

Specialty Training Requirements (STR)

Name of Specialty:	Paediatric Cardiology
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Note: In addition to the training requirements stated in this STR, residents must comply with any other regulatory requirements or practice-based requirements mandated by the healthcare institutions or place of practice.

Scope of Paediatric Cardiology

The scope of Paediatric Cardiology covers the diagnosis, management and prevention of cardiovascular problems in infants, children and adolescents in both inpatient and outpatient settings.

Paediatric Cardiology encompasses in-depth knowledge of foetal, neonatal and paediatric cardiovascular physiology. Core areas of Paediatric Cardiology include congenital heart diseases (acyanotic, cyanotic and complex lesions), acquired heart diseases such as, but not limited to cardiac arrhythmias, Kawasaki disease, rheumatic heart disease, myocarditis, pericarditis, cardiomyopathies, infective endocarditis, pulmonary hypertension as well as cardiac involvement in systemic diseases.

Paediatric cardiologists have expertise in performing and / or interpreting cardiac investigative modalities including echocardiography (transthoracic, transoesophageal, epicardial), electrocardiogram, cardiac catheter studies, stress testing including cardiopulmonary exercise test (CPET), and advance imaging such as CT angiography and Cardiac Magnetic Resonance Imaging.

Purpose of the Residency Programme

The Residency programme in Paediatric Cardiology provides opportunities for further training to residents who have completed Paediatric Medicine training.

The purpose of the programme is to produce Paediatric Cardiologists who are competent in:

- a) Diagnosis and management of common presentations referred to the subspecialty, both in the inpatient and outpatient settings
- b) Diagnosis and management of cyanotic and acyanotic congenital heart diseases
- c) Diagnosis and management of acquired non-atherosclerotic coronary artery disease, cardiomyopathy, heart failure, valvular heart disease and arrhythmias
- d) Ordering and interpreting relevant cardiac investigations including electrocardiogram, echocardiogram, chest X-rays, Holter electrocardiogram, stress treadmill electrocardiogram, cardiac CT and MRI, and 6-minute walk test
- e) Performing echocardiography (transthoracic and transoesophageal)
- f) Performing diagnostic cardiac catheterisation
- g) Performing emergency cardiac procedures such as balloon atrial septostomy, transvenous pacing and pericardiocentesis
- h) Providing optimal team-based care to infants and children with serious cardiac conditions in the paediatric intensive care, neonatal intensive care, high dependency units and emergency department

As Paediatric Cardiology is a subspecialty under Paediatric Medicine, the Paediatric Cardiology trainees are expected to have already satisfied the Paediatric Medicine EPAs, including important non-clinical skills stated therein.

Admission Requirements

At the point of application for this subspecialty residency programme,

- a) Applicants must be either completing or had completed their primary specialty in Paediatric Medicine;
- b) Applicants must be employed by employers endorsed by Ministry of Health (MOH); and
- c) Residents who wish to switch to this residency programme must have waited at least one year between resignation from his / her previous residency programme and application for this residency programme.

At the point of entry to this residency programme, residents must have fulfilled the following requirements:

- a) Have obtained specialist accreditation in Paediatric Medicine, or have applied for specialist accreditation in the Paediatric Medicine from Specialists Accreditation Board (SAB); and
- b) Have a valid Conditional or Full Registration with Singapore Medical Council (SMC).

Selection Procedures

Applicants must apply for the programme through the annual residency intake matching exercise conducted by MOH Holdings (MOHH).

Continuity plan: Selection should be conducted via a virtual platform in the event of a protracted outbreak whereby face-to-face on-site meeting is disallowed and cross institution movement is restricted.

Less Than Full Time Training

Less than full-time training is not allowed. Exceptions may be granted by SAB on a case-by-case basis.

Non-traditional Training Route

The Programme must not accept application for mid-stream entry to residency programme by an International Medical Graduates (IMG).

Separation

The PD must verify residency training for all residents within 30 days from the point of notification for residents' separation / exit, including residents who did not complete the programme.

Duration of Specialty Training

The training duration must be 24 months.

Maximum candidature: All subspecialty residents must complete the training requirements, requisite examinations and obtain their exit certification from JCST not more than 24 months beyond the usual length of their training programme. The total candidature for Paediatric Cardiology is 24 months Paediatric Cardiology residency + 24 months candidature.

“Make-up” Training

“Make-up” training must be arranged when residents:

- Exceed days of allowable leave of absence / duration away from training;
- or
- Fail to make satisfactory progress in training.

The duration of make-up training should be decided by the Joint Coordinating Committee (JCC) and should depend on the duration away from training and / or the time deemed necessary for remediation in areas of deficiency. The JCC should review residents’ progress at the end of the “make-up” training period and decide if further training is needed.

Any shortfall in core training requirements must be made up by the stipulated training year and / or before completion of residency training.

Learning Outcomes: Entrustable Professional Activities (EPAs)

Residents must achieve level 3 of the following EPAs by the end of residency training:

	Title
EPA 7	Performing Cardiac Catheterisation

Residents must achieve level 4 of the following EPAs by the end of residency training:

	Title
EPA 1	Performing and Interpreting Echocardiograph
EPA 2	Managing Structural Heart Diseases
EPA 3	Managing Cardiac Arrhythmias
EPA 4	Managing Acquired Heart Disease
EPA 5	Managing Disorders of Cardiac Function
EPA 6	Managing Acute Paediatric Cardiac Emergencies

Learning Outcomes: Core Competencies, Sub-competencies and Milestones

The programme must integrate the following competencies into the curriculum, and structure the curriculum to support resident attainment of these competencies in the local context.

Residents must demonstrate the following core competencies:

1) Patient Care and Procedural Skills

Residents must demonstrate the ability to:

- Gather essential and accurate information about the patient
- Counsel patients and family members
- Make informed diagnostic and therapeutic decisions
- Prescribe and perform essential medical procedures
- Provide effective, compassionate and appropriate health management, maintenance, and prevention guidance

Residents must demonstrate the ability to:

- Diagnose and manage the following specific cardiac presentations and disorders:
 - Cardiac murmur
 - Syncope
 - Palpitations
 - Chest pain
 - Congenital acyanotic heart diseases
 - Congenital cyanotic heart diseases
 - Common rhythm disorders
 - Common cardiac emergencies
 - Cardiac failure
 - Kawasaki disease and its complications
 - Acute myocarditis
 - Acute pericarditis
 - Cardiomyopathies
 - Rheumatic heart disease
 - Infective endocarditis
- Perform and interpret unsupervised transthoracic and transoesophageal echocardiography
- Perform and interpret cardiology-related procedures including cardiac catheterisation, pericardiocentesis, transvenous pacing and balloon atrial septostomy
- Develop protocols in advanced cardiac therapeutics for patients with congenital and acquired heart diseases
- Work in a multi-disciplinary team with cardiothoracic surgeons, intensivists, radiologists, radiographers, nurses and technologists in the management of cardiac patients

2) Medical Knowledge

Residents must demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioural sciences, as well as the application of this knowledge to patient care.

Residents must demonstrate knowledge of the following and apply them to patient care:

- Clinical history taking and cardiac examination
- Cardiac and vascular anatomy, cardiac and respiratory physiology, and cardiac electrophysiology.
- Pathophysiology of congenital and acquired cardiac diseases in children.
- Normal cardiac rhythm and arrhythmias
- Embryology of the heart and great vessels
- Genetics in certain cardiac conditions, including the principles of genetic counselling in the context of inherited structural heart diseases, cardiomyopathies and rhythm disorders.
- Cardiovascular anatomical and physiological changes in the newborns, including cardiac issues encountered in the term and pre-term neonates.
- Relevant laboratory studies and imaging techniques in the investigation of cardiac disorders in children.
- Indications, interpretations and performing echocardiography (transthoracic and transoesophageal)
- Indications, interpretations and performing diagnostic cardiac catheterisation
- Cardiac failure, including acute and chronic therapies, and management of complications

3) System-based Practice

Residents must demonstrate the ability to:

- Work effectively in various health care delivery settings and systems relevant to their clinical specialty
- Coordinate patient care within the health care system relevant to their clinical specialty
- Incorporate considerations of cost awareness and risk/benefit analysis in patient care
- Advocate for quality patient care and optimal patient care systems
- Work in inter-professional teams to enhance patient safety and improve patient care quality. This includes effective transitions of patient care and structured patient hand-off processes.
- Participate in identifying systems errors and in implementing potential systems solutions

4) Practice-based Learning and Improvement

Residents must demonstrate a commitment to lifelong learning.

Resident must demonstrate the ability to:

- Investigate and evaluate patient care practices
- Appraise and assimilate scientific evidence
- Improve the practice of medicine
- Identify and perform appropriate learning activities based on learning needs

5) Professionalism

Residents must demonstrate a commitment to professionalism and adherence to ethical principles including the SMC's Ethical Code and Ethical Guidelines (ECEG).

Residents must:

- Demonstrate professional conduct and accountability
- Demonstrate humanism and cultural proficiency
- Maintain emotional, physical and mental health, and pursue continual personal and professional growth
- Demonstrate an understanding of medical ethics and law

6) Interpersonal and Communication Skills

Residents must demonstrate ability to:

- Effectively exchange information with patients, their families and professional associates.
- Create and sustain a therapeutic relationship with patients and families
- Work effectively as a member or leader of a health care team
- Maintain accurate medical records

Other Competency: Teaching and Supervisory Skills

Residents must demonstrate ability to:

- Teach others
- Supervise others

The milestones are still being worked on and will be included once these have been approved.

Learning Outcomes: Others

Residents must attend Medical Ethics, Professionalism and Health Law course conducted by Singapore Medical Association (SMA).

Curriculum

The curriculum and detailed syllabus relevant for local practice must be made available in the Residency Programme Handbook and given to the residents at the start of residency.

The PD must provide clear goals and objectives for each component of clinical experience.

Learning Methods and Approaches: Scheduled Didactic and Classroom Sessions

The programme must schedule a minimum of 16 hours of dedicated educational and learning activities each month. These could be a combination of didactic sessions (multidisciplinary meetings, Continuing Medical Education (CME) lectures, journal critique, topic reviews, peer review round, Mortality and morbidity rounds) or bedside teaching sessions facilitated by faculty and peers. The residents must attend at least 70% of the scheduled didactic sessions.

The Programme must schedule, and residents must attend the following:

Type of scheduled learning activities	Minimum Frequency	Remarks
Procedural training	8 hours per month	NIL
Cased-based / Entrustment based discussions (EbD)	2 hours per month	NIL
Multidisciplinary meetings	4 hours per month	This can be Paediatric Intensive Care-specific meetings, cardiothoracic surgical-specific meetings, radiology meetings. This can take the form of clinical case discussion, journal clubs, topic reviews or histology-based discussion.
CME lecture	1 hour per week	Besides Cardiology-specific CME, department CME lectures can be counted for this.
Peer review round	4 times per year	General Paediatrics peer review rounds can be counted for this.
Morbidity and mortality round	4 times per year	Besides National Audit, General Paediatrics morbidity and mortality rounds can be counted for this.

In the event of an outbreak where face-to-face teaching is disallowed, apart from procedural training, all the other learning activities stated above should be conducted online.

Learning Methods and Approaches: Clinical Experiences

The clinical experience must include the following:

- Residents must conduct regular inpatient ward rounds, looking after patients admitted to paediatric cardiology service daily during weekdays and participate in weekend rounds based on service requirements, in compliance with the duty-hour guidelines.
- Residents must run their own specialty clinics in paediatric cardiology.
- Residents must be provided with the opportunity to provide subspecialty consult service to colleagues from general paediatrics and other subspecialties under supervision, both during and out-of-hours. The recommended frequency for this is at least 1 week every month for 24 months.

Residents must acquire clinical experience in:

1) Care of Newborn to Young Adults

- a) Settings include general paediatric units, neonatal units, paediatric cardiology unit and clinic, paediatric intensive care, unit and paediatric emergency department
- b) Diagnosis of and management of the following groups of conditions:
 - Congenital structural heart disease
 - Cardiac arrhythmias
 - Acquired heart disease
 - Disorders of cardiac function

2) Paediatric Cardiology Emergency Care

- a) Settings include general paediatric units, neonatal units, paediatric cardiology unit and clinic, paediatric intensive care, unit and paediatric emergency department
- b) Cases include acute paediatric cardiac emergencies such as unstable cardiac arrhythmias, cardiogenic shock, cardiac tamponade and unstable critical congenital heart defects

3) Paediatric Cardiology Intensive Care (PICU)

- a) PICU on call: 1 per month (total 24 calls in 2 years) encouraged but not compulsory
- b) Respond to cases in PICU
- c) Management of post-operative cardiac patients in PICU

4) Performing and Interpreting Echocardiography

- a) Training, observation and review of echocardiography in clinic, PICU and operating room
- b) Perform at least 200 echocardiograms
- c) Interpret and review at least 100 additional echocardiograms

5) Cardiac Catheterisation

- a) Perform 20 vascular cannulations

- b) Perform 10 right heart study
- c) Assist in at least 10 interventional device closure

The training sites in Singapore for paediatric cardiology are Department of Paediatrics of NUH and Department of Paediatrics of KKH.

Learning Methods and Approaches: Scholarly/Teaching Activities

Residents must complete the following scholarly / teaching activities:

	Name of activity	Brief description: nature of activity, minimum number to be achieved, when it is attempted
1.	Case presentation with literature review	At least once for every 6-month rotation, such as during department grand rounds, peer review learning, morbidity and mortality rounds, subspecialty meetings.
2.	Teaching and supervision of medical students, interns and junior residents	At least once during residency.
3.	Research or clinical practice improvement / quality improvement project or publication	At least one of any of the following: • Presentation of the results of a research project at a local, regional or international conference • Writing of guidelines • Clinical practice improvement / quality improvement project • Successful submission of an external grant • First author paper published in a peer-reviewed journal, preference will be for a hypothesis-driven piece of work, or a critical meta-analysis of the literature, or a systematic review of clinical practice • Part of a thesis submission for a PhD or Masters of Clinical Investigation • Book chapter

Learning Methods and Approaches: Documentation of Learning

Residents must keep a log of their clinical and procedural experience in the designated Paediatric Cardiology Training Logbook / Portfolio.

Residents must log the following clinical cases and practical procedures:

- Interesting, unusual and clinical cases with learning points. Residents should log ample inpatient and outpatient cases and the case log should be discussed with supervisor every 6 monthly. Interesting cases with learning points will be

used for case conference discussion and Entrustment based Discussions (EbD) and Direct Observation of Procedural Skills (DOPS).

- Case conferences logged over the 2 years will consist of: (total 24 in 2 years)

Case Conferences on	Number to be logged
Interpreting echocardiography*	8
Cardiac arrhythmias	8
Cardiac catheterisation	8

*At least 3 Transthoracic echocardiography (TTE) and at least 3 Transoesophageal echocardiography (TEE) case conference presentations should be logged over 2 years.

- EbD's logged over the 2 years will consist of: (total 36 in 2 years)

EbD's on	Number to be logged
Interpreting echocardiography**	12
Congenital structural heart disease	4
Cardiac arrhythmias	4
Acquired heart disease	4
Disorders of cardiac function	4
Paediatric cardiology emergency care	4
Cardiac catheterisation***	4

**A minimum of 12 EbDs on challenging/interesting/pre-surgical echocardiographic study in terms of obtaining images or interpretation of findings) should be logged over 2 years.

***A minimum of 4 EbDs centered around diagnostic or interventional cardiac catheterisation study, with at least one discussion of a right heart catheter/device closure procedure and findings and challenges encountered during procedures should be logged over 2 years.

- DOPS logged over 2 years will consist of: (total 64 in 2 years)

DOPS on	Number to be logged
Interpreting echocardiography:	Total 48
(i) Acyanotic heart conditions	5 (minimum)
(ii) Cyanotic heart diseases	5 (minimum)
(iii) Coronary anomaly	2 (minimum)
(iv) Aortic arch anomaly	2 (minimum)
(v) Segmental sequential analysis	10 (minimum)
(vi) Paediatric cardiology emergency care****	8
(vii) Cardiac catheterisation	8

****Interesting emergency procedures will have 8 DOPS logged over the 2 years. This will include any 2 of cardioversion / defibrillation / transcutaneous pacing, 1 on pericardiocentesis (residents are expected to be able to assist this procedure as part of a team once they attained Level 4 for this EPA), 1 on balloon atrial septostomy and 1 on transvenous pacing.

- Trainees are expected to perform and interpret:

Procedures	Minimum Number
Echocardiography	200
Cardiac catheterisation	30
Perform Vascular cannulations	20
Perform Diagnostic catheter study	10
Assist in intervention catheterisation	10

This will include cases used for EbDs and case conferences.

Summative Assessments

	Summative assessments	
	Clinical, patient-facing, psychomotor skills etc.	Cognitive, written etc.
SS2	Attainment of requisite entrustment levels for EPAs	Viva Voce Exit Examination (4 stations, 30 minutes per station): 3 stations on Paediatric Cardiology Clinical Cases 1 station on Journal Critique (with additional 60 minutes reading time, prior to the exam)
SS1		Nil

S/N	<u>Learning outcomes</u>	<u>Summative assessment components</u>	
		Component a: Attainment of requisite entrustment levels for EPAs	Component b: Viva Voce Exit examination
1	EPA 1: Performing and Interpreting Echocardiography	✓	✓
2	EPA 2: Managing Structural Heart Diseases	✓	✓
3	EPA 3: Managing Cardiac Arrhythmias	✓	✓
4	EPA 4: Managing Acquired Heart Disease	✓	✓
5	EPA 5: Managing Disorders of Cardiac Function	✓	✓

6	EPA 6: Managing Acute Paediatric Cardiac Emergencies	✓	✓
7	EPA 7: Performing Cardiac Catheterisation	✓	✓