Chronic Kidney Disease (CKD) in Primary Care

Identify, Manage, Refer
## IDENTIFY risk

- Diabetes
- Hypertension
- Family history of kidney disease
- Nephrototoxic medication exposure
- Medication requiring renal dose-adjustment
- High-risk ethnic groups—First Nations, African, South Asian, Hispanic
- Vascular disease—prior diagnosis of CVD, Stroke/TIA or PVD
- Multi-system disease with potential kidney involvement (e.g. Systemic Lupus Erythematosus)

## INVESTIGATE through testing

### Creatinine umol/L or eGFR mL/min/1.73m² by CKD-EPI equation
- If patient of African descent, multiply eGFR results by 1.159
- In patient with a new finding of reduced eGFR or a rapid rise in serum creatinine, exclude causes of acute kidney injury (e.g. volume depletion, intercurrent illness, nephrotoxins, obstruction), then repeat creatinine/eGFR after correcting potential causes of deterioration

### Urine ACR mg/mmol (Albumin to Creatinine Ratio)
- Preferably 1st am void. At least 2 out of 3 random urine ACRs must be elevated in order to be considered abnormal

### Urinalysis

## ASSESS test results

**Patient presenting with one or more of these test results:**

**Action**

- Retest ACR, eGFR and Urinalysis in 2 weeks
- Manage medically
- Order renal ultrasound (if GU obstruction then refer to Urology)
- Refer to Nephrology (see Referral form)

### eGFR < 30
- Rapidly declining eGFR by > 20% over days to weeks
- eGFR 30-60 AND eGFR decline ≥ 10 mL/min/1.73 m² in 1 year

- ACR > 60 in non-diabetic
- ACR > 30 in non-diabetic and age < 70 yrs
- ACR > 220 or 24 hour protein > 3 g/TV
- Hematuria AND ACR > 3 mg/mmol

- Hereditary Kidney disease (e.g. polycystic kidneys)
- Potassium or acid-base disorders
- Pregnancy and CKD
- Kidney Failure Risk > 5% at 5 years (Kidney Failure Risk Equation)

### Stable eGFR 30–59 and ACR < 3

### Stable eGFR 30–59 and ACR 3–30 with no hematuria

### eGFR 60–89 and ACR < 30 with no hematuria

### eGFR ≥ 90 and ACR < 3

**Refer to Nephrology with the following**

- Medical history
- Medication list
- Recent Creatinine/eGFR results (and previous results if available)
- Urea
- Electrolytes
- Bicarbonate or Total CO₂
- Calcium
- Phosphate
- Albumin
- Urinalysis
- Urine albumin to creatinine ratio (ACR)
- Attach renal ultrasound results if available

*ACR in mg/mmol # eGFR in mL/min/1.73m² (CKD-EPI equation)
MANAGE medically

Assess patient for reversible causes of kidney injury
- Volume depletion, hypotension, obstruction, nephrotoxic drugs (such as NSAIDs, Lithium, Aminoglycosides, Tacrolimus, Cyclosporine, and Contrast Media)

Slow Progression of CKD and Modify Cardiovascular Risk
- BP management & ACR management
  - Diabetes target < 130/80
  - Non diabetes target < 140/90
  - Use ACEi* or ARB* as 1st line for CKD and add other agents as required
  - Restrict sodium to < 2 gm/day
  - ADPKD target < 110/75 in age < 50 and eGFR > 60
- ACR management
  - If ACR > 30 use ACEi/ARB*
- Glycemic control
  - Target A1C as per Canadian Diabetes Association Guidelines: guidelines.diabetes.ca/fullguidelines
- Lipid control
  - Use statins as per Canadian Cardiovascular Society and Canadian Diabetes Association Guidelines: onlinecjc.ca/article/S0828-282X(16)30732-2/abstract and guidelines.diabetes.ca/fullguidelines
- Lifestyle modification
  - Stop smoking
  - Increase physical activity
  - Target healthy body weight BMI 18-25
  - Avoid high animal protein intake > 1.2 g/kg/d
  - Maintain adequate fluid intake

Medication Considerations and Patient Safety
- Nephrotoxic medications should be avoided or used with caution in patients with any degree of CKD, as indicated by eGFR. Regular monitoring of kidney function is required. Avoid NSAIDS. Avoid dual RAAS blockade.
- Contrast media dye poses a risk of acute kidney injury (AKI) in patients with CKD. If procedure is medically necessary, monitor renal function pre and post dye. Cessation of ACEi*, ARB*, diuretics as well as metformin are recommended prior to procedure. Gadolinium should be avoided in patients with eGFR < 30; caution in eGFR 30-60 due to risk of nephrogenic systemic fibrosis
- Patients with CKD are at risk of AKI with volume depletion (e.g., severe nausea, vomiting and diarrhea lasting > 24 hours). If unable to maintain adequate fluid intake during an illness, withholding medications is recommended based on the acronym SADMANS: S (sulfonylureas), A (ACEi*), D (diuretics, direct renin inhibitors), M (Metformin), A (ARB*), N (NSAIDs), S (SGLT2 inhibitors) guidelines.diabetes.ca/docs/cpg/Appendix-8.pdf
- Be aware of common drugs excreted by the kidneys that may require renal dose adjustments (Novel Anticoagulants, Antihyperglycemics, Antimicrobials, Antivirals, Opioids, Antihyperlipidemics, Psychotropics and Miscellaneous [gabapentin, digoxin, spironolactone, allopurinol, colchicine, ranitidine, metoclopramide]) and ensure all renally excreted medications are dose adjusted as per Cockcroft Gault equation or use alternative treatment.

What is the most accurate and reliable index of kidney function for drug dosing?
Historically, the most frequently used equation to estimate kidney function and dose medications has been the Cockcroft and Gault (CG) Creatinine Clearance (CrCl, reported in mL/min). Medications approved prior to 2009 were developed before creatinine standardization using Isotope Dilution Mass Spectrometry (IDMS). The effect is that recommended drug doses are likely lower than they would be today using IDMS standardization. Currently, the CKD-EPI equation (reported in mL/min/1.73m²) is the most accurate method for eGFR but documentation of its utility for drug dosing is limited.

It is important for clinicians to compare estimates of renal function and this is of particular importance for those drugs with a narrow therapeutic index. Additionally, regardless of calculation method used, measurement should still be considered estimations and patient-specific variables need to be taken into account (e.g. extremes of body size, extremes of age, paraplegia/quadriplegia, situations with rapidly changing renal function, etc.).

Utilize CG CrCl or individualized CKD-EPI eGFR in mL/min (i.e. not normalized for body surface area) for drug dosing especially in patients whose BSA is considerably larger or smaller than 1.73m²

- CG CrCl (mL/min) = (140-age) x IBW (kg) x 1.2 / SCr (umol/L) [multiply by 0.85 if female] where: IBW = ideal body weight
- eGFR\(^{30}\) (mL/min) = CKD EPI eGFR (mL/min/1.73m²) x estimated BSA or use GFR calculator where: BSA (body surface area) = 0.007184 x W\(^{0.425}\) x H\(^{0.725}\) (Dubois formula) or BSA = √ height (cm) x weight (kg)/3600 (Mostellar Formula)

* Avoid ACEi/ARB in pregnancy; use effective contraception in women of child-bearing potential; monitor potassium & eGFR within 2 weeks of initiation and stop if eGFR falls by more than 25-30%
**Definition of Kidney Disease**
Kidney Disease Improving Global Outcomes (KDIGO) defines CKD as abnormalities of kidney structure or function, present for > 3 months, with implications for health.

**Criteria for CKD** are any of the following present for > 3 months:
- Albuminuria ACR ≥3mg/mmol
- Urine sediment abnormalities (e.g. RBC casts, RBCs, WBC casts and WBCs)
- Electrolyte and other abnormalities due to tubular disorders
- Abnormalities detected by histology
- Structural abnormalities detected by imaging
- History of kidney transplantation
- eGFR < 60 mL/min/1.73m²

**Importantly regarding eGFR**
- eGFR will automatically be reported on all Adult (≥18 yrs) outpatient Creatinines (except emergency and renal dialysis units)
- eGFR will be calculated using the CKD-EPI equation, multiply the eGFR results by 1.159 if patient is of African descent
- eGFR results greater than 90 will be reported as > 90
- CKD-EPI eGFR has not been extensively validated for drug dosing

**Interpret eGFR with caution**
- High or low muscle mass (athletes, malnourished, paraplegics)
- Specific diets with unusually high or low protein, such as high dietary creatine intake (creatine supplements)

**Interpreting ACR**
- Albumin or protein in the urine is a marker of both progression of kidney disease and increased risk of CV events
- A random urine ACR is preferred (vs. 24 hour) to detect proteinuria (ideally first morning void)
- ACR ≥ 3.0 mg/mmol is clinically significant

**Prognosis of CKD by GFR and Albuminuria Categories: KDIGO 2012**

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**CKD Notes**

- low risk, if no other markers of kidney disease, no CKD
- moderately increased risk
- high risk
- very high risk

- eGFR serial monitoring is crucial when diagnosing CKD, one reading alone is not useful
- eGFR should not be used in pregnant woman and situations where creatinine is changing rapidly (acute kidney injury or acute illness requiring hospitalization)

**CKD Clinical Decision Support Tools**
Chronic Kidney Disease (CKD) Clinical Pathway, University of Calgary: [www.ckdpathway.ca](http://www.ckdpathway.ca)
Kidney Wise Toolkit: Identification, Detection and Management of CKD, Ontario Renal Network (ORN) [www.kidneywise.ca](http://www.kidneywise.ca)

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