

Approach to the detection and management of chronic kidney disease

What primary care providers need to know

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Abstract

Objective To help primary care providers, both family physicians and nurse practitioners, identify, detect, and manage patients with and at risk of chronic kidney disease (CKD), as well as outline criteria for appropriate referral to nephrology.

Sources of information Published guidelines on the topic of CKD and its comorbidities were reviewed. A MEDLINE search was conducted using the MeSH terms *chronic renal insufficiency*, *family practice*, and *primary health care*. The search was limited to reviews and articles in English. The search covered all relevant articles from 2006 to the present.

Main message The KidneyWise clinical tool kit, created by the Ontario Renal Network and available at www.kidneywise.ca, provides evidence-informed, practical guidance to primary care providers on the diagnosis and management of CKD. A component of this tool is an algorithm that offers a step-by-step approach to diagnosing and managing CKD. This resource will help empower providers to identify those at high risk of this condition, order appropriate diagnostic tests, help prevent further disease progression, and reduce comorbid cardiovascular risk in patients with CKD.

Conclusion Most patients with CKD can be managed in primary care. Serial follow-up is essential to identify patients at high risk of progression to advanced stages of CKD, including end-stage renal disease. Primary care providers must continue to work together with local nephrologists to improve the lives of those living with CKD.

Editor's key points

- ▶ Chronic kidney disease (CKD) is an abnormality of kidney function that is present for more than 3 months; criteria required to make a diagnosis of CKD include a persistent reduction in estimated glomerular filtration rate of less than 60 mL/min per 1.73 m² or 1 or more markers of kidney injury (eg, albuminuria). The increasing prevalence of CKD can be attributed in part to risk factors such as the growing elderly population and increasing rates of diabetes and hypertension.
- ▶ Screening for CKD should only be conducted for patients with known risk factors and in the absence of an acute intercurrent illness. The tests of choice to diagnose CKD include estimated glomerular filtration rate and urine albumin-creatinine ratio. For patients with CKD who progress to more advanced stages or meet recommended referral criteria (eg, rapid deterioration in kidney function), it is important to seek consultation from a nephrologist.
- ▶ Primary care management of CKD involves implementing measures that reduce cardiovascular risk (eg, lifestyle modifications), minimize further kidney injury (eg, avoiding nephrotoxins), and slow the rate of CKD progression (using renin-angiotensin system blockade for pharmacotherapy).

Points de repère du rédacteur

- ▶ Les néphropathies chroniques (NC) sont une anomalie de la fonction rénale qui dure plus de 3 mois; les critères nécessaires pour poser un diagnostic de NC comprennent une réduction persistante du taux de filtration glomérulaire de moins de 60 mL/min par 1,73 m², ou 1 ou plusieurs des marqueurs de lésion rénale (p. ex. albuminurie). La prévalence à la hausse des NC peut en partie être attribuable au vieillissement de la population et aux taux accrus de diabète et d'hypertension.
- ▶ Le dépistage des NC devrait se limiter aux patients ayant des facteurs de risque connus et en l'absence de maladies aiguës intercurrentes. Pour diagnostiquer les NC, les analyses à privilégier sont le taux estimé de filtration glomérulaire et le ratio albumine-créatinine dans l'urine. Il importe de demander une consultation en néphrologie pour les patients atteints d'une NC qui progresse à des stades plus avancés ou qui répondent aux critères recommandés à cet égard (p. ex. détérioration rapide de la fonction rénale).
- ▶ La prise en charge des NC en soins primaires comporte la mise en œuvre de mesures qui réduisent les risques cardiovasculaires (p. ex. modifications au mode de vie), réduisent l'aggravation des lésions rénales (p. ex. en évitant les néphrotoxines) et ralentissent le taux d'évolution de la NC (recourir au blocage du système rénine-angiotensine comme pharmacothérapie).

Détection et prise en charge des néphropathies chroniques

Ce que les médecins de soins primaires doivent savoir

Résumé

Objectif Aider les professionnels des soins primaires, tant les médecins de famille que les infirmières praticiennes, à identifier, dépister et prendre en charge les patients atteints ou à risque d'une néphropathie chronique (NC), et présenter les critères justifiant une demande appropriée de consultation en néphrologie.

Sources de l'information Les guides de pratique clinique publiés sur les NC et leurs comorbidités ont été passés en revue. Une recension dans MEDLINE a été effectuée au moyen des expressions MeSH *chronic renal insufficiency, family practice* et *primary health care*. La recherche documentaire s'est limitée aux revues et aux articles en anglais, et couvrait tous les articles pertinents de 2006 à aujourd'hui.

Message principal La trousse d'outils cliniques *KidneyWise*, produite par le Réseau rénal de l'Ontario et accessible en anglais à www.kidneywise.ca, offre des conseils pratiques, éclairés par des données probantes, à l'intention des professionnels des soins primaires sur le diagnostic et la prise en charge des NC. Parmi les outils de la trousse se trouve un algorithme qui propose une approche par étapes à l'égard du diagnostic et de la prise en charge des NC. Cette ressource aidera les professionnels à identifier les personnes à risque élevé de contracter cette maladie, à prescrire les analyses diagnostiques appropriées, à freiner la progression de la maladie, et à réduire les risques cardiovasculaires concomitants chez les patients atteints de NC.

Conclusion La plupart des patients souffrant d'une NC peuvent être pris en charge en soins primaires. Il est essentiel de procéder à un suivi périodique pour identifier les patients à risque élevé que leur maladie évolue vers des stades avancés, y compris la néphropathie au stade terminal. Les professionnels des soins primaires doivent continuer à travailler avec les néphrologues locaux pour améliorer la vie des personnes vivant avec une NC.

Case descriptions

Case 1. A 57-year-old woman with hypertension (HTN) moves to your practice now that her family physician has retired. Her laboratory test results completed in the past year reveal an estimated glomerular filtration rate (eGFR) of 55 mL/min per 1.73 m² and a urine albumin-creatinine ratio (ACR) of 5.0 mg/mmol. Does this patient have chronic kidney disease (CKD)?

Case 2. A 50-year-old man with newly diagnosed type 2 diabetes mellitus (DM) comes to your office to review his laboratory test results. His hemoglobin A_{1c} (HbA_{1c}) level is 7%. His urine ACR, on 2 occasions (3 months apart), is 10.0 mg/mmol. His blood pressure (BP) is stable at 125/75 mm Hg. He is not taking any medications. What CKD management issues should be discussed with this patient?

Case 3. An 85-year-old man is admitted to the nursing home unit where you work. He has HTN and DM, both optimally controlled. Should you screen this patient for CKD?

Chronic kidney disease, as defined by the Kidney Disease: Improving Global Outcomes (KDIGO) international guidelines, is an abnormality of kidney structure or function that is present for more than 3 months, with implications for health.^{1,2} Criteria required to make a diagnosis of CKD include a persistent reduction in eGFR of less than 60 mL/min per 1.73 m² or 1 or more markers of kidney injury (eg, albuminuria, abnormal urine sediment).^{1,2} Between 1.3 and 2.9 million Canadians are estimated to have CKD, and the increasing prevalence can be attributed in part to risk factors such as the growing elderly population and increasing rates of DM and HTN.² Chronic kidney disease has been identified as a premature risk factor for death and often coexists with cardiovascular disease, resulting in a substantial burden on the health care system.² Furthermore, patients with advanced CKD who progress to end-stage renal disease (ESRD) require dialysis or a kidney transplant to survive.³ Hemodialysis costs the Canadian health care system approximately \$71 000 to \$107 000 per patient per year of treatment, depending on whether it is provided at home or in a hospital or clinic setting, respectively, while the initial cost of transplant is estimated to be \$100 000.⁴

Given this serious public health dilemma, early detection and prevention of progression of CKD through primary care is essential.^{3,5} Primary care providers (PCPs) are well positioned to manage most CKD cases independently given that most patients are at low risk of progression to ESRD.^{2,3,6,7} Furthermore, as the role of primary care in the treatment of chronic cardiovascular diseases such as DM, HTN, and coronary artery disease has expanded dramatically over the past few years, PCPs are well positioned to manage these CKD comorbidities. For patients with CKD who do progress to advanced stages, prompt referral to nephrology is associated with better patient outcomes and experiences along their care journey.^{2,6,7}

To help PCPs identify, detect, and manage patients with and at risk of CKD, as well as determine when referral to a nephrologist is appropriate, this article will use a tool created by the Ontario Renal Network to outline a step-by-step approach to diagnosing and managing CKD.

Sources of information

Published guidelines on the topic of CKD and its comorbidities (eg, HTN, DM, hyperlipidemia) were reviewed. A MEDLINE search was conducted using the MeSH terms *chronic renal insufficiency*, *family practice*, and *primary health care*. The search was limited to reviews and articles in English. The search covered all relevant articles from 2006 to the present.

Main message

The Ontario Renal Network, a provincial government agency that manages the delivery of CKD services in Ontario, created the KidneyWise clinical tool kit (available at www.kidneywise.ca) to help PCPs determine which patients are at high risk of developing CKD, and help them properly diagnose and manage the disease in order to reduce the risk of further progression.⁸ One of the tool's components is an evidence-based clinical algorithm (**Figure 1**), which offers a step-by-step approach to the identification and management of CKD, and its steps are further outlined here.⁸

Step 1: Identify and evaluate patients at risk of CKD.

The Canadian Society of Nephrology, along with other international expert panels, does not support general population-based screening for CKD.^{2,6,9,10} Instead, it is recommended that high-risk populations be targeted when testing for the presence of CKD. These include patients with HTN, DM, and cardiovascular disease (coronary artery disease, congestive heart failure, stroke, peripheral vascular disease).¹⁰ First Nations, Inuit, and Metis peoples are also at higher risk of developing ESRD, primarily through the higher rates of obesity and DM in these populations.^{11,12} Given that the risk of CKD increases with age, with 27.6% of those older than age 60 having an eGFR of less than 60 mL/min per 1.73 m², coupled with the aim of sparing valuable health care resources, limiting CKD screening to those with cardiovascular disease between the ages of 60 and 75 is reasonable.^{8,13} This age parameter serves as a caution against screening for CKD in the frail elderly or those with a short life expectancy.⁷ It is also important to note that a substantial proportion of otherwise healthy seniors will have an eGFR of less than 60 mL/min per 1.73 m² owing to normal aging.⁸ Although other risk factors could be added to this list (eg, family history of stage 5 CKD, hereditary kidney disease, polycystic kidney disease, or hereditary nephritis; and those with a multisystem disease with renal involvement [eg, systemic lupus erythematosus]),^{10,14} those with HTN, DM, and cardiovascular disease (aged 60 to 75) are the high-risk populations most commonly found in primary care settings.^{8,13}

Step 2: Detect CKD. Once a patient is identified as being at elevated risk of developing CKD, there are 2 investigations that should be ordered: an eGFR and a urine ACR test.^{6,9,10}

Estimated glomerular filtration rate: In most outpatient laboratories in Canada, an eGFR is automatically obtained when a serum creatinine measurement is ordered and serves as a measure of kidney function. Stages of CKD, as outlined in the KDIGO international guidelines, are based on eGFR results (**Figure 2**).¹ In isolation, an eGFR result of less than 60 mL/min per 1.73 m² for a period of 3 months, confirmed on repeat testing, is enough to make the diagnosis of CKD.¹ Most patients with CKD who are managed in primary care will fall into stage 3—the G3a and G3b categories (eGFR of 30 to 59 mL/min per 1.73 m²). Patients who have more advanced CKD (eGFR of <30 mL/min per 1.73 m²) fall into stage 4 or 5 CKD and are usually managed in consultation with a nephrologist (discussed further in the management section below).^{2,6,7}

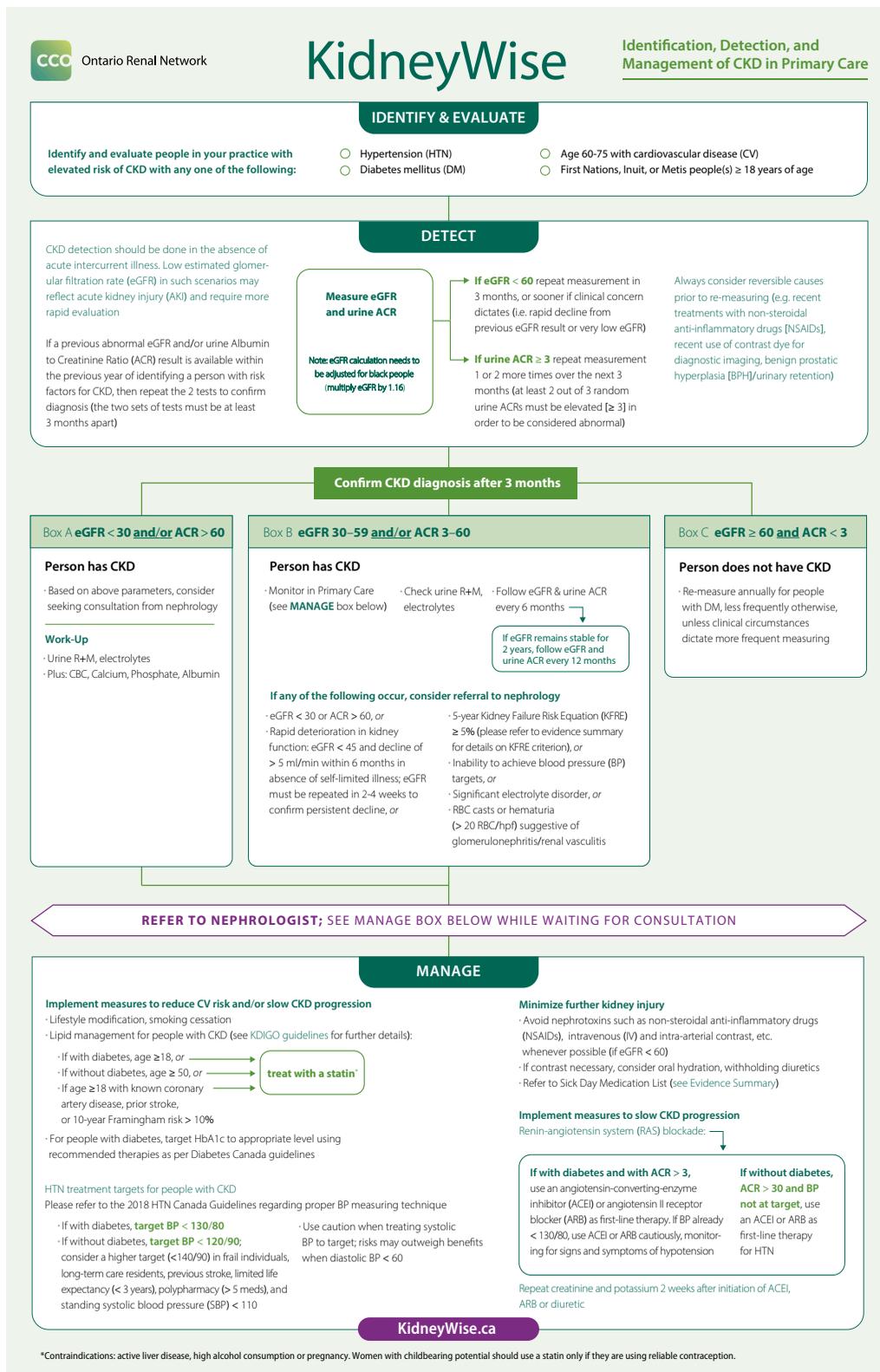
Urine ACR: The urine ACR test is a measure of kidney damage or injury in which protein (albumin) is abnormally excreted.¹ Two abnormal results with values greater than 3 mg/mmol, confirmed on repeat testing, over a period of 3 months can also be used to diagnose CKD.^{1-3,6} Unlike eGFR, if the first 2 urine ACR results are discordant, a third test must be ordered to determine if the result is normal or abnormal.²

It is also recommended that PCPs not order 24-hour urine tests for protein to diagnose patients with CKD. A urine ACR test is a more appropriate choice and much less onerous, given that the patient can provide a sample in the provider's office or affiliated laboratory.^{1,10} The 24-hour urine collection is reserved for patients with more advanced CKD who are being assessed by a nephrologist. Chronic kidney disease can also be staged based on the persistent presence of albuminuria (**Figure 2**).¹

In CKD detection, other factors that need to be considered include acute kidney injury (AKI) and intercurrent illness.

Acute kidney injury and intercurrent illness: Although 2 abnormal eGFR or urine ACR results over a period of 3 months are required to make a diagnosis of CKD, any initial abnormal test results in an asymptomatic patient that cause concern should be investigated promptly to rule out reversible causes of AKI.^{1,6,7,10} For example, an unexpectedly low baseline eGFR, or a value that is considerably lower than a previous test result, might be due to undisclosed frequent use of over-the-counter nonsteroidal anti-inflammatory drugs (NSAIDs), a known nephrotoxic class of medications.^{1,6,7,15} An abnormal test result might also reflect a patient who was screened while living with an acute intercurrent illness (eg, viral gastroenteritis).⁸ The latter cause of renal impairment likely reflects an AKI secondary to dehydration or volume depletion as opposed to CKD.^{1,15} Another possibility includes patients experiencing urinary retention (eg, benign prostatic hypertrophy). Although renal imaging studies are not routinely recommended when screening for CKD, a renal ultrasound would be an appropriate investigation to rule out suspected obstructive uropathy.^{6,15}

Figure 1. Algorithm for identifying, detecting, and managing chronic kidney disease



Reproduced from the Ontario Renal Network.⁸

Figure 2. Current CKD nomenclature used by KDIGO: Classification of CKD is based on cause, GFR category, and albuminuria category.

Prognosis of CKD by GFR and Albuminuria Categories: KDIGO 2012

				Persistent albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30-300 mg/g 3-30 mg/mmol	>300 mg/g >30 mg/mmol
GFR categories (mL/min/1.73 m ²) Description and range	G1	Normal or high	≥90			
	G2	Mildly decreased	60-89			
	G3a	Mildly to moderately decreased	45-59			
	G3b	Moderately to severely decreased	30-44			
	G4	Severely decreased	15-29			
	G5	Kidney failure	<15			

Green: low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk; Orange: high risk; Red, very high risk.

CKD—chronic kidney disease, GFR—glomerular filtration rate, KDIGO—Kidney Disease: Improving Global Outcomes. Reproduced with permission from the KDIGO Work Group.¹

Possible scenarios when interpreting CKD investigation results: Assuming an AKI is not present, there are 3 possible scenarios that can occur with repeat CKD testing 3 months after the initial eGFR or urine ACR tests revealed abnormal results:

- with an eGFR of 60 mL/min per 1.73 m² or higher and an ACR of less than 3 mg/mmol, the patient does not have CKD;
- with an eGFR of 30 to 59 mL/min per 1.73 m² or an ACR of 3 to 60 mg/mmol, the patient has CKD; and
- with an eGFR of less than 30 mL/min per 1.73 m² or ACR greater than 60 mg/mmol, the patient has CKD and a consultation with a nephrologist is recommended (Figure 1).⁸

Follow-up investigations: For patients whose test results are negative for CKD, follow-up is recommended at least on an annual basis, particularly for patients with DM.^{8,10} For patients who are newly diagnosed with CKD, PCPs should arrange to discuss the diagnosis and order further investigations, including electrolyte measurement and a urinalysis (routine and microscopic) to look for red blood cell casts (eg, glomerulonephritis).^{6,7} These patients will also require serial monitoring (eGFR and urine ACR) for signs of progression to advanced CKD. The recommended frequency is based primarily on

expert opinion, but every 6 months, reduced to annually once the patient's eGFR is stable for a 2-year period, is a reasonable approach.^{1,6,8}

Although most patients with CKD will not progress to ESRD and can be managed by their PCPs, there are circumstances in which referral to nephrology is recommended, as outlined in **Box 1**.^{6-8,14,16,17} One of the criteria for referral incorporates the Kidney Failure Risk Equation (KFRE), calculated using the patient's age, sex, and eGFR and urine ACR values.¹⁷ The KFRE provides a validated estimate of risk of progression to ESRD, and a 5-year KFRE probability of 5% or more helps identify higher-risk patients who should be considered for referral.^{17,18} A KFRE calculator is available at https://qxmd.com/calculate/calculator_308/kidney-failure-risk-equation-4-variable.

Step 3: Manage CKD. Primary care management of CKD involves implementing measures that reduce cardiovascular risk, minimizing further kidney injury, and slowing the rate of CKD progression.

Reduce cardiovascular risk and slow CKD progression: It has already been established that as a patient's kidney function or eGFR decreases, his or her risk of a cardiovascular complication increases, especially when transitioning through the stages toward advanced

CKD.^{1,6,7,19} For example, the adjusted hazard ratios for cardiovascular events are 1.4, 2.0, and 2.8 for eGFR ranges of 45 to 59 mL/min per 1.73 m², 30 to 44 mL/min per 1.73 m², and 15 to 29 mL/min per 1.73 m², respectively.¹⁹ The adjusted risk of death and hospitalization follows a similar pattern.¹⁹ This direct correlation therefore warrants the implementation of primary care measures to modify cardiovascular risk factors of patients with CKD.

Box 1. Circumstances in which referral to nephrology is recommended

Indications for referral for CKD, including proteinuria, are the following:

- eGFR of < 30 mL/min per 1.73 m², or
- rapid deterioration in kidney function (ie, eGFR of < 45 mL/min per 1.73 m² and decline of > 5 mL/min per 1.73 m² within 6 mo in absence of self-limiting illness; eGFR must be repeated in 2-4 wk to confirm persistent decline), or
- ACR of > 60 mg/mmol, or
- 5-year KFRE probability of ≥ 5%

Other indications for referral to nephrology include the following:

- resistant or suspected secondary hypertension
- suspected glomerulonephritis or renal vasculitis, including RBC casts or hematuria (> 20 RBCs per high-power field)
- metabolic workup for recurrent renal stones
- serious electrolyte disorder

ACR—albumin-creatinine ratio, CKD—chronic kidney disease, eGFR—estimated glomerular filtration rate, KFRE—Kidney Failure Risk Equation, RBC—red blood cell.
Data from Vassalotti et al,⁶ Sakhuja et al,⁷ Ontario Renal Network,⁸ Interdisciplinary Chronic Disease Collaboration et al,¹⁴ Canadian Diabetes Association Clinical Practice Guidelines Expert Committee,¹⁶ and Tangri et al.¹⁷

Lifestyle modifications such as regular exercise (30 minutes per day), healthy eating, and avoidance of smoking should be included in a CKD treatment plan,^{1,2} and interdisciplinary health care providers should be used, where available, as part of a team-based approach (eg, registered dietitian, nurse). For patients with CKD and DM, glycemic control targets as recommended by Diabetes Canada should be followed.¹⁶ The KDIGO recommendations on starting statin therapy for CKD patients differ slightly from the Framingham approach and can be found in **Figure 3**.^{20,21} It is important to remember to counsel patients before initiating pharmacotherapy in order to review the risks and benefits of treatment.

The recommended BP treatment targets for people with CKD and HTN are based on the results of the Systolic Blood Pressure Intervention Trial (SPRINT).²² Please refer to the 2018 Hypertension Canada guidelines regarding proper BP measurement technique.²³ The SPRINT randomized controlled trial²² included people with CKD (but not DM) and found that an unattended systolic BP treatment target of less than 120 mm Hg, measured with an automated oscillatory BP monitor, reduced cardiovascular outcomes and mortality compared with a target of less than 140 mm Hg.²² It is recommended that higher systolic BP targets (140 mm Hg) are appropriate for people with CKD, who were not well represented in SPRINT, and who are at increased risk of adverse events, including those with a history of stroke, those with frailty, those who live in long-term care facilities, those with limited life expectancy (< 3 years), or those with orthostatic hypotension (standing systolic BP of < 110 mm Hg). It is also recommended that a cautious approach to treatment be taken for people who take 5 or more medications (polypharmacy)²⁴ or whose diastolic BP is less than 60 mm Hg, as risks might outweigh benefits (eg, falls).²⁵

Figure 3. The KDIGO CKD lipid guidelines for management of hyperlipidemia



CAD—coronary artery disease, CKD—chronic kidney disease, DM—diabetes mellitus, KDIGO—Kidney Disease: Improving Global Outcomes.
*Contraindications include acute liver disease, high alcohol consumption, or pregnancy. Women with child-bearing potential should only use a statin if there is reliable contraception.
Data from KDIGO Lipid Work Group²⁰ and Anderson et al.²¹

Similar precautions should be taken into account for people with CKD and DM whose recommended BP treatment target is less than 130/80 mm Hg.^{16,23}

Minimize further kidney injury: To minimize further kidney injury in patients with CKD, nephrotoxins should be avoided. For example, if patients with CKD are unable to maintain adequate fluid intake during an illness (eg, viral gastroenteritis) and are at risk of volume depletion, it is recommended that potentially nephrotoxic or renally excreted drugs be withheld until the patient has recovered.⁶ As outlined in the Diabetes Canada guidelines, these can be recalled by referring to the acronym SADMANS (sulfonylureas, angiotensin-converting enzyme inhibitors [ACEIs], diuretics, metformin, angiotensin receptor blockers [ARBs], NSAIDs, and sodium-glucose cotransporter-2 inhibitors).¹⁶ Aside from exceptional circumstances, prolonged use of NSAIDs should not be recommended to patients with CKD, including over-the-counter use.^{1,6,7}

There are also a variety of medications excreted by the kidneys that require dose adjustment in those with CKD to prevent complications, especially in frail elderly patients, and providers should refer to their local pharmacists or accredited drug databases for guidance.^{1,7} Finally, if a patient requires a diagnostic imaging test involving the use of contrast dye, he or she should be instructed to hydrate beforehand and counseled regarding interrupting diuretic use where applicable to reduce the risk of contrast-induced nephropathy.^{1,6}

Use renin-angiotensin system blockade to help prevent progression to advanced CKD: Achieving BP control in CKD patients with HTN, and using ACEI or ARB medications, known as *renin-angiotensin system blockade*, to manage proteinuria can help prevent progression to advanced CKD.^{1,6,7} For patients with CKD and DM who have HTN (BP >130/80 mm Hg), as well as proteinuria (eg, diabetic nephropathy), an ACEI or ARB should be used as first-line treatment if their urine ACR level is persistently greater than 3 mg/mmol.²³ Renin-angiotensin system blockade has also been shown to decrease progression of CKD in normotensive patients with DM who have abnormal urine ACR levels.^{8,16} For patients with CKD but without DM, whose BP levels are not at target, an ACEI or ARB should be used as first-line pharmacotherapy if the urine ACR level is persistently greater than 30 mg/mmol.²³ In either circumstance, if required, the dose of an ACEI or ARB should be maximized over time while monitoring for unwanted side effects (eg, orthostatic hypotension and hyperkalemia).

It is important to remember to measure serum potassium and creatinine levels and eGFR approximately 2 weeks after any initiation or dose titration of an ACEI, ARB, or diuretic to monitor for the development of a potassium disorder or a substantial decrease in eGFR.^{1,6} A substantial drop in eGFR or rise in serum creatinine level (eg, >25%) might suggest volume depletion,

concomitant NSAID use, or underlying renovascular disease (for those taking ACEIs or ARBs) that might require further evaluation. This higher-risk group should be monitored carefully and, in some cases, might need a reduction or discontinuation of the offending drug until further advice from nephrology is obtained.^{6,16} Outpatient management strategies for hyperkalemia include restriction of dietary potassium and consideration of a thiazide or loop diuretic to increase potassium excretion.^{6,16}

Combination therapy with an ACEI plus an ARB (dual renin-angiotensin system blockade) should not be prescribed. Trials have shown complications such as AKI and severe hyperkalemia, with no associated mortality or cardiovascular benefit.^{1,6,7,10,16}

Step 4: Refer to nephrology, if appropriate. It is very important for PCPs to identify patients with CKD at an early stage of the disease to prevent or delay the progression to advanced CKD or even ESRD.⁷ For patients with CKD who do progress, timely access to a nephrologist is essential to manage any advanced disease complications and potentially prepare patients for renal replacement therapy (eg, dialysis or renal transplant).⁷ When requesting a nephrology consultation, additional investigations are recommended.^{2,6,8,14} Please refer to the KidneyWise tool kit for details.⁸ This workup is merely a guideline and might vary depending on the consultant nephrologist's preferences.

In situations where nephrology consultation is required, PCPs should aim for a shared care model in which they do not lose the relationship with their patient, even in cases requiring ongoing nephrology follow-up.⁷ Patients with CKD still require ongoing preventive care (eg, cancer screening, vaccinations), management of acute and other chronic medical conditions, and mental health counseling, all of which are most suitably provided at the primary care level.

Resources for PCPs

In addition to the clinical algorithm presented and summarized in this article (**Figure 1**), the KidneyWise tool kit (www.kidneywise.ca) provides an outpatient nephrology referral form that can be incorporated into an electronic medical record for ease of use.⁸ There is also an interactive online tool that allows providers to review their CKD workup with patients at the point of care and serves as an educational resource for medical trainees.

Another useful Canadian CKD resource for primary care is the *CKD Clinical Pathway* (available at www.ckdpathway.ca), which was developed by the Interdisciplinary Chronic Disease Collaboration with support from the Northern and Southern Alberta Renal Programs.¹⁴ This clinical pathway has additional information on self-management and dietary advice for patients with CKD not included to date with the KidneyWise tool kit.

We hope that with the use of the above-mentioned CKD resources, both PCPs and patients can be empowered to play a more active role in the management of this condition.²⁶

Case resolutions

Case 1. Although it was appropriate to screen this patient for CKD given her known diagnosis of HTN, one cannot make a diagnosis of CKD on isolated abnormal eGFR or urine ACR results. A repeat of these tests should be done in 3 months to confirm whether the patient has CKD.

Case 2. For this patient, lifestyle counseling (eg, exercising regularly, maintaining a healthy weight, avoiding smoking) should be reviewed, and a referral to a diabetes educator, if available, should be considered. He should start statin therapy to reduce his risk of cardiovascular disease. Renin-angiotensin system blockade therapy with an ACEI or ARB should be started owing to his albuminuria level being higher than 3 mg/mmol, and his eGFR and electrolyte levels should be checked 2 to 3 weeks after starting treatment. His BP should be closely monitored to prevent orthostatic hypotension.

Case 3. Although testing for CKD in frail elderly patients is not recommended, obtaining a baseline eGFR level is appropriate to determine if medication doses need to be adjusted in those with renal impairment. This is especially important during influenza outbreaks in long-term care settings where treatment with oseltamivir might be appropriate.²⁷ If the eGFR results suggested the possibility that this patient had advanced CKD, a conservative care approach should be considered given the patient's age and limited life expectancy. These decisions should always include a discussion around goals of care with the patient and the patient's substitute decision makers.

Conclusion

Screening for CKD should only be conducted for patients with known risk factors and in the absence of an acute intercurrent illness. The tests of choice to diagnose CKD include an eGFR and urine ACR. Most cases of CKD in primary care are low risk for progression and can be managed exclusively by PCPs. For patients with CKD who progress to more advanced stages (**Figure 2**)¹ or meet recommended referral criteria (**Box 1**),^{6-8,14,16,17} it is important to seek consultation from a nephrologist and work together to provide patients with the best care. 🌿

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Contributors

Both authors contributed to the literature review and interpretation, and to preparing the manuscript for submission.

Competing interests

None declared

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