

Self-assessment/CPD answers

Below, you can find the answers to the self-assessment questions published in this chapter.

Answers

Initial management of lower urinary tract symptoms and bladder outlet obstruction

Question 1

Correct answer: E. All patients need a full medical history, an examination including a digital rectal examination, simple urinalysis and a means to quantify the symptoms, such as a symptom score or frequency–volume chart. Renal function tests are only needed in *initial* management if there are ‘red flags’ such as a clinical suspicion of renal impairment, for example on patients with nocturnal enuresis, a palpable bladder, hydronephrosis, recurrent urinary tract infections or renal tract calculi.

Question 2

Correct answer: C. This man has both bothersome symptoms, making him a good candidate for α -adrenoceptor blocker treatment. He also has at least five risk factors for progression including urinary retention (age, severe symptoms, prostate volume, prostate-specific antigen, residual volume) and therefore will also benefit from 5 α -reductase therapy, which will reduce his risk of retention or progression by >50%.

Question 3

Correct answer: D. It is likely that this man has high-pressure chronic retention, which can be life-threatening because of severe renal failure and a risk of a significant salt-losing diuresis after catheterization. He should therefore be catheterized in hospital and monitored closely for urine output and electrolyte balance. The alternatives are all inadequate.

Urinary tract infection

Question 1

Correct answer: B. If a non-pregnant woman under the age of 65 presents with one bout of dysuria, new nocturia or cloudy urine, evidence indicates that urinalysis is sufficient to guide diagnosis. If urinalysis is positive for nitrites or leucocytes and blood, urinary tract infection is likely so a course of empirical antibiotics could be offered. Antibiotics (C) should not be prescribed before urine testing. Sending urine for culture (D,E) is not necessary in women <65 years who are not at risk of antibiotic resistance but have positive urinalysis.

Question 2

Correct answer: D. It is appropriate to offer antibiotics in this patient presenting with recurrent symptoms of cystitis. It is

important to send urine for culture before the first dose of antibiotic as frequent treatment of infections carries a risk of antibiotic resistance. Evidence does not support using cranberry juice (A) or topical oestrogen therapy (B) in premenopausal women to reduce frequency of infection. It is not appropriate to withhold antibiotics as previous courses have been effective and treatment can be guided by previous culture results, if available. There is a risk of resistance with frequent infections so it is important to send urine for culture (D), but it is not necessary to wait until this result is available.

Question 3

Correct answer: A. Urine should be sent for culture in all men presenting with suspected urinary tract infection and antibiotics should be started immediately, not delayed (E). An extended 7-day course of antibiotics is prescribed because of the risk of complications such as prostatitis, and trimethoprim is first-line choice. A 3-day (B) course is too short. Sexually transmitted infections (STIs; C) are a possibility but urinary tract infection is more likely with this combination of symptoms and nitrites on urine dipstick testing; it is therefore more appropriate to treat immediately than wait for the results of tests for STIs. Urine culture should always be sent in men presenting with suspected urinary tract infection and without features of prostatitis, and ciprofloxacin would not be first-line treatment (D).

Assessment and management of acute kidney injury

Question 1

Correct answer: D. This woman is highly likely to be volume deplete and requires careful volume resuscitation regardless of whether she is in the ‘pre-renal’ phase of her acute kidney injury (AKI) or has now progressed to overt acute tubular necrosis (ATN) as the latter will be worsened by uncorrected renal hypoperfusion. Bladder catheterization (A) will not help as volume replacement should be guided by the haemodynamic response (evidenced from regular clinical review, including of the postural BP response) rather than urine output. An ultrasound (B) is not a priority as the cause of her AKI seems clear (ischaemia) – a post-renal aetiology should be borne in mind if the AKI fails to respond to fluid management. The fractional excretion of sodium (C) may be difficult to interpret in the context of her thiazide diuretic and does not alter immediate management. There is no immediate indication for active management of her hyperkalaemia

(E) provided there are no worrying ECG changes but her biochemistry should be tracked, closely.

Question 2

Correct answer: E. Serum creatinine is a delayed marker of renal dysfunction but, in a young man with presumably good pre-morbid health, an initial septic renal insult might be expected to have declared itself earlier in the admission (serum creatinine accumulates by about 50–100 micromol/litre/day or more in severe renal failure depending on factors such as muscle mass and diet). In addition, he was not overtly septic on admission and seemed to have responded to antibiotics. These make acute tubular necrosis (A) unlikely and there had been no obvious haemodynamic disturbance to suggest pre-renal impairment (B). A glomerulonephritis (C or D) would have shown a much more 'active' urine with both blood and protein, with a post-infectious cause (C) usually presenting after a latent period of about 10 days. An acute allergic interstitial nephritis (E), is a strong possibility, his having received several doses of antibiotic, and may not be associated with either blood eosinophilia or a rash. The near bland urinalysis is typical of tubulo-interstitial diseases. The next step would be to contact the renal unit to consider the need for renal biopsy to confirm the diagnosis.

Question 3

Correct answer: D. Survivors of AKI may not regain their original level of renal function and there is no need for further assessment (including in-patient monitoring), provided: renal function remains stable at within 1.5 times baseline, there is no evidence of new onset or worsened proteinuria or of blood pressure control (E). He does not need renal follow-up (A) as he is dialysis-independent and his new baseline has not reached stage G4 or 5 CKD (<https://renal.org/information-resources/the-uk-eckd-guide/ckd-stages/>). Starting perindopril just prior to discharge is risky if follow-up arrangements breakdown (B) and there is no pressing indication to do so (C) – his GP, knowing his discharge level of renal function, will place him on the practice CKD register, if he is not already on it, and this will trigger, not just regular monitoring of renal function, but also quantification of microalbuminuria, the presence of which might indicate the need for an angiotensin-converting enzyme inhibitor (ACEI). The discharge summary, as a matter of course, should include details of the AKI episode, its maximum stage, likely causes, the need for renal replacement therapy (and whether this is continuing) and discharge renal function (if dialysis independent at the time of discharge).

Epidemiology and causes of chronic kidney disease

Question 1

Correct answer: B. Diabetic nephropathy is the single most common cause of chronic kidney disease (CKD) worldwide and affects approximately 40% of all people with diabetes mellitus. It typically develops after at least 10 years of diabetes. A genetic disorder (E) is unlikely because these usually present

at a younger age. Glomerulonephritis (A) is possible but less likely than diabetic nephropathy. Urinary obstruction (D) is not usually associated with albuminuria. He is at relatively low risk of having HIV/AIDs (C).

Question 2

Correct answer: C. The 2014 NICE guideline on the investigation and management of CKD recommends that all people with a first-degree relative that develops end-stage kidney disease should be tested for CKD. Many genetic disorders that cause CKD were not identified in the past and she should therefore be tested regardless of whether or not a specific genetic disorder has been identified in her father. Not all genetic disorders present at a young age. For example, autosomal dominant polycystic kidney disease typically presents in the third and fourth decades of life. The sex of the affected relative would only be relevant in the case of a male patient if an x-linked disorder was suspected.

Question 3

Correct answer: A. The most likely cause is cardiorenal syndrome because cardiac failure is frequently associated with reduced glomerular filtration rate (GFR) secondary to reduced cardiac output and the effect of diuretic and other medications. Glomerulonephritis (B) is typically associated with haematuria and proteinuria, which were absent. Obstructive uropathy (C) is unlikely in older women unless there is a specific cause like pelvic malignancy. Adult polycystic kidney disease (D) is unlikely without a positive family history. Myeloma (E) is less likely than cardiorenal syndrome.

Management of chronic kidney disease

Question 1

Correct answer: B. This patient has confirmed hypertension from ambulatory blood pressure measurements. There is evidence that in patients with hypertension and albuminuria, regardless of diabetes mellitus status, renin–angiotensin system agents such as ACEIs and angiotensin receptor blockers (ARBs) have a protective effect on kidney function. Therefore, an ACEI is the most appropriate initial treatment. A calcium channel blocker (C) is the best add-on therapy if blood pressure is not adequately controlled with an ACEI: non-dihydropyridine calcium channel blockers, such as diltiazem and verapamil, have an anti-proteinuric effect and are therefore preferred over dihydropyridine calcium channel blockers in this clinical setting. Thiazide diuretics (A) are a useful adjunct to combination therapy with ACEIs and calcium channel blockers, but not first-line therapy unless there is an additional indication, for example oedema. Combination therapy with ACE and ARB agents is not recommended because of the risk of hyperkalaemia and acute kidney injury.

Question 2

Correct answer: C. Antihypertensive therapy is proven to slow the progression of diabetic kidney disease. The ACCORD and UKPDS trials demonstrated that improved glycaemic control prevents albuminuria, which in itself is a risk factor for progression of CKD. However, intensive glycaemic control failed to show any benefit in renal endpoints compared with standard glycaemic control (aiming for $HbA_{1c} < 58$ mmol/mol (7.5%)) (D). Stopping smoking and weight loss (A, E) are appropriate modifications that can improve cardiovascular outcomes in CKD patients; they may also reduce disease progression, but this is less certain. Metformin is associated with type A lactic acidosis in CKD patients, and current guidance is to discontinue it with an estimated glomerular filtration rate (eGFR) < 30 ml/minute/1.73 m². However, metformin is not nephrotoxic, and discontinuation has no direct effect on the progression of kidney disease (so B is incorrect).

Question 3

Correct answer: C. This patient has a fall in eGFR of 15% after initiation of an ACEI. Some reduction in GFR is expected because of haemodynamic changes within the kidney. Renal artery stenosis, severe intrarenal vascular disease and hypovolaemia can cause an exaggerated fall in GFR. For this reason, a rise in creatinine of $> 30\%$ is considered significant and should prompt withdrawal of any ACEI/ARB agent and further investigation (A, D). The blood pressure is now below the target threshold for CKD in a non-diabetic patient without proteinuria ($< 140/90$ mmHg) so there is no reason to titrate the dose of lisinopril (B) up at this stage. Whilst a calcium channel blocker is a suitable alternative for patients intolerant of renin-angiotensin-aldosterone system inhibitors, a change in drug class is not necessary at this stage. The most appropriate management plan is to continue the current dose and monitor renal function.

Urological disorders in children that progress to chronic renal failure

Question 1

Correct answer: D. This is a boy with a history suggestive of posterior urethral valves with renal impairment and an intercurrent infection. Placement of a catheter allows drainage of the obstructed infected system and relieves pressure on the kidneys. This needs to be achieved and infection treated before performing a micturating cystourethrogram to confirm the diagnosis and any subsequent treatment with endoscopic ablation of posterior urethral valves. Relieving the obstruction often leads to the improvement in creatinine without the need for dialysis.

Question 2

Correct answer: B. This is a urological emergency. This girl has an obstructed single kidney and requires urgent drainage

of that kidney followed by definitive management of the stone. This girl is anuric indicating complete obstruction to the ureter, thereby a MAG-3 scan will not provide further information in this case. Once the obstruction has been relieved, the urine, blood and the stone should be sent for metabolic investigation to identify a cause. Urine can also be sent to exclude urine infection.

Question 3

Correct answer: A. This young lady is likely to have a neuropathic bladder after her diagnosis of transverse myelitis. A thickened bladder wall and incomplete emptying is suggestive of bladder outflow obstruction. Videourodynamic investigation provides information on detrusor pressures during the storage phase and also the pressure-flow relationship during voiding, the fluoroscopy would provide further information during the voiding phase of any obstruction (e.g. detrusor-sphincter-dyssynergia) and any vesico-ureteric reflux of urine. The results will help plan further bladder management and may include medications to reduce storage pressures and catheterization to improve bladder drainage, reducing the risk of further infections \pm damage to the kidneys. Subsequent investigation should include dimercaptosuccinic acid (DMSA) scan to assess for any renal scarring and measurement of glomerular filtration rate to investigate for renal impairment. Repeating an MRI should only be considered if there are other new neurological concerns and a MAG-3 scan will indicate if there is delay in drainage from the kidneys, but not the cause of the delay.

Renal bone disease

Question 1

Correct answer: D. Cinacalcet with (B) or without (A) calcium is inadvisable as calcium levels are already low and could be further lowered by cinacalcet, which reduces the sensitivity of parathyroid cells to calcium levels. Alfacalcidol (C) is more acceptable, but colecalciferol has shown some benefit to these patients and can increase calcium more efficaciously; therefore a combination of the two (D) is best. Colecalciferol alone (E) is unlikely to completely address the situation.

Question 2

Correct answer: B. Bisphosphonate use and heavy pharmacological suppression of parathyroid hormone (PTH) precipitates low bone turnover disease. Hyperparathyroidism (A) is unlikely as PTH is relatively suppressed in this patient when it would be expected to be high. Myeloma (C) is possible but less likely in this scenario, and calciphylaxis (D) is primarily a disorder of skin and blood vessels. E is incorrect.

Question 3

Correct answer: E. Cinacalcet reduces the sensitivity of parathyroid cells to calcium, thus lowering the calcium level. The other options are relatively contraindicated by the high calcium levels, and bisphosphonates are not yet appropriate here as a diagnosis of osteoporosis has not been made. A dual energy X-ray absorptiometry (DEXA) scan when measurements of PTH and electrolytes have improved may be appropriate to see if osteoporosis treatment is recommended.

Cardiovascular complications of chronic kidney disease**Question 1**

Correct answer: D. The examination findings are consistent with fluid overload and heart failure. The driver of hypertension in ESKD is fluid overload, hypertensive crisis less likely. These presentations predominate in end-stage kidney disease, rather than atheromatous-dependent coronary events. The ECG findings are non-specific, and serial troponins do not show a significant rise, making ischaemic heart disease (A and E) unlikely. Pulmonary embolism (B) is unlikely in the absence of venous thrombosis, and findings are not suggestive (e.g. no chest pain, no right heart predominant heart failure signs).

Question 2

Correct answer: A. Tight blood pressure control with an ARB is recommended and will slow progression of kidney disease and reduce cardiovascular mortality by as much as 17% in a recent meta-analysis of relevant trials. Statins (E) also have proven benefit with a modest effect on cardiovascular mortality. While not yet endorsed by clinical guidelines, Sodium–glucose co-transporter-2 (D) inhibitors have been shown to improve both renal and cardiovascular outcomes in patients with diabetic kidney disease and eGFR as low as 30 – however in the recent CREDENCE trial cardiovascular mortality outcomes did not reach statistical significance.

Question 3

Correct answer: C. Blood pressure has now fallen to target levels, and proteinuria has improved. Following commencement of an ARB there can be an expected rise in creatinine of up to 30% that does not reflect a true decrease in GFR and only requires monitoring (B). Because blood pressure has reached target levels, there is no need to add an additional agent (A). Changing to a calcium channel blocker (D) will not provide equivalent renal or cardiovascular outcomes. Given already on statin therapy, there is no significant benefit to re-checking lipid profile or altering usual dose of atorvastatin (E).

Anaemia and chronic kidney disease**Question 1**

Correct answer: D. Despite the fact this man has relatively recently been given a large dose of iron, the ferritin

concentration is inappropriately low, suggesting continuing loss from the gastrointestinal tract. Of the available choices, only an endoscopy (D) is able to detect gastrointestinal blood loss.

Question 2

Correct answer: C. This case would seem to be a fairly straightforward case of uncontrolled hypertension leading to an intracerebral bleed. However, what could easily be missed is the haemoglobin concentration being inappropriately high for the patient's degree of renal function. Therefore, an investigation for an erythropoietin-producing tumour of the kidney is indicated and of the available investigations, only a CT scan of the abdomen (C) would help determine this.

Question 3

Correct answer: C. The patient is anaemic and his serum ferritin is below the desired target of 100 micrograms/litre in chronic kidney disease; therefore he should be given iron in the first instance. Intravenous iron is preferable over oral iron (D) because of the increased amount of iron that can be given. His C-reactive protein is only 12; there is no suggestion of an active infection and so iron should be safe. As this man is a potential transplant candidate and has no evidence of active haemorrhage, a blood transfusion (A) is not indicated. At this stage, there is no suggestion of a gastrointestinal bleed and therefore an endoscopy (B) is not necessary. Corticosteroids (E) are not indicated.

Haemodialysis**Question 1**

Correct answer: E. In suitable patients (such as this one) pre-emptive renal transplantation should be offered as the first line. Renal transplantation in suitable patients is associated with significantly improved outcomes compared to dialysis and provides the best chance of restoring a normal lifestyle. Current guidelines recommend that patients are listed within 6 months of their anticipated start on dialysis. The work-up process, which includes investigating live donor options, takes time and it is reasonable to commence such preparations when the recipient eGFR drops below 20 ml/minute/1.73 m², making this the preferable option now for this patient. It would also be reasonable to make plans for arteriovenous future fistula creation in future months though not immediately (A). Review (D) is not, by itself, appropriate since planning for replacement therapy needs to be initiated now. There are no indications for urgent initiation of dialysis so a dialysis catheter (B) is not appropriate. As the patient is relatively young, and otherwise fit, conservative treatment (C) is also inappropriate.

Question 2

Correct answer: D. This patient is severely uraemic, encephalopathic, and has life-threatening hyperkalaemia. He

needs emergency dialysis. Glucose and insulin (A) is inappropriate since the patient has access for dialysis in situ and the administration of glucose and insulin will only be a temporary measure as it drives potassium intracellularly rather than lowering total body potassium. Furthermore, this may hinder potassium removal by dialysis. The patient is at risk of disequilibrium syndrome if dialysis is too intense. A short dialysis treatment time (D) using a low blood pump speed and a low surface area dialyser is required. This makes options B and C incorrect. Although the patient is encephalopathic there are no features of airway compromise and his Glasgow Coma Scale score is >8 . There is no indication for intubation. (E) though the patient does require high dependency care.

Question 3

Correct answer: A. This clinical picture is in keeping with a catheter-associated bacteraemia. Blood cultures (A) must be taken before giving empirical intravenous antibiotics (C) so that a culprit organism can be identified and subsequent antimicrobial therapy can be appropriately tailored. Catheter removal (B) may be required at a later stage but many cases settle without this. Paracetamol (D) may be helpful to bring down the patient's temperature and make them feel more comfortable but does not address the probable bacteraemia and is not the most appropriate immediate step. Stopping dialysis and changing the dialyser (E) would be appropriate management for a severe (Type A) dialyser reaction, but this is highly unlikely to be the cause of this patient's problem.

Peritoneal dialysis

Question 1

Correct answer: D. This patient has cloudy effluent; the most common cause is peritoneal dialysis peritonitis. A surgical review (A) would be helpful if there were concern about bowel perforation in the case of mixed bacteria. Intravenous antibiotics (E) would be considered in addition to intraperitoneal antibiotics if the patient was showing signs of sepsis. The International Society of Peritoneal Dialysis 2016 guideline recommends empirical intra-peritoneal antibiotic treatment to cover Gram-positive and Gram-negative organisms at presentation of peritoneal dialysis peritonitis after appropriate samples have been taken for cell count, Gram staining and culture. Once the organism has been cultured the antibiotics should be rationalized (B).

Question 2

Correct answer: E. As a fast transporter, this woman has a tendency to reabsorb glucose from the dialysate fluid much more quicker than an average or slow transporter. This leads to her retaining fluid. A sequential stepwise approach is needed, which would ideally begin with increasing the concentration of the glucose in the dialysate. An important goal is to avoid fluid retention from any of the dialysate bags. If the situation does not improve, automated peritoneal dialysis (B) or icodextrin, a glucose polymer (D), would be consid-

ered as second-line treatment. Diuretics can be used to increase urine flow (A) but this is unlikely to be particularly effective given the stage 5CKD. Change to haemodialysis (C) would be necessary if it was not possible to manage the fluid balance appropriately utilising the peritoneal dialysis prescription.

Question 3

Correct answer: C. Assisted peritoneal dialysis is the most appropriate form of home-based therapy as this man is elderly and has co-morbid conditions. Chronic ambulatory peritoneal dialysis (D) is incorrect because of the practicalities relating to his poor mobility and vision. He has chosen a home-based therapy, and it is important to allow patients to have autonomy over their care. As long as he is suitable for a home therapy, hospital-based care (A) is incorrect. Transplantation (E) is inappropriate given the patient's age and comorbidities. Although age is not a barrier to transplantation, the patient's life expectancy has to be taken into account. A study comparing quality of life and physical function in older patients treated with either assisted peritoneal dialysis or centre-based haemodialysis found no difference except that treatment satisfaction was higher in patients on peritoneal dialysis. He has indicated he would like to try renal replacement therapy and therefore (C) is in appropriate at this stage – however a realistic assessment of prognosis should be given and discussions initiated regarding the patient's preference should his condition deteriorate.

Kidney disease in the elderly

Question 1

Correct answer: C. Elderly people are at great risk of falls, especially in the context of taking multiple antihypertensives. A fall resulting in an injury such as a fractured neck of femur carries a significant risk of morbidity and mortality, and reduction in function. Although this patient has systolic hypertension and proteinuric CKD, any further increases in antihypertensive medication should be deferred until the possibility of postural hypotension has been assessed. It must also always be borne in mind that the targets for managing CKD have largely been derived from trial data that excluded elderly people, and did not have endpoints relevant to them. Therefore ACEIs and ARBs (A), although first-line treatment in younger patients, may not be of benefit and can predispose to hyperkalaemia and worsen episodes of AKI in elderly individuals. This lady is already relatively bradycardic, and increasing the dose of bisoprolol (B) could worsen this, especially given the estimated glomerular rate. α -Adrenoceptor blockers such as doxazosin (D) and nitrates are particularly likely to cause postural hypotension. The patient has significant systolic hypertension, and therefore stopping amlodipine (E) would not initially be warranted.

Question 2

Correct answer: D. Elderly patients can find dialysis very burdensome – both the physical demands of dialysis itself, and the travelling and waiting for transport. Achieving

adequate dialysis can also be challenging, especially in patients with cardiovascular disease. Early identification of struggling patients can facilitate advance care-planning, discussion of options for conservative management and involvement of palliative care. Increasing the number of dialysis sessions (A) might dialyse the patient more adequately but is clearly not the solution here. Peritoneal dialysis (B) might facilitate more gentle, home-based dialysis, but it imposes its own burdens on patients and carers, and would require a general anaesthetic for surgical catheter placement given the history of abdominal surgery here. He is not a candidate for transplantation (C). The situation is undesirable and untenable for the patient and his daughter and needs to be addressed; thus continuation of the current regimen (E) is not the correct option. In busy, pressured situations, patients can lose autonomy and this goes unnoticed until it is too late.

Question 3

Correct answer: C. The most likely cause of anuric AKI in an elderly man is urinary retention caused by prostatic enlargement. This can be precipitated by certain drugs, including antihistamines. A bedside bladder scan will confirm this, and passing a urinary catheter will ultimately remedy it (this can be difficult if the prostate is very large, and can require urological assistance). If the bladder is empty, formal ultrasound of the kidneys, ureters and bladder will exclude an upper tract obstruction cause by stones or malignancy, the latter being more common in the elderly. Antiglomerular basement membrane disease (E; formerly known as Goodpasture's syndrome) can cause anuric AKI and has a second peak of prevalence in elderly individuals, but is far less likely here than obstruction. Intravenous bicarbonate (A) would temporarily correct the acidosis and hyperkalaemia, but promoting the removal of acid and potassium in urine is more definitive. The patient may require haemodialysis (B) later, but it is not

the next step. There is nothing to suggest gross volume depletion so a fluid challenge (D) is likely to be unsuccessful and could be harmful.

Comprehensive conservative care for patients with advanced chronic kidney disease

Question 1

Correct answer: D. There is no indication for routine psychiatric assessment before taking such a decision (A).

The next step should include giving further education about both conservative and dialysis options (D). There is no evidence that dialysis would improve his quality of life (C). E is incorrect. The patient can change his mind and therefore adequate education about both modalities should be offered to enable an informed decision (D).

Question 2

Correct answer: E. A short period of dialysis (A) is very invasive and is unlikely to help. Amitriptyline (B), optimizing the patient's diabetic control (C) and a long-acting antihistamine (D) may each offer some help to the patient, but gabapentin (E) is more likely to give her some relief from the itching in this situation.

Question 3

Correct answer: A. Oxycodone (A) is the next available option on the World Health Organization analgesic ladder; morphine (B) and codeine (E) should be avoided as they tend to accumulate more in patients with advanced CKD and reduced eGFR. Non-steroidal anti-inflammatory drugs (C) should be avoided given the associated risks and side effects in such patients. A topical opioid (D) can be considered if oxycodone does not help.