Context for the session

The objectives **for this session** are:

- Describe the range of urinary symptoms that present in clinical practice
- Describe how to gather a history of a patient presenting with urinary symptoms or thirst
- Describe the key "red flag" symptoms in the assessment of urinary symptoms
- Practise the abdominal examination
- Perform a urinalysis

Students will have covered the following in the two-week urinary symptoms and thirst block:

In **Case-Based Learning** students consider a 22-year-old male medical student with type 1 diabetes mellitus presenting with DKA; and a 22-year-old woman presenting with diabetes insipidus.

In **Lectures, workshops and practical** learnt about:

- Polyuria and thirst; complications of Diabetes Mellitus; blood in the urine, micro and macroscopic haematuria; oedema; drugs that increase urine output; uraemia; dysuria, frequency and flank pain; urinary tract measurements and urinary incontinence; lower urinary tract symptoms (LUTS)
- Nephrotoxicity and the principles of prescribing
- Applied Anatomy and Imaging Practical (Urinary)

Specifics for urinary symptoms and thirst in GP clinical contact

Introduction

In this session, students should have the opportunity to apply their knowledge by interviewing and examining patients with urinary symptoms.

As with the previous sessions:

- refer to the Year 2 GP handbook which covers the information common to all sessions.
- use the attached “session plan” as a guide on how to use your time with your group

Allow time for:

- introductions (reflecting on any learning/action points from their previous case, abdominal symptoms
- student-led interaction with patient(s), and
- debriefing the group (usually without the patient present) to ask questions and consolidate learning.

(Expert) patients

Suitable patients for the block are:

- A patient with chronic renal failure or who has a past history of acute renal failure or a patient with renal transplant or on dialysis

- A patient with recurrent or chronic urinary symptoms e.g. prostate cancer or prostatic hypertrophy or has an indwelling catheter
- A patient with type 1 or type 2 diabetes
- Any patient suitable for abdominal examination or skills practice

Tasks

Start by assessing their learning needs:

- discuss the students' learning during their urinary symptoms and thirst CBL case
- how much opportunity have they had to practise examining the abdomen?
- what do they feel confident in and what are they unsure about?

Prepare for the session. Brainstorm (use the supplied mind map, if you find this helpful):

- common urinary symptoms
- how to assess and differentiate between causes of urine symptoms
- specific history and associated features of diabetes (type 1 and type 2)
- how to approach an abdominal examination, including the kidneys and bladder

Follow the usual timetable of talking to one or two patients, but, if possible, also allow time for the students to revise their abdominal and urinalysis examination skills (check what they covered in secondary care during their Abdominal pain case).


Urinary symptoms and thirst
Symptoms
Dysuria
Pain
Suprapubic discomfort (Cystitis)
Loin pain
Fever, rigors
Cloudy urine
"Storage"
Urinary urgency
Urinary frequency
Nocturia
Incontinence
"Voiding"
Urinary hesitancy
Poor flow
Terminal dribbling
Polyuria or oliguria
Haematuria
Visible
(Non-visible)
Pneumaturia
Urethral discharge
Rectal/perineal pain
Lower Urinary Tract Symptoms (LUTS)
Storage and voiding symptoms
Differential diagnoses
Detrusor muscle overactivity
UTI
Neurological disease
Men only
Benign prostatic enlargement
Prostate cancer
Prostatitis
Diabetes
Polydipsia & polyuria
Other
Blurred vision
Weight loss
Fatigue
Abdominal pain
Recurrent infections
Renal disease
Asymptomatic
Non-specific symptoms ("uraemia")
Anorexia, nausea and vomiting
Lethargy
Breathlessness
Poor concentration
Pruritis
Oedema
Acute Kidney Injury (AKI)
Pre-renal
Renal
Post-renal
Chronic Kidney Disease (CKD)
Nephrotic syndrome
Proteinuria, hypoalbuminuria, oedema
Urine infection
Lower
Urinary frequency, urgency, dysuria
Upper (pyelonephritis)
Fever, rigors, loin pain, vomiting
Renal calculi
Colicky loin pain > testicle/labium

Information given to students

You should be aware of:

- urinary tract infection including pyelonephritis
- kidney stones
- acute and chronic renal failure
- type 1 & type 2 diabetes
- prostatic hypertrophy
- carcinoma of the urinary tract including prostate cancer.

History

Common urinary symptoms that present in clinical practice:

- Dysuria – pain or discomfort on urination
- Problems with volume of urine: Anuria (absence of urine), Oliguria (<500mL of urine produce per day) or the opposite, Polyuria
- Storage problems; urgency, frequency of urination, nocturia (passing urine at night) and urge incontinence
- Voiding problems; hesitancy (waiting for urination to start) straining to pass urine, poor stream, terminal dribbling, and a sensation of incomplete emptying. Retention is obstruction of urine flow. Bladder outflow obstruction can be caused by an enlarged prostate (in men) urethral obstruction, or genital prolapse (in women).
- Problems with the constituents of urine: Haematuria (micro or macroscopic) or proteinuria (more than 150mg of protein in the urine per day)—if heavy the patient may notice frothy urine.

Lower urinary symptoms (LUTS) are problems with the storage of urine e.g. incontinence or with the passage of urine e.g. pain or difficulty passing urine.

Urinary incontinence

- Stress incontinence is where the pelvic floor muscles are too weak to fully control the passage of urine with a rise in intra-abdominal pressure e.g. coughing and sneezing.
- Urge incontinence is where there is a sudden urge to urinate with difficulty controlling the passage of urine, this can be due to “detrusor instability” where the bladder is overactive and contracts before the bladder is full, the pressure overrides voluntary control.

Neurological conditions can affect the storage of urine, the control of the sphincters or loss of sensation, and cause problems with the co-ordination and control of urination.

Urinary calculi can occur anywhere along the urinary tract.

- Stones in the renal pelvis or in the bladder can be asymptomatic and present with non-visible haematuria.
- Kidney stones can cause severe loin pain.
- Those that occur at narrow sites such as pelvic-ureteric junction cause pain from obstruction, the pain comes in waves (colicky) and the patient is often unable to lie still with the bouts of pain.
- If the obstruction is in the lower ureter it can radiate to the testes/genitals.

Passing too much or too little urine

- Polyuria can be caused by high fluid intake, or too much urine being produced either through osmotic diuresis (diabetes mellitus) or inadequate secretion of, or resistance to, antidiuretic hormone (ADH) in diabetes insipidus. Medication e.g. diuretics can increase urination.
- Oliguria or anuria can be caused by inadequate fluid intake, obstruction or renal failure.

Haematuria: Bleeding can occur anywhere along the urinary tract from the glomerulus of the kidney to the lining of the bladder. Ask if it is painful or painless, and if the bleeding is constant or intermittent.

- Visible haematuria (patients may describe brown (like tea without milk), pink urine or frank red blood). 60% of renal tumours and 80% of bladder cancers present with bleeding, but they are rare in patients under 40.
- Haematuria in bladder cancer usually painless and intermittent.
- Bleeding can be associated with renal stones and infection but usually the patient will have other symptoms associated with these.

Examination

Setting up for examination	**WIPPPE** **W**ash hands **I**ntroduce yourself and identify patient **P**ermission – explain procedure and gain consent **P**osition – initially at 45°, totally flat later in examination **P**ain – check that the patient is comfortable **E**xposure – adequately expose the whole upper torso (or at least from the bottom of the sternum to the symphysis pubis)
General examination	• Look to see if the patient is comfortable or obviously in pain. Do they look well or unwell? • Vital signs (if acutely unwell or infection suspected) • High or low body mass index. Are they cachectic? • Are they jaundiced or pale? • Comment on any relevant findings e.g. food/drink, nil by mouth (NBM) sign, vomit bowls, IV infusions, nasogastric tubes, surgical drains, catheter.
Hands and nails	• Look for *clubbing*, *leukonychia*, *koilonychia*, *palmar erythema*, and *tar staining*. • Feel for *Dupuytren's contracture*. • Check pulse. • Count respiratory rate—breaths in 15 seconds x4. Normal is 12-15 at rest (15-20 in some patients e.g. anxiety). • *Hepatic flap* (asterixis): identical to hypercapnic flap. Ask the patient to hold their arms out in front of them with their hands dorsiflexed at the wrist (ask patient to "cock their wrists back"). Hold for at least 15 seconds. Look for a coarse flapping tremor. Seen in encephalopathy due to liver failure.

Arms	Look for: *Bruising* – can be due to a coagulation disorder due to liver failure *Scratch marks* (excoriations) – suggests itch (pruritus) which may be due to jaundice (early sign) *Track marks* – scars due to intravenous drug use (risk factor for hepatitis B & C)
Neck	Examine for cervical and supraclavicular *lymph nodes* (stand behind the patient). *Virchow's node* – left sided supraclavicular lymph node which, if enlarged, suggests gastric malignancy.
Face/Mouth	**Eyes:** *Jaundice* – ask patient to look down and retract upper eyelid to expose the sclera. Is there a yellow discolouration of the sclera (scleral icterus)? *Conjunctival pallor* – anaemia *Kayser-Fleischer rings* – copper deposits in the iris seen in Wilson's disease (best seen with a slit lamp) *Xanthelasma* – raised yellow lesions caused by a build-up of lipids beneath the skin (hypercholesterolaemia) Inspect the **mouth, throat and tongue**: *Ulcers* – seen in Crohn's and IBD *Angular stomatitis* – painful cracks at the corners of the mouth seen in thiamine, B12 and iron deficiencies *Glossitis* – red, swollen tongue seen in iron, B12 and folate deficiencies
Inspection	Expose the **chest**. Look for: *Spider naevi* (>5 is abnormal) *Gynaecomastia* – excessive development of breast tissue in males. Causes: alcoholic liver disease, drugs. *Loss of chest hair* in men (chronic liver disease) Cover the chest as appropriate. Ask patient: "are you comfortable lying flat?". If yes, lay patient flat with their head on a single pillow. If no, lay them as flat as possible whilst maintaining patient comfort. The patient's arms should be at their sides. This helps to relax the abdominal wall. Expose the **abdomen** from the bottom of the sternum to the symphysis pubis. Look for: *Distension*: consider the 5 F's (fat, fluid, flatus, faeces, foetus) *Scars*: recent scars will be pink and vascular, old scars are white and may be indurated. Look carefully for small laparoscopic scars (including infra-umbilical). *Visible veins*: abnormally prominent veins suggest portal hypertension or vena cava obstruction. *Caput medusae:* veins radiating out from the umbilicus. *Stomas*: Where is it located on the abdomen? Can you see any exposed mucosa? What does it look like? Is there a bag? What's in the bag? Any blood, pus, mucus?

	A stoma may be formed from the large bowel, small bowel or renal tract. *Striae*: pink or white stretch marks. Caused by weight gain or rapid weight loss. Pink/purple in Cushing's syndrome.
Palpation	Squat by the side of the bed (or raise couch up). You should look at the patient's face for signs of pain whilst palpating the abdomen. "Do you have any pain in your abdomen?". If yes, "can you show me where?". "Please let me know if I cause you any discomfort" **Light palpation**: Starting away from any site of pain, use one hand to lightly palpate all 9 regions of the abdomen. When palpating, keep your whole hand in contact with the abdomen and use your fingers to palpate (flexing at the metacarpo-phalangeal joints). Note the site of any tenderness. **Deep palpation**: Repeat as above with deeper palpation (more pressure) taking care over areas of tenderness. Feel for masses or structural abnormalities. If you feel a lump, try to describe its exact location, size, shape, surface, consistency, mobility, movement with respiration, tenderness and whether or not it is pulsatile. **Palpating the abdominal organs**: Feel for the *liver* (start at the RIF, move up to the right hypochondrium) and *spleen* (start at the RIF, move up to the left hypochondrium). Move your hand up when the patient breathes out and press into the abdomen when the patient breathes in. Ballot the *kidneys* at the flanks. Feel for an *abdominal aortic aneurysm* (AAA) just above the umbilicus.
Percussion	Produces a hollow resonance, it produces a dull thud without resonance over fluid and solid masses. Press the middle finger of your non-dominant hand firmly onto the abdomen. Tap it with the flexed index or middle finger of your dominant hand. Percussing for the liver: start at the right iliac fossa (RIF) and percuss up to the right costal margin listening for areas of dullness. Then percuss down the chest from the 5th intercostal space mid-clavicular line listening for dullness indicating the upper border of the liver. Normal liver extends from the 5th rib to the costal margin. Percuss for the spleen from the RIF to the left costal margin. Percuss for the bladder from the umbilicus down to the symphysis pubis.
Auscultation	Listen for bowel sounds with the diaphragm of the stethoscope to the right of the umbilicus. Listens for up to 2 minutes if needed. Listen 2-3 cm above and lateral to the umbilicus for bruits from renal artery stenosis.
Lower limb	Check for pitting oedema, bruising and erythema nodosum. Examine hernia orifices, inguinal nodes and external genitalia as appropriate.
Investigations	Perform a digital rectal examination if indicated Urine dip (+ β HCG if patient is female)
Closing	Cover patient/help them dress or get off couch if required, thank patient. Explain any findings to patient. Wash hands.

Urinalysis

Dipping a urine sample with a multistix test detects several substances in the urine including glucose, proteins, red cells, ketones and by products of bacteria such as nitrites. It can help:

- diagnose urinary tract infections and renal stones
- test for and monitor diabetes, kidney disease, high blood pressure, liver disease and other conditions such as metabolic disorders
- monitoring in pregnancy.

An explanation to patients about what a urine dipstix test is can be found here:

https://patient.info/health/urine-dipstick-test

and how to collect a mid-stream specimen of urine here:

https://patient.info/health/midstream-specimen-of-urine-msu

The below table is taken from the Consultation and Procedural skills (CAPS) logbook for students from Year 3 onwards. It gives a clear run through of how to do a urinalysis.

	Performance Criteria: The student will:
1.	Introduce yourself, explain procedure to patient and obtain consent
2.	Prepare equipment
3.	Check that reagent strip has not passed expiry date
4.	Ask patient when urine sample was passed
5.	Put gloves on
6.	Observe colour and opacity
7.	Remove reagent strip from bottle, replace lid immediately and check that test pads are the correct colour at the start
8.	Dip the reagent strip into the sample of urine, ensuring that all the test pads are covered.
9.	Remove reagent strip immediately, as you do so drag the back of the test strip against the sample pot to remove excess urine
10.	Replace lid on urine sample bottle
11.	Hold the stick so the urine does not run into individual test squares, wait the appropriate time before reading each result
12.	Use stopwatch to record time accurately and hold colour key next to the reagent strip*
13.	Decide if urine sample needs to be sent to laboratory or if the patient needs to do a MSU and then dispose of reagent strip and gloves. Dispose of urine in sluice or return to patient.
14.	Wash hands
15.	Explain results to patient and decide what further action is necessary.
16.	Record results accurately in notes.

* Beware colour blindness

Non-visible haematuria is picked up on urinalysis. It is important to exclude menstrual blood as a contaminate of the urine.

Proteinuria may indicate underlying renal disease (which can be otherwise asymptomatic).

- Nephrotic syndrome is the combination of heavy proteinuria (>3.5g/24 hours), hypoalbuminemia and oedema.
- Patients may also have peripheral oedema, pleural effusions and ascites and you should ask about symptoms of malignancy e.g. weight loss, change of bowel habit and persistent cough and chronic inflammation such as rheumatoid arthritis or inflammatory bowel disease.

Differential diagnoses

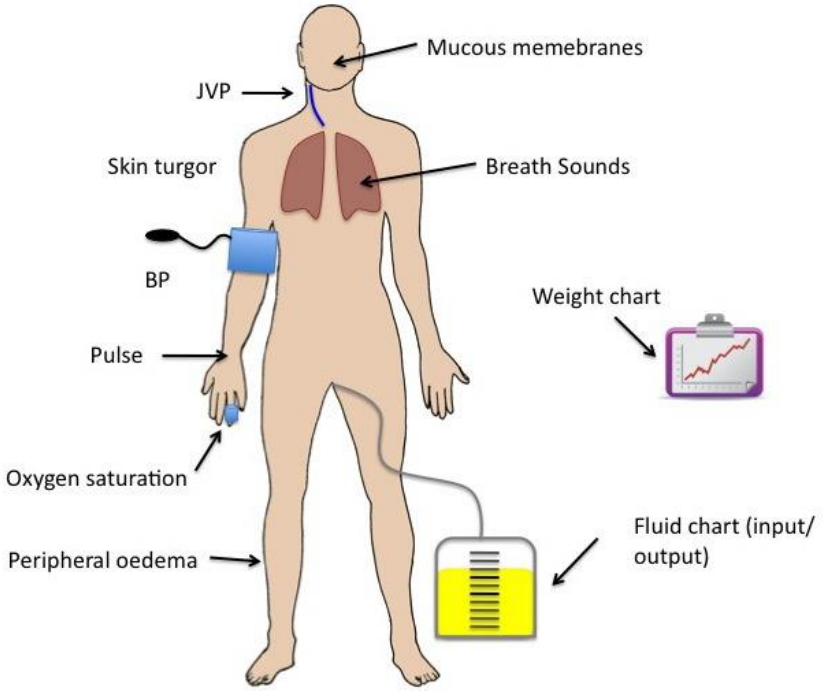
Causes of polyuria and thirst:

- Diabetes mellitus
- Psychogenic or primary polydipsia.
- Diabetes insipidus
- Cushing's syndrome
- Hypercalcaemia
- Hyperkalaemia
- Diuretic abuse

How to assess hydration status

Symptoms/signs of

- hypovolaemia: reduced skin turgor, dry mucous membranes, tachycardia and low blood pressure
- fluid overloaded with peripheral and pulmonary oedema, ascites and raised JVP.



Monitoring of weight and fluid input/output may be needed to help assess fluid balance.

Urinary tract infections

Identify specific history and associated features of UTI e.g. dysuria, frequency, passing small amounts of urine, suprapubic pain, any haematuria?

- Associated symptoms
  - Suggestive of ascending infection; fever, rigors, loin pain, systemic features e.g. vomiting
  - Suggestive of sexually transmitted infection; urethral or vaginal discharge or bleeding, risk factors for STI, testicular pain or swelling (epididymitis or orchitis), pelvic pain or pain on intercourse.
  - Confusion or agitation—in the elderly this may indicate an UTI, babies may just present with fever, poor feeding, and vomiting, older children with abdominal pain or incontinence or bed wetting when they are usually dry.
  - Ask about risk factors for UTI e.g. symptoms suggestive of prostate enlargement
- Past medical history: Recurrent infections (may need investigation or prophylactic treatment), known renal disease, diabetes or abnormality of the renal and urinary tract.
- Medications: Allergies, recently used antibiotics (to guide treatment), NSAIDs or other medications that may damage the kidney
- Family history: Hereditary renal disease e.g. polycystic kidneys
- Social history: Smoking is a risk factor for bladder cancer. Ketamine used as a recreational drug can cause irreversible bladder damage and cystitis-like symptoms.

Pyelonephritis is infection of the kidneys and is indicated by fever >38^{o}C, renal angle (flank) pain and systemic symptoms such as rigors and vomiting.

Kidney stones also cause severe pain on urination and haematuria.

Sexually transmitted infections can also cause dysuria and can inflame the urethra (urethritis). Prostatitis can be caused by organisms that are sexually transmitted or those that cause urinary infections.

Renal disease

Renal disease is often initially picked up on rising serum creatinine rather than symptoms.

Patients in acute or chronic renal failure may present with:

- uraemia: nausea and vomiting, anorexia
- confusion
- fluid retention: peripheral oedema; increasing breathlessness - pulmonary oedema, pleural effusions
- oliguria or anuria
- postural hypotension and dehydration, if the patient is volume depleted

Things to consider in the history are:

- Past medical history: Hypertension, vascular disease, diabetes, inflammatory disease such as rheumatoid arthritis, urinary tract stones, known renal disease including renal transplant are all important to be aware of.
- Medication: Long term medication, recent changes in medication, recent courses of antibiotic and herbal or over the counter treatment such as NSAIDs.

- Family history: Diabetes, hypertension and vascular disease and genetic renal disease such as polycystic kidney disease or Alport syndrome (results in eye abnormalities, hearing loss and kidney disease and usually presents in childhood with non-visible haematuria).

The list of possible causes of decreased renal function is long.

- In Acute kidney injury (AKI) there is often a combination of factors e.g. vomiting and diarrhoea leading to dehydration in a patient on medication such as ACE inhibitors.
- In chronic kidney disease (CKD), patients should be managed by reducing overall cardiovascular risk and optimising renal function (e.g. stopping medication that may worsen renal function such as NSAIDs), and optimising blood pressure.

Consider pre-renal, renal and post renal causes:

- Pre-renal: Hypovolaemia from fluid loss e.g. vomiting or diarrhoea, medication (NSAIDS), sepsis, renal artery stenosis, relative hypovolaemia e.g. heart failure
- Renal: Glomerular disease and vasculitis (diverse range of immune mediated disorders that cause destruction), interstitial nephritis (drug induced e.g. antibiotics, IV contrast), acute tubular necrosis (may have a pre-renal cause) including rhabdomyolysis and myeloma (myoglobin and abnormal proteins are toxic to the tubules) trauma, malignant hypertension.
- Post-renal: The blockage may occur from outside the ureter e.g. pelvic mass, in the lumen e.g. stones or in the wall of the ureter e.g. tumour. Urine output is also affected by neurogenic bladder or by causes of bladder outflow obstruction e.g. prostatic enlargement, urethral stricture or iatrogenic e.g. blocked catheter.

Medication is a common cause of reduced renal function, so a good medication history is essential.

Diabetes

Diabetes occurs when there is too much circulating glucose in the blood.

Type 1 develops quickly (over days or weeks) when the pancreas stops making insulin. It is usually diagnosed in children or young adults but can present later in life.

Type 2 develops more gradually and where the body doesn't make enough insulin for the body's needs (impaired insulin secretion) and insulin resistance in the liver, adipose tissue and skeletal muscle. Type 2 diabetes is more common in people who are over 40, and those who are overweight or obese though it is increasingly being seen in younger people.

Patients may present:

- acutely: ketoacidosis or hyperosmolar hyperglycaemic state
- sub-acutely: Weight loss, thirst with polydipsia, passing large amounts of urine; polyuria, lethargy, irritability, infections, genital itching, blurred vision, tingling in hands/feet. Beware – can be a very slow insidious onset
- with complications: Skin changes including necrobiosis lipoidica, neuropathy, nephropathy, arterial or eye disease
- asymptomatically: i.e. picked up by accident/on screening tests

Diagnosis. Urinalysis can pick up glycosuria but this is not diagnostic, so patients need plasma glucose or HbA1c (HbA1c is not helpful in young people or those who are unwell or have a rapid onset of symptoms who need a plasma glucose checked):

- HbA1c of >48 mmol/mol (6.5%)

- Random plasma glucose of ≥11.1mmol/l
- Fasting plasma glucose ≥ 7mmol/l
- Glucose tolerance test (GTT) Glucose ≥ 11.1mmol/l 2 hours after 75g of glucose

Patients with Type 1 diabetes are typically younger than 50 years and present with one or more of:

- Rapid weight loss
- Thirst, polyuria and/or polydipsia
- Fatigue
- BMI below 25 kg/m2
- Ketoacidosis
- Personal and/or family history of autoimmune disease

Do not discount type 1 diabetes in people old than 50 years or with a higher body mass index.

Patients with Type 2 diabetes may present with

- thirst
- polyuria
- blurred vision
- weight loss
- recurrent infections, and
- fatigue

but these are often mild or may be absent.

They may also have risk factors for type 2 diabetes such as a strong family history, obesity, or Black or Asian family origin.

Complications of diabetes include:

- Short term:
    - Hypoglycaemia—after physical activity or reduced food intake in those on insulin or glucose lowering medication or when the glucose is dangerously high as in ketoacidosis.
    - Increased infections. Patients with diabetes should be immunised against flu (annually) and pneumococcal infection (once)
- Long term
    - Arterial disease resulting in cardiovascular disease
    - Chronic kidney disease
    - Eye problems—damage to the small arteries of the retina
    - Nerve damage
    - Foot problems and impotence due to poor circulation and nerve damage.

Management of diabetes:

- Patients with suspected type 1 diabetes should be referred to a specialist team to confirm diabetes and start treatment the same day.
- In the longer term in both type 1 and type 2 diabetes the nearer blood glucose is to normal, the less the risk of complications, but this can result in more hypoglycaemic episodes for diabetic patients on insulin.

- Long term complications are also reduced by reducing other risk factors such as high blood pressure, and regular monitoring for diabetic eye disease, renal disease and checking for neuropathy (by checking sensation in the feet), foot care is important.
- Education and diet and lifestyle advice are vital. Education includes understanding and managing diabetes, understanding medication and self-monitoring. Patients need advice on benefits and driving. People with diabetes also need to know where and how to seek help, including advice on managing incurrent illness.

Resources

NICE CKS has excellent resources on the following relevant topics:

- Lower urinary tract symptoms in men
- Urinary tract infection (lower) – women
- Chronic Kidney Disease (CKD)
- Diabetes - type 1 | Health topics A to Z | CKS | NICE & Diabetes - type 2 | Health topics A to Z | CKS | NICE

Patients can access support and information via these charities:

- Diabetes UK
- Prostate Cancer UK

Abdominal examination:

Abdominal Examination - OSCE Guide | Geeky Medics