

CKD DEFINITION:

- Kidney damage for ≥ 3 months, defined by abnormalities:
 - Structural: kidney biopsy, proteinuria, imaging
 - Functional: eGFR < 60 mL/min
- CKD is classified based on: cause, eGFR, albuminuria

CKD SCREENING:

- Diabetes, HTN, CVD
- Family hx of CKD (parents, siblings)
- Ethnic groups: First Nations, Pacific Islanders, African, Asian
- History of AKI

CKD COMPLICATIONS:

- Increased length of stay in hospital
- Increase risk of AKI and increase of morbidity/ mortality associated with AKI episode
- Increase risk of adverse drug reactions
- Increased risk for cardiovascular events
 - > Can't use risk scores such as FRS
- Increase mortality risk

CKD DIAGNOSIS:

Clinical presentation	<ul style="list-style-type: none"> • Most patients are asymptomatic • Past medical hx • Kidney sx (hematuria, bubbly/frothy urine, flank pain) • Extra-renal sx (edema, fever, hypertension, uremia sx) • Sudden/severity onset of sx
Blood tests	<ul style="list-style-type: none"> • SCr / eGFR: trend is very important • CBC, electrolytes • Immunologic markers
Urinalysis	<ul style="list-style-type: none"> • WBC/RBC/cellular casts/crystals • ACR (albuminuria)
Renal ultrasound	<ul style="list-style-type: none"> • Obstruction due to cancer, BPH, stones • Polycystics kidney disease • Chronic change \rightarrow small echogenic kidneys
Renal biopsy	<ul style="list-style-type: none"> • To obtain an exact diagnosis and guide therapeutic management • Prognostication • Invasive procedure, bleeding risk

CKD GENERAL MANAGERMENTS:

Treatment of reversible cause of CKD	<ul style="list-style-type: none"> • Txt of original disease • Improve renal perfusion • Stop nephrotoxic meds & dose-adjust based on eGFR • Urinary tract obstruction
Preventing or slowing down progression of CKD	<ul style="list-style-type: none"> • Avoid nephrotoxic drugs • Avoid AKI episodes (ACEI/ARB/diuretic if dehydrated) • Decreased proteinuria • BP control / BG control • Treatment of metabolic acidosis • Smoking cessation
Treatment of CKD complications	<ul style="list-style-type: none"> • Hyperkalemia • Metabolic acidosis • Hyperuricemia • Anemia, bone mineral disorders • CV risk assessment and dyslipidemia • Mental health, sexual health • Volume overload/edema • Uremic sx (nausea/no appetite, malnutrition, neuropathy, confusion/ encephalopathy, pericarditis, pruritis, fatigue/malaise)
Education about options if reach ESRD	<ul style="list-style-type: none"> • Dialysis (HD s. PD) • Transplantation • Conservative care

URINALYSIS

GROSS VISUAL EXAMINATION

	Normal	Influenced by
Color	Light yellow	Diet, drugs, other medical conditions
Clarity	Clear	Turbidity usually due to infxn, precipitated crystals

URINE DIPSTICK: semi-quantitative assessment

	Normal	Influenced by
Heme	-ve	<ul style="list-style-type: none"> • Urinary RBCs • Free Hb, Mb • Semen • HD • Vitamin c
Leukocyte esterase <i>(lysed of neutrophils/ macrophages)</i>	-ve	FALSE NEGATIVES if... <ul style="list-style-type: none"> • Concentrated urine • Proteinuria • Glucosuria
Nitrite	-ve	<i>Enterobacteriaceae</i> or <i>Klebsiella</i> convert nitrate to nitrite
Protein	-ve	<ul style="list-style-type: none"> • Detects albuminuria > 300 mg/d <ul style="list-style-type: none"> ◦ Depends on urine dilution • If positive \rightarrow have ACR done (tests routinely done in all CKD patients)
pH	4.5 – 8	<ul style="list-style-type: none"> • Low pH: metabolic acidosis • High pH: renal tubular acidosis
Specific gravity <i>(reflect of osmolality)</i>	1.010 - 1.025	INCREASED WITH <ul style="list-style-type: none"> • Glucosuria • Radio contrast
Glucose	-ve	<ul style="list-style-type: none"> • Increase blood glucose (>10 mmol/L) • Proximal tubule inability to reabsorb glucose • SGLT-2 inhibitors
Ketones <i>(produced by fat metabolism)</i>	-ve	<ul style="list-style-type: none"> • DKA • Infection • Stress states • Pregnancy • Starvation • Low-carb diet
Bilirubin <i>(breakdown of RBC, usually by liver)</i>	-ve	<ul style="list-style-type: none"> • Liver disease • Hemolysis • Bile duct obstruction

MICROSCOPIC EVALUATION: quantification for leukocytes/ erythrocytes (per hpf)

Crystals	<ul style="list-style-type: none"> • Uric acid • Calcium phosphate • Calcium oxalate • Cysteine • Struvite stones
Casts	Organic matrix (protein) formed in the tubular lumen usually because of urine stasis, low pH and greater urine concentration
Clear	<ul style="list-style-type: none"> • Infection • Precipitated crystals
RBCs	<ul style="list-style-type: none"> • Glomerular nephritis • Glomerular hematuria • Interstitial nephritis (30%)
WBCs	<ul style="list-style-type: none"> • Interstitial (more likely) • Glomerular inflammation
Renal epithelial cells	<ul style="list-style-type: none"> • Acute tubular necrosis • Acute interstitial nephritis • Proliferative GN
Granular	<ul style="list-style-type: none"> • ATN
Hyaline	<ul style="list-style-type: none"> • Non-specific • Pt on diuretics
Waxy	<ul style="list-style-type: none"> • Non-specific • Usually in AKI or CKD
Broad	<ul style="list-style-type: none"> • Advanced CKD