Appendix 2: Congenital Cardiac Surgery Syllabus

The syllabus is organised by topics which are the presenting conditions of patients in relation to the sub-specialty. Trainees are expected to have exposure to all topics in phase 3 of training.

WBA
Formative WBAs may be used to assess and provide feedback on any areas of clinical activity. However, other than for the critical conditions, index procedures or where they have been identified to address a concern, WBAs are optional and trainees, therefore, do not need to use WBAs to evidence their learning against each syllabus topic.

Standards for depth of knowledge during surgical training
The following methodology is used to define the relevant depth of knowledge required of the surgical trainee. Each topic 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 phase 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 level at which one would expect a UK consultant surgeon to function.
- Is capable of supervising trainees.

The technical skill competency level which trainees need to achieve differs significantly in the 2 special interest areas of Cardiac and Thoracic surgery

Syllabus

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 Circulation	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		
Diagnose 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-Pulmonary 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	3	4

circulation on PICU and management of common complications

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) / EXTRA CORPOREAL LIFE SUPPORT (ECLS)

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		
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

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
Explanation 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

P
B
A
M
S
F

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

P
B
A
M
S
F

* 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	3	4

repair and pulmonary valvotomy in childhood		
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

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