**Pediatric Nephrology Fellowship**
**درجة الزمالة فى تخصص امراض كلى الاطفال**

June 4
2015

## Contents:

| Learning and Reference Materials | 24 |
|---|---|

# Introduction:

A pediatric nephrologist is a trained pediatrician specializing in the investigation and treatment of children with renal disease and renal failure. He will often share the care of these children with a general practitioner or general pediatrician. His place of work will normally be an established pediatric nephrology unit. This should offer a full range of renal diagnostic facilities and facilities for treatment of acute and chronic renal failure in children. These will usually be part of an academic department of pediatrics in which research is an integral activity and in which nephrology will be linked with other pediatric subspecialties.

Mansoura 2015

## Entry requirements:

Entry to pediatric nephrology training requires the following qualifications:

Post-graduate master degree in Pediatrics or an Egyptian Fellowship of Pediatrics.

# Program content

1. **Urinary Tract**
2. **Pathophysiology**
3. **Glomerular Disorders**
4. **Tubular Disorders**
5. **Inherited Renal Diseases**
6. **Hypertension and Renovascular Disease**
7. **Acute Kidney Injury**
8. **Chronic Kidney Disease**
9. **Complications of Chronic Kidney Disease**
10. **Renal Replacement Therapy**
11. **Transplantation**
12. **Prevention of Renal Disease e.g., by screening programs**
13. **Renal Function Testing**
14. **Pharmacology of Drugs in Renal Diseases**
15. **Procedural Competencies**
16. **Others**

**17.**

# Indented Learning Outcomes (ILOs)

## 1- URINARY TRACT

### 1.1 Urinary tract structure and disorders of micturition

***Knowledge***

Understand the development and anatomy of urinary tract

Know the importance of genital abnormalities, ambiguous genitalia, inter sex and their association with renal and other disease

Know the physiology of normal micturition and acquisition of bladder control

Understand the causes of disturbed micturition

Understand the pathophysiology of the neuropathic bladder

Understand the role of urodynamics in the investigation of disturbed micturition

***Skills***

Able to interpret urodynamic studies and instigate appropriate management

Able to investigate and manage disorders of micturition and bladder dysfunction

***Level Descriptor***

1. Able to investigate and manage children with bladder dysfunction plus enuresis
2. Able to coordinate investigation and management of more complex cases including neuropathic bladder and genito-urinary abnormalities

### 1.2 Urinary tract infection

***Knowledge***

Know the epidemiology and microbiology of UTI and role of host defence mechanism

Understand the clinical signs and symptoms of UTI in different ages of children

Understand evidence base linking UTI, vesico-ureteric reflux, reflux nephropathy and progression to chronic kidney disease

***Skills***

Able to investigate and manage UTI in different age groups appropriately

Able to coordinate follow up radiological investigations of UTI

Able to select appropriate antimicrobials to treat UTI and adjust according to antibiotic sensitivities

***Level Descriptor***

1. Able to apply clinical knowledge to manage all children with UTI +/- associated VUR

### 1.3 Urinary tract obstruction

***Knowledge***

Know the anatomy of the urinary tract and the common sites and causes of urinary tract obstruction

Know the acute presentation of urinary tract obstruction and understand the long term consequences of urinary tract obstruction

Know the types of reconstructive procedures undertaken in children and the relevance to future management including transplantation

***Skills***

Able to investigate and manage patients with urinary tract obstruction appropriately (including management of fluid and electrolyte disturbances occurring after the relief of obstruction)

Able to recognise when appropriate to involve radiologists and urologists

Able to explains to patients/carers the interventions available to patients with urinary tract obstruction and bladder dysfunction (including neurogenic bladder) to avoid infection and prevent progressive renal damage.
Able to identify, investigate and manage more complex cases including renal transplant patients.

***Level Descriptor***

1. Able to identify, investigate and manage patients with urinary tract obstruction both simple and complex, liasing with other professionals where indicated.

**1.4 Renal stone disease**

***Knowledge***

Know the causes and pathophysiology of renal stone formation, including associations with renal tubular or genetic disorders
Know the clinical presentation of renal stone disease and its effect on renal function
Understand how to investigate a patient with renal stones using biochemical and imaging techniques
Know treatment options available including dietary and lifestyle measures to reduce renal stone risk

***Skills***

Able to assess the patient with renal stones and appropriately investigates patients with recurrent renal stones
Able to discusses with a patient/carer suitable simple and dietary measures to reduce risk of renal stone formation
Able to recognises the limitation of medical treatment and appropriately refers patients for surgical assessment
Able to recognise the need to appropriately involve other clinicians including dieticians, urologists and radiologists

***Level Descriptor***

1. Able recognise and manage patients with renal stone disease - history taking, clinical examination, appropriate investigations and management.

## 2- PATHOPHYSIOLOGY

**2.1 Disorders of fluid and electrolyte and acid base regulation**

***Knowledge***

Understand the clinical importance of fluid, electrolytes and acid base abnormalities
Understand the physiology of water, electrolyte and acid base metabolism
Understand the methods used to investigate fluid, electrolyte and acid base abnormalities

***Skills***

Able to assess patients with disorders of fluid, electrolyte and acid base homeostasis and administer appropriate management
Able to perform a thorough and accurate clinical examination which includes the assessment of the volume state
Able to interpret the results of appropriate biochemical investigations
Able to manage patients with fluid, electrolyte and acid base disorder

***Level Descriptor***

1. Able to manage the full range of fluid and electrolyte abnormalities and respond to changes appropriately.

## 3- GLOMERULAR DISORDERS

### 3.1 Haematuria

***Knowledge***

Understand the pathophysiology of micro and macroscopic haematuria

Know the causes of haematuria and define the relationship to systemic diseases

***Skills***

Able to formulate a differential diagnosis, appropriate plan of investigation and management for a child with haematuria

Able to recognise the indication for renal biopsy in the investigation of haematuria and discus the associated risks, likely prognosis and requirement for long-term review.

***Level Descriptor***

1. Able to manage a child presenting with haematuria liasing with other colleagues as indicated.

### 3.2 Proteinuria and nephrotic syndrome

***Knowledge***

Understand the pathophysiology of proteinuria and nephrotic syndrome

Understand the physiological and pathological causes of proteinuria

Know the causes of proteinuria and relationship to systemic diseases

Know the risk of extrarenal complications of nephrotic syndrome

Understand the treatment options available, and the potential adverse effects, for the management of proteinuria and associated extrarenal complications

***Skills***

Able to formulate a differential diagnosis, appropriate plan of investigation and management for a patient with asymptomatic proteinuria, symptomatic proteinuria or nephrotic syndrome

Able to assess the severity of proteinuria and risk of extra renal complications

Able to recognise the indications for renal biopsy in the investigation of proteinuria and discuss the associated risks, likely prognosis and requirement for long-term review.

***Level Descriptor***

1. Able to investigate and manage a child presenting with proteinuria and nephrotic syndrome liasing with other colleagues as indicated.

### 3.3 Glomerular disorders/vasculitis

***Knowledge***

Understand the aetiology, pathology and genetics of glomerular disease

Understand the pathophysiology of systemic disease causing glomerulonephritis especially vasculitis, SLE, viral infections including HIV and thrombotic microangiopathies

Understand the natural history and prognosis for the different glomerulonephritides

Know the investigations required in a patient with glomerulonephritis both at time of presentation and during long term follow up (including role of renal biopsy(
Know the available management strategies (both specific and non-specific) including immunosuppression, cytotoxic drugs and plasmaphoresis

***Skills***

Able to clinically assess patients with glomerulonephritis with or without systemic involvement
Able to Investigate patients with suspected glomerulonephritis appropriately including laboratory tests, imaging, renal biopsy and tissue diagnosis from other organs including skin.
Able to interprets the results of laboratory investigations and renal biopsy findings
Able to manage fluids, electrolytes and hypertension in glomerular disorders
Able to makes appropriate decisions about urgency of treatment
Able to determine the role of immunosuppression - balancing risks and benefits and monitoring long term use

***Level Descriptor***

1. Able to investigate and manage a child presenting with suspected glomerulonephritis liasing with other colleagues as indicated and to discuss diagnosis, treatment strategies and prognosis with the child and family.

## 4- TUBULAR DISORDERS

### 4.1 Tubulointerstitial nephritis

***Knowledge***

Understand the pathophysiology of interstitial nephritis and tubulo-interstitial disease, their causes and links with systemic diseases
Know the investigations needed in patients with interstitial nephritis
Understand the natural history and prognosis of interstitial nephritis
Understand the management strategies for treatment and the place for steroids or other immunosuppression

***Skills***

Able to assess patients with interstitial nephritis and take a full drug and environmental history
Able to investigate patients appropriately including the use of laboratory tests, imaging and renal biopsy
Able to interpret the results of appropriate laboratory investigations and renal biopsy findings
Able to makes decisions about urgency of treatment and the place of steroids or other immune suppression

***Level Descriptor***

1. Able to manage both primary interstitial nephritis and that associated with systemic disease

### 4.2 Tubular disorders

***Knowledge***

Understand the different causes and clinical presentations of primary and secondary tubular disorders
Understand the expanding knowledge regarding the genetic basis of primary tubulopathies

***Skills***

Able to investigate and manage tubular disorders with particular emphasis on correction of acid base and electrolyte disturbance
Able to organise the screening and investigations required to detect associated disorders in primary tubulopathies

***Level Descriptor***

Able to investigate, manage and coordinate the care of children with primary and secondary tubulopathies

## 5- INHERITED RENAL DISEASES

### 5.1 Inherited and metabolic disease

***Knowledge***

Understand the pathophysiology and genetics of rarer metabolic disorders leading to renal disease - cystinosis, oxalosis, methylmalonic acidaemia.
Know the investigations required for rarer inherited and metabolic disorders.
Know the natural history, treatment and prognosis of these rarer metabolic disorders.

***Skills***

Able to assess patients with inherited diseases and be aware of the systemic features found in these diseases.
Able to Initiate investigations including laboratory tests, imaging and renal biopsy when appropriate.
Able to Initiate specific treatment appropriately
Able to explain to children/parent/cares long term and progressive nature of these diseases
Able to determine when screening is required and to interpret the results of screening tests.

***Level Descriptor***

1. Able to understand and manage children presenting with inherited and rarer metabolic disease and to liase with other colleagues including pathologists, geneticists, adult renal physicians and primary care doctors as indicated.

### 5.2 Cystic kidney disease

***Knowledge***

Understand the causes, clinical manifestations and outcomes of renal cystic disease
Understand the modes of inheritance and methods of screening
Know the potential extra renal associations, eg hepatic fibrosis

***Skills***

Able to investigate and manage cystic kidney disease including liaising with hepatologists and geneticists

***Level Descriptor***

Able to understand and manage children presenting with cystic kidney disease and to counsel the child and family regarding inheritance, management and long-term prognosis.

## 6- HYPERTENSION AND RENOVASCULAR DISEASE

### 6.1 Renovascular disease

***Knowledge***

Understand the causes and pathophysiology of renovascular disease

Know the methods used to investigate renovascular disease

Know the risks and complications of investigations such as angiography

Understand the natural history of the disease and the long term outcomes of intervention and medical management

***Skills***

Be able to assess patients who may have renovascular disease and determine if further investigation and intervention are required

Able to act to minimise the risks of acute kidney injury after angiographic procedures

Able to counsel a child/parent/carer about risks and benefits of investigations and interventions such as angiography and angioplasty/stent

Able to provide long term care of blood pressure and cardiovascular risk for the patient with renovascular disease

***Level Descriptor***

1. Able to understand and manage children presenting with renovascular disease and liase with other professionals as indicated and to counsel the child and family appropriately.

**6.2 Hypertension**

***Knowledge***

Understand the pathophysiology of primary (essential) hypertension

Know the causes of secondary hypertension and how to investigate and treat

Be able to define hypertension according to normal BP data in children

Understand the techniques of BP measurement, their advantages and limitations

Know the importance of non pharmacological measures in achieving blood pressure targets in children

Understand the mechanisms of action and potential side effects of anti hypertensive drugs and the tolerability and convenience of prescribed regimens

***Skills***

Able to assess a child with hypertension (including use of home and ambulatory blood pressure monitoring) and appropriately investigate to exclude underlying secondary causes

Able to identify the child with secondary hypertension who is suitable for definitive treatment; recognise and be able to counsel child/parent/carer about the limitations of such intervention

Able to monitor and review the effectiveness of blood pressure control over time with child/parent/carer and designated general paediatrician

***Level Descriptor***

1. Able to indentify, investigate and comprehensively manage

**6.3 Haemolytic uraemic syndrome**

***Knowledge***

Understand the disorders that comprise the haemolytic uraemic syndrome, their aetiology, multi-system clinical manifestation, pathogenesis and outcome

Know the epidemiology and public health aspects of verocytotoxin-producing Escherichia coli infection

***Skills***

Able to recognise, investigate and manage diarrhoea + (D+) and diarrhoea - (D-) HUS

Able to institute management of associated AKI

Able to recognise appropriate use of specific therapies in the management of HUS including plasma infusions, plasma exchange and ecluzimab

***Level Descriptor***

1. Able to understand and comprehensively manage children presenting with D+ and D- HUS

**7- Acute Kidney Injury (AKI)**

***Knowledge***

Know the causes of AKI

Understand the pathophysiology of AKI in different clinical scenarios eg multi-organ failure, glomerulonephritis/systemic disease

Know the methods available to define AKI

Understand the treatment options relevant to manage AKI (including potential side effects.(

Understand the principles and indications for renal replacement therapy (including CVVHD, CVVHDF) in AKI.

***Skills***

Able to identify patients at risk of AKI and take appropriate preventative steps where possible

Able to investigate and manage the underlying cause of AKI (including initiation of immunosuppression and plasma exchange(

Able to assess and manage fluid, electrolyte, acid-base disturbances, hypertension and nutrition

Able to select and prescribe the appropriate dialysis modality

***Level Descriptor***

1. Able to accurately assess, investigate and initiate management of acute kidney injury working with other health professionals and to provide support for colleagues in the management of complex cases.

**8- Chronic Kidney Disease (CKD)**

***Knowledge***

Know the causes of chronic kidney disease (CKD(

Understand the presentation and clinical course and prognosis of different causes of CKD throughout childhood and adolescence

Know the classification of CKD

Understand the basis and use of estimated glomerular filtration rate (eGFR)

Understand the pathophysiology of systemic complications of CKD, including bone disease and anaemia

Understand the indications for renal replacement therapy (RRT) including transplantation

***Skills***

Able to investigate and manage chronic renal failure

Able to identify and treat potential reversible causes
Able to assess the degree of renal failure, monitor its progression and instigate appropriate renal replacement therapy
Able to manages fluid balance, electrolyte and acid base disturbance
Able to manage anaemia secondary to CKD
Able to instigate appropriate treatment to prevent and treat renal bone disease
Able to assess and manage growth and nutrition, including the use of enteral feeding and growth hormone
Able to identify and manage cardiovascular risk factors including hyperlipidaemia and hypertension

***Level Descriptor***

1. Able to provide comprehensive care for children and adolescents with CKD from diagnosis through to RRT.
2. Able to work within the MDT framework to optimize the care and support of children/parents/carers and their families.

## 9- COMPLICATIONS OF CHRONIC KIDNEY DISEASE

### 9.1 Renal anaemia

***Knowledge***

Understand the pathophysiology of renal anaemia and the haematological and biochemical methods to diagnose, assess and monitor treatment in renal anaemia
Understand the distinction between anaemia secondary to chronic kidney disease and other causes
Know the indications for and the use of erythropoietic stimulating agents (ESA's) and their complications
Know the indications for the use of oral and parenteral iron therapy and its complications

***Skills***

Able to diagnose and treat renal anaemia, monitor the effects of treatment and manage failure of treatment
Able to manage renal anaemia in chronic kidney disease patient not yet on renal replacement therapy
Able to manage renal anaemia in chronic kidney disease patient on renal replacement therapy
Able to prescribe and monitor iron replacement therapy
Able to audit the use of ESA's and iron therapy in individual patients and patient populations

***Level Descriptor***

1. Know how to treat patients with renal anaemia using appropriate ESA's and iron replacement and to take account of the functional status of patient when choosing patients for treatment
2. Able to manage and monitor the complications of treatment of renal anaemia

### 9.2 Renal bone disease

***Knowledge***

Understand the physiology of calcium, phosphate, bone and mineral metabolism and the pathophysiology of renal bone disease.
Understand the use of biochemical tests and imaging techniques in the diagnosis and management of renal bone disease

Know the indications for and the clinical use of dietary modification, phosphate binders, vitamin D preparations, calcimimetic drugs and parathyroidectomy.
Understand how to appropriately monitor patients to assess response to treatment for renal bone disease

***Skills***
Able to interpret the results of biochemical and radiological investigations in patients with disorders of bone and mineral metabolism
Able to prevent, diagnose and manage renal bone disease in children with chronic kidney disease before the initiation of renal replacement therapy
Able to manage renal bone disease in patients on peritoneal dialysis, haemodialysis and with a renal transplant
Able to explain available treatment options to children/parents/carers.
***Level Descriptor***

1. Able to understand and comprehensively

## 10- RENAL REPLACEMENT THERAPY

### 10.1 Haemodialysis
***Knowledge***
Understand the principles of haemodialysis and efficiency in comparison to other dialysis modalities
Know the choices of vascular access and their relative merits and potential complications
Understand the methods available for assessment of haemodialysis adequacy in children and adolescents
***Skills***
Be able to plan and prescribe/adjust haemodialysis and monitor its effects and adequacy
Be able to manage different forms of vascular access, and their complications, working with dialysis nurses, vascular surgeons and interventional radiologists
Be able to diagnose and manage the complications of haemodialysis
Be able to discuss haemodialysis treatment, vascular access choice and potential complications and their management with parent/guardian and child ( if appropriate(
***Level Descriptor***

1. Understand haemodialysis treatment in depth and together with the MDT be able to prescribe, adjust and monitor treatment adequacy
2. Able to confidently explain all aspects of haemodialysis to parent/guardian and child (if appropriate) and take in to account the impact of therapy on family life.

### 10.2 Peritoneal Dialysis
***Knowledge***
Understand the principles of peritoneal dialysis and efficiency in comparison to other dialysis modalities
Know the relative contraindications to peritoneal dialysis
Understand the therapeutic and life styles advantages of different modes of peritoneal dialysis
Know the methods available for assessment of adequacy in peritoneal dialysis

Know and understand the surgical procedure for insertion of peritoneal dialysis catheters and the complications of peritoneal dialysis access and of the dialysis itself

***Skills***

Be able to assess suitability of child/ adolescent and their family for peritoneal dialysis with input from MDT

Be able to manage child/adolescent following insertion of peritoneal dialysis catheter including prescription of acute dialysis if required

Be able to plan and prescribe long-term peritoneal dialysis and monitor its effects and adequacy

Be able to diagnose and manage the complications of peritoneal dialysis, and of peritoneal dialysis access, working with dialysis nurses, and surgeons

Be able to discuss peritoneal dialysis therapy, potential complications and their management with parent/guardian and child ( if appropriate(

***Level Descriptor***

1. Understand peritoneal dialysis treatment and together with the MDT be able to prescribe, adjust and monitor treatment adequacy.
2. Able to confidently explain all aspects of peritoneal dialysis to parent/guardian and child (if appropriate) and take in to account impact of therapy on family life.

**10.3 Acute dialysis and plasma exchange**

***Knowledge***

Know the indications for acute dialysis and plasma exchange

Understand the principles of haemodialysis, haemofiltration and haemodiafiltration and indications for their use

Understand the principles of plasma exchange and potential complications of treatment

Know the methods of creating vascular access for acute renal replacement therapy

***Skills***

Able to assess the suitability of a patient for haemodialysis or haemofiltration

Able to prescribe haemodialysis and haemofiltration safely, adjust prescriptions appropriately and monitor response to treatment

Able to prescribe medication safely to patients with acute kidney injury

Able to assess the suitability of a patient for plasmaphoresis

Able to prescribes plasmaphoresis safely and assesses response to treatment in conjunction with Apharesis Team

Able to manage the patient with acute renal failure requiring both plasmaphoresis and acute renal replacement therapy

***Level Descriptor***

1. Able to understand and manage acute dialysis and plasma exchange.
2. Able to work with other health professionals to comprehensively manage children undergoing acute dialysis or plasma exchange.

## 11- TRANSPLANTATION

### 11.1 Pre transplant evaluation

***Knowledge***

Understand the role of renal transplantation in the management of children with end stage renal disease

Understand the principles of renal transplantation, and the medical, surgical, ethical and social contraindications

Know the benefits and risks of transplantation in comparison with other treatment modalities for end stage renal disease

Understand the risks and benefits associated with different organ types, eg living donor and deceased donor transplantation

Know the principles of blood group typing, HLA matching and donor-recipient cross matching

Understand the ethical and legal framework (especially the Human Tissue Act) governing renal transplantation

***Skills***

Able to assess the suitability of children with end stage renal disease for renal transplantation

Able to discuss the issues around living donor transplantation and pre dialysis transplantation

Able to counsel patients and relatives in all aspects of renal transplantation including living kidney donation

Able to develop and follow protocols for pre transplant assessment of recipients.

***Level Descriptor***

1. Able to evaluate and manage appropriately children who are suitable for transplantation liaising with other health professionals as indicated.

### 11.2 Renal transplantation acute stage

***Knowledge***

Understand the issues that can influence patient and renal transplant survival in the first 3 months following renal transplantation

Know the medical and surgical problems which occur in the first 3 months following renal transplant

Know the indications for radiological investigation (ultrasound scan, radio isotope scanning etc) and renal transplant biopsy in the acute stage following renal transplant

Know the role of renal transplant biopsy in the diagnosis of acute rejection

Understand the mode of action and adverse effects of immunosuppressive agents

Understand the potential for interaction of immunosuppressive agents with other drugs

Know the available management strategies for acute transplant rejection

Understand the factors in the early post transplant stage that influence long term graft function

***Skills***

Able to optimise graft and patient outcome in the first 3 months after renal transplantation

Able to assess the significance of changes in renal transplant function
Able to investigate renal transplant patients with acute transplant dysfunction and interpret the results of investigations
Able to plan and modify immunosuppressive therapy regimens
Able to counsel patients and relatives in all aspects of renal transplantation

***Level Descriptor***

1. Able to understand and comprehensively manage patients in the early stages post renal transplantation liaising with other health professionals as indicated.

### 11.3 Renal transplantation long-term care

***Knowledge***

Understand the factors that can influence long term patient and renal transplant survival
Know the medical and surgical problems which can occur after the first 3 months following renal transplant
Know the causes of renal dysfunction more than 3 months after renal transplantation
Understand the potential long term adverse effects of immunosuppressive agents
Understand the strategies that maximise long term graft function and survival
Understand the increased risk of cardiovascular and malignant disease in long term transplant patients and the treatment and preventative strategies available

***Skills***

Able to identify declining transplant function, assess the significance of changes, investigate appropriately, and make appropriate changes to management
Able to utilise strategies that optimise long term graft and patient outcomes
Able to identify and manage cardiovascular, malignant and infectious problems in renal transplant recipients
Able to modify long term immunosuppressive therapy regimens and tailor to an individual patient considering other co-morbid conditions and changing circumstances
Able to minimize and manage the medical complications of a failing renal transplant
Able to counsel patients and relatives in all aspects of renal transplantation, including graft failure and preparation for dialysis or re-transplantation

***Level Descriptor***

1. Able to understand and manage the causes of renal transplant dysfunction after 3 months post renal transplant and liaise with other health professionals including primary care doctors as indicated.

## 12- Renal Function Testing

***Knowledge***

Trainees are encouraged to develop knowledge and expertise in the following areas, including indications, contraindications, complications, interpretation of results, cost effectiveness, and application to patient care of:

1. Urinalysis, including dipstick and sediment
2. Measurement of renal plasma flow and GFR, including interpretation of serum creatinine concentration and calculation of its clearance rate
3. Measurement of renal concentrating and diluting capacity

4. Measurement of microalbuminuria
5. Measurement of proteinuria using semiquantitative and quantitative methods
6. Assessment of urinary acidification
7. Assessment of renal sodium and potassium handling
8. Renal radiology:
    a. Urography
    b. Ultrasonography
    c. Radionuelide scans
    d. Computed tomography
    e. Magnetic resonance imaging
    f. Renal circulation imaging (angiography)

***Skills***

Trainees must be given sufficient direct experience to develop expertise in their performance and interpretation of:

1. Urinalysis
2. Accurate and timed complete collection of urine for renal function testing, proteinuria and microalbuminunia
3. Fractional excretion of electrolytes

**13- Pharmacology of Drugs in Renal Disease**

***Knowledge***

Trainees must acquire knowledge and understanding of the following areas during the course of their training:

1. Principles of drug pharmacokinetics
2. Renal handling of drugs and chemicals
3. Mechanisms of drug metabolism
4. Drug prescribing in disease states and during dialysis
5. Relevant drug-drug interactions
6. Mechanisms of drug nephrotoxicity
7. Management of drug-include renal diseases
8. Therapeutic drug monitoring
9. Renal transplant immunosuppression

***Skills***

Trainees should also be familiar with, and preferably have experience in, the following areas, in both an outpatient and inpatient setting:

1. Trainees must diagnose and manage patients with different drug-include renal syndromes
2. Trainees should be able to prescribe for and adjust drug dosage in patients with renal dysfunction
3. Trainees should understand indications of therapeutic drug monitoring
4. Trainees should be able to access drug and poison information
5. Trainees should be familiar with common overdoses and the need for extracorporeal therapy
6. Trainees should prescribe and manage immunosuppression for renal transplantation

**14- PROCEDURAL COMPETENCIES**

**14.1 Renal Biopsy (Native and Transplant)**

***Knowledge***

Know the indications for native and transplant renal biopsy

Know the anatomy of the native kidneys in relation to performing a renal biopsy

Know the contra-indications to performing a renal biopsy

Know the potential complications of renal biopsy and their relative frequency

***Skills***

Able to organise the necessary investigations to minimize risk of renal biopsy

Able to take informed consent from child/parent/guardian for native and transplant renal biopsies

Able to appropriately manage any complications that occur post biopsy

Able to interpret renal biopsy findings with the assistance of a Renal Histopathologist and draw conclusions re treatment options and prognosis

Able to discusses biopsy findings, treatment options and prognosis with parent/ guardian and child (where appropriate)

OPTIONAL: Able to competently perform ultrasound guided native renal biopsy (with or without radiological assistance)

OPTIONAL: Able to competently perform ultrasound guided transplant renal biopsy (with or without radiological assistance)

***Level Descriptor***

1. Able to confidently discuss the indications and potential complications of renal biopsy with parent/guardian and child where appropriate.
2. Able to manage complications if they arise.
3. Able to confidently discuss the result of renal biopsy with parent/guardian and child where appropriate and possible treatment options and prognosis.

## 15- OTHERS

### 15.1 Pediatric-Adult interface

***Knowledge***

Understand the main causes of kidney disease in young people which may be associated with long term survival and require transfer to adult services

Understand the issues of compliance, consent and confidentiality in adolescents and young people.

Understand the impact of renal disease on other physical systems and psychosocial functioning of the patient/parents/careers and other involved professionals

***Skills***

Able to treat patient holistically and sensitively in accordance with the patients wishes and taking into account the needs and wishes of the careers and other family members

Able to manage the change of environment within which the patient will be managed

Able to manage the change in personnel and referral systems applicable to CKD patients, dialysis patients and transplant patients at the paediatric/adult interface.

Able to recognise when the timing of referral from paediatric/young persons service to adult renal services appropriate

***Level Descriptor***

1. Understand the main causes of kidney disease in young people which may be associated with long term survival and require transfer to adult services.
2. Able to manage young people as they transfer to adult care involving the wider MDT as appropriate.

**15.2 Feto-Maternal - Neonatal-Pediatric interface**

***Knowledge***

Know the main causes of antenatally detected renal disease - obstructive uropathies, anatomical abnormalities, hydronephrosis and cystic kidney disease

Understand the importance of and difficulties associated with antenatal counselling.

Understand the impact of antenatally detected renal abnormalities on the physical and psychological functioning of parents and wider family

***Skills***

Able to assess the possible impact of the antenatal diagnosis liasing with fetal medicine, radiology, neonatology and urology.

Able to explain to family the probable post natal course and longer term prognosis relating to the antenatal diagnosis

***Level Descriptor***

1. Able to recognise and manage the main causes of antenatally detected renal disease and to liase with other health professionals as indicated.

## Structure and Regulation

The pediatric nephrology fellowship requires two years of supervised training program that must be conducted in accredited hospitals before sitting for the final examination. The board will announce a list of accredited hospitals annually.

During the entire training program, the candidate must be dedicated full time and must be fully responsible for patient care under supervision of fellowship trainers.

**The Fellowship is divided into 4 semesters**

| Semester | Course | Code | Credit Hours | |
|---|---|---|---|---|
| | | | Course | Total |
| Semester I | **Applied anatomy and embryology of kidney & urinary tract** | PNEPH 309 AN | 0.5 | 5 |
| | **Applied physiology of the kidney & urinary tract** | PNEPH 309 PH | ١ | |
| | **Applied pathology of pediatric renal diseases** | PNEPH 309PA | 0.5 | |
| | **Basic principles of diagnosis and treatment of pediatric renal diseases:**<br>• harmacokinetics and dynamic of drugs used in renal diseases<br>• nfection control in renal units<br>• rinciple of renal biopsy<br>• rinciple of renal imaging<br>• rinciple of screening for renal diseases<br>• mmunogenitics renal of diseases | PNEPH 309DT | 3 | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| **Semester II, III, IV Semester Semester Semester** | **Pediatric Renal Diseases**<br><br>**Module 1:**<br>• **Pathophysiology**<br>• **Glomerular Disorders**<br>• **Tubular Disorders**<br>• **Hypertension And Renovascular Disease** | **NEPH 309** | **6** | **18** |
| | | | | |
| | **Module 2:**<br>• **Urinary Tract**<br>• **Inherited Renal Diseases**<br>• **Acute Kidney Injury**<br>• **Chronic kidney Disease**<br>• **Others** | | **6** | |
| | | | | |
| | **Module 3:**<br><br>• **Renal Replacement Therapy**<br>• **Complications of Chronic Kidney Disease**<br>• **Transplantation** | | **6** | |
| **Clinical training (throughout the 4 semesters)** | | | **7** | |

**Regulations**

**Trainees Duties and obligations**

1. The trainees should attend and participate. Attendance and participation should not be less than 75% of the total number of activities within any training rotation / period including:
    1. Daily morning patients' rounds and meetings.
    2. Clinical round presentation, at least once weekly to cover various topics, problems or research.
    3. Journal club meeting.
    4. Interdepartmental meetings/ morbidity and mortality meetings.
    5. Grand staff rounds.
2. Trainees should be actively involved and fully responsible for patient care including sharing in making decisions about diagnosis and management under supervision of the consultants.
3. Trainees should be responsible (under supervision) for outpatient and in patients' routine work.
4. Trainees must take supervised shifts according to the hospitals requirements and regulations.
5. Trainees should be responsible for supervised admission of the patients from the OPD or the ER.
6. Trainees should share in the completion of the following documents under supervision.
    6. Complete history and physical examination form.
    7. Investigation requests, (laboratory, radiology, pathology, etc.).
    8. Reporting results of the investigations
    9. The plan of management after consultation and approval from supervisors
    10. Daily progress notes.
    11. Order medication sheets
    12. Order the necessary diagnostic procedures
    13. Discussion of the case with the trainer and consultants
    14. Discharge summaries.
    15. Sick leaves and medical reports
7. Trainees should inform the senior staff of any high-risk patient admission.
8. The trainees should attend the t nephrology outpatient clinics & clinics related to the rotation in different subspecialties as requested by trainers & supervisory staff. They should participate in different patients' interviews and share in management under supervision.

**Learning settings:**

Learning will take place in a variety of settings with a range of approaches:
Acute settings
Community settings
Handover
Ward rounds
Multi-disciplinary meetings
Audits and research
E-learning
Seminars
Lecture
External training courses
Reflective practice
Self-directed learning

**Methods of assessment:**

**i) WPBAs (Workplace Based Assessments)**

- MiniCEX (Mini-Clinical Evaluation exercise)
- DOPS (Direct Observation of Practical Skills)
- CbD (Case-based Discussion)

**ii) Log book review**

**iii) Trainer Report**

## Learning and Reference Materials

### *Recommended References & Textbooks*

Text book of Pediatric Nephrology

Kidney Transplantation Principles and Practice Peter j. morris

Comprehensive textbook of Pediatric Nephrology

Handbook of Nephrologic Emergencies, AE Parrish

www.uptodateonline.com

Global Kidney Academy: http://www.globalkidneyacademy.co.uk