that should be reported to them. • Collaborating with external bodies by preparing and presenting reports as required

The Assessment System

Overview of the Assessment System

The curriculum adopts the following GMC definitions:

Assessment
A systematic procedure for measuring a trainee's progress or level of achievement, against defined criteria to make a judgement about a trainee.

Assessment system
An assessment system refers to an integrated set of assessments which is in place for the entire postgraduate training programme and which is blueprinted against and supports the approved curriculum.

Purpose of the Assessment system

The purpose of the assessment system is to:

- Determine whether trainees are meeting the standards of competence and performance specified at various stages in the curriculum for surgical training.
- Provide systematic and comprehensive feedback as part of the learning cycle.
- Determine whether trainees have acquired the common and specialty-based knowledge, clinical judgement, operative and technical skills, and generic professional behaviour and leadership skills required to practice at the level of CCT in the designated surgical specialty.
- Address all the domains of Good Medical Practice and conform to the principles laid down by the Postgraduate Medical Education and Training Board.

Components of the Assessment system

The individual components of the assessment system are:

- Workplace based assessments covering knowledge, clinical judgement, technical skills and professional behaviour and attitudes together with the surgical logbook of procedures to support the assessment of operative skills
- Examinations held at key stages; during the early years of training and towards the end of specialist training
- The learning agreement and the assigned educational supervisors' report
- An annual review of competence progression (ARCP)

- Overarching Assessment Blueprint 2010 (PDF: 174Kb)
- Assessment Framework 2010 (PDF: 11Kb)

In order to be included in the assessment system, the assessments methods selected have to meet the following criteria. They have to be:

- **Valid** - To ensure face validity, the workplace based assessments comprise direct observations of workplace tasks. The complexity of the tasks increases in line with progression through the training programme. To ensure content validity all the assessment instruments have been blueprinted against all the Good Medical Practice.
- **Reliable** - In order to increase reliability, there will be multiple measures of outcomes. ISCP assessments make use of several observers' judgements, multiple assessment methods (triangulation) and take place frequently. The planned systematic and permanent programme of assessor training for trainers and Assigned Educational Supervisors (AESs) through the deaneries helps gain maximum reliability of placement reports.
- **Feasible** - The practicality of the assessments in the training and working environment has been taken into account. The assessment should not add a significant amount of time to the workplace task being assessed and assessors should be able to complete the scoring and feedback part of the assessment in 5-10 minutes.
- **Cost-effectiveness** – Once staff have been trained in the assessment process and are familiar with the ISCP website, the only significant additional costs should be any extra time taken for

assessments and feedback and the induction of new Assigned Educational Supervisors. The most substantial extra time investment will be in the regular appraisal process for units that did not previously have such a system.

- **Opportunities for feedback** – All the assessments, both those for learning and of learning, include a feedback element.
- **Impact on learning** - The workplace based assessments are all designed to include immediate feedback as part of the process. A minimum number of three appraisals with the AES per clinical placement are built into the training system. The formal examinations all provide limited feedback as part of the summative process. The assessment process thus has a continuous developmental impact on learning. The emphasis given to reflective practice within the portfolio also impacts directly on learning.

Types of Assessment

The Assessment Framework

The Overarching Blueprint (PDF: 174Kb) demonstrates that the curriculum is consistent with the four Good Medical Practice domains contained in the GMC's *Framework for Appraisal and Assessment*. The specialty specific syllabuses specify the knowledge, skills and performance required for different stages of training and is underpinned by patient safety. The professional behaviour and leadership skills syllabus specifies the standards for patient safety; communication, partnership and team-working and maintaining trust. The standards have been informed by the Academy Common Competence Framework and the Academy and NHSII Leadership Competence Framework.

Curriculum assessment runs throughout training as illustrated in the Assessment Framework and is common to all disciplines of surgery.

Types of Assessment

Assessments can be categorised as for or of learning, although there is a link between the two.

Assessment for Learning - Is primarily aimed at aiding learning through constructive feedback that identifies areas for development. Alternative terms are Formative or Low-stakes assessment. Lower reliability is acceptable for individual assessments as they can and should be repeated frequently. This increases their reliability and helps to document progress. Such assessments are ideally undertaken in the workplace. [GMC]

Assessments for learning are used in the curriculum as part of a developmental or ongoing teaching and learning process and mainly comprise of workplace-based assessments. They provide the trainee with educational feedback from skilled clinicians that should result in reflection on practice and an improvement in the quality of care. Assessments are collated in the learning portfolio and are regularly reviewed during each placement, providing evidence for the judgement of the Assigned Educational Supervisors' (AES) reports to the Programme Director and the ARCP. Assessments for learning therefore contribute to summative judgements of the trainee's progress.

Assessment of Learning - Is primarily aimed at determining a level of competence to permit progression training or certification. Such assessments are undertaken infrequently (e.g. examinations) and must have high reliability as they often form the basis of decisions. Alternative terms are Summative or High-stakes assessment. [GMC]

Assessments of learning in the curriculum are focussed on the waypoints in the specialty syllabuses. For the most part these comprise the examinations, structured AES's end of placement reports and some courses which, taken in the round, cover the important elements of the syllabus and ensure that no gaps in achievement are allowed to develop. They are collated at the ARCP panel, which determines progress or otherwise.

The balance between the two assessment approaches principally relates to the relationship between competence and performance. Competence (can do) is necessary but not sufficient for performance (does), and as trainees' experience increases so performance-based assessment in the workplace becomes more important.

Workplace Based Assessments

The purpose of workplace based assessment (WPBA)

The primary purpose of WPBA is of providing short loop feedback between trainers and their trainees – a formative assessment to support learning. They are designed to be mainly trainee driven but may be trainer triggered. The number of types and intensity of each type of WPBA in any one assessment cycle will be initially determined by the Learning Agreement fashioned at the beginning of a training placement and regularly reviewed. The intensity may be altered to reflect progression and trainee need. For example a trainee in difficulty would undertake more frequent assessments above an agreed baseline for all trainees. In that sense WPBAs meet the criterion of being adaptive.

These are designed to:

Provide feedback to trainers and trainees as part of the learning cycle

The most important use of the workplace-based assessments is in providing trainees with formative feedback to inform and develop their practice. Each assessment is scored only for the purpose of providing meaningful feedback on one encounter. The assessments should be viewed as part of a process throughout training, enabling trainees to build on assessor feedback and chart their own progress. Trainees should complete more than the minimum number identified.

Provide formative guidance on practice

Surgical trainees can use different methods to assess themselves against important criteria (especially that of clinical reasoning and decision-making) as they learn and perform practical tasks. The methods also encourage dialogue between the trainee and assigned educational supervisor (AES) and other clinical supervisors.

Encompass the assessment of skills, knowledge, behaviour and attitudes during day-to-day surgical practice

Workplace-based assessment is trainee led; the trainee chooses the timing, the case and assessor under the guidance of the AES via the learning agreement. It is the trainee's responsibility to ensure completion of the required number of the agreed type of assessments by the end of each placement.

Provide a reference point on which current levels of competence can be compared with those at the end of a particular stage of training

The primary aim is for trainees to use assessments throughout their training programmes to demonstrate their learning and development. At the start of a level it would be normal for trainees to have some assessments which are less than satisfactory because their performance is not yet at the standard for the completion of that level. In cases where assessments are less than satisfactory, trainees should repeat assessments as often as required to show progress.

Inform the (summative) assessment of the AES at the completion of each placement

Although the principal role of workplace assessment is formative, the summary evidence will be used to inform the annual review process and will contribute to the decision made as to how well the trainee is progressing.

Contribute towards a body of evidence held in the learning portfolio and made available for the annual review of competence progression panel and planned educational reviews

At the end of a period of training, the trainee's whole portfolio will be reviewed. The accumulation of formative assessments will be one of a range of indicators that inform the decision as to satisfactory completion of training at the annual review of competence progression.

- Guidance on the frequency and timing of workplace-based assessments (WPBAs) (PDF: 44Kb)

- Guidance on good practice use of the workplace-based assessments (WPBAs) (PDF: 42Kb)

The assessment methods used are:

- CBD (Case Based Discussion)
- CEX (Clinical Evaluation Exercise)
- PBA (Procedure-based Assessment)
- DOPS (Direct Observation of Procedural Skills in Surgery)
- Multi Source Feedback (Peer Assessment Tool)

CBD

Case Based Discussion

CBD was developed for the foundation training period and has been contextualised to the surgical environment. This method is designed to assess clinical judgement, decision-making and the application of medical knowledge in relation to patient care in cases for which the trainee has been directly responsible. The method is particularly designed to test higher order thinking and synthesis as it allows assessors to explore deeper understanding of how trainees compile, prioritise and apply knowledge. CBD is not focused on the trainees' ability to make a diagnosis nor is it a viva-style assessment.

The process is a structured, in-depth discussion between the trainee and assigned educational supervisor about how a clinical case was managed by the trainee; talking through what occurred, considerations and reasons for actions. By using clinical cases that offer a challenge to the trainee, rather than routine cases, the trainee is able to explain the complexities involved and the reasoning behind choices they made. It also enables the discussion of the ethical and legal framework of practice. It uses patient records as the basis for dialogue, for systematic assessment and structured feedback. As the actual record is the focus for the discussion, the assessor can also evaluate the quality of record keeping and the presentation of cases.

Most assessments take no longer than 15-20 minutes. After completing the discussion and filling in the assessment form, the assigned educational supervisor should provide immediate feedback to the trainee. Feedback would normally take about 5 minutes.

Related Documents

Title of Document	
CBD - Assessment Form (Blank)	Form »
Guidance Notes for CBD	Guidance »
Tips for using Case-based Discussion (CBD)	Tips

CEX

Clinical Evaluation Exercise

The CEX is a method of assessing skills essential to the provision of good clinical care and to facilitate feedback. It assesses the trainees' clinical and professional skills on the ward, on ward rounds, in Accident and Emergency, or in outpatient clinics. It was designed originally by the American Board of Internal Medicine but has been contextualised to the surgical environment.

Trainees will be assessed on different clinical problems that they encounter from within the curriculum in a range of clinical settings. Trainees are encouraged to choose a different assessor for each assessment but one of the assessors must be the current assigned educational supervisor. Each assessor must be registered with ISCP and have expertise in the clinical problem.

The assessment involves observing the trainee interact with a patient in a clinical encounter. The areas of competence covered include: history taking, physical examination, professionalism, clinical judgement, communication skills, organisation/efficiency and overall clinical care. Most encounters should take between 15-20 minutes.

Assessors do not need to have prior knowledge of the trainee. The assessor's evaluation is recorded on a structured checklist that enables the assessor to provide developmental verbal feedback to the trainee immediately after the encounter. Feedback would normally take about 5 minutes.

Related Documents

Title of Document	
CEX - Assessment Form (Blank)	Form »
Guidance Notes for CEX	Guidance »
Tips for using Clinical Evaluation Exercise (CEX)	Tips »

PBA

Procedure-based Assessments

PBAs assess trainees' technical, operative and professional skills in a range of specialty procedures or parts of procedures during routine surgical practice up to the level of CCT. PBAs provide a framework to assess practice and facilitate feedback in order to direct learning. The PBA was originally developed by the Orthopaedic Competence Assessment Project (OCAP) for trauma and orthopaedic surgery and has been further developed by the SACs for all the surgical specialties.

The assessment method uses two principal components:

- A series of competencies within six domains. Most of the competencies are common to all procedures, but a relatively small number of competencies within certain domains are specific to a particular procedure.
- A global assessment that is divided into four levels of overall global rating. The highest rating is the ability to perform the procedure to the standard expected of a specialist in practice within the NHS (the level required for the Certificate of Completion of Training - CCT).

The assessment form is supported by a worksheet consisting of descriptors outlining desirable and undesirable behaviours that assist the assessor in deciding whether or not the trainee has reached a satisfactory standard for CCT, on the occasion observed, or requires development.

The procedures chosen should be representative of those that the trainee would normally carry out at that level and will be one of an indicative list of index procedures relevant to the specialty. The trainee generally chooses the timing and makes the arrangements with the assessor. Usually the assessor will be the trainee's assigned educational supervisor, but it is anticipated that other surgical consultants will take on the assessment of certain procedures depending on the trainee's work pattern. Trainees are encouraged to request assessments on as many procedures as possible with a range of different assessors.

Assessors do not need to have prior knowledge of the trainee. The assessor will observe the trainee undertaking the agreed sections of the PBA in the normal course of workplace activity (usually scrubbed). Given the priority of patient care, the assessor must choose the appropriate level of supervision depending on the trainee's stage of training. Trainees will carry out the procedure, explaining what they intend to do throughout. The assessor will provide verbal prompts, if required, and intervene if patient safety is at risk.

Related Documents

Title of Document	
Trainer/Trainee Guidance Points for using PBA's	Guidance »
Trainers' Validation worksheet for PBAs	Worksheet »

Tips for using Procedure-based Assessment (PBA)	Tips »

DOPS

Direct Observation of Procedural Skills in Surgery

DOPS is used to assess the trainees' technical, operative and professional skills in a range of basic diagnostic and interventional procedures, or parts of procedures, during routine surgical practice and facilitate developmental feedback. DOPS is used in simpler environments and procedures and can take place in wards or outpatient clinics as well as in the operating theatre. It is a surgical version of an assessment tool originally developed and evaluated by the UK Royal Colleges of Physicians.

The DOPS form can be used routinely every time the trainer supervises a trainee carrying out one of the specified procedures, with the aim of making the assessment part of routine surgical training practice. The procedures reflect the index procedures in each specialty syllabus in the initial stage (ST1 and ST2) which are routinely carried out at the trainees' workplace.

The assessment involves an assessor observing the trainee perform a practical procedure within the workplace. Assessors do not need to have prior knowledge of the trainee. The assessor's evaluation is recorded on a structured checklist that enables the assessor to provide verbal developmental feedback to the trainee immediately afterwards. Trainees are encouraged to choose a different assessor for each assessment but one of the assessors must be the current assigned educational supervisor. Most procedures take no longer than 15-20 minutes. The assessor will provide immediate feedback to the trainee after completing the observation and evaluation. Feedback would normally take about 5 minutes.

The DOPS form is scored for the purpose of providing feedback to the trainee. The overall rating on any one assessment can only be completed if the entire procedure is observed. A judgement will be made at completion of the placement as to the overall level of performance achieved in each of the assessed surgical procedures.

Related Documents

Title of Document	
DOPS Asssessment Form (Blank)	Form »
Guidance Notes for DOPS	Guidance »
Tips for using DOPS	Tips »

Logbook

The surgical logbook is web-based and enables the trainee to record each surgical operative procedure undertaken. The logbook provides a record of the scope and volume of operative exposure and level of supervision required. It is seen as corroborative evidence of the experience of the trainee gained in carrying out surgical procedures when discussing progress with the assigned educational supervisor; at the ARCP and during the planned educational reviews. The logbook conforms to the Data Protection Act.

The Observation of Teaching (optional workplace-based assessment)

The Observation of Teaching form provides formative feedback to trainees as part of the ongoing culture of reflective learning that workplace-based assessment seeks to develop. It was adapted from the Teaching Observation Tool developed by the Joint Royal College's of Physicians' Training Board (JRCPTB) for use in surgery. It is an optional tool to facilitate assessment of instances of teaching as and when they arise.

The form is intended for use in assessing any example of teaching by a trainee that is directly observed by the assessor. This must be in a formal situation where others are gathered specifically to learn from the speaker, but does not include bedside teaching or other occasions of teaching in the presence of a patient. Assessors may be any surgeon with suitable experience to review the teaching event; it is likely these will be consultants for trainees in higher specialty levels. As this form is optional, there is no minimum number of assessments required.

Possible areas for consideration to aid assessment and evaluation are included in the Guidance Notes below. It should be noted that these are suggested considerations and not mandatory competencies for recording comments and observations.

Related Documents

Title of Document	
Observation of Teaching - Assessment Form (Blank)	Form »
Guidance Notes for Observation of Teaching	Guidance »

The Assessment of Audit (optional workplace-based assessment)

The Assessment of Audit reviews a trainee's competence in completing an audit. Like all Workplace-based assessments, it is intended to support reflective learning through structured feedback. It was adapted for surgery from an instrument originally developed and evaluated by the UK Royal Colleges of Physicians.

The assessment can be undertaken whenever an audit is presented or otherwise submitted for review. It is recommended that more than one assessor takes part in the assessment, and this may be any surgeon with experience appropriate to the process. Assessors do not need any prior knowledge of the trainee or their performance to date, nor do the assessors need to be the trainee's current Assigned Educational Supervisor.

Verbal feedback should be given immediately after the assessment and should take no more than five minutes to provide. A summary of the feedback with any action points should be recorded on the Assessment of Audit form and uploaded into the trainee's portfolio.

The Assessment of Audit guidance notes provide a breakdown of competencies evaluate by this method.

Related Documents

Title of Document	
Assessment of Audit - Assessment Form (Blank)	Form »
Guidance Notes for Assessment of Audit	Guidance »

MSF

Peer Assessment Tool

The MSF, also known as 360° or peer assessment, is a method of assessing professional competence within a team-working environment and providing developmental feedback to the trainee. Trainees should complete the MSF once a year. The trainee's AES may request further assessments if there are areas of concern at any time during training. The MSF should be undertaken in the third month of the first four-month placement in a training year, in the fifth month of the first six-month placement in a training year or in the fifth month of a one-year placement. This allows time for raters to submit their online assessments and the generation of a trainee's personalised assessment chart for discussion with the AES before the end of the placement, and for a further MSF to be performed before the end of the training year, if required.

Surgical trainees work as part of a multi-professional team with other people who have complementary skills. Trainees are expected to understand the range of roles and expertise of team members in order to communicate effectively to achieve high quality service for patients. MSF comprises a self-assessment and assessments of a trainee's performance from a range of co-workers. It uses up to 12 raters with a minimum of 8. Raters are chosen by the trainee and will always include the assigned educational supervisor and a range of colleagues covering different grades and environments (e.g. ward, theatre, outpatients) but not patients.

Feedback is in the form of a peer assessment chart that enables comparison of the self-assessment with the collated views received from co-workers for each of the 16 competencies including a global rating on a 3-point scale. The competencies map across to the standards of Good Medical Practice and to the core objectives of the intercollegiate surgical curriculum.

The assigned educational supervisor will meet with the trainee to discuss the feedback on performance in the MSF. Trainees are not given access to individual assessments. The method enables serious concerns, such as those about a trainee's probity and health, to be flagged up in confidence to the assigned educational supervisor, enabling appropriate action to be taken. Assigned educational supervisors sign off the trainee's MSF assessment and make comments for the annual review. They can also recommend a repeat MSF.

MSF - Self Assessment Form (Blank)	Form »
MSF - Assessor Form (Blank)	Form »
MSF Guidance	Guidance »

The Practicalities of Work Based Assessments

Introduction

'I have no time to do this'

The clips located here are intended to illustrate the utility and versatility of the work based assessment tools (WBA). They show that no more than ten minutes are required for any of these tools to be used meaningfully. They can be undertaken as a planned or as an opportunistic exercise. Any interaction with a trainee and trainer can be converted into a learning opportunity and then be evidenced for the benefit of the trainee and trainer as a WBA.

Despite their original name of Assessment tools, these interactional opportunities were never intended to be used summatively. Collectively they are used as part of the Annual Review of Competence Progression (ARCP) which is a summative process. However individually the tools are designed to develop trainees and are formative assessment tools and can:

- Trigger conversations between trainee and trainer
- Enable observation and discussion of clinical practice
- Record good practice and outline areas for development of knowledge, skills, judgement and professional behaviour
- Formulate action plans for development
- Enable trainees to analyse pattern recognition.

The tools are **not** intended to:

- Score trainees;
- Summate progress globally;
- Predict future performance;
- Be completed without a face to face feedback conversation.

These assessments can be divided into:

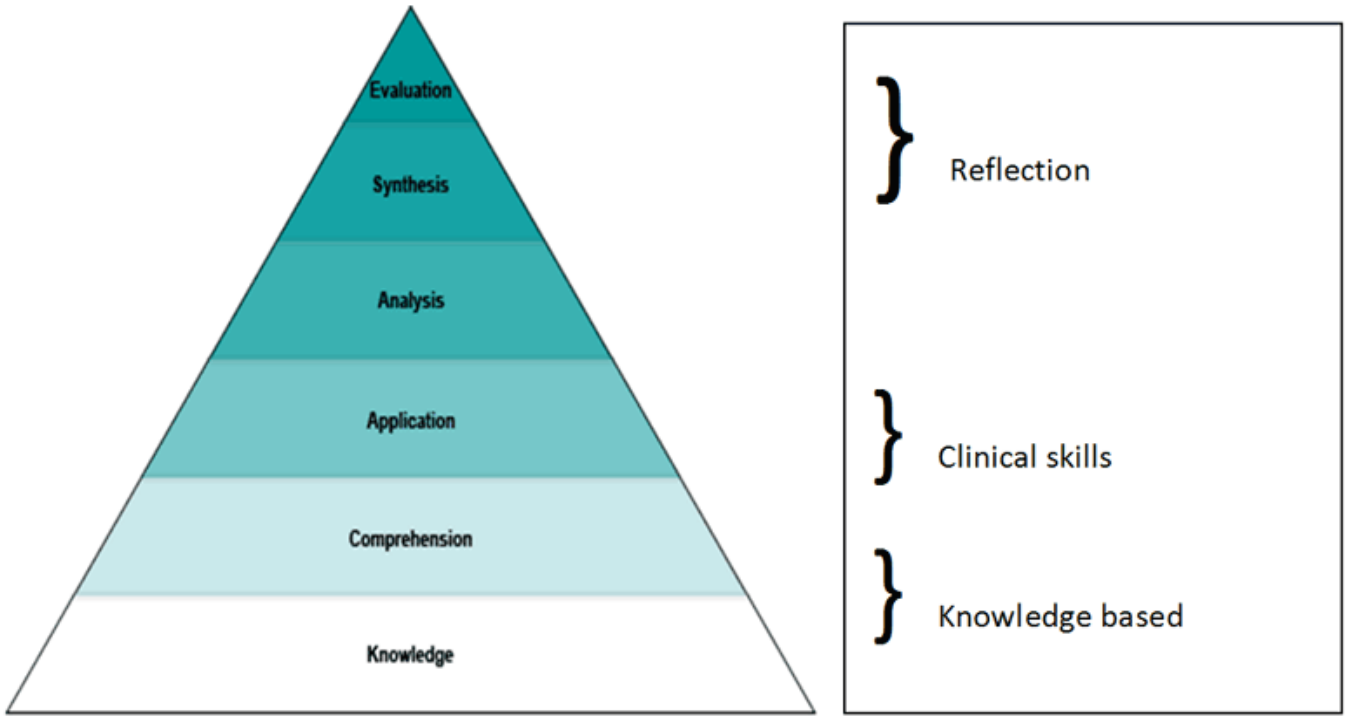
1. Observational tools

The purpose of the CEX, DOPS and PBA tools is to encourage trainee practice within a supported environment, followed by a developmental conversation (feedback) to identify elements of good practice and areas for development. Such development should be discussed in terms of follow up actions that will extend the trainee's technical proficiency and clinical skills.

2. Discussion tools

The CBD can record any conversation which reviews a trainee's practice or their thoughts about practice. From an office based, time protected tutorial to the short conversation that happens in the theatre coffee room, or even the corridor, a CBD allows trainers to explore the thinking of their trainees, and to share understanding and professional thinking. CBDs focus on knowledge and understanding and occur at different levels of Bloom's taxonomy (see figure below). CBDs that look at information are addressing the knowledge base of the trainee. This may be asking trainees for the classification of shock. A trainer could take the discussion beyond the classification to look at how that knowledge relates to the understanding of the patient's condition and the symptoms manifested by the patient. Application relates to the use of knowledge and understanding in practice and so the trainee may be asked to consider the possible treatment options for that patient. Analysis and synthesis are higher order levels of the thinking or cognitive function and CBDs that look at a situation reflectively, to break it down and consider what elements helped or hindered patient care, can be invaluable to trainees in reviewing and making sense of their experiences and in extending their critical thinking. At the evaluation level trainees may well be engaging in discussions that relate to service improvement and changes in practice at a group level rather than an individual one.

Blooms Taxonomy



3. Insight tools

The Multi Source Feedback collects subjective views of trainees from a specified range of colleagues (consultants, specialty doctors, senior nurses and other Health care providers.) The benefit of the MSF lies in the conversation between trainer and trainee to review and discuss the overview of the collated comments.

Practicalities

As a trainer, one is under pressure of training multiple trainees all at differing levels of competence and therefore with different training needs. EWTD and the constraints of managing a service as well as training require that we use our time smarter rather than working longer hours for both trainees and trainers. One educational opportunity whether in an operating theatre, on call or in a clinic can be developed into a targeted learning opportunity for individual but multiple trainees.

The following videos will demonstrate how one case can:

1. Allow targeted learning for multiple trainees
2. Can be alongside our normal surgical practice
3. Can utilise wastage time during our surgical practice
4. That each case can produce multiple items of evidence of trainee development for their portfolio

Each scenario demonstrated ensures that:

1. **Although the trainer facilitates the discussion, that the recording of the case is undertaken by the trainee**
2. **Each discussion concludes with an action plan which tasks the trainee with further development**

Observational Tools

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Video clips

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Video clips

Insight Tools

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The Multi Source Feedback (previously known as Mini PAT) tool is used to provide a 360 degree range of feedback across a spectrum of professional domains which are closely related to the GMC duties of a good doctor. Trainees fill in their self rating form and they ask a range of people for their ratings too, anonymously. When the data is collated electronically the Educational Supervisor will meet with the trainee to discuss the overview of the data.

Video clips

Examinations

Examinations are held at two key stages: during initial training and towards the end of specialist training.

MRCS

Core surgical trainees will take the MRCS examination. The MRCS assesses knowledge and skills that are encompassed within the common surgical component of the “early years” syllabus and the early years components of the Professional Behaviour and Leadership syllabus to which the MRCS syllabus is blueprinted. It is inevitable that although the examination assesses the common surgical component of the curriculum, the assessment will take place within a specialty context.

The purpose of the MRCS examination is to determine that trainees have acquired the knowledge, skills and attributes required for the early years of surgical training and, for trainees following the Intercollegiate Surgical Curriculum Programme, to determine their ability to progress to higher specialist training in surgery.

The MRCS examination consists of two parts, A & B. Although divided into two parts, the Intercollegiate MRCS is a single examination. The written component (Part A) consists of a MCQ and EMI (Extended matching item questions) combined into a single part A. These two components address knowledge and applied knowledge in the generality of surgery.

Part B consists of an Objective Structured Clinical Examination (OSCE). The overall design of the OSCE tests skills and applied knowledge. It is innovative in that it has some optional elements which permit some choice in the contexts of which the common surgical skills and knowledge may be tested. In addition to the Part A anatomical assessments, the OSCE also provides candidates with the opportunity to demonstrate their three dimensional anatomical knowledge in the context of their likely future surgical career, without losing the vital need to ensure a thorough overall grip of generic three dimensional surgical anatomy.

Both Parts A and B must be completed to pass the MRCS.

Trainees will typically take the examination towards the end of the CT2/ST1 year. If the candidate is unsuccessful, there will be an opportunity to re-sit the examination during CT3/ST2, prior to entry to ST3. Progression to ST3 will not be possible unless the MRCS (or DOHNS) examination is achieved. Such timing will fit well with the timetable currently in place for selection into ST3.

The choice of speciality context stations is not delineated in the award of MRCS. Successful candidates all are awarded exactly the same diploma as a measure of their core surgical competences.

Further information can be obtained from www.intercollegiatemrcs.org.uk

DOHNS and MRCS(ENT)

From August 2008 acquisition of Part A (written paper) of MRCS and acquisition of Part 1 and Part 2 of the DO-HNS examination has allowed candidates to acquire an Intercollegiate MRCS which is ENT themed and this has been used as part of the essential criteria for recruitment into ST3 which takes place on a national basis (International equivalence is sought where this examination is not accessible).

At a date to be announced following August 2010, Otolaryngology trainees at CT1/2 level in ENT themed core surgical training posts should undertake Part A of the MRCS and the Part 2 DO-HNS OSCE which will allow candidates to acquire the Intercollegiate MRCS(ENT) Diploma. The DO-HNS examination still exists as a separate entity but is not a requirement for ST3 unless paired with the MRCS as explained above.

FRCS

The Intercollegiate Specialty Examinations (FRCS) are summative assessments in each of the nine surgical specialties. They form part of the overall assessment system for UK and Irish Surgical Trainees who have participated in a formal surgical training programme leading to a Certificate of Completion of Training (CCT).

The applicant must provide evidence of having reached the standard of clinical competence defined in the Intercollegiate Surgical Curriculum for the award of the (CCT) by the General Medical Council (GMC). Since January 1997, success in the FRCS examination has been a mandatory requirement for CCT and entry to the Specialist Register. Passing the examination provides evidence towards the award of a CCT.

Section 1 is a written test composed of two Multiple Choice Questions papers; Paper 1: Single Best Answer [SBA] and Paper 2: Extended Matching Items [EMI]. Candidates must meet the required standard in Section 1 in order to gain eligibility to proceed to Section 2.

Section 2 is the clinical component of the examination. It consists of discussions around a series of carefully designed and structured standardised case based scenarios.

Further information can be obtained from www.intercollegiate.org.uk

Feedback

All the assessments in the curriculum, both those for learning and of learning, include a feedback element. Workplace based assessments are designed to include immediate feedback for learning as part of two-way dialogue towards improving practice. The formal examinations all provide limited feedback as part of the summative process. Assigned Educational Supervisors are able to provide further feedback to each of their trainees through the regular planned educational review and appraisal that features at the beginning, middle and end of each placement, using information contained in the portfolio on workplace based assessments and feedback from other trainers in the workplace.

Educational feedback:

- Enhances the validity of the assessment and ensures trainees receive constructive criticism on their performance.
- Is given by skilled clinicians, thereby enhancing the learning process.

Constructive formative feedback includes three elements:

- Outline of the strengths the trainee displays,
- Suggestions for development,
- Action plan for improvement.

Feedback is complimented by the trainees reflection on his/her practice with the aim of improving the quality of care.

- Tips on giving structured feedback {PDF:42kb)

Annual Review of Competence Progression (ARCP)

Purpose of the ARCP (adapted from the Gold Guide 2010):

The ARCP[1] is a formal deanery School of Surgery process which scrutinises each surgical trainee's suitability to progress to the next stage of, or complete, the training programme. It follows on from the appraisal process and bases its recommendations on the evidence that has been gathered in the trainee's learning portfolio during the period between ARCP reviews. The ARCP records that the required curriculum competences and experience are being acquired, and that this is at an appropriate rate. It also provides a coherent record of a trainee's progress. The ARCP is not in itself an assessment exercise of clinical or professional competence.

The ARCP should normally be undertaken on at least an annual basis for all trainees in surgical training. Some deaneries or Schools of Surgery plan to arrange two ARCPs each year in the early years of training. An ARCP panel may be convened more frequently if there is a need to deal with progression issues outside the normal schedule.

The Royal Colleges of Surgery use the opportunity afforded, through their representative on the panel, to monitor the quality of training being delivered by the programme and/or its components.

Further information on this process can be found in the Guide to Postgraduate Specialty Training.

Preparation for the ARCP

The trainee's learning portfolio provides the evidence of progress. It is the trainee's responsibility to ensure that the documentary evidence is complete in good time for the ARCP. The Annual Review Checklist lists the components that should normally be completed in time for the panel meeting.

The ARCP Panel

Please note that during the time of the panel meeting, members of an ARCP panel will have access to the portfolios of the trainees they review. Panel members are appointed by the Deanery and are likely to include the following:

- Postgraduate Dean or deputy
- Programme Director
- Chair of the Specialty Training Committee
- College/Faculty representatives (e.g. from the specialty SAC)
- Assigned educational supervisors (including AESs who have not been directly responsible for the trainee's placements)
- Associate Directors/Deans
- Academic representatives (for academic programmes only)
- A representative from an employing authority

ARCP Outcomes

1. Trainee is achieving progress and competencies at the expected rate
2. Development of specific competencies required – additional training time not required
3. Inadequate progress by the trainee – additional training time required
4. Released from training programme with our without specified competencies
5. Incomplete evidence presented – additional training time may be required
6. Gained all required competencies; will be recommended as having completed the training programme and for an award of a CCT or CESR

[1] Previously known as the Record of In-Training Assessment or RITA

- Guidance for trainees preparing for the ARCP (PDF:55kb)