
Appendix C

Renal Services Described for Non-physicians

This appendix provides information on the issues discussed in this report, background information on renal failure and the services available for treatment.

The role of the kidneys

- 1.1 The kidneys are paired organs located at the back of the abdominal cavity. Their primary function is to produce urine, which allows the removal of metabolism-related waste products from the blood. The kidneys also have a role in controlling fluid balance, blood pressure, red blood cell production and the maintenance of healthy bones. Kidney function is measured by their filtration function per minute using a term called glomerular filtration rate (GFR). A GFR value can be estimated from a blood creatinine test in conjunction with the age, gender and ethnicity of a patient. This so-called estimated GFR (eGFR) is regarded as normal if greater than 60 ml/min. Once the GFR falls to less than 10–15 ml/min renal replacement therapy (RRT) is needed with dialysis or a kidney transplant.

Kidney diseases

- 1.2 Around 13,000 people die from kidney (renal) failure in the UK each year though this is an underestimate, as many deaths do not record renal failure as a contributing factor. Kidney diseases can occur suddenly ('acute') or over months and years

('chronic'). Chronic kidney disease is relatively common affecting over 5% of the population often elderly patients with mild impairment of kidney function.

Chronic kidney disease (CKD) and established renal failure (ERF)

- 1.3 Chronic kidney disease affects approximately 3 million people in the UK and occurs because of slow damage to the kidneys over years. The incidence increases with age and is higher in patients of South Asian and African descent. In the initial stages of CKD, patients are usually well and there is little to find on clinical examination. Early abnormal findings may include elevated blood pressure (hypertension) and abnormalities such as protein or blood in the urine (proteinuria/haematuria). However, the lack of symptoms means many patients present to medical services with advanced disease. In the latter stages of CKD, patients may complain of tiredness, a loss of appetite, feeling sick (nausea), itching (pruritus), swollen legs (oedema) and breathlessness.
- 1.4 Other terms used for chronic kidney disease include chronic renal impairment, chronic renal insufficiency and chronic renal failure. Established renal failure (ERF) refers to kidney function that has deteriorated to a level where RRT treatment is required to sustain life. Treatment options include dialysis and renal transplantation though some

patients decide not to receive RRT and opt for conservative management.

Causes of CKD

- 1.5 Most renal diseases that cause renal failure fall into five categories.
1. Diabetes mellitus: is by far the most common systemic disease that affects the kidneys (up to 50% of all renal disease patients have diabetes). Diabetic patients often develop progressive kidney damage over many years, particularly if blood glucose levels and blood pressure are poorly controlled. Careful lifelong supervision of diabetes has a major impact in preventing kidney damage. Other systemic diseases that can cause kidney damage include systemic lupus erythematosus, vasculitis, amyloidosis and multiple myeloma.
 2. Glomerulonephritis: this term describes conditions that damage the glomeruli (the filtering units of the kidneys that start the process of urine formation). There are many different causes of glomerulonephritis with some being relatively benign and others progressing to established renal failure.
 3. High blood pressure (hypertension): particularly when severe or 'accelerated' hypertension causes chronic kidney disease. Early recognition and treatment of high blood pressure can halt (and to some extent reverse) the associated kidney damage. Hypertension is a common cause of renal failure in patients of African origin.
 4. Obstruction and/or kidney infection (pyelonephritis): CKD can be a consequence of any pathology that obstructs the free flow of urine through the urinary system. Most often obstruction is secondary to enlargement of the prostate gland in elderly men, but other causes include kidney stones, bladder tumours and congenital abnormalities of the renal tract which can lead to associated recurrent kidney infections.
 5. Genetic disease: the commonest genetic disease causing CKD is polycystic kidney disease. This condition, along with many rare inherited diseases affecting the kidneys, accounts for about 8% of all kidney failure in the UK.

Prevention and management

- 1.6 Within the UK, risk factors for CKD, such as diabetes, obesity and hypertension are becoming more common. Consequently, the NHS is more focused on CKD prevention by early detection and treatment of risk factors. Although many of the diseases causing CKD are not preventable, their recognition is important to allow appropriate treatment of any complications and preparation for renal replacement therapy.
- 1.7 Clear guidelines are in place for the management of CKD by both general practitioners and hospital kidney specialists (nephrologists) [1]. Currently there is no general population screening for renal disease; instead, targeted screening of patient groups 'at-risk' of renal disease, such as diabetic or hypertensive patients, occurs. This normally involves testing the urine for proteinuria in addition to blood tests for an estimated GFR.

Acute kidney injury

- 1.8 Acute kidney injury (AKI) has replaced the previous term 'acute renal failure'. AKI, which is often a reversible process, occurs when there is a rapid loss of renal function usually due to a major disruption to the circulation such as with shock in the setting of septicaemia or major trauma. Some patients with AKI require dialysis for a few days or weeks until their renal function improves, though a small proportion of individuals never recover kidney function. AKI normally occurs in the context of other serious illness and approximately 50% of patients with AKI who receive dialysis do not survive.

Complications and comorbidity

- 1.9 Patients with chronic kidney disease often have accompanying illnesses (comorbidities). Some are due to the primary disease, e.g. diabetes may cause blindness and diseases of blood vessels. Others, such as anaemia, bone disease and heart failure, are consequences of the renal failure. In

In addition, many patients with established renal failure, have diseases affecting the heart and blood vessels particularly ischaemic heart disease and peripheral vascular disease. Comorbidity, can influence the choice of treatment for ERF and may reduce its benefits.

Renal replacement therapy

1.10 The term renal replacement therapy encompasses the three treatments used in established renal failure: haemodialysis (HD), peritoneal dialysis (PD) and kidney transplantation. Both forms of dialysis remove waste products from the blood, but the other complications of established renal failure, such as anaemia and abnormal bone metabolism (hyperparathyroidism), require treatment with medications. Patients under the age of 70 may undergo kidney transplantation as a form of treatment. If successful, a kidney transplant returns an individual to good health and removes the need for dialysis.

Renal dialysis

1.11 Dialysis involves the removal of waste products from the blood by allowing these products to diffuse across a thin membrane into dialysis fluid, which is then discarded along with the toxic waste products. The fluid is chemically composed to draw or 'attract' excess salts and water from the blood to cross the membrane, without the blood itself being in contact with the fluid.

Haemodialysis

1.12 The method first used to achieve dialysis was the artificial kidney (also known as haemodialysis). This involves the attachment of the patient's circulation to a machine through which fluid is passed and harmful substances are removed from the blood. A disadvantage of this method is that some form of permanent access to the circulation must be produced to be used at every treatment.

The majority of patients on haemodialysis receive three four-hour sessions a week, at either a hospital-based dialysis centre or a community-based unit (satellite unit) away from the main renal centre. A small number of patients perform their own dialysis at home (home haemodialysis) and the number and duration of treatments will vary.

Peritoneal dialysis

1.13 An alternative form of dialysis is peritoneal dialysis, most commonly in the form of continuous ambulatory peritoneal dialysis (CAPD). In this technique, dialysis fluid is inserted, via a plastic tube (catheter), into the peritoneal cavity (space around the bowel) where it dwells for variable time before being removed and replaced. The fluid must be sterile in order to avoid infection and inflammation of the peritoneum (peritonitis), which is the main complication of the treatment. Each fluid exchange takes 30 to 40 minutes to perform and is repeated three or four times daily.

Renal transplantation

1.14 Renal transplantation replaces all the kidneys' functions, so erythropoietin and vitamin D supplementation are unnecessary. Transplantation involves the placement of a single kidney in the pelvis. Patients receiving a kidney transplant require anti-rejection (immunosuppressant) drugs, such as tacrolimus, cyclosporin, and mycophenolate mofetil, for the lifetime of the transplant. These drugs have many undesirable side effects, including the acceleration of vascular disease, increased risk of infection and higher rates of cancer (malignancy). Therefore vascular disease is more common in transplant patients than in healthy individuals of the same age. The average lifespan of a kidney transplant is between 10 and 15 years, which means some younger patients, will receive more than one transplant during their lifetime, often with periods of dialysis in-between.

1.15 For many patients, renal transplantation, from either a live or deceased donor, is the best treatment

in terms of survival and quality of life. Unfortunately, despite changes in policy and legislation there remains a shortage of kidneys for transplant.

Nature of renal services

1.16 The work of a nephrologist includes the early detection and diagnosis of renal disease and the long-term management of its complications such as high blood pressure, anaemia and bone disease. The nephrologist may share some management with the general practitioner or other physicians; relying on them to refer patients early for initial diagnosis and specific treatment. At any one time, perhaps only 5% of patients under their care are inpatients in wards with a further 20% attending the renal centre regularly for haemodialysis. However, inpatient nephrology and the care of patients receiving centre-based dialysis are specialised, complex and require experienced medical advice to be available on a 24-hour basis. Other renal work is sustained on an outpatient basis; this includes renal replacement therapy by dialysis and the care of transplant patients.

1.17 There are six major components to renal medicine.

1. Renal replacement therapy. The most significant element of work relates to the preparation of patients with advanced CKD for RRT and their medical supervision for the remainder of their lives. The patient population will present increasing challenges for renal staffing as more elderly and sicker patients (with comorbid diseases) are accepted for treatment.
2. Emergency work. The emergency work associated with the specialty consists of:

- i. treatment of acute renal failure, often involving the failure of other major organs thus co-operation with other medical specialities, including critical care, is therefore a vital component of this aspect of the service;
 - ii. management of medical emergencies arising from an established renal failure programme. This workload is expanding as the number, age, and comorbidity of patients starting renal replacement therapy increases.
3. Routine nephrology. A substantial workload is associated with the immunological and metabolic nature of renal disease which requires investigative procedures in an inpatient setting. It is estimated that ten inpatient beds per million of the population are required for this work.
 4. Investigation and management of fluid and electrolyte disorders. This makes up a variable proportion of the nephrologists work, depending on the other expertise available in the hospital.
 5. Outpatient work. The outpatient work in renal medicine consists of non-specialised nephrology clinics together with clinics for dialysis and renal transplant patients.
 6. Research and teaching activities. Many nephrologists have clinical or laboratory-based research interests and/or involvement with training of medical students and future kidney specialists.

References

1. National Collaborating Centre for Chronic Conditions. Chronic kidney disease: national clinical guideline for early identification and management in adults in primary and secondary care. *London: Royal College of Physicians*, September 2008.