

Specialty Training Requirements (STR)

Name of Specialty:	Paediatric Intensive Care
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Contents

Scope of Paediatric Intensive Care	2
Purpose of the Residency Programme	2
Admission Requirements	3
Selection Procedures	3
Less Than Full Time Training	3
Non-traditional Training Route.....	3
Separation	3
Duration of Specialty Training.....	4
“Make-up” Training	4
Learning Outcomes: Entrustable Professional Activities (EPAs).....	4
Learning Outcomes: Core Competencies, Sub-competencies and Milestones	5
Learning Outcomes: Others.....	10
Curriculum	10
Learning Methods and Approaches: Scheduled Didactic and Classroom Sessions	10
Learning Methods and Approaches: Clinical Experiences	11
Learning Methods and Approaches: Scholarly / Teaching Activities	12
Learning Methods and Approaches: Documentation of Learning	12
Summative Assessments	14

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 Intensive Care

The scope of Paediatric intensive care as a subspecialty is broad and encompasses the comprehensive management of critically ill children from neonates to adolescents. It involves a multidisciplinary approach to diagnose, treat, resuscitate, and monitor a wide range of life-threatening health conditions. Key aspects include:

- 1. Critical Care Management:** Providing advanced respiratory support, haemodynamic stabilisation, and organ support for children with severe illnesses or injuries.
- 2. Multisystem Disease Management:** Handling complex cases involving the respiratory, cardiovascular, neurological, renal, endocrine, and haematological systems.
- 3. Procedural Skills:** Performing invasive procedures such as intubation, central line insertion, arterial line insertion, chest drain insertion, and bedside point-of-care ultrasound.
- 4. Monitoring and Diagnostics:** Utilising advanced monitoring techniques and diagnostic tools to assess and respond to rapidly changing clinical scenarios.
- 5. Preventive and Supportive Care:** Managing nutrition, infection control, and psychological support to improve patient outcomes.
- 6. End-of-life care:** Providing end-of-life care for critically ill paediatric patients, including bereavement support, and organ donation counselling.
- 7. Research and Education:** Contributing to advances in paediatric critical care through research, training, and protocol development.
- 8. Transition of Care:** Ensuring proper transfer to specialised or general wards or rehabilitation centres, and planning long-term follow-up for survivors of critical illness.

Overall, paediatric intensive care is a dynamic, highly specialised field with a focus on advanced resuscitation, quality survival, and advancing the understanding of critical paediatric conditions.

Purpose of the Residency Programme

The purpose of the programme is to produce Paediatric Intensivists who are competent in the coordination of the multi-disciplinary holistic care of a critically ill paediatric patient. Upon graduation from the paediatric intensive care residency programme and passing the requisite examinations, the resident will be accredited as a subspecialist in Paediatric Intensive Care under Specialists Accreditation Board (SAB).

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 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 Programme Directors (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 Intensive Care is 24 months Paediatric Intensive Care 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 4 of the following EPAs by the end of residency training:

	Title
EPA 1	Managing Critically Ill Patients in Paediatric ICU
EPA 2	Managing and Coordinating Resources in the PICU
EPA 3	Providing End-Of-Life Care (EOL) In PICU
EPA 4	Coordinating and Providing Intra-Hospital Transport for Critically Ill Children
EPA 5	Performing Procedures in Critically Ill Children & Adolescents
EPA 6	Managing Paediatric Patients on Extracorporeal Membrane Oxygenation (ECMO)
EPA 7	Managing Paediatric Patients on Acute Renal Replacement Therapy

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 in the following:

- Holistic approach to a critically ill child
- Management of organ system(s) failure, including extra-corporeal life support systems
- Monitoring and supportive care of the critically ill patient
- Cardiopulmonary resuscitation and crisis resource management
- Perform PICU-related practical procedures
- Transportation of critically ill children
- Management of ethical and end-of-life issues associated with critical illness
- Certification of brain death
- Facilitation of organ donation
- Management of chronically ill, technology dependent children

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 conditions:

Cardiovascular disorders

- Cardiogenic shock
- Congestive heart failure
- Cardiomyopathies
- Cardiac dysrhythmias
- Myocarditis
- Congenital heart disease (cyanotic and acyanotic) and pericardial disease

- Pulmonary hypertension
- Systemic hypertension
- Arterial and venous thrombo-embolic disease
- Post-operative congenital heart surgery

Respiratory disorders

- Respiratory failure
- Acute lung injury
- Congenital diaphragmatic hernia and other diseases of the diaphragm
- Airway obstruction
- Aspiration syndromes
- Air leak syndromes
- Pulmonary haemorrhage
- Asthma and status asthmaticus
- Suppurative lung disease and its complications
- Chronic lung disease and its complications
- Fibrosing lung disease* and its complications
- Pleural disease
- Mediastinal and thoracic tumours
- Congenital lung abnormalities
- Post-operative care after thoracic surgery

Renal disorders

- Acute and chronic renal failure
- Renal/urinary tract infection
- Glomerulonephritis
- Rhabdomyolysis
- Haemolytic uraemic syndrome*
- Congenital renal abnormalities
- Renal tubular acidosis and acute tubular necrosis
- Nephrotic/nephritic syndrome
- Renal transplantation and complication*

CNS / Neuromuscular disorders

- Vascular disorders (haemorrhagic, thrombotic, vasculitic and ischaemic events)
- Encephalopathies
- Acute flaccid paralysis*
- Demyelinating syndromes
- Critical illness neuropathy / myopathy
- Cerebral oedema and ischaemia
- Infective disorders (meningitis, encephalitis, brain abscesses)
- Brain death certification and persistent vegetative state
- Seizures and status epilepticus
- Cerebral neoplasm and post-operative management

- Congenital myopathies and disorders of the neuromuscular junction
- Neuro-regressive diseases

Endocrine disorders

- Diabetes mellitus and diabetic ketoacidosis
- Pituitary and hypothalamic disorders
- Adrenal disorders
- Acute thyroid disorders
- Hormonal response to critical illness
- Pheochromocytoma*
- Obesity
- Central diabetes insipidus

Genetic and metabolic disorders

- Inborn errors of metabolism
- Re-feeding syndromes and malnutrition
- Metabolic response to critical illness, surgery and sepsis

Trauma

- Trauma (including polytrauma)
- Drowning
- Non accidental injury
- Crush syndrome
- Haemorrhagic shock

Haematological/oncological conditions

- Cytopenias
- Defects in haemostasis (Disseminated Intravascular Coagulation, thrombocytopenia, thrombophilia, fibrinolysis, anticoagulation)
- Acute haemolytic disorders including microangiopathic haemolytic anaemias (Thrombotic Thrombocytopenic Purpura, Haemolytic Uraemic Syndrome)
- Transfusion reactions
- Complications associated with haematopoietic stem cell transplantation and cellular therapy
- Tumour lysis syndrome
- Leucostasis
- Febrile neutropenia including neutropenic shock
- Methaemoglobinaemia*

Immunology, rheumatology disorders

- Severe drug reactions including Stevens-Johnson syndrome, toxic epidermal necrolysis syndrome
- Anaphylaxis
- Immunodeficiencies (primary and secondary)
- Connective tissue and immune-mediated systemic diseases

- Immuno-modulation

Acid base, Fluid and electrolyte disorders

- Dys-electrolytemias involving sodium, potassium, calcium, magnesium and phosphate
- Acute dehydration
- Water intoxication*
- Acid-base disorders (chronic and acute, compensated and uncompensated)

Gastrointestinal disorders

- Congenital GIT malformations
- Abdominal wall defects*
- Enterocolitis
- Malabsorption including short gut syndrome
- Pancreatitis
- Hepatic and biliary disease
- Obstructive jaundice
- Fulminant Hepatic failure
- Liver transplantation and complications*

Infectious conditions

- Community acquired infections in the ICU
- Nosocomial infections in the ICU
- Super antigen syndromes
- Sepsis and septic shock (including multi-organ dysfunction)

Environmental agents

- Toxidromes
- Drug overdoses and poisoning
- Hyperthermia (including heat stroke, malignant hyperthermia)*
- Hypothermia
- Electrical injury*
- Burns (flame, corrosive, scald)
- Inhalational injury
- Carbon monoxide poisoning, cyanide toxicity*

*Condition may be rare and not compulsory to log.

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 Singapore Medical Council'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
Procedural training e.g. central line insertion, intubation, point-of-care ultrasound	6 hours per month
Case-based / Entrustment based discussions (EbD)	4 hours per month
CME lectures	4 hours per month (Besides Paediatric ICU-specific CME, department CME lectures can be counted for this)
Peer review learning activities	4 times per year (General Paediatrics peer review rounds can be counted for this)
Morbidity and mortality rounds	6 times per year

	(General Paediatrics morbidity and mortality rounds can be counted for this)
Radiology meetings or any multidisciplinary meetings e.g. joint cardiac conference	1 hour per month
Journal club or evidence-based topic reviews (if any)	6 times per year

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

Residents must acquire clinical experience in:

- Management of critically ill paediatric patients from newborns to young adults
- Paediatric Intensive Care, as part of a multi-disciplinary team
- Paediatric Intensive Care management including management of critically ill children, trauma cases
- Interpretation of diagnostic investigations e.g. blood investigations, X-rays, electrocardiograms (ECGs), computed tomography (CT) scans, magnetic resonance imaging (MRI)

Residents must complete the following rotations:

- a) 3 months of Anaesthesia which includes Paediatric Anaesthesia
- b) 18 months of Paediatric Intensive Care at a recognised tertiary level Paediatric Intensive Care training unit
- c) 3 months of elective postings

Recommended electives include:

- a) *Paediatric Surgery*
- b) *Paediatric Neurosurgery*
- c) *Paediatric Cardiothoracic surgery*
- d) *Paediatric Transport Service at an accredited training centre*
- e) *Paediatric Anaesthesia*
- f) *Paediatric Infectious Diseases*
- g) *Paediatric Cardiology*
- h) *Paediatric Pulmonology*
- i) *Adult Critical care*
- j) *Research*

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 one teaching activity 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

In the event that face-to-face on-site meetings are disallowed, the above training sessions or activities should be conducted virtually.

Learning Methods and Approaches: Documentation of Learning

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

Residents from AY2027 intake onwards must log:

1. At least one clinical case of each of the conditions listed under Medical Knowledge competence in section C.R4, except for the rare conditions indicated by asterix*.

The rare conditions are as follows:

- Fibrosing lung disease and complications*
- Haemolytic uraemic syndrome*
- Renal transplantation and complications*
- Acute flaccid paralysis*
- Pheochromocytoma*
- Methaemoglobinaemia*
- Water intoxication*
- Abdominal wall defects*
- Liver transplantation and complications*
- Hyperthermia (including heat stroke, malignant hyperthermia)*
- Electrical injury*
- Carbon monoxide poisoning, cyanide toxicity*

2. Practical Procedures as listed below.

Procedures	Number required
Endotracheal tube exchange over a Bougie	2
Management of difficult airway and use of intubation airway adjuncts such as laryngeal mask airway, bougie, video laryngoscopy	2
Tracheostomy tube change	2
Nasopharyngeal airway insertion	2
Femoral vein central venous catheter placement (including dialysis vascular catheters)	2
Internal jugular vein central venous catheter placement (including dialysis vascular catheters)	2
Peripheral intra-arterial line placement	2
Femoral intra-arterial line placement	2
Chest drain insertion	2 (simulated procedure acceptable)
Planning and execution of procedural sedation for high-risk patients (e.g. patients with hemodynamic instability, raised Intracranial Pressure, known difficult airway, mediastinal mass, etc.)	2
Provision of non-invasive ventilatory support	2
Management of mechanical ventilation in the critically ill patient	2

(e.g. acute respiratory distress syndrome, severe asthma, restrictive Right Ventricular physiology/Fontan patient)	
Temporary pacing	2 (simulated procedure acceptable)

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 (total 4 stations, 30 minutes per station): 3 stations on Paediatric Intensive Care Clinical Cases (including 1 case with question on ethics) 1 station on Journal Critique (with additional 60 minutes reading time, prior to the exam)
SS1		Nil

S/N	Learning outcomes	Summative assessment components	
		Component a: Attainment of requisite entrustment levels for EPAs	Component b: Viva Voce Exit examination
1	EPA 1: Managing Critically Ill Patients in Paediatric ICU	✓	✓
2	EPA 2: Managing and Coordinating Resources in the PICU	✓	
3	EPA 3: Providing End-Of-Life Care (EOL) In PICU	✓	✓
4	EPA 4: Coordinating and Providing Intra-Hospital Transport for Critically Ill Children	✓	
5	EPA 5: Performing Procedures in Critically Ill Children & Adolescents	✓	✓

6	EPA 6: Managing Paediatric Patients on Extracorporeal Membrane Oxygenation (ECMO)	✓	✓
7	EPA 7: Managing Paediatric Patients on Acute Renal Replacement Therapy	✓	✓