

# **AST PROGRAMME**

## **PAEDIATRIC MEDICINE NEPHROLOGY**

### **(A) INTRODUCTION**

#### **Definition**

Paediatric subspecialization is important with the rapid increase in knowledge, not only in evidence-based medicine, but also in understanding of the molecular pathogenesis of diseases. In Paediatrics, an understanding of the genomic basis of disease is also of utmost importance, as many diseases are inherited. In addition, for Paediatric Nephrology, the subspecialist has also to develop technical knowledge of dialysis, similar to our colleagues in Adult Nephrology, and be able to adapt this to the smallest infant, including premature infants. Moreover, the acceptance of renal transplantation as the ultimate goal of renal replacement therapy, means that the Paediatric Nephrologist must also have a very good understanding of transplantation immunology to be able to be competent in the management of this group of patients. Therefore Paediatric Nephrology is a well-established Board-certified speciality in North America. For the past two decades, it is also a recognized subspecialty in UK, Australia and in most countries in Europe, with Paediatric Dialysis Centres run by a certified Paediatric Nephrologist.

#### **Objective(s) of Training**

The goal of the Paediatric Nephrology Subspecialty Training is to provide broad educational exposure to the paediatric trainee, in all aspects of Paediatric Nephrology, including acute and chronic paediatric renal replacement therapy, as well as to participate as a team member with the various paediatric subspecialists in providing comprehensive care to children with chronic and complex illnesses.

The Paediatric Nephrology Subspecialty Training provides opportunities for further mandatory training in a designated Paediatric Nephrology to Senior Residents who have achieved competence in basic paediatric and neonatal care, and have achieved the competencies of a General Paediatric Specialist, including an understanding of Adolescent Medicine, and its impact on Subspecialty care. The Paediatric Nephrology Subspecialty Training will be able to address the more complex nephrology problems which occur in infants, children and adolescents, and will be able to manage these problems in the context of the children's physical, mental and emotional growth and development from infancy to adolescence, and the transition into adulthood. The Paediatric Nephrologist will also be accredited to undertake the complex technologies involved in dialysis.

### **(B) PROGRAMME OVERVIEW**

#### **Trainee Duration**

The traineeship programme for Paediatric Nephrology Subspecialty Training is conducted for a period of 2 years, after successful exit from the Paediatric Medicine Residency Training Program. In addition to the requisite requirements for general paediatric specialist training, the minimum training requirements for Paediatric Nephrology specialist training include:

- a) Minimum one-year exposure to chronic renal replacement therapy, including chronic dialysis, both peritoneal dialysis and haemodialysis, and renal transplantation
- b) Minimum one-year exposure to critical care nephrology including acute dialysis.

## (C) ADMISSION REQUIREMENTS

### Entry Criteria/ Pre-requisites

Applicants must fulfill the following entry criteria/ pre-requisites as stated below:

- commencement of sub-specialty would be after exiting from Paediatric Medicine residency
- Residents can apply only in their final year of residency (R6)

## (D) TRAINING SYLLABUS

### Competencies for the AST Programme in Paediatric Nephrology

For the AST Programme, the expected **general competencies** to be achieved at the end of training are as follows:

- a) Acquisition of fundamental knowledge base and ability to apply such knowledge base to provide appropriate clinical care in paediatric nephrology
- b) Acquisition of advanced theoretical knowledge, clinical examination and assessment skills required for competent practice in paediatric nephrology
- c) Acquisition of communication skills to be able to communicate effectively and sensitively with patients and their families, colleagues and other allied health professionals
- d) Ability to recognise the various socio-economic and cultural factors that contribute to illness and vulnerability in patients from diverse backgrounds
- e) Acquisition of advanced life support management skills
- f) Acquisition of all basic and advanced technical skills related to General Paediatrics and Paediatric Nephrology
- g) Ability to perform allocated tasks and plans and prioritises tasks appropriately
- h) Ability to work within multi-disciplinary teams and development of leadership skills while still accepting leadership from other members of the multi-professional team
- i) Ability to perform allocated teaching and training tasks and plans and deliver teaching to trainees and other professionals
- j) Development of peer-mentoring skills
- k) Development of management skills and ability to take responsibility for a defined project
- l) Ability to design audit projects and understand risk management
- m) Ability to write appropriate clinical guidelines
- n) Understanding the principles of critical appraisal and research methodology and appraising the literature critically, with application to clinical practice
- o) Recognising the need for, and development of appropriate patient advocacy skills
- p) Recognising the need to promote and maintain excellence through actively supporting or participating in research and a program of continuing professional development

The core curriculum for Paediatric Nephrology will encompass knowledge and skills in the assessment and management of patients presenting with nephrology problems in the acute in-patient, as well as outpatient settings:

- a) Understand the physiology of renal function and the pathophysiology of renal disease
- b) Ability to assess fluid status and initiate appropriate fluid management
- c) Knowledge and understanding of fluid and electrolyte imbalance in children with renal problems
- d) Knowledge and understanding of the changes in fluid, electrolyte and renal physiology during the neonatal period, including that of premature infants
- e) Understanding of the role of different imaging techniques in the investigation of urinary tract

- disorders
- f) Knowledge of histopathology as it applies to paediatric kidney disease
  - g) Knowledge of the genetics of kidney disease, including the principles of genetic counselling in the context of inherited renal disorders
  - h) Knowledge and approach to chronic kidney disease, including prevention of progression and management of complications
  - i) Understanding of the social implications of chronic renal disease and renal failure
  - j) Understanding of the principles of prescribing in children with renal dysfunction
  - k) Knowledge and understanding of the following specific renal disorders
    - i. Haematuria and proteinuria
    - ii. Glomerulonephritis including their presentations such as nephrotic syndrome, nephritic syndrome and rapidly progressive glomerulonephritis
    - iii. Acute kidney injury
    - iv. Chronic kidney disease and its complications including anaemia, mineral bone disease and growth failure
    - v. Hypertension
    - vi. Prenatal diagnosis of urinary tract abnormalities
    - vii. Renal calculi
    - viii. Cystic disorders of the kidney
    - ix. Inherited glomerular diseases
    - x. Voiding disorders
    - xi. Urogenital abnormalities and their surgical management
    - xii. Renal tubular disorders including renal tubular acidosis
    - xiii. Haemolytic-uremic syndrome
  - l) Work in a multi-disciplinary team with paediatric urologists to manage patients with urological problems
  - m) Understanding the basics of acute and chronic dialytic therapy. This should include:
    - i. Managing the patient with acute kidney injury including the use of acute renal replacement therapies such as acute peritoneal dialysis, acute haemodialysis and continuous venovenous hemodiafiltration
    - ii. Performing hemodialysis procedures including managing the patient with hemodialysis complications
    - iii. Performing peritoneal dialysis procedures and managing the patient with peritoneal dialysis complications
    - iv. Planning the long-term management of dialysis patients
    - v. Managing the adolescent dialysis patient, and learning to address the problems of non-adherence and transition care
    - vi. Providing counselling to patients and families with end-stage kidney failure
  - n) Understanding the basics of transplantation immunology and management of the transplant patient, including adolescents with problems of non-compliance
  - o) Working in a multi-disciplinary team to manage children with chronic renal failure, including dieticians, social workers, clinical practice nurses, community organizations dialysis nurses, transplant coordinators, medical social workers, dialysis nurses, transplant coordinators, child life therapists, psychologists, and community organizations including dialysis centres to organize care for children with kidney disease
  - p) Performing nephrology-related procedures including renal biopsy and central line insertion for dialysis
  - q) Developing protocols in advanced renal therapeutics for patients with glomerulonephritis, including plasmapheresis
  - r) Understanding the principles of critical appraisal and evidence-based practice of paediatric nephrology

## Evaluation of Trainees:

**Table 2: Expected frequency of assessments**

	<b>AST – Yr 1</b>	<b>AST – Yr 2</b>
<b>CBD</b>	2 every 6 months	2 every 6 months
<b>MSF</b>	1 every 6 months	1 every 6 months
<b>Portfolio review</b>	1 every 6 months	1 every 6 months
<b>Supervisor’s report</b>	1 every 6 months	1 every 6 months
<b>Exit Examination</b>		Essential

**Table 3: Other areas of curriculum and assessment**

<b>Patient Care</b>	Lectures, interactive tutorials, journal clubs All trainees must clock in $\geq 4$ hours training time per week, encompassing these activities. <b>Assessment:</b> CBD Scholarly Activity Exit Examination
<b>Medical knowledge</b>	
<b>Practice based learning</b>	Journal club: leads discussion Clinical Practice Improvement Programme or Audit Project Paediatric Nephrology Competencies  <b>Assessment:</b> Supervisor to assess performance
<b>Communication skills</b>	Leads tutorials, supervised teaching of junior residents by senior residents  <b>Assessment:</b> Supervisor to assess performance at tutorials MSF CBD: skills in written documentation
<b>Professionalism</b>	Ethics Workshop Reflective exercises documented for portfolio and discussed with supervisor  <b>Assessment:</b> MSF
<b>System based practice</b>	Morbidity / Mortality rounds / Sentinel events: identifying system errors Health care delivery course  <b>Assessment:</b> MSF: Ability to function as part of a multi-disciplinary team

## **E) INSTITUTIONAL REQUIREMENTS (FACILITIES & RESOURCES)**

### **Minimum and Preferred Teaching Faculty: Trainee Ratio**

All the members of the teaching staff should have received accreditation by the Specialist Accreditation Board. The teaching faculty should represent paediatric nephrologists, the full range of other paediatric subspecialties and other related disciplines such as paediatric surgery, radiology, and child psychiatry. The minimum teaching faculty: trainee ratio will be as determined by the Specialist Accreditation Board.

Designated supervisors as defined by the Specialist Accreditation Board are required to meet and review the trainee's progress every 2 months. The aim of such a review is to ensure that the trainee is exposed to and taught all aspects of the specialty. Deficiencies in training (both theoretical and practical) should be recognised, and appropriate steps taken to overcome them.

### **Requirements for Facilities for Study and Training**

Adequate inpatient and outpatient facilities must be available to meet the needs of the general and subspecialty programmes. There must be a full intensive-care facility, as well as a facility for dealing with paediatric emergency patients. Patients should range in age from the newborn through to the young adult. There should be adequate numbers of inpatients and outpatients, as well as new and follow-up patients so as to ensure sufficient clinical exposure and training. Support services should include clinical laboratories, intensive care, occupational and physiotherapy, speech pathology, diagnostic imaging, respiratory therapy, pathology, pharmacology and social services.

Trainees must have access to on-site library or collection of appropriate texts and journals, as well as computer access to electronic databases and on-line search engines for medical literature.

## **(F) SUPERVISION OF TRAINEES**

### **Supervision of Training**

#### ***Advanced training***

Clinical duties will include supervision of a ward, inpatient consults, outpatient general and subspecialty clinics, and special procedures provided by a subspecialty. Trainees must keep a log of their training activities and record their training experience. Responsibility for supervision is accorded by the consultant heading that particular subspecialty, and includes clinical work, research focus and 6-monthly assessments.

## **(G) ASSESSMENT AND FEEDBACK**

### **Logbook**

All trainees are expected to keep a log book which will be reviewed on a monthly basis by the main supervisor. The log book will have a record of cases managed or consulted. Notes should be made regarding difficult or complicated cases. CME activities should also be recorded.

All other teaching experiences e.g. conferences, seminars, papers presented should also be recorded.

## **Documentation of training**

Documentation of work experience and training received will be Paediatric Nephrology training portfolios. The Paediatric Nephrology training portfolio must be submitted at the Exit Examination in Paediatric Nephrology. Trainees are expected to attend a minimum of 4 hours of training sessions per week.

The training portfolio will help to:

- Trainee's work experience, training
- Education supervision
- Professional development plans
- Workshops attended
- Reflective entries
- Annual review of 6 core competencies
- Requisite formative work assessments

## **Feedback**

Six-monthly interviews with the trainees should be conducted to ensure that the training objectives for each rotation have been adequately met, as well as to monitor for any difficulties in workload and training activities. Feedback forms should also be provided at the end of each posting, and the programme supervisor is responsible for collating the results and instituting the appropriate changes to the training programmes.

## **(H) EXIT EXAMINATION**

### **Exit Examination in Paediatric Nephrology**

The trainee must undergo an Exit Examination in Paediatric Nephrology upon satisfactory completion of 2 years of advanced training. The trainee must pass the Exit Examination within the stipulated training period (maximum 3 years beyond the stipulated time frame), unless special permission has been obtained from JCST for any extenuating circumstances, in order to be accredited by the Specialist Accreditation Board (SAB) of the Singapore Medical Council (SMC) as a Paediatric Specialist.

### **Application for Exit Examination**

Candidates who have completed the requirements for advanced training and are eligible for the Paediatric Nephrology Exit Examination must submit their completed training portfolios and application form endorsed by their Heads of Departments indicating that they have fulfilled all the posting requirements satisfactorily. Candidates will be notified of the exit examination dates at least 2 months in advance.

### **Exit Examination Format**

The exit examination shall consist of the following sections:

- Appraisal of the Scholarly Activity, Reflective Entry on an adolescent problem in Paediatric Nephrology, and assessment of experience and competence based on the log book.

- Structured Examination consisting of the following sections:
  - Clinical case scenario on any problem in General Paediatric Nephrology
  - Clinical case scenario on a problem in Chronic Dialysis
  - Clinical case scenario on a problem in Transplantation
  - Journal critique on a problem in Paediatric Nephrology

## **(I) GENERAL GUIDELINES**

**Please refer to Annex 1 for General JCST Guidelines on the following:**

- Leave Guidelines
- Training Deliverables
- Retrospective Recognition (Not applicable to IM AST)
- Changes to Training Period
- Part-time Training
- Overseas Training
- Withdrawal of Traineeship
- Exit Certification

## **APPENDIX A**

### **CURRICULUM FOR DUAL ACCREDITATION PROGRAMME IN PAEDIATRIC MEDICINE AND PAEDIATRIC NEPHROLOGY LEADING TO SPECIALIST ACCREDITATION IN SINGAPORE**

#### **A. General Paediatric Nephrology**

The core curriculum for Paediatric Nephrology will encompass knowledge and skills in the assessment and management of patients presenting with nephrology problems in the acute in-patient, as well as outpatient settings. The Paediatric Nephrologist must be able to work in a multidisciplinary team with the Paediatric Urologists to manage surgical problems arising from urinary tract malformations. The Paediatric Nephrologist should be able to perform a critical appraisal of the literature and have a good understanding of evidence based practice in Paediatric Nephrology. The core curriculum includes:

- Physiology of renal function and estimation of renal function
- Pathophysiology of renal disease
- Assessment of fluid status and appropriate fluid management
- Fluid and electrolyte imbalance in children with renal problems
- Imaging techniques in the investigation of urinary tract disorders
- Histopathology as it applies to paediatric kidney disease
- Genetics of kidney disease, including the principles of genetic counselling in the context of inherited renal disorders
- Approach to chronic kidney disease, including prevention of progression and management of complications such as anaemia, mineral bone disease and growth failure
- Social implications of chronic renal disease and renal failure
- Adolescent non-adherence and transition care in patients with kidney disease
- Principles of prescribing in children with renal dysfunction
- Specific renal disorders:
  - Haematuria and proteinuria
  - Glomerulonephritis including their presentations such as nephrotic syndrome, nephritic syndrome and rapidly progressive glomerulonephritis
    - Inherited glomerular diseases
    - Acute kidney injury
    - Hypertension
    - Urolithiasis
    - Congenital abnormalities of the kidney and urinary tract
    - Cystic disorders of the kidney
    - Incontinence and voiding disorders including lower urinary tract dysfunction
    - Urogenital abnormalities and their surgical management
    - Principles of urodynamics
    - Renal tubular disorders including renal tubular acidosis
    - Metabolic diseases that affect the kidney
    - Haemolytic-uremic syndrome
    - Renal biopsy procedure and complications
  - Advanced renal therapeutics for glomerulonephritis such as the use of biologics and plasmapheresis

#### **B. Neonatal Nephrology**



An understanding of fetal kidney development and function, including the changes following birth is important in the practice of neonatal nephrology. The core curriculum should therefore include:

- Changes in fluid, electrolyte and renal physiology during the neonatal period, including that of premature infants
- Antenatal diagnosis of urinary tract abnormalities
- Influence of antenatal and perinatal factors on kidney growth and development and their subsequent effect on adult renal diseases
- Acute kidney injury in neonates including acute renal replacement therapy

### **C. Paediatric Dialysis**

The Paediatric Nephrologist should have a good understanding of the principles of dialysis both in the acute and chronic setting. The Paediatric Nephrologist should have a minimum one-year experience in the management of paediatric patients on chronic dialysis, and a minimum two-year experience in the management of paediatric acute dialysis.

- Peritoneal dialysis
- Principles of peritoneal dialysis
- Peritoneal dialysis access
- Peritoneal dialysis prescription
- Assessment of peritoneal transport characteristics and dialysis adequacy
- Complications of peritoneal dialysis
- Composition of dialysate including biocompatibility
- Modalities of peritoneal dialysis including chronic ambulatory peritoneal dialysis, automated peritoneal dialysis and manual peritoneal dialysis
- Haemodialysis
- Principles of vascular access and their complications
- Principles of haemodialysis
- Assessment of haemodialysis adequacy and recirculation
- Complications of haemodialysis
- Mechanics of haemodialysis machines, including troubleshooting of the alarms
- Biocompatibility of haemodialyzers
- Principles of anticoagulation
- Modalities of haemodialysis including hybrid therapy
- Management of haemodialysis unit
- Continuous venovenous haemodialysis and haemofiltration
- Principles of continuous venovenous haemodiafiltration
- Principles of anticoagulation
- Complications of continuous venovenous haemodiafiltration
- Biocompatibility of haemofilters
- Other modalities of dialysis including MARS

### **D. Paediatric Transplantation**

The Paediatric Nephrologist should have experience in the management of renal transplant recipients. The Paediatric Nephrologist should have a minimum one-year experience in the management of paediatric transplant recipients.

- Principles of transplantation immunology and immunosuppression
- Transplant donor workup
- Transplant recipient workup
- Management of the peri-transplant period
- Management of post-transplant infections
- Management of chronic allograft dysfunction
- Psychosocial aspects of the paediatric transplant recipient including adolescent problems of non-

adherence and transition care

- Understanding of the functions of the Transplant Registry

## **E. Procedures**

The Paediatric Nephrologist should have been trained in the following procedures specific for management of children with kidney disease.

- Preparation and Support
  - Informed consent for procedure
  - Principles of sedation and pain control including patients with renal failure and hypertension
- Principles of asepsis
- Percutaneous renal biopsy procedure: a minimum of 10 renal biopsies must be performed during his/her training period for full accreditation.
- Dialysis access procedures
  - Haemodialysis catheters
  - Acute peritoneal dialysis catheter insertion: a minimum of 3 acute peritoneal dialysis catheter insertion should be performed during his/her training period for full accreditation.