

Updated programme for harmonization of training in nephrology in the European Union

David W.P. Lappin¹ and Jorge B. Cannata-Andia², on behalf of the UEMS Section in Nephrology

¹Galway University Hospitals, Galway, Ireland and ²Hospital Universitario Central de Asturias, Instituto Reina Sofia de Investigación, RedinRen del Instituto de Salud Carlos III, Universidad de Oviedo, Spain

Correspondence and offprint requests to: David W.P. Lappin; E-mail: david.lappin@hse.ie

Abstract

In 1996, the first European Union of Medical Specialists (UEMS) minimum standards programme in nephrology was published. Since then, medical practice in an expanded European Union (EU) has evolved significantly. These changes have prompted the UEMS Nephrology Section to update and review the programme on harmonization of nephrology training in the EU. Although directives of the EU indicate that a specialist from one EU member state must be recognized in all EU member states, the current practical implications of these directives are limited due to the important existing differences in the EU member states' training programmes. Although not exhaustive, the present document aims to profile a minimum common framework of nephrology training in the EU for both trainers and higher-specialty trainees. The nephrology programme addresses several topics, among them enrolment requirements, duration and organization of the training and a detailed description of the knowledge, competences, practical skills and attitudes necessary to become a specialist in nephrology. Whilst the development of a standard, pan-EU nephrology training programme is not realistic, the UEMS Nephrology section believes that this does not diminish the need for improving harmonization of training in the EU.

Keywords: training nephrology; UEMS nephrology section; harmonization of training; nephrology programme

Introduction

The original European Union of Medical Specialists (UEMS) programme for minimum training standards in nephrology was published in 1996 [1]. Significant changes in medical practice have stimulated discussions in the UEMS nephrology section on the need for updating the original training programme.

There remain considerable variations in the practice of nephrology within the European Union (EU). Nephrology is regarded as a sub-specialty of general medicine and practised alongside each other in some countries, but in the majority of EU countries, specialist practices are only nephrology. This creates some difficulty in producing a training programme that will be acceptable in both circumstances, but it is widely recognized that nephrologists should have a sound training in general medicine due to the many medical problems that occur in patients with renal disease. We acknowledge that flexibility will be required in how individual countries configure the overall specialty training package.

It is a long-held belief of the Specialty Section in Nephrology that the best way of achieving harmonization across Europe is by regular external approval of training centres. Many EU countries already have a system of peer review of training centres, and it is thought that the most

appropriate way of proceeding for an observer from the UEMS would be to attend at least some of these reviews in each country. The logistics and cost of such a process require further examination.

The directives of the EU indicate that a doctor recognized as a specialist in one member state must be recognized as a specialist in all other member states. This has caused some concern due to a perceived difference in the training standards throughout the EU in the Specialty Section in Nephrology UEMS difference in the training standards throughout the EU. If the training programme is accepted for widespread use throughout Europe, the concern about inequalities in training should disappear with time. The Specialty Section in Nephrology of the UEMS recognizes that it will take time for some countries to move from their current training programmes to the proposed European standard. It was envisaged that all member states of the EU would be able to comply by the year 2000, although further accession to the EU in recent years has necessitated a re-analysis of an appropriate timeframe to achieve this ideal. Our goal now is that the core harmonization proposals can be widely implemented by 2015.

The agreed programme, detailed below, is not meant to be exhaustive; rather it should act as a minimum common framework for EU-wide training. It is a significant

challenge to produce universally acceptable training recommendations and we must recognize the limitations inherent in any training document that aims to marry ideas from numerous different training programmes. Looking to the future, as the EU graduates seek to gain further experience abroad, a more comprehensive and universally implemented training programme should facilitate worldwide recognition of EU training in renal medicine. This updated programme has been developed following widespread consultation amongst the nephrology community and all member states, through their UEMS representatives, were invited to contribute to the recommendations.

European programme for medical training in nephrology

Entry requirements

Doctors enrolling in training programmes in nephrology should have completed a minimum of 2 years general medical training (GMT). GMT should include acute unselected medical intakes. A period of experience in nephrology of up to 6 months is considered desirable before entry in to the training programme, although not essential. If GMT is divided into four periods of 6 months each, all four should involve contact with patients, at least three should be concerned with acute medical problems, and at least two should involve acute unselected medical intake.

Duration and organization of training

The duration of training in nephrology is 4 years and should take place in a recognized teaching hospital. Three years of the training must be in clinical practice in nephrology. The other year may be in nephrology, general medicine, a related specialty or research. This year may be taken at any stage, or may be spaced out over the period of the nephrology training. The programme to which the trainee is appointed will have a named trainer or trainers who will be responsible for the development and direction of a coordinated and complete training programme. Both trainers and trainees are expected to have a good knowledge of the training curriculum and should use it as a guide for their training programme. Trainees should attend study days as advised by the National Specialty Director, and training courses in audit, ethics and leadership skills are suggested, in addition to compliance with ACLS accreditation. A written record of training will be maintained, to be countersigned by the relevant trainer/programme director annually. The trainees should demonstrate a progressive acquisition of responsibility in clinical management. Formal education and feedback on professional competencies are encouraged.

Some renal physicians may wish to participate in the acute medical intake and to be responsible for the care of unselected, acutely ill general medical patients, in which case dual accreditation in Renal Medicine and General Internal Medicine is required. Programmes may be flexible and allow accreditation with other related specialties such as Intensive Care Medicine, or Interventional Radiology.

In order to enhance the training process, and ensure that trainees are continually aware of their progress and the requirements of their training programme, regular formative and summative appraisals are recommended

throughout each training year. Although, mostly informal, such ongoing feedback should serve as a motivational tool to identify knowledge deficits on a continual basis. The emphasis of the training curriculum is on learning rather than teaching and trainees are expected to take responsibility for their own learning and the utilization of opportunities for learning throughout their training.

A formal period spent undertaking a research project is desirable in order to develop an understanding of both research methodology and the formal practice of research.

Medical training in nephrology

Nephrology is a predominantly clinical specialty dealing with diseases of the kidneys as they affect people of all ages. Besides the pathophysiological processes involved and the physical impact of each condition, the psychosocial effects must also be understood. The potential benefits and risks of specific treatments must be learned and experience gained in a multidisciplinary approach to management of patients with kidney disease. The physician may later wish to develop sub-specialty expertise in areas such as transplantation, obstetric medicine and vasculitis, therefore it is important that an interest in such topics should be facilitated during training.

Trainees should be required to have the necessary competences, recognizing the manifestations of renal diseases and developing practical skills and attitudes, to formulate differential diagnoses, conduct the appropriate plan of investigation and manage all aspects of the diseases outlined below in this paper. A sound knowledge of the major randomized controlled trials, systematic reviews and international/national guidelines in the various fields of nephrology, dialysis and transplantation is also important.

Manifestations of renal disease

Anatomy and physiology of the kidney and urinary tract

Definition of the normal anatomy and physiology of the genitourinary tract with particular reference to glomerular function and the workings of individual segments of the renal tubule. The differences between normal and pathological anatomical variants and interpretation of routine and complex biochemistry and radiological investigations.

Urinary abnormalities

Haematuria. Causes of both microscopic and macroscopic haematuria, relationship of haematuria with systemic disease, appropriate investigations to further study the haematuria. The use of phase contrast and bright field microscopy to recognize glomerular causes of urine red blood cells, and describe both the indications for and complications of renal biopsy in haematuria. To understand the interface between urology and nephrology for assessing and managing haematuria is essential.

Proteinuria. Pathophysiology of proteinuria and the nephrotic syndrome, differences between physiological and pathological causes of asymptomatic proteinuria and the relationship between proteinuria and systemic disease.

Sound knowledge of the extra-renal complications of nephrotic syndrome and their management, including ordering of appropriate investigations for proteinuria. Differential diagnosis, appropriate plan of investigation and management of a patient with asymptomatic proteinuria, symptomatic proteinuria or nephrotic syndrome and indications for and complications of renal biopsy in proteinuria.

Disorders of fluids, electrolytes and acid–base disorders

Management of fluid, electrolyte, acid–base disorders and abnormalities of bone mineral metabolism. Definition of the pathophysiology of sodium, potassium and hydrogen ion imbalance, calcium, phosphate and bone mineral metabolism and the pathophysiology of water imbalance. Description of the methods used to investigate fluid, electrolyte and acid–base regulation, and bone mineral metabolism in renal patients. Demonstration of competency at clinical and laboratory assessment of volume status and interpretation of the results of biochemical investigations together with appropriate management of the identified disorders.

Vascular and bone disorders

Hypertension. Pathophysiology of hypertension, list of the causes of secondary hypertension, appropriate investigations and management and knowledge of the guidelines for treating hypertension, including management in primary renal disease, chronic kidney disease (CKD) and diabetic nephropathy. Competency in the assessment and management of difficult hypertension, investigation of secondary hypertension and tailoring antihypertensive therapy.

Renovascular disease. Pathophysiology and prognosis of renovascular disease (RVD), indications and methods to investigate and intervene in RVD and competence in initiating appropriate diagnosis, investigation and management for patients who may have RVD. How to provide long-term care of blood pressure and cardiovascular risk for patients with RVD.

Mineral and bone disorders. Chronic kidney disease–bone and mineral disorders (MBD) are prevalent and important complications highly related with CKD patient's outcomes. Updated knowledge of the pathogenesis, diagnosis and management of these disorders is needed. They include the recognition of the different components of the CKD–MBD, including cardiovascular complications and vascular calcification, in order to prescribe appropriate treatment regimens for prevention and treatment of these disorders.

Glomerular and tubulointerstitial disease

Primary glomerular disease. Describe the primary causes of glomerular disease; understand the natural history and prognosis of glomerular disease and know the appropriate investigations including the indications for immunological screening. Knowledge of the appropriate management strategies taking cognizance of the limitations of available treatment evidence. Demonstration of

practical understanding of relevant investigations, including serology and renal biopsy, prescribing appropriate treatment regimens for primary glomerular disease and balancing the risks of immunosuppression versus potential benefits in individual patients.

Tubulointerstitial disease. Knowledge and understanding of pathophysiology of interstitial nephritis and tubulointerstitial disease, causes and links with systemic diseases and treatment of interstitial nephritis, including the use of corticosteroids. Accurate assessment of patients with tubulointerstitial disease including commencement of appropriate investigations, management and follow-up.

Acute kidney injury

Description of possible causes and initial investigations and treatment of acute kidney injury (AKI) (including CRRT in ICU) and treatments of underlying causes of AKI. Understanding of the decision rules for early detection of patients at risk of AKI, AKI scoring systems (e.g. RIFLE, AKIN) and the pharmacology of commonly used drugs in AKI and dose adjustments required. Practical skills should include the ability to identify patients at high risk of AKI (including contrast induced nephropathy (CIN), rhabdomyolysis, tumour lysis), institution of preventative measures, the initiation and interpretation of appropriate investigations and appropriate commencement of renal replacement therapy (RRT). Engagement with intensivists and other relevant support specialties in managing AKI should be fostered.

Chronic kidney disease

Knowledge of, and ability to list the causes and stages of CKD, the investigations used to assess the cause, severity and reversibility of CKD, the natural history and prognosis of CKD and the available treatment strategies, the pharmacology of commonly used drugs in CKD and dose adjustments required. Demonstration of ability to differentiate AKI from CKD, to identify CKD patients at higher risk of progression and initiate treatment to delay progression, to identify and treat CKD patients with high cardiovascular risk, to manage secondary complications of CKD (anaemia, MBD, hypertension, nutrition), and to assess and discuss with patients plans for RRT and preemptive transplantation in a timely fashion.

Nephro-urological conditions

Urinary tract infection. Description of causes of and predisposing factors to urinary tract infection, understanding of the mechanisms of action of antimicrobials and management of recurrent urinary tract infection. Competence in the appropriate investigation of urinary tract infection, rational prescription of antimicrobials in urinary tract infection and in the recognition of the role of microbiologists, urologists and specialist nurses in the management of urinary tract infections.

Urinary tract obstruction, neurogenic bladder and vesico-ureteric reflux. Recognition of both acute and chronic presentation of urinary tract obstruction and their consequences, definition of the fluid and electrolyte disturbances

occurring after the relief of obstruction and their management and description of the type of reconstructive procedures undertaken in children and adults together with the relevance to future management, including transplantation. Competence in the practical investigation and management of urinary tract obstruction and bladder dysfunction.

Renal stone disease. Causes of renal stone disease, appropriate biochemical investigations and treatment of renal stone disease. Assessment of patients with renal stone disease, appropriate investigations including the interpretation of serum and urine biochemical investigations in patients with renal stone disease. To recognize the limitations of medical treatment to prevent kidney stones.

Renal disorders associated with other conditions

Systemic vasculitis and connective tissue disease. Classification, definition and description of the pathology and underlying immunological mechanisms of vasculitis and connective tissue disease (CTD), description and classification of the renal histological changes in vasculitis and CTD and role of immunosuppression and plasma exchange in these diseases. Demonstration of the ability to take a relevant history and perform the appropriate examinations to diagnose and categorize the patient, to carry out the appropriate investigations, including renal biopsy and treatment. Competence in the longer term follow-up, and ability to work closely with other specialists involved in the care of these patients.

Diabetic nephropathy. Knowledge of the pathophysiology of diabetic nephropathy, risk factors, available screening methods, role of multifactorial interventions in preventing and delaying diabetic nephropathy and indications for referral of diabetic patients to combined diabetes-renal clinics and specialist renal clinics. Demonstration of the ability to elicit appropriate history and examination to diagnose and assess the patient who may have diabetic nephropathy, to diagnose non-diabetic renal disease in the diabetic patient, to implement and monitor treatment of hypertension in diabetes, with specific reference to renin-angiotensin-aldosterone system blockade, hyperglycaemia and dyslipidaemia, in addition to the appropriate assessment for kidney alone or combined kidney-pancreas transplantation.

Dysproteinaemias, amyloidosis, cryoglobulinaemia, Fabry's disease. Recognition and understanding of the pathogenesis of renal disease in dysproteinaemias, amyloidosis, mixed essential cryoglobulinaemia, Fabry's disease (as examples) demonstration of the ability to take a relevant history and perform an appropriate examination to diagnose and assess the patient who may have systemic disease affecting the kidney. Use and interpretation of the relevant investigations, initiation of the appropriate therapies, knowledge of the potential adverse renal effects of some of the therapies and demonstration of

the ability to work closely with other specialists involved in the care of such patients.

The kidney in pregnancy. Understanding of how pregnancy affects renal function in normal individuals and in those with pre-existing renal disease, including those on renal replacement therapy, how renal disease impacts on maternal and foetal outcomes. The adverse effects of drug treatment on both patient and foetus. Ability to manage hypertensive disorders in pregnancy. Identification and investigation of renal disease arising in pregnancy, deterioration of renal function in a pregnant transplant patient. Knowledge of the inheritance of genetic disorders, recognition of the need for genetic counselling and appropriate referral.

Adult polycystic kidney disease

Knowledge of genetics and pathophysiology of ADPKD, and description of the natural history of ADPKD and its long-term management. Accurate clinical assessment of the patient with ADPKD and demonstration of the ability to interpret radiological investigations of ADPKD, appreciating their limitations. Design of long-term management plans for ADPKD, including advice on appropriate family screening and interpretation of screening results.

Drug prescribing in renal disease

Sound knowledge of pharmacokinetics and handling of drugs in the presence of kidney disease including how drugs may affect renal function, and the effect of haemodialysis (HD), haemofiltration, haemodiafiltration and peritoneal dialysis (PD) upon drug prescribing. Principles of drug interactions with particular reference to immunosuppressive drugs. Competence in safe and efficient prescribing in patients with different degrees of kidney insufficiency and promotion of safe prescribing and drug utilization in conjunction with clinical pharmacists.

Renal replacement therapies and end-of-life care

Dialysis. Sound knowledge of the principles and practice of acute renal replacement modalities, chronic HD and PD and an understanding of the methods, complications and maintenance of acute and chronic dialysis access for renal replacement therapy. Competence in temporary vascular access, prescription of chronic renal replacement therapy and advising on drug prescribing in advanced renal failure. Knowledge of the management of dialysis complications, recognition of technique failure and arrangement of orderly transition between dialysis modalities. Appropriate management of nutrition, blood pressure, anaemia and mineral bone disease in dialysis patients. Demonstration of ability to effectively manage end-of-life care in CKD and dialysis patients.

Renal transplantation. Description of the principles of renal transplantation and acute and longer term medical and surgical care of transplant recipients. Understanding the use of, and short- and long-term complications of immunosuppression and other common therapies in renal transplantation. Appropriate assessment and counselling

of patients for transplantation, including living donation. Competence in initiating, monitoring and adjusting immunosuppression in the immediate and later stages of transplantation. Ability to diagnose and manage early and late complications of transplantation, identifying transplant failure and organizing repeat workup for further transplant and timely transition to dialysis.

Procedural skills

Kidney biopsy (optional). Knowledge of the anatomy of native and transplant kidneys and indication for and complications of renal biopsy. Adequate selection of the patient for renal biopsy, performance of ultrasound-guided biopsy of both native and transplant kidneys and management of the complications of renal biopsy, including appropriate use of urology and interventional radiology support.

Vascular access. Description of the anatomy of the major central veins and list of the indications and complications of temporary catheter insertion. Demonstration of appropriate patient selection, education and consent in the insertion of both temporary neck and femoral catheters under ultrasound control together with competence in the management of the complications of catheter insertion.

Renal and vascular ultrasound (optional). Description of the anatomy of central veins and the anatomy of native and transplant kidneys. The use of ultrasound to localize native and transplant kidneys and identify abnormalities, to identify central veins and to measure carotid artery intimal thickness and pulse-wave velocities.

Twenty-four-hour blood pressure monitoring (ABPM). Competence in describing the indications for ABPM, use of ABPM in the appropriate settings and interpretation of ABPM with modification of antihypertensives accordingly.

Attitudes

In addition to the cognitive and practical skills essential for excellence in patient care, a competent specialist should demonstrate, in parallel: empathy and rapport with patients, their relatives and friends; a willingness to provide patients with appropriate verbal and written information; a willingness to practice as part of a team of health care professionals; a willingness to participate in research, audit and standard setting; an appreciation of the ethical issues in dialysis and transplantation; due concern for rational use of economic resources; a continuous commitment to teaching and supporting lifelong learning amongst all health care professionals, and ongoing development of management skills. Trainees should be familiar with quality control and continuous quality improvement programmes and their relevance to modern practice.

Training outside the European community

Approval of training in a renal unit out with the European community will only be considered if evidence of the nature of training has been submitted in advance of the appropriate training authority. This will normally require a written statement from the department which the trainee will visit and written support from the trainee's own programme director obtained in advance of commencing a training post outside of the EU. This training could be clinical or in research and will be recognized for up to a maximum of 2 years.

Assessment of training

Assessment of the trainee will be made by the appropriate authority within each country and will be based on both personal interview and review of the written record of training, signed annually by the training programme director.

The assessment of training may utilize the Mini Clinical Evaluation Exercise, direct observation of practical skills, Case-Based Discussions, multisource feedback and methods adapted for the purpose, at the discretion of the NSD and nominated trainer. They are offered as a means of providing the trainee with attested evidence of achievement in certain areas of the curriculum, e.g. 'competence in procedural skills, or in generic components'. Assessment will also be supported by the trainee's portfolio of achievements and performance at relevant meetings, presentations, audit, in tests of knowledge, attendance at courses and educational events.

The end-of-year assessment process should include, in addition to a report on clinical skills, an assessment in areas such as team working skills, leadership skills, handling of complaints and conflict management. Ideally, the assessment panel for penultimate year assessments should include an independent assessor from outside the trainee's training programme. In the future, arrangements may be made for international representation at the time of the final assessment with the aim of awarding a European Diploma in Nephrology.

Clinical experience

At least 2 years must be spent in training centres fulfilling the following requirements:

- (i) At least three specialists in nephrology, each practising nephrology for at least 5 half-days per week;
- (ii) Facilities for treatment of acute renal failure by HD, continuous haemofiltration or allied techniques and offering experience of the management of patients with multi-organ failure in intensive care units;
- (iii) Provision of chronic renal replacement therapy including HD and CAPD. The total experience gained in HD should be 6 months with 3 months in PD although these periods of time may run concurrently. If the centre does not offer renal transplantation, arrangements must be made for the trainee to be seconded to a transplant unit for at least 6 months;
- (iv) Weekly renal clinics for non-dialysis patients;
- (v) Full diagnostic facilities including ultrasound, CT scan, angiography, radio-nuclear investigation (or ready access to same) and renal biopsy;
- (vi) Full laboratory service for diagnosis and management of renal patients including medical biochemistry,

- haematology, immunology, microbiology and histology;
- (vii) Regular meetings with radiology, pathology and urology departments;
 - (viii) Regular audit;
 - (ix) Provision of multidisciplinary clinical meetings;
 - (x) Library facilities, with Internet access and access to online journals;
 - (xi) An ongoing research programme in nephrology is desirable;
 - (xii) The remaining years of training in clinical nephrology can be undertaken in units where some, but not all, of the above facilities are available.

Research experience

It is desirable that all trainees should undertake a period of structured research in their training years, although it is recognized that, for many trainees, a more substantial period of research will be undertaken outside of the specified training programme.

Acknowledgements. The authors wish to acknowledge the contributions of the nephrologists listed below from the UEMS Nephrology Section and National Nephrology Associations, who reviewed and/or contributed to this paper: T. Adragao, T. Apostolou, N. Basic Jukic, J. Barata, P. Blankestijn, R. Coppo, H. Daugaard, M. Dranitzki-Elhalel, O. Heimbürger, R. Krediet, J. Malyazko, A. Martinez-Castelao, P. Mason, F. Ortega, P. Passadakis, D. Reklaityte, I. Slotki, S. Sonkodi, O. Soylemezoglu, P. Stroumza, V. Teplan, C. Tomson, G. Visvaidis and T. Weinstein.

Conflict of interest statement. None declared.

Reference

1. Specialty Section in Nephrology UEMS. Programme for harmonization of training in nephrology in the European Union. *Nephrol Dial Transplant* 1996; 11: 1657-1660

Received for publication: 8.8.12; Accepted in revised form: 12.11.12