Renal System Summary

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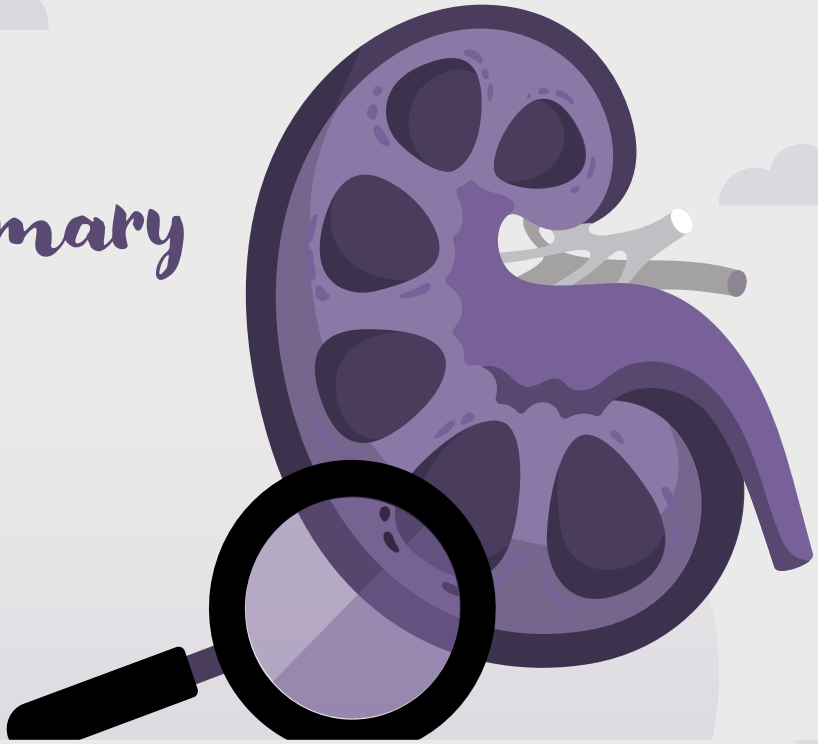

🎯 The Renal System :

🧠 Kidney Anatomy & Physiology

Structure / Topic	Details
Kidneys	• Lie posteriorly in the abdomen, retroperitoneally, on either side of the spine at T12–L3 level • Size: 11–14 cm long • Right kidney lies 1.5 cm lower than left (due to liver) • Anterior to kidneys: liver and spleen • Move downwards during inspiration as lungs expand
Blood Supply	• Receive ~25% of cardiac output • Account for ~10% of basal metabolic rate
Microscopic Anatomy	• Each kidney contains approximately 1 million nephrons
Nephron Components	• Glomerulus • Proximal tubule • Loop of Henle • Distal tubule • Collecting duct
Urine Formation	• Glomerular filtration → tubular secretion and reabsorption → enters calyces and renal pelvis
Kidney Functions	• Excretion of metabolic waste (e.g urea, creatinine) • Maintenance of salt, water, and electrolyte homeostasis • Regulation of blood pressure via renin–angiotensin–aldosterone system • Endocrine functions: erythropoiesis and vitamin D metabolism
Innervation	• Renal capsule and ureter: innervated by T10–12/L1 nerve roots *past* • Pain from these structures is felt in these dermatomes

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🧪 Bladder

- The **bladder** acts as a **reservoir**.
- As it fills, it becomes **ovoid** and rises **out of the pelvis** in the midline, toward the **umbilicus**, behind the anterior abdominal wall.
- **Bladder wall** contains the **detrusor muscle**, which:
    - Contracts under **parasympathetic control**
    - Allows **urine to pass through the urethra** (**micturition**)
- Conscious desire to void occurs when bladder holds **250–350 mL**.*past*

Structure	Description
Male urethra	Extends from bladder to tip of penis
	Divided into: **prostatic, membranous, and spongiose parts**
Female urethra	Much shorter
	External meatus: **anterior to vaginal orifice**, **posterior to clitoris**

Urethral Sphincters *imp*

Sphincter	Location	Control	Innervation
Internal	At bladder neck	Involuntary	–
External	Surrounds membranous urethra	Voluntary	**Pudendal nerves (S2–4)**

The History of Renal Disease

- **Renal disease may be asymptomatic or present with non-specific symptoms:**
  - **Lethargy, Breathlessness**
- **Often only after initial investigation can focused renal history be taken.**

⚠ Common Presenting Symptoms ⚠:

Dysuria

- **Defined as pain or discomfort during urination**
- **Common in urinary tract infections (UTI)**
- **Usually accompanied by:**
  - **Urinary frequency, Urgency, Suprapubic discomfort (cystitis)**
- **Other causes:**
  - **Urethritis, Acute prostatitis (may have severe perineal or rectal pain)**

Ask about:

1. **Systemic signs:**
   - **Fever (>38.0 °C), Suprapubic discomfort**
   - **Suggests pyelonephritis if with:**

        - **Rigors, Vomiting, Flank pain**
        - ⚠ ***Preceding UTI symptoms may be absent***

2. **Obstructive urinary symptoms:**
    - **Slow flow, Hesitancy, Incomplete emptying, Dribbling , Nocturia**
3. **Hx. of sexual contacts**

◆ Loin Pain

- **Often caused by ureteric obstruction**
- **Most common cause: renal calculi**
- **Described as 'colicky' pain:**
    - **Comes in waves**
    - **Pt. is restless, moves around bed**
      (⚠ *unlike peritonism where patient lies still*)

Ask about:

- **Location:**
    - **Loin only → pelvic/upper ureter obstruction**
    - **Radiating to testicle/labium → lower ureter obstruction**
- **Presence of:**
    - **Fever, Rigors**
    - **Dysuria → suggests infection**
- **History of previous episodes of loin pain**

Other possible causes of loin pain:

- **Bleeding from:**
    - **Renal tumor**
    - **Ureteric tumor**
- **Infection**
- **Non-renal causes (must be considered):**
    - **Leaking aortic aneurysm (especially in older patients with vascular disease)**
    - **Ectopic pregnancy (in women of childbearing age)**

Voiding Symptoms:

- **Symptoms arise due to either:**
  - **Bladder storage problems**
  - **Voiding phase problems**

Ask About:

*** Storage symptoms: urgency, frequency, nocturia, urge incontinence**

*** Voiding symptoms: hesitancy, poor stream, straining to void, terminal dribbling**

➤ These may be followed by a sense of incomplete emptying

Causes:

Symptom Type	Common Causes
Storage symptoms	**Bladder, prostate or urethral problems:** **• UTI** **• Tumour** **• Urethral calculi** **• Obstruction from prostatic enlargement** **• Neurological disease (e.g. multiple sclerosis)**
Voiding symptoms	**• Men: Bladder outflow obstruction (prostatic enlargement)** **• Women: Urethral obstruction or genital prolapse**

Incontinence in Women *imp*

Type of Incontinence	Description	Cause	Notes
Stress incontinence	**Leakage of urine during increased abdominal pressure**	**Weakened pelvic floor muscles**	**Triggered by coughing, sneezing**
Urge incontinence	**Sudden urge to urinate followed by involuntary leakage**	**–**	**May occur alone or with stress incontinence; increases with age**
Overflow incontinence	**Urine leakage without warning**	**Often related to bladder overdistension**	**Occurs with position changes; typically painless**

Polyuria:

- **Defined as passing higher volumes of urine**

- **Causes include:**
  - **Excess water intake**
  - **Osmotic diuresis (e.g. in diabetes mellitus)**
  - **Diabetes insipidus (due to inadequate secretion or action of vasopressin [ADH])**

🚫 Oliguria and Anuria:

Term	Definition	Causes
Oliguria	**Passing <500 mL/day**	**Very low fluid intake, mechanical obstruction, or loss of kidney fx.**
Anuria	**Complete absence of urine**	**Same causes as oliguria**

🔍 Pneumaturia:

- **Defined as passing gas bubbles in urine**
- **Suggests a fistula between the bladder and colon**
- **Causes:**
  - **Diverticular abscess, Malignancy, Inflammatory bowel disease**

🩸 Hematuria

Type	Description
Visible hematuria	**Seen as pink, red or brown urine**
Non-visible hematuria	**Detected only via urinalysis or microscopy (dipstick ≥ 1+)**

🔍 Ask About (Visible Hematuria):

- **Previous episodes: frequency, persistence, or intermittent pattern**
- **Possible causes: anywhere in renal tract (glomerulus to bladder)**

***IgA nephropathy = most common glomerular cause**
→ Often follows non-specific upper respiratory tract infection

***Hematuria from bladder tumours is:**
→ Painless, Intermittent
⚠️ **Important to exclude in patients >45 years without UTI**

🔎 Additional Questions:

- **Loin pain → may indicate:**
  - **Ureteric obstruction from blood, calculi, or tumour**
  - **Also associated with renal cell carcinoma**
- **Fever, dysuria, suprapubic pain, frequency → may indicate urinary infection**
- **Family history of renal disease → consider polycystic kidney disease**
  → May cause visible hematuria via cyst rupture

Non-visible Hematuria:

- **Defined as positive dipstick (≥1+)**
- **Indicates renal or urinary tract disease**
- **In women of reproductive age, most common cause = menstrual blood contamination**

💥 Proteinuria and Nephrotic Syndrome

Proteinuria:

Type	Definition
Proteinuria	Excretion of >150 mg/day of protein in urine
	Often asymptomatic
	Persistent proteinuria may indicate renal disease

💥 Nephrotic Syndrome:

Feature	Description
Proteinuria	>3.5 g/24 hours
Other features	Hypoalbuminaemia and oedema

- **May develop over:**
  - **Few weeks (e.g. minimal change disease) → may cause AKI**
  - **Many months (e.g. membranous nephropathy) → suggests CKD**
- **Most common cause: Diabetes mellitus**
- **Other findings:**
  - **Frothy urine (due to protein) , Hyperlipidaemia , Hypercoagulability, Increased infx. risk**

🔍 Ask About:

🔬 Clinical Features Suggestive of Nephrotic Syndrome

Category	Details
Systemic Symptoms	**Weight loss, altered bowel habit, cough, back pain**
Chronic Inflammatory Conditions	**Especially if undertreated:** **• RA , Inflammatory bowel disease** **• Bronchiectasis** **→ May lead to nephrotic syndrome via renal AA amyloid deposition**
Oedema	**• Ankle swelling (pitting oedema)** **• In younger patients: facial swelling, puffy eyelids (especially in the morning)**
Respiratory Symptom	**Breathlessness → may be due to pleural effusions**
Abdominal Symptom	**Abdominal swelling → due to ascites**

🧪 Acute Kidney Injury (AKI)

Aspect	Details
Definition	AKI includes a spectrum from **mild functional changes** to **dialysis-requiring failure**.
Typical presentation	Recently identified **rise in serum creatinine**.
Risk factor	Increased risk in patients with **pre-existing CKD**.
Types of AKI	**- Prerenal , Intrinsic (Renal), Postrenal *imp***

🔷 Prerenal AKI

Topic	Details
Main cause	**Volume depletion (hypovolaemia)**
Ask about (fluid loss)	• Vomiting • Diarrhoea • Bleeding • Inadequate oral intake (due to nausea or delirium)
Ask about (procedures)	• Recent operations or investigations • Fasting • Bowel preparation
Ask about (infection)	• Fever , Sweats , Productive cough , Dysuria

Predisposing conditions	• Heart failure • Liver disease
Drugs to ask about	• ACE inhibitors (block RAAS) • Other antihypertensives • Diuretics (e.g. furosemide, spironolactone) • NSAIDs (also cause **interstitial nephritis**, **minimal change disease**)

🔷 Intrinsic AKI

Topic	Details
Most common cause (hospital setting)	**Acute tubular injury (ATI)**, which may lead to **acute tubular necrosis (ATN)**
Mechanism	Typically follows **renal hypoperfusion → ischaemia–reperfusion injury**
Other causes	• **Rhabdomyolysis *past*** (suggested by prolonged immobilisation, e.g. after a fall)
Recovery	ATI typically recovers over **days to weeks**
Can be first sign of systemic disease	• **Myeloma** • **Infective endocarditis** • **Vasculitis** • **Systemic lupus erythematosus**

📝 Ask About:

Category	Details
Recent illness or surgery	–
Drug history	• Any recent changes in medications
Common AKI-causing drugs	• Antibiotics, NSAIDs , Proton pump inhibitors
Can cause	**Allergic interstitial nephritis** (almost any drug may be implicated)
Systemic symptoms	weight loss, fever, night sweats, tiredness, arthralgia, myalgia, bony pain, numbness, weakness, rashes, cough, breathlessness

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🔷 Primary Glomerulonephritis (Cause of AKI)

Feature	Details

Most common type (by region)	**IgA nephropathy** → common in **northern and western hemispheres**
Classic presentation	Visible haematuria **following upper respiratory tract infection** → called **'synpharyngitic haematuria'**
Other related cause	**Postinfectious glomerulonephritis** due to **beta-haemolytic streptococcal infection** of throat or skin

Ask About:

Question	What to look for
Prior episodes	Recurrent haematuria
Loin pain and haematuria	Suggests glomerulonephritis
Previous sore throat	Suggests **IgA nephropathy** or **post-streptococcal GN**

Postrenal AKI

Topic	Details
Definition	AKI due to **obstruction from renal pelvis to urethra**
Most common cause	**Bladder outflow obstruction** ➤ In men: often from **prostatic hypertrophy** (benign or malignant)

معظم الباست على هذا الجدول

Ask About:

Symptom	Description
Urinary symptoms	• Urgency , Frequency , Nocturia ,Incontinence
Voiding difficulty	• Poor stream , Terminal dribbling
Prostate evaluation	• Previous **prostate exams** • **PSA** (Prostate-Specific Antigen) levels
Pain	**Suprapubic pain**
Neurological signs	• **Leg weakness , Perineal numbness** • **Faecal incontinence** → may suggest **spinal cord lesion**

12.2 Causes of acute kidney injury

Prerenal
- Hypovolaemia (e.g. blood loss, diarrhoea, vomiting, diuresis or inadequate oral intake)
- Relative hypovolaemia (e.g. heart failure or nephrotic syndrome)
- Sepsis
- Drugs (e.g. antihypertensives, diuretics or non-steroidal anti-inflammatory drugs)
- Renal artery stenosis or occlusion
- Hepatorenal syndrome

Intrarenal
- Glomerular disease (e.g. immunoglobulin A nephropathy, systemic vasculitis or systemic lupus erythematosus)
- Interstitial nephritis (drug-induced)
- Acute tubular necrosis/injury (may follow a prerenal cause)
- Multiple myeloma
- Rhabdomyolysis
- Intrarenal crystal deposition (e.g. urate nephropathy or ethylene glycol poisoning)
- Thrombotic microangiopathy (e.g. haemolytic uraemic syndrome or scleroderma renal crisis)
- Accelerated-phase hypertension
- Cholesterol emboli

Postrenal
- Renal stones (in papilla, ureter, or bladder)
- Papillary necrosis
- Ureteric or bladder transitional cell carcinoma
- Intraabdominal or pelvic malignancy (e.g. cervical carcinoma)
- Retroperitoneal fibrosis
- Blood clot
- Bladder outflow obstruction (e.g. prostatic enlargement)
- Neurogenic bladder
- Urethral stricture
- Posterior urethral valves
- Iatrogenic (e.g. ureteric damage at surgery, blocked urethral catheter)

🔶 Urinary Retention

Type	Description
Acute urinary retention	• **Complete inability to pass urine** • Associated **suprapubic discomfort**
Chronic urinary retention	• Usually **painless**

🔶 Ureteric Obstruction (AKI):

→ For ureteric disease to cause acute kidney injury, **both kidneys must be affected**, or the patient must have a **single functioning kidney**. The most common cause of ureteric obstruction is **malignancy**, including cancers of the **bladder**, **cervix**, **ovary**, or **uterus**. These conditions are **usually painless**. The clinical history should explore any **prior diagnosis** of malignancy, as well as any **recent operations** or **radiotherapy**.

🧠 Chronic Kidney Disease (CKD)

Chronic kidney disease (CKD) is defined by the **degree of renal dysfunction** and/or the **presence of proteinuria**. These abnormalities must be **present for at least 3 months** to meet diagnostic criteria. Therefore, the diagnosis of CKD requires **preceding biochemical data** to differentiate it from **acute kidney injury (AKI)**. Most patients with CKD remain **asymptomatic** until they develop **kidney failure**.

🔍 Ask About (Early CKD Evaluation):

- **Underlying conditions** that may explain the aetiology of CKD:
    - Diabetes mellitus
    - Vascular disease:
        - History of myocardial infarction
        - Stroke
        - Peripheral vascular disease
    - Hypertension , Hyperlipidaemia
    - Episodes of **acute glomerulonephritis** (e.g. **IgA nephropathy**)
    - History of **nephrotic syndrome** (e.g. **membranous disease**)
- **Previous incidental urine abnormalities**:
    - Proteinuria
    - Non-visible haematuria
      ➤ May suggest **preceding glomerular disease**
- **Family history**:

- Important due to **genetic diseases** that can present as CKD
  ➤ A **detailed family history** is required

🩸 Kidney Failure and Uraemia

In some cases, patients may present with symptoms of **uraemia**, especially in those with ⚫ **known end-stage kidney disease** and an **estimated glomerular filtration rate (eGFR) <10 mL/min/1.73 m²**. These symptoms are often **non-specific**.

- Ask About (Uraemic Symptoms):

- anorexia, nausea and vomiting, lethargy, poor concentration, pruritus, Peripheral oedema
- Breathlessness (may be due to **fluid overload**, **worsening acidosis**, or **anaemia**)

- Less commonly, uraemia may present with: Pericarditis , Peripheral neuropathy

12.3 Definition of chronic kidney disease

CKD stage	eGFR (mL/min/1.73 m²)	Description	Management
1	≥90	Kidney damage with normal or ↑ GFR	Observe; control blood pressure and risk factors
2	60–89	Kidney damage with mild ↓ GFR	
3A	45–59	Moderate ↓ GFR	
3B	30–44		
4	15–29	Severe ↓ GFR	Prepare for kidney failure
5	<15	Kidney failure	Dialysis, transplantation or conservative care

p: the addition of p to a stage (e.g. 2p, 3Bp) means that there is significant proteinuria. Proteinuria is quantified on the basis of an albumin : creatinine (ACR) or protein : creatinine (PCR; see Box 12.4).
T: the addition of T to a stage (e.g. 4T) indicates that the patient has a renal transplant.
D: the addition of D to stage 5 CKD (i.e. 5D) indicates that the patient is on dialysis.

(e)GFR, (estimated) glomerular filtration rate.

💊 The Patient with a Renal Transplant

It is important to **identify early** in the clinical history whether a patient has had a **renal transplant**. The main presenting problems in transplant patients include:

- A **decline in kidney function** (usually detected via routine blood tests)
- **Infection**, **Malignancy**

The risks of **infection and malignancy** are increased due to **immunosuppression**. Notably, infections in these patients may be **masked** by the effects of immunosuppressive therapy. **Lymphoma**, in particular, should be considered after transplantation.

📋 Ask About:

Topic	Details
Date of transplant	Rejection is **more common in the first few weeks**
Immunosuppression	Ask about **current and past immunosuppressive treatments**, and **any recent changes** that may raise rejection risk
Intercurrent illness	Could contribute to **AKI**
Symptoms	Fever • Weight loss • Cough • Breathlessness • Dysuria • Tenderness over the graft

Dialysis Patient

Types of Dialysis:

Dialysis Type	Description	Access Type	Common Complications	Ask About
Haemodialysis	Delivered via vascular access	Arteriovenous fistula or tunnelled vascular catheter	• Fistula thrombosis (loss of thrill → vascular emergency) • Catheter infection	• Fever and rigors (especially post-dialysis)
Peritoneal Dialysis	Delivered via tunnelled catheter into peritoneum	Tunnelled peritoneal catheter	• Infection	• Abdominal pain • Cloudy peritoneal dialysate fluid

Other Presenting Symptoms in Renal Disease

- **Hypertension**, **Anaemia**, **Electrolyte disorders**

Past Medical History:

Ask the patient about their **past medical history**, specifically:

- Hypertension, Vascular disease, DM
- Inflammatory diseases:
    - RA, Inflammatory bowel disease, Chronic infections
- Urinary tract stones or urinary tract surgery
- Any **previous evidence of renal disease**, including:
    - Dialysis, Renal transplantation

Drug History

- Long-term medications, Recent changes in treatment, Recent courses of antibiotics
- Use of **non-prescription medications**, including:
    - NSAIDs, Herbal remedies

Family History

What to Ask	Details
Family history of...	• Hypertension, stroke, diabetes, deafness, Renal disease
If parents deceased	Ask age and known cause of death
Most common inherited renal conditions	**•Autosomal Dominant Polycystic Kidney Disease (ADPKD)** **•Alport Syndrome (Hereditary Nephritis)**
ADPKD مهم	• Affects both males and females • Often found across generations • 10% have **no family history** (e.g. family died before diagnosis) • Associated with **berry aneurysms** → ask about **subarachnoid haemorrhage** in relatives
Alport Syndrome مهم	• Caused by **type IV collagen abnormalities** • Often causes **early-onset deafness** • Genetically heterogeneous (X-linked most common) • Presents as **non-visible haematuria in childhood** or **significant renal disease in late teens/early adulthood**

🏠 Social History

- **Smoking**, **Alcohol intake**, **Recreational drug use**
- **Social support**, including:
  - Family
  - Housing
  - Social work involvement
- **Occupation**
- **Level of independence** in daily living activities
- **Impact of illness** on ability to work

📋 Renal past papers ⋆.˚

#	Question	Answer	Brief Explanation *extra*
1	Choose the correct intrarenal cause for acute kidney injury	**Rhabdomyolysis**	Intrarenal AKI includes Rhabdomyolysis.
2	A patient with renal stone that caused renal injury. What's the type of this acute kidney injury?	**Postrenal AKI**	Stones can cause urinary obstruction → postrenal AKI.

3	All causes red urine EXCEPT	**Hemolysis**	Hemolysis usually breaks RBCs **in the bloodstream**, not in urine.
4	Someone doesn't hear well with vision problems. His mother has the same.	**Alport Syndrome**	Alport's: hereditary nephritis + sensorineural deafness + ocular anomalies.
5	Bladder outlet obstruction...all associated EXCEPT	**Polyuria**	Polyuria is not typical to this issue.
6	A 14-year-old with hematuria, frothy urine, and deafness; brother with same	**Alport Syndrome**	Classic Alport presentation: renal + hearing + eye signs.
7	A 46F with CKD, HTN, family hx of cerebral aneurysm	**Adult Polycystic Kidney Disease (APKD)**	APKD: autosomal dominant, presents with HTN, flank pain, hematuria; associated with berry aneurysm.
8	Male with dysuria, frequency, perineal pain	**Prostatitis**	Presents with frequency, dysuria, perineal/rectal pain.
9	Not a predisposing factor for renal stones	**Hypocalcemia**	Stones are linked to hypercalciuria, dehydration, gout, etc.
10	Patient with renal failure — which is NOT expected?	**Polycythemia**	CKD usually causes anemia, not polycythemia.
11	Innervation of renal capsule and ureter is:	**T10-12_ L1**	Autonomic innervation for kidney and ureters is **T10-12–L1**
12	Conscious desire to urinate occurs at bladder volume of:	**250–350 mL**	First urge to void felt when bladder holds ~250–350 mL.
13	Area between urethra and ureters in the bladder	**Trigone**	Trigone is the anatomical area between ureters and urethra openings.
14	5 y/o with renal + ear + eye symptoms	**Alport Syndrome**	Pediatric triad for Alport: nephritis, deafness, ocular issues.
15	Loin pain radiating to groin	**Ureteric colic**	Classic for ureteric stone: flank pain radiating to groin/testes.

Physical Examination in Renal Disease

General Appearance

- Advanced CKD may cause pallor and pruritic scratch marks.
- Severe cases can present with drowsiness, myoclonic twitching, asterixis, or hiccups.
- Yellowish skin tone may appear in advanced uraemia.
- Breathlessness may result from fluid overload or acidosis-induced hyperventilation.

✅ Hands & Nails

Fig. 12.6 Muehrcke's lines. (From Short N, Shah C. Muehrcke's lines. Ar

Fig. 12.7 Half-and-half (Lindsay's) nails.

- **Palmar creases pallor** → may indicate anemia.
- **Nails**:
  - *Muehrcke's lines* → hypoalbuminaemia (nephrotic syndrome)
  - *Half-and-half (Lindsay's) nails* → CKD (proximal white, distal red/brown)

✅ Dialysis Access

- Check arms for **AV fistula** (visible veins, palpable thrill); absent thrill suggests **thrombosis** → urgent surgical referral.
- Look for **chest exit site** of tunnelled catheter; follow line to internal jugular vein.
- Note any **scars** from previous fistulae.

✅ Face & Eyes

- Look for **malar rash** → systemic lupus erythematosus
- **Conjunctival pallor** → anaemia
- **Red/inflamed eyes** → scleritis or uveitis (systemic vasculitis)
- **Fundoscopy**:
  - *Diabetic retinopathy*: common in diabetic CKD
  - *Hypertensive retinopathy*: arteriolar narrowing, AV nipping, cotton-wool spots, haemorrhages
  - *Severe hypertension*: flame haemorrhages, papilloedema → possible cause of AKI
- **Mouth:**
  - *Gingival hyperplasia* → calcineurin inhibitors (e.g ciclosporin, tacrolimus)
  - *Uraemic fetor* → late-stage CKD

✅ Skin

- Check for **rashes**, **bruises**, **scratch marks**, and **excoriations**
- **Vasculitic rash** (purpura, esp. legs) → may indicate systemic vasculitis, Henoch-Schönlein purpura, or cryoglobulinaemia *past*
- **Drug rashes** raise suspicion of **allergic interstitial nephritis**

- Rashes may be subtle in darker skin tones → ask about skin changes

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📊 Fluid Status Assessment

Component	Details
General signs	• Dehydration: sunken eyes, dry mucosa, reduced skin turgor (check chest, not forearm)
	• Fluid overload: breathlessness (pulmonary oedema or pleural effusion), visible oedema
Pulse & BP	• Avoid BP cuff on arm with AV fistula
	• Look for tachycardia/hypotension (hypovolaemia)
	• Measure standing vs. sitting BP for postural drop
Jugular Venous Pressure	• Elevated in fluid overload or uraemic pericarditis (rare cardiac tamponade)
Chest Examination	• Signs of pulmonary oedema or pleural effusion
	• Auscultate heart for: – *3rd heart sound* → fluid overload – *4th heart sound* → LV stiffening (HTN) – *Flow murmur* → CKD anaemia – *Quiet sounds* → pericardial effusion – *Pericardial rub* → uraemia
Peripheral Oedema	• Pitting oedema: check from ankles upward (mid-calf, knee, thigh)
	• In bedbound patients: sacral oedema
	• Severe cases: oedema may extend to scrotum/labia
	• Significant oedema → hallmark of nephrotic syndrome
Weight Monitoring	• Use sequential weights to track fluid loss/gain
Fluid Charts	• Correlate exam findings with recorded fluid input (oral/IV) and output (urine/other losses)

🔍 Abdominal Examination in renal system:

📋 Patient Preparation

- Patient lies **flat**, with **arms by sides** + Abdomen exposed fully to the **anterior iliac spine**

👁 Inspection

Inspect for	Details
Distension in flanks	May suggest **ascites** (fluid overload) or **large polycystic kidneys**
Operative scars	- Renal transplant scars: seen in **left/right iliac fossa** extending **inferiorly to midline** - Nephrectomy scars: visible in left/right flank (often performed in ADPKD to create space for transplant)
Dialysis catheters	Look for **peritoneal dialysis catheter**

✋ Palpation

- Use **right hand**, flat and in full contact
- **Kneel beside bed**, avoid touching floor
- Begin with **light**, then **deep palpation**
- Observe the **face** for pain or discomfort
- Examine for **abdominal aortic aneurysm** + Describe any **masses** felt

🔄 Palpating Enlarged Kidneys

Finding	Details
Palpable flank mass	May indicate **enlarged kidney**; you should be able to "**get above**" it
Ballotting technique	Used to feel **deeply placed kidney** Left hand behind back at 12th rib, right hand presses down, Ask patient to breathe deeply and flex left fingers upward while palpating anteriorly
Most common cause	**ADPKD** (Autosomal Dominant Polycystic Kidney Disease)

Transplanted Kidney

- Palpable as **mass (12–14 cm)** in either **iliac fossa**, typically on the **right**
- **Tenderness** may suggest **graft pyelonephritis or rejection**

Palpable Bladder

- Felt as a **soft, midline, suprapubic mass**
- Cannot **“get below”** it
- Causes **discomfort** in **acute retention**

Renal Angle Tenderness

- Check for **tenderness** if **pyelonephritis** suspected
- If not elicited on palpation, **sit patient up** and **percuss with closed fist** over **renal angles**

Percussion

Structure	Percussion Technique / Note
Ascites	Use **shifting dullness** or **fluid thrill** methods
Peritoneal dialysis fluid	Percussion will identify **fluid level**
Enlarged bladder	Percuss **midline from umbilicus downward** until note becomes **dull**
Enlarged kidneys	Note should remain **resonant** over the kidneys

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Auscultation

- Listen for **abdominal bruits** over:
  - **Epigastrium**
  - **Both renal arteries**
- Bruits may indicate:
  - **Renovascular disease**
  - **Atheromatous disease** in systemic arteries
- **Targeted Examination of Other Systems**

System	What to Examine	Associated Renal Implications
Joints	- Inflammation and swelling - Chronic arthritis (e.g. rheumatoid) - Bony tenderness in the spine - NSAID use for arthritis	- May indicate **systemic vasculitis** - **Amyloid** deposition → nephrotic syndrome - **Myeloma** - **NSAIDs** → risk of **AKI**
Nervous System	- Peripheral neuropathy (sensory and/or motor)	- Seen in **systemic vasculitis** - Common in **CKD with diabetes mellitus**
Prostate	-	- Relevant for **voiding symptoms**, obstruction, or **post-renal AKI**