

GUIDELINES & PROTOCOLS

ADVISORY COMMITTEE

Chronic Kidney Disease – Identification, Evaluation and Management of Patients

Effective Date: September 15, 2008

Scope

The first part of this guideline provides recommendations for the investigation and evaluation of adult patients (19+) at risk for chronic kidney disease (CKD). The second part of this guideline focuses on the management of adult patients with known CKD and includes care objectives and patient self-management.

Specialized management of established CKD, e.g. erythropoietic agents for anemia, renal replacement therapy, and treatment of calcium, phosphate, or parathyroid hormone (PTH) abnormalities is beyond the scope of this guideline.

Diagnostic Code: 585 (chronic renal failure)

Part 1: Identification and Evaluation of Patients at Risk for CKD

This section covers:

- I. Prevention and risk factors
- II. Investigation
- III. Diagnosis and staging of CKD
- IV. Determining the cause of CKD
- V. Evaluating patients with abnormal screening tests
- VI. Flow diagram for evaluating and managing suspected CKD

I. Prevention and risk factors

Identify patients at risk for CKD based upon a directed medical and surgical history including co-morbidities (e.g. diabetes, cardiovascular disease [CVD]) and dietary, social, demographic and cultural factors, a review of symptoms, and physical examination. Populations at increased risk include those with:

- Diabetes
- Hypertension with or without CVD
- A family history of kidney disease
- Specific high-risk ethnic groups: First Nations, Pacific Islanders, African descent and Asians

Note: Age > 60 years is associated with an increased risk of impaired kidney function, but evidence is insufficient to recommend screening solely on the basis of age.

II. Investigation

It is recommended that physicians screen at-risk populations every 1-2 years depending upon clinical circumstances (e.g. yearly for persons with diabetes) using serum creatinine and random urine tests (macroscopic/microscopic urinalysis and ACR). Estimated glomerular filtration rate

(eGFR) is the best marker for CKD and is computed from the serum creatinine. Most labs in British Columbia (BC) automatically report eGFR when a serum creatinine is ordered. (See Appendix B for further information on eGFR calculations.)

Investigational tests

a) Serum testing: eGFR values:

- < 60 mL/min and **persistent** (present for > 3 months) indicates substantial reduction in kidney function.
- > 60 mL/min and < 100 mL/min, in the absence of urine abnormalities or structural abnormalities on imaging studies (e.g. ultrasound), does not indicate kidney disease.
- Age > 75 years: accuracy of eGFR for patients over 75 is questionable and may underestimate true kidney function. Values of eGFR < 45 should be considered as a likely indicator of decreased renal function and merit further work-up. Values between 45 and 60 may reflect normal variation in the absence of other conditions, however, caution is still recommended with respect to medications, dye, and risk of acute kidney injury with severe illnesses. Correlation with clinical condition is recommended.¹
- Age > 85 years: equation for eGFR is problematic and risk of progression of CKD is not known. In the absence of other metabolic or hematological abnormalities, a conservative approach is recommended. Values between 45 and 60 may reflect normal variation in the absence of other conditions. Caution is still recommended with respect to medications, dye, and risk of acute kidney injury with severe illnesses.
- Estimates based on serum creatinine measurements (eGFR) may be unreliable in patients with very large or small body habitus, those on specific diets (very high or very low protein), and in patients receiving medications that interfere with the excretion of creatinine (e.g. trimethoprim and sulfamethoxazole, ciprofloxacin, fenofibrate).
- Exercise, diet and/or hydration status may affect kidney function estimates or the degree of albuminuria/proteinuria. If baseline tests are abnormal or subsequent tests are significantly different from baseline, confirmation by repeat testing is warranted.

b) Urine testing: macroscopic/microscopic analysis and albumin/creatinine ratio (ACR) values

- Random urine tests for macroscopic/microscopic urinalysis and ACR:
 - Significant abnormalities: persistent white blood cells or red blood cells in the absence of infection or instrumentation; presence of any cellular casts is always pathological.
 - ACR elevation (> 2.0 mg/mmol males; > 2.8 mg/mmol females) on 2 out of 3 serial tests performed 1 week to 2 months apart indicates micro-vascular disease +/- glomerular disease.
- Urine test abnormalities, even with persistent eGFR values ≥ 60 ml/min, indicate abnormal kidney function, either as an isolated condition or as a symptom of a systemic disease.
- 24-hour urine collections are not necessary in most cases.
- ACR is the method that allows one to test for albumin present in quantities above normal but below the detectable range on standard dipsticks. In the past, the word microalbumin has been used, but this may lead to a false impression that there is a different molecule when there is not. Thus, ACR is the preferred method by which to assess abnormal levels of albumin. Note that this guideline uses the thresholds adopted by the Canadian Diabetes Association for the detection of microalbuminuria. As methods improve and further data becomes available, these cutoffs may be revised. Serial ACR tests can normally be incorporated into the routine visit schedule.

Acting on test results

- Normal: repeat annually or as clinically indicated and monitor blood pressure.
- Abnormal: confirm and evaluate (Table 1 below).

III. Diagnosis and staging of CKD

CKD is defined as eGFR < 60 mL/min for > 3 months, or evidence of kidney damage (pathologic abnormalities or markers of damage, including abnormalities in blood or urine tests or imaging studies). If CKD is present, determine its stage based on eGFR, urinalysis, and ACR. The following staging system, designed by the US National Kidney Foundation with international input, is recommended to facilitate assessment and management of CKD.^{2,3}

Table 1. Stages of CKD

Stage	Description	eGFR ^a	Potential Complications of reduced eGFR ^a (alphabetically)
1	Kidney damage ^b with normal or ↑ eGFR	≥ 90	<ul style="list-style-type: none">• Anemia, including functional iron deficiency• BP increases• Calcium absorption decreases• Dyslipidemia/heart failure/volume overload• Hyperkalemia• Hyperparathyroidism• Hyperphosphatemia• Left ventricular hypertrophy• Metabolic acidosis• Malnutrition potential (late)
2	Kidney damage ^b with mild ↓ eGFR	60-89	
3	Moderate ↓ in eGFR	30-59	
4	Severe ↓ in eGFR	15-29	
5	Kidney failure	< 15 or on dialysis	

NOTES:

- ^a The listed complications are not specific to CKD but tend to occur with increasing frequency and are more directly attributable to CKD at lower eGFR (e.g. stages 4 and 5). If complications are noted at an early stage of CKD, investigation of alternative causes is recommended, e.g. profound anemia at eGFR of 55 ml/min is likely not attributable to low kidney function alone.
- ^b Kidney damage is defined as pathological abnormalities (kidney biopsy results) or markers of damage including abnormalities in blood or urine tests (protein/albumin in the urine, red blood cells, white blood cells or casts) or imaging studies.²

IV. Determining the cause of CKD

Impaired kidney function is often multi-factorial. If possible, determine a primary cause of kidney disease in all patients. Kidney ultrasound is a useful examination to identify polycystic kidney disease, cancer, stones, and obstruction. Discrepancy in kidney size may signal clinically significant renal artery stenosis (the work up for renal artery stenosis is beyond the scope of this guideline).

Even if a primary cause seems obvious (e.g. hypertension, diabetes), the possibility of a serious underlying disorder (e.g. vasculitis, systemic lupus erythematosus) must be considered in patients with:

- Abnormal urinalysis, e.g. proteinuria, hematuria, cellular casts, or combinations thereof.
- Rapid sustained decline in kidney function (Δ eGFR > 10-15%/year) despite remedy of reversible precipitants e.g. volume contraction, febrile illness, medications.
- Consistent impairment of kidney function in the absence of risk factors.
- Constitutional symptoms suggesting systemic illness.
- Sudden or severe onset of symptoms, e.g. edema unrelated to heart or liver disease.

Refer to an internist or nephrologist for further evaluation if an etiology cannot be determined. Note that occasionally a screening test will identify a serious systemic disease or early stages of an acute illness. In patients with active urine sediments (rbc casts or cellular casts ± protein), constitutional symptoms, or unexplained severity of kidney dysfunction, prompt consultation with a specialist and/or re-evaluation of tests is indicated.

V. Evaluating patients with abnormal screening tests

Patient management should reflect CKD stage and eGFR, urinalysis and ACR results (see Table 2).

Table 2. Evaluating patients with abnormal screening tests ^a

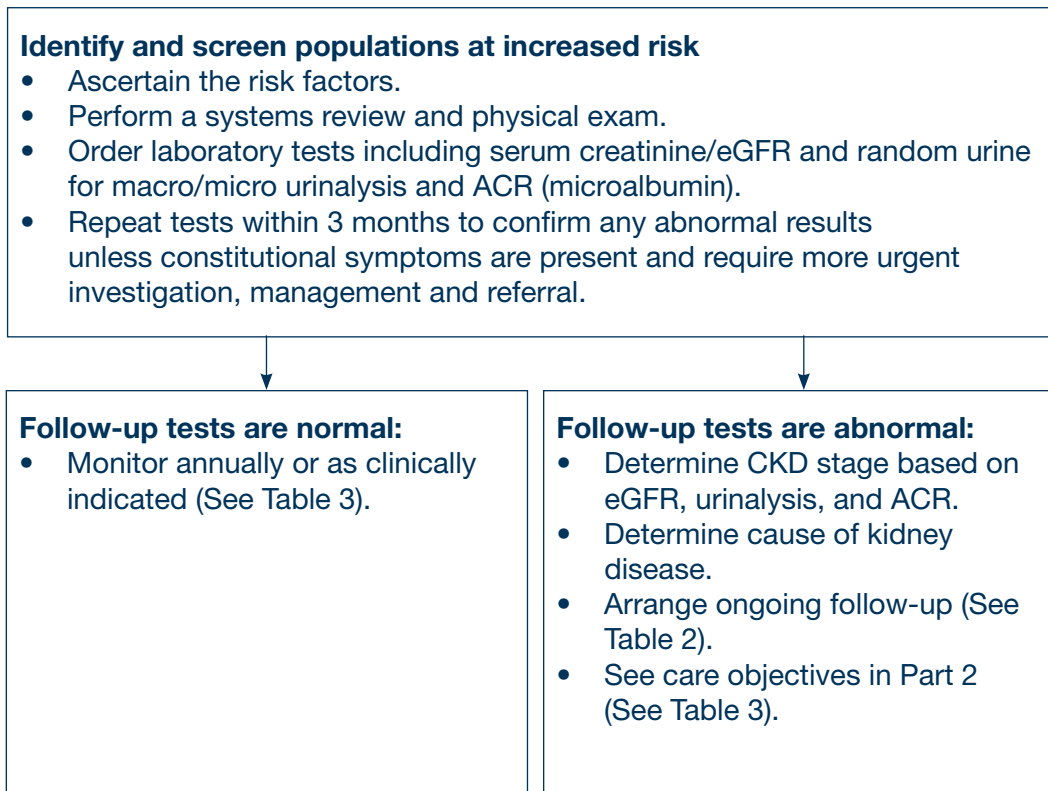
Stage	Other Results	Recommendations ^b
Stage 1 or 2; eGFR ≥ 60mL/min plus evidence of kidney damage ^c	Urinalysis normal but ACR equivocal (2-20 male; 2.8-28 female) on at least 2 out of 3 occasions	<ul style="list-style-type: none"> • Determine cause of CKD. • See management advice in Part 2. • Consider kidney U/S.^d • Order annual creatinine and urine tests. • Consider referral to nephrologist/internist^e if urine protein is increasing, eGFR is declining > 10% annually, or serum K⁺ is repeatedly > 6.0 mmol/L.
	Urinalysis abnormal or ACR abnormal (> 20 male; > 28 female)	<ul style="list-style-type: none"> • See management advice in Part 2. • Consider kidney U/S. • Consider referral to nephrologist/internist. • Consider referral to urologist for isolated microhematuria even if U/S is normal.
Stage 3; eGFR = 30-59 mL/min	Urinalysis normal but ACR equivocal (2-20 male; 2.8-28 female)	<ul style="list-style-type: none"> • See management advice in Part 2. • Consider kidney U/S. • Order annual creatinine and urine tests q 6 months. • Consider referral to nephrologist/internist if urine protein increasing or eGFR declining > 10%/year.
	Urinalysis abnormal or ACR abnormal (> 20 male; > 28 female)	<ul style="list-style-type: none"> • See management advice in Part 2. • Order kidney U/S. • Consider referral to nephrologist/internist.
Stage 4; eGFR = 15-29 mL/min	Regardless of other results	<ul style="list-style-type: none"> • See management advice in Part 2. • Refer to nephrologist/internist.
Stage 5; eGFR < 15-mL/min	Regardless of other results	<ul style="list-style-type: none"> • See management advice in Part 2. • Refer urgently to nephrologist/internist.

KEY: ACR=albumin/creatinine ratio, CKD=chronic kidney disease, CVD=cardiovascular disease, eGFR=estimated glomerular filtration rate, K=potassium, U/S=ultrasound

NOTES:

- ^a In the absence of other systemic illness.
- ^b All CKD patients are at risk for CVD therefore the usual protocols for CVD risk, evaluation, and treatment should be followed.⁴
- ^c Patients with eGFR > 60 ml/min, in the absence of abnormalities of urine or imaging tests, do not have Stage 1 or 2 CKD. If the patient is in a high-risk population, repeated screening is recommended at regular intervals.
- ^d Kidney U/S may be required in those with a family history of polycystic kidney disease or symptoms of urinary tract obstruction, infection, or stones. It can also quickly identify reversible conditions.
- ^e Internists are skilled in the initial workup and management of early CKD, and given the usual concomitant association of CKD and CVD, are also appropriate as the initial referral.

Figure 1. Flow Diagram for Evaluating and Managing Patients with Suspected CKD



Part 2: Management of Patients with Established CKD

This section covers:

- I. Identifying care objectives and targets
- II. Practice points for goal setting
- III. Supporting patient self-management
- IV. Meeting care objectives

I. Identifying care objectives and targets

Physicians will ideally identify care objectives for all patients with CKD (see Table 3). Depending on the level of kidney function and complexity of therapy required, these care objectives may be more or less difficult to achieve without help from a specialized team of health care professionals including a nephrologist. Treatment goals must be tailored to the individual.

Table 3: Care objectives and targets

Care	Objective	Target
BP	Measure and record at diagnosis and at every visit thereafter. See BC guideline: <i>Hypertension – Detection, Diagnosis and Management</i> at www.BCGuidelines.ca	<ul style="list-style-type: none"> BP < 130/80. ACEI/ARB recommended in addition to other drugs.*
Kidney function measurements	Obtain regular measurements of serum creatinine for eGFR (at least q 6 months) and after any change in medications, medical intervention, or clinical status.	Stability of kidney function or < 10-15% decline in eGFR annually.
Urine testing	ACR (microalbumin) every 6-12 months or as clinically indicated.	<ul style="list-style-type: none"> Reduce abnormal values by 50% or more from baseline. ACEI/ARBs recommended.*
Monitor serum electrolytes	<ul style="list-style-type: none"> Measure after change in medications, medical intervention, or clinical status with particular attention to K⁺. Check serum creatinine and K⁺ prior to starting ACEIs and ARBs, within 2 weeks of starting, and within 2 weeks after dose increase. Serum creatinine rise >20% or eGFR decrease >15% after dose increase should be followed by further measurements within 2 weeks. 	
CVD risk assessment & lipid profiles	<ul style="list-style-type: none"> Calculate & record CVD risk. Manage in accordance with relevant guidelines. Check fasting lipids yearly once target values are achieved & more frequently in patients on lipid lowering medication. 	<ul style="list-style-type: none"> Reduce risk in those at high risk. Lipid targets (<70 yrs): LDL < 2.5; TC/HDL ratio < 4.0.
Diabetes: Blood glucose control over time	<ul style="list-style-type: none"> Measure A1C q 3 months or as clinically indicated. See <i>Diabetes Care</i> guideline at www.BCGuidelines.ca Long-acting sulfonylureas may be associated with hypoglycemia with unstable eGFR, especially those below 45. If recurrent hypoglycemia, or unstable eGFR consider using short-acting sulfonylureas or non-sulfonylureas. In those with unstable eGFR or acute changes in clinical condition, metformin should be held. 	A1C: ≤ 7.0% (0.07).
Weight & nutrition	Record weight & BMI on each visit for comparison.	Adequate nutrition and BMI near ideal (18.5-24.9).†
Smoking	Encourage patient to stop smoking, enquire at every visit, support when receptive.	Complete smoking cessation.
Assessment of conditions associated with CKD	Measure at least yearly (more frequently with advanced CKD): <ul style="list-style-type: none"> CBC. Mineral metabolism (calcium, phosphorus, iPTH). Nutrition profile (albumin). 	<ul style="list-style-type: none"> Hgb within normal range for sex if not on ESA treatment, Hgb > 110- 125 g/L if on ESA treatment. Transferrin saturation > 20%. Calcium 2.2-2.5 mmol/L. Phosphorus 0.75-1.4 mmol/L. iPTH in normal range.⁵ Albumin in normal range.
Flu vaccine	Immunize annually.	Prevention of influenza.
Pneumococcal vaccine	Immunize every 10 years.	Prevention of pneumonia.
Awareness of Hepatitis B risk	Immunization at a higher level of eGFR more likely to result in seroconversion if patient is being considered for hemodialysis. Screening and vaccination in consultation with nephrology team.	Seroconversion, prevention of Hep B (seroconversion rate higher if immunized early). ⁶
Limit exposure to nephrotoxins/drug adjustments	<ul style="list-style-type: none"> Reduce risk of acute or chronic deterioration of kidney function. Adjust renally excreted drugs according to kidney function. 	Avoidance of aminoglycosides, NSAIDs, COX-2 inhibitors, intravenous or intra-arterial radiocontrast studies.
Psychosocial health	<ul style="list-style-type: none"> Depression and grief reaction may occur with chronic disease. Identify and address psychosocial problems that affect the illness. 	<ul style="list-style-type: none"> Providing support. Optimize self-management.

KEY: BP=blood pressure; A1C=glycated hemoglobin (previously HbA1C); ACEI=angiotensin-converting enzyme inhibitor; ARB=angiotensin II receptor blocker; ACR=albumin/creatinine ratio; BMI, body mass index; COX-2=cyclooxygenase-2; ESA=erythropoiesis-stimulating agent; eGFR=estimated glomerular filtration rate; HDL=high-density lipoprotein; Hgb=hemoglobin; iPTH=intact parathyroid hormone; LDL=low-density lipoprotein; NSAID, non-steroidal anti-inflammatory drug; TC=total cholesterol.

NOTES FOR TABLE 3: * Reduction of proteinuria can be facilitated by the use of ACEI/ARBs. This has been shown to reduce the rate of progression of chronic renal insufficiency in hypertensive patients with diabetes or chronic glomerulonephritis.^{7,8}

† In severe CKD (eGFR < 15ml/min), weight loss may indicate a catabolic state and a possible need for dialysis.

II. Practice points for goal setting

When setting goals with your patient, consider the following:

- Exercise, diet, and/or hydration status may affect kidney function estimates or the degree of albuminuria/proteinuria. If baseline tests are abnormal or subsequent tests are significantly different from baseline, confirm by repeat testing.
- Rigorous control of BP has been shown to reduce the risk of complications and mortality rates. In particular, the inhibition of the renin angiotensin system with ACE inhibitors or ARBs has been shown to be very effective. Diuretics, β -blockers, and/or calcium channel blockers may also be required since most patients require more than two medications to reach target values.⁹ See BC guideline: *Hypertension – Detection, Diagnosis and Management*.
- Every adult with kidney disease may be at increased risk of cardiovascular disease.^{4,10}
- Nephrotoxic medications (e.g. NSAIDs, COX-2 inhibitors, aminoglycosides) should be avoided or used with caution in patients with even mild kidney impairment (eGFR 60-90 mL/min with evidence of kidney damage), and kidney function should be monitored if they are used.
- IV or intra-arterial radiocontrast use poses a high risk of acute kidney injury in patients with Stage 4 or 5 CKD and a moderate risk in patients with Stage 3 disease.¹¹ If imaging is required, alternate imaging techniques, including MRI angiography, should be considered for these patients. If no alternative exists and the procedure is medically necessary, the patient should provide written informed consent and protection with IV hydration and N-acetyl cysteine may be used according to a published protocol, or in consultation with nephrologists.¹²
- Patients with CKD are at high risk of further acute kidney injury with volume contraction, e.g. nausea, vomiting, diarrheal illnesses, or the use of certain bowel preparations.
- Review medication list, identify medications excreted by the kidneys (e.g. metformin, digoxin and lithium) and adjust dosages as appropriate or use alternate treatment.¹³ (see Physician's Resource section).
- Rapid deterioration in kidney function (a decline of eGFR >10-15% annually) warrants urgent referral to a nephrologist or internist.
- Preparation for kidney replacement treatment requires a minimum of 12 months, therefore referral for consideration of kidney replacement should take this into account.
- Many patients with CKD also have diabetes and/or heart disease. Explaining the linkage between these conditions and how treating one condition benefits others may lessen the psychological impact of several separate diagnoses.¹⁴

III. Supporting patient self-management

People with CKD have better outcomes if they take an active role in the management of their own condition and they should be encouraged to do so. Denial, often associated with grief reaction, is common in patients with chronic disease affecting a vital organ. Efforts to introduce preventive lifestyle and medical therapy may fail until understanding and acceptance have been achieved. CKD care teams are skilled at dealing with this issue.

To support patient self-management, the physician should:

- Support patients through the process of accepting the diagnosis of a chronic illness.
- Ensure that patients understand the implications of the diagnosis and their role in self-management.
- Help patients identify a support team.
- Involve patients in defining the best possible goals for care, including lifestyle modifications such as smoking cessation, healthy diets, weight management, exercise, and social support.
- Encourage patients to monitor their own progress through the use of diaries or logbooks to track clinical values, and self-monitor BP (and blood glucose where appropriate).
- Reinforce lifestyle modifications at each visit.
- Explain and discuss the results of investigations and consultations.

- Identify community resources that can provide patients with the information, skills and support needed to understand and manage their condition, and direct or refer patients to those resources.
- Patient self-management resources are listed in *Chronic Kidney Disease: A Guide for Patients*, are available at www.BCGuidelines.ca

IV. Meeting care objectives

The care of CKD patients is very similar to care of any patient with a chronic illness, thus similar principles should be applied. Evidence indicates that the care of chronic diseases such as CKD can be improved by the implementation of regular scheduled reviews of clinical and laboratory parameters.

Physicians are encouraged to:

- Create a patient register to identify all patients with impaired kidney function in their practice.
- Participate in a community or provincial patient register wherever possible.
- Use a flow sheet for each patient with kidney disease. (See Appendix C for sample flow sheet.)
- Use an organized recall system to ensure that laboratory investigations and subsequent office reviews are performed at regularly scheduled appropriate intervals.
- Review patient records to ensure care objectives are met.

There is increasing evidence that at lower levels of eGFR, patients benefit from inclusion in multidisciplinary clinics. It is recommended that primary care physicians seek opportunities within their communities to ensure these resources are accessed.^{15,16,17}

Rationale

This guideline outlines strategies that may help the primary care practitioner meet the complex needs of persons with CKD, including accurate and timely diagnosis, exploration of its etiology, and appropriate management of common factors affecting progression and co-morbid conditions.

CKD is a serious population health problem with a significant impact on individuals, families, society, and health services. It is often associated with other common chronic diseases such as diabetes, hypertension, and heart disease. Based on population studies, the estimated prevalence of significant kidney impairment (eGFR < 60 ml/min) in British Columbia is 145,000 people, approaching the prevalence of Type II diabetes; however, because many cases are undiagnosed, this is likely a true significant underestimate.

There is increasing awareness of CKD in all practices.¹⁸ CKD increases the risk of cardiac morbidity and mortality to levels ten times that of population mean risk in addition to placing persons at risk of end stage renal disease requiring dialysis.^{19,20} Recent studies have demonstrated that the presence of impaired kidney function worsens prognosis for length of hospital stay, morbidity, and mortality.^{4,10,21,22,23} Thus, while not all people with kidney disease will require dialysis, they are all at higher risk for poor outcomes, adverse reactions to medications and interventions, and episodes of acute kidney failure.^{4,21,24,25}

The outcome of patients who go on to dialysis remains poor with ten per cent annual mortality; the overall five-year survival rate is worse than that of all cancers except cancer of the lung.²⁶ Evidence clearly indicates that efforts to control hypertension and proteinuria (and hyperglycemia in persons with diabetes) can prevent or postpone the development of progressive kidney function decline.^{7,8, 27,28,29,30,31,32,33,34} However, levels of care for milder stages of CKD remain suboptimal and practitioners often do not provide screening and management in accordance with published guidelines.^{35,36, 37}

The efficacy of statins in a population with CKD is currently under evaluation in the SHARP trial.³⁸ Until the results are reported, basic risk reduction approaches are recommended as provided in the BC clinical practice guideline, *Cardiovascular Disease - Primary Prevention*.³⁹ For people without heart disease, a Framingham risk-based approach to treatment with statins is suggested for people with a ten-year coronary heart disease (CHD) risk of 20% or more. Treatment of the high risk population should be to an LDL target of 2.5 mmol LDL/L or a ratio of TC/HDL of < 4.

The BC clinical practice guideline, *Diabetes Care*, recommends a risk-based approach for lipid management with treatment to an LDL target of 2.5 mmol/L for high-risk patients (> 20 % CHD risk using the UKPDS calculator).⁴⁰ This approach is consistent with the recent ASPEN trial which showed no benefit using statins for people with low to moderate risk of CHD (low risk, 12% smokers)⁴¹ and the CARDS trial, which showed a benefit for population at higher-risk (23% smokers).⁴² For elderly patients (70+ years), the PROSPER trial found that statins did not reduce CHD and stroke events in men and women without CHD.⁴³

References

1. Gill J, Malyuk R, Djurdjev O, et al. Use of GFR equations to adjust drug doses in an elderly multi-ethnic group – a cautionary tale. *Nephrol Dial Transplant* 2007;22(10):2894-9.
2. National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. *Am J Kidney Dis* 2002;39(2) Suppl 1:S1-266.
3. Levey AS, Atkins R, Coresh J, et al. Chronic kidney disease as a global public health problem: approaches and initiatives – a position statement from Kidney Disease Improving Global Outcomes. *Kidney Int* 2007;72(3):247-59.
4. Sarnak MJ, Levey AS, Schoolwerth AC, et al. Kidney disease as a risk factor for development of cardiovascular disease: a statement from the American Heart Association Councils on Kidney in Cardiovascular Disease, High Blood Pressure Research, Clinical Cardiology, and Epidemiology and Prevention. *Circulation* 2003;108(17):2154-69.
5. Levin A, Bakris G, Molitch M, et al. Prevalence of abnormal serum vitamin D, PTH, calcium and phosphorus in patients with chronic kidney disease: results of the study to evaluate early kidney disease. *Kidney Int* 2007;71:31-8.
6. Da Roza G, Loewen AHS, Djurdjev O, et al. Stage of CKD predicts seroconversion after hepatitis B immunization: earlier is better. *Am J Kidney Dis* 2003;42(6):1184-92.
7. Trivedi HS, Pang MM, Campbell A, et al. Slowing the progression of chronic renal failure: economic benefits and patients perspectives. *Am J Kidney Dis* 2002;39:721-9.
8. Coyle D, Rodby R, Soroka S, et al. Cost-effectiveness of irbesartan 300 mg given early versus late in patients with hypertension and a history of type 2 diabetes and renal disease: a Canadian perspective. *Clin Ther* 2007;29(7):1508-23.
9. Guidelines and Protocols Advisory Committee. Hypertension – Detection, Diagnosis and Management. [Clinical Practice Guideline]. Available from www.BCGuidelines.ca. Accessed August 12, 2008.
10. Go AS, Chertow GM, Fan D, et al. Chronic kidney disease and the risks of death, cardiovascular events and hospitalization. *N Engl J Med* 2004;351(13):1296-305.
11. Tepel M, van der Giet M, Schwarzfeld C, et al. Prevention of radiographic-contrast-agent-induced reductions in renal function by acetylcysteine. *N Engl J Med* 2000;343(3):180-4.
12. Komenda P, Zalunardo N, Burnett S, et al. Conservative outpatient renoprotective protocol in patients with low GFR undergoing contrast angiography: a case series. *Clin Exp Nephrol* 2007;11(3):209-13.
13. Kappel J, Calissi P. Nephrology: 3. Safe drug prescribing for patients with renal insufficiency. *CMAJ* 2002;166(4):473-7.
14. Komenda, P, Levin, A. Analysis of cardiovascular disease and kidney outcomes in multidisciplinary chronic kidney disease clinics: complex disease requires complex care models. *Curr Opin Nephrol Hypertens* 2006;15(1):61-6.
15. Goldstein M, Yassa T, Dacouris N, et al. Multidisciplinary predialysis care and morbidity and mortality of patients on dialysis. *Am J Kidney Dis* 2004;44(4):706-14.
16. Curtis BM, Ravani P, Malberti F, et al. The short- and long-term impact of multi-disciplinary clinics in

- addition to standard nephrology care on patient outcomes. *Nephrol Dial Transplant* 2005;20(1):147-54.
17. Hemmelgarn BR, Manns BJ, Zhang J, et al. Association between multidisciplinary care and survival for elderly patients with chronic kidney disease. *J Am Soc Nephrol* 2007;18(3):993-9.
 18. Stevens L A, Cooper S, Singh S, et al. Detection of chronic kidney disease in non-nephrology practices: an important focus for intervention. *BCMJ* 2005;47(6):305-11.
 19. Valmadrid CT, Klein R, Moss SE, et al. The risk of cardiovascular disease mortality associated with microalbuminuria and gross proteinuria in persons with older-onset diabetes mellitus. *Arch Intern Med* 2000;160(8):1093-100.
 20. Canadian Institute for Health Information. CORR reports – treatment of end-stage organ failure in Canada 1995 to 2004 (2006 Annual Report). 2007 February [132 pages]. Available from http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=PG_710_E&cw_topic=710&cw_rel=AR_5_E#full. Accessed August 14, 2008.
 21. Culleton BF, Larson MG, Wilson PW, et al. Cardiovascular disease and mortality in a community-based cohort with mild renal insufficiency. *Kidney Int* 1999;56(6):2214-19.
 22. Curtis BM, Parfrey PS. How can the cardiac death rate be reduced in dialysis patients? *Semin Dial* 2002;15(1):22-24.
 23. Humphries K, Stigant, C, Levin A, et al. Outcomes after percutaneous coronary interventions in patients with CKD: improved outcome in the stenting era. *Am J Kidney Dis* 2005;45(6):1002-9.
 24. Levin A. Prevalence of cardiovascular damage in early renal disease. *Nephrol Dial Transplant* 2001;16 Suppl 2:7-11.
 25. Hemmelgarn BR, Zhang J, Manns BJ, et al. Progression of kidney dysfunction in the community-dwelling elderly. *Kidney Int* 2006;69(12):2155-61.
 26. Arun CS, Stoddart J, Mackin P, et al. Significance of microalbuminuria in long-duration type 1 diabetes. *Diabetes Care* 2003;26(7):2144-9.
 27. Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 1993;329(14):977-986.
 28. Modification of the Diet in Renal Disease Study Group. The effects of dietary protein restriction and blood-pressure control on the progression of chronic renal disease: modification of diet in renal disease study group. *N Engl J Med* 1994;330(13):877-84.
 29. Diabetes Control and Complications Trial (DCCT) Research Group. Effect of intensive therapy on development and progression of nephropathy in the DCCT. *Kidney Int* 1995;47:1703-20.
 30. Bakris GL. Lower blood pressure goals for patients with diabetes: the National Kidney Foundation consensus report. *J Clin Hypertension* 2000;369-71.
 31. Heart Outcomes Prevention Evaluation (HOPE) Study Investigators. Effects of ramipril on cardiovascular and microvascular outcomes in people with diabetes mellitus: results of the HOPE study and MICRO-HOPE substudy. *Lancet* 2000;335(9200):253-9.
 32. RENAAL Study Investigators. Effects of losartan on renal and cardiovascular outcomes in patients with type 2 diabetes and nephropathy. *N Engl J Med* 2001;345(12):851-60.
 33. Duncan L, Heathcote J, Djurdjev O, et al. Screening for renal disease using serum creatinine: who are we missing? *Nephrol Dial Transplant* 2001;16(5):1042-6.
 34. ACE Inhibitors in Diabetic Nephropathy Trialist Group. Should all patients with type I diabetes mellitus receive angiotensin-converting enzyme inhibitors? A meta-analysis of individual patient data. *Ann Intern Med* 2001;134(5):370-9.
 35. Valderrabano F, Golper T, Muirhead N et al. Chronic kidney disease: why is current management uncoordinated and suboptimal? *Nephrol Dial Transplant* 2001;16 Suppl 7:61-4.
 36. Powe NR. Early referral in chronic kidney disease: An enormous opportunity for prevention. *Am J Kidney Dis* 2003;41(2):505-7.
 37. Stigant C, Stevens L, Levin A. Nephrology: 4. Strategies for the care of adults with chronic kidney disease. *CMAJ* 2003;168(12):1553-60.
 38. SHARP Study of Heart and Renal Protection. Clinical trial information available at www.sharpinfo.org Accessed August 14, 2008.
 39. Guidelines and Protocols Advisory Committee. Cardiovascular Disease – Primary Prevention. [Clinical Practice Guideline]. Available at www.BCGuidelines.ca. Accessed August 14, 2008.

40. Guidelines and Protocols Advisory Committee. Diabetes Care. [Clinical Practice Guideline]. Available at www.BCGuidelines.ca. Accessed August 14, 2008.
41. Knopp RH, d’Emden M, Smilde JG, et al. Efficacy and safety of atorvastatin in the prevention of cardiovascular end points in subjects with type 2 diabetes: the Atorvastatin Study for Prevention of Coronary Heart Disease Endpoints in non-insulin-dependent diabetes mellitus (ASPEN). *Diabetes Care* 2006;29(7):1478-85.
42. Colhoun H, Betteridge DT, Durrington PN, et al. 2004. Primary prevention of cardiovascular disease with atorvastatin in type 2 diabetes in the Collaborative Atorvastatin Diabetes Study (CARDS): multicentre randomised placebo-controlled trial. *Lancet* 2004;364(9435):685-96.
43. Shepherd J, Blauw GJ, Murphy MB, et al. Pravastatin in elderly individuals at risk of vascular disease (PROSPER): a randomised controlled trial. *Lancet* 2002;360(9346):1623-30.

This guideline is based on scientific evidence current as of the Effective Date.

This guideline was developed by the Guidelines and Protocols Advisory Committee, approved by the British Columbia Medical Association, and adopted by the Medical Services Commission.

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The principles of the Guidelines and Protocols Advisory Committee are to:

- encourage appropriate responses to common medical situations
- recommend actions that are sufficient and efficient, neither excessive nor deficient
- permit exceptions when justified by clinical circumstances.

Appendices

Appendix A – Physician Resources

Appendix B – Calculating eGFR: Conversion Table

Appendix C – Chronic Kidney Disease Flow Sheet

Appendix D – Chronic Kidney Disease – A Guide for Patients

Associated Documents

The following documents accompany this guideline:

- Summary

Disclaimer

The Clinical Practice Guidelines (the “Guidelines”) have been developed by the Guidelines and Protocols Advisory Committee on behalf of the Medical Services Commission. The Guidelines are intended to give an understanding of a clinical problem, and outline one or more preferred approaches to the investigation and management of the problem. The Guidelines are not intended as a substitute for the advice or professional judgment of a health care professional, nor are they intended to be the only approach to the management of clinical problems.

Chronic Kidney Disease

PHYSICIAN RESOURCES

Effective Date: September 15, 2008

Location	Hospital	Clinic Name	Phone Number
Abbotsford	Fraser Health	Kidney Care Clinic.....	604 851-3074
Kamloops	RIH	Kidney Clinic	250 314-2849
Kelowna	KGH	Renal Health Clinic.....	250 862-4300 ext 3386
Surrey	SMH	Kidney Care Centre.....	604 587-7630
Penticton	PRH	Renal Health Clinic (Pre-dialysis)	250 770-5507
Prince George	PGRH	Outpatient Renal Clinic	250 565-2747
Trail	Kiro Wellness Centre	Kidney Care Clinic.....	250 364-3450
Vancouver	St. Paul's	Kidney Function Clinic	604 806-9025
Vancouver	VGH	Hemodialysis Unit	604 875-4181
Victoria	RJH	Kidney Care Clinic.....	1 888 370-8224 or 250 370-8224

BC Provincial Renal Agency (BCPRA)

PHSA, Suite 700-1380 Burrard Street, Vancouver, BC, V6Z 2H3
Phone: 604 875-7340; Fax: 604 875-7366; www.bcrenalagency.ca

The BC Provincial Renal Agency is a collaborative of renal health professionals who coordinates the care of patients with kidney disease in BC.

Kidney Foundation of Canada (BC Branch)

604 736-9775 (Vancouver area) 1 800 567-8112 (elsewhere in BC); Fax: 604 736-9703
www.kidney.bc.ca; e-mail: info@kidney.bc.ca

The Kidney Foundation provides educational materials related to various aspects of kidney disease and treatment and offers a number of patient services. The Foundation has facilitated educational sessions on chronic kidney disease for family physicians. For more information please refer to the Web site or contact the BC Branch.

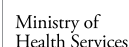
National Kidney Foundation (USA)

The National Kidney Foundation Web site, www.kidney.org, includes a section for health care professionals as well as on-line access to the K/DOQI guidelines.

Further information on nephrotoxic drugs

Kappel J, Calissi P. Nephrology: 3. Safe drug prescribing for patients with renal insufficiency. CMAJ 2002;166(4):473-477

www.fpnotebook.com/Renal/Pharm/NphrtxcDrgs.htm



Calculating eGFR: Conversion Table

The MDRD and Cockcroft-Gault calculators used to calculate eGFR are available at www.kidney.org.

S-Creatinine to eGFR Conversion Table

For those physicians whose laboratories are not yet able to calculate eGFR, the following tables provide approximate eGFR values by gender. Values have been calculated using the MDRD calculation for use with standardized creatinine assays (Levey AS, et al. Ann Intern Med 2006;145(4):247-54) and should be considered approximate only. Note that ‘normal’ eGFR = 100-120ml/min/1.73 m². The use of the calculators or table below, does not require a 24-hour urine sample collection.

- Stage 1 = > 90 ml/min with abnormalities on UA or US
- Stage 2 = 60 – 89 ml/min with abnormalities on UA or US
- Stage 3 = 30 – 59 ml/min
- Stage 4 = 15 – 29 ml/min
- Stage 5 = <15 ml/min

WOMEN S-Creatinine	AGE (YEARS)					
	20-39	40-49	50-59	60-69	70-79	≥80
40 – 49	142	131	125	121	118	115
50 – 59	113	104	100	96	93	91
60 – 69	93	85	82	79	77	75
70 – 79	79	72	70	67	65	64
80 – 89	68	63	60	58	57	55
90 – 99	60	55	53	51	50	48
100 – 109	53	49	47	46	44	43
110 – 119	48	44	42	41	40	39
120 – 129	44	40	39	37	36	35
130 – 139	40	37	35	34	33	32
140 – 149	37	34	33	31	31	30
150 – 159	34	31	30	29	28	28
160 – 169	32	29	28	27	26	26
170 – 179	30	27	26	25	25	24
180 – 189	28	26	25	24	23	22
190 – 199	26	24	23	22	22	21
200 – 209	25	23	22	21	20	20
210 – 219	23	21	21	20	19	19
220 – 229	22	20	20	19	18	18
230 – 239	21	19	19	18	17	17
240 – 249	20	18	18	17	17	16
250 – 259	19	18	17	16	16	16
260 – 269	18	17	16	16	15	15
270 – 279	18	16	16	15	15	14
280 – 289	17	16	15	14	14	14
290 – 299	16	15	14	14	13	13

- Stage 1 > 90 ml/min with abnormalities on UA or US
- Stage 2 = 60 – 89 ml/min with abnormalities on UA or US
- Stage 3 = 30 – 59 ml/min
- Stage 4 = 15 – 29 ml/min

MEN	AGE (YEARS)					
	20-39	40-49	50-59	60-69	70-79	≥80
S-Creatinine						
40 – 49	191	176	169	163	159	155
50 – 59	152	140	134	130	126	123
60 – 69	125	115	111	107	104	101
70 – 79	106	98	94	91	88	86
80 – 89	92	85	81	78	76	74
90 – 99	81	74	71	69	67	65
100 – 109	72	66	64	61	60	58
110 – 119	65	60	57	55	54	52
120 – 129	59	54	52	50	49	48
130 – 139	54	50	48	46	45	44
140 – 149	50	46	44	42	41	40
150 – 159	46	42	41	39	38	37
160 – 169	43	39	38	36	35	35
170 – 179	40	37	35	34	33	32
180 – 189	37	34	33	32	31	30
190 – 199	35	32	31	30	29	29
200 – 209	33	31	29	28	28	27
210 – 219	31	29	28	27	26	25
220 – 229	30	27	26	26	25	24
230 – 239	28	26	25	24	24	23
240 – 249	27	25	24	23	22	22
250 – 259	26	24	23	22	21	21
260 – 269	25	23	22	21	21	20
270 – 279	24	22	21	20	20	19
280 – 289	23	21	20	19	19	18
290 – 299	22	20	19	19	18	18



CHRONIC KIDNEY DISEASE FLOW SHEET

This Flow Sheet is based on the Guideline, Chronic Kidney Disease
Web site: <http://www.bcguidelines.ca>



NAME OF PATIENT	SEX <input type="checkbox"/> M <input type="checkbox"/> F	AGE AT DIAGNOSIS	DATE OF BIRTH
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CARE OBJECTIVES	SELF MANAGEMENT (Discuss with patient)
DIAGNOSIS TYPE OF CKD: <input type="checkbox"/> HTN <input type="checkbox"/> POLYCYSTIC KD <input type="checkbox"/> DM <input type="checkbox"/> OTHER: _____ RISK FACTORS AND CO-MORBID CONDITIONS <input type="checkbox"/> Smoker <input type="checkbox"/> Alcohol/Substance abuse <input type="checkbox"/> Obesity (target BMI < 25) <input type="checkbox"/> Other: _____ <input type="checkbox"/> Diabetes <input type="checkbox"/> HTN <input type="checkbox"/> CAD <input type="checkbox"/> Cardiomyopathy <input type="checkbox"/> CHF <input type="checkbox"/> Atrial fibrillation <input type="checkbox"/> Other arrhythmia <input type="checkbox"/> Valvular HD <input type="checkbox"/> PVD <input type="checkbox"/> Lipid abnormality <input type="checkbox"/> Asthma <input type="checkbox"/> COPD <input type="checkbox"/> Liver disease <input type="checkbox"/> Depression	<input type="checkbox"/> Explain diagnosis and implications of CKD <input type="checkbox"/> Self monitor with flow sheet <input type="checkbox"/> Review medication list (see reverse) <input type="checkbox"/> Discuss CVD risk assessment & management strategies <input type="checkbox"/> Kidney-specific education <input type="checkbox"/> Identify support team and resources <input type="checkbox"/> Smoking cessation: <i>Quit Now</i> 1 877 455-2233 <input type="checkbox"/> Weight, exercise and nutrition status <input type="checkbox"/> Promote psychosocial health

VISITS					
DATE	BP	WEIGHT	LABS (most recent)		NOTES: CLINICAL STATUS, CARE OBJECTIVES AND FOLLOW-UP ISSUES
	every visit	Lbs Kg every visit	A1C (DM only) q3m	ACR q6-12m	
	< 130/80	BMI < 25	≤ 7%	≥ 50% ↓ from baseline	Stable*

REMINDERS: 1) ESTABLISH REGULAR VISIT AND LAB WORK SCHEDULE 2) REFER TO NEPHROLOGY TEAM 3) * ΔeGFR < 10-15% ANNUAL DECLINE ANNUALLY OR AS CLINICALLY INDICATED

LAB WORK (at least annually)

DATE	LIPIDS		ANEMIA		MINERAL METABOLISM			
	LDL < 2.5 high-risk (<70 yrs)	Ratio <4.0	Hgb WNR/110-125 on tx	TSAT >20%	Ca 2.2 - 2.5	Phos 0.75 - 1.4	PTH WNR	Albumin WNR

VACCINATIONS

Annual Flu: DATE

Pneumovax (q10y): DATE

Hepatitis B (series completed): DATE

Chronic Kidney Disease

A GUIDE FOR PATIENTS

Effective Date: September 15, 2008

What is chronic kidney disease (CKD)?

Kidneys are as important to your health as your heart or your lungs. Shaped like kidney beans and about the size of your fist, your kidneys are located on either side of your spine under the lower ribs. Their main task is to remove waste products from your blood. Your kidneys also produce important hormones that regulate some of your body's functions and help balance water and minerals in your body.

Chronic kidney disease (CKD) refers to a medical condition where your kidneys' ability to filter wastes from your body is impaired. CKD usually starts slowly and progresses over a number of years. If diagnosed and treated early, CKD may be slowed down or stopped. However, if it keeps getting worse, CKD may lead to kidney failure, also called End-Stage Renal Disease (ESRD). If you have ESRD, treatment options include dialysis or a kidney transplant. These treatments can help you stay healthy and continue your daily activities.

There is no cure for CKD – the goal of treatment is to keep the kidneys functioning as long as possible by detecting and treating the disease at its early stages. Sometimes, if treated early, all that may be needed is a change in your diet, control of your blood pressure and/or some specific medication.

What are the symptoms of kidney disease?

CKD is a silent disease. Most people do not have any symptoms in the early stages. Symptoms begin when most of your kidney function is lost. Symptoms that may show up as your kidney function deteriorates include frequent headaches, fatigue, and itching all over the body.

As kidney disease worsens, the body is unable to get rid of waste products and excess water. This condition is called uremia. In addition to earlier symptoms, you may experience:

- Frequent urination or passing less urine
- Swelling in legs, ankles, feet, face, and/or hands
- Metallic or bad taste in mouth
- Nausea and vomiting
- Loss of appetite
- Shortness of breath
- Feeling cold
- Trouble concentrating, dizziness
- Leg pain/muscle cramps

Who is at risk of developing CKD?

The leading causes of kidney failure are **diabetes** and **high blood pressure**. These conditions interfere with the filtering ability of the kidneys and can lead to kidney failure. **Early diagnosis and careful management of these conditions can delay and even prevent the onset of kidney failure. Talk to your doctor if you have diabetes or hypertension. Other factors that increase a person's risk of developing CKD include:**

- Family history of kidney disease (e.g. polycystic kidney disease)
- Certain ethnic groups (First Nations, Pacific Islanders)
- Overuse of anti-inflammatory drugs and pain-killers
- Infection or injury to the kidneys (e.g. glomerulonephritis)

How can I prevent or control CKD?

There is no cure for CKD, but by learning more about your illness and taking an active part in managing your health you may be able to keep your kidneys functioning longer. Consider using the *Chronic Kidney Disease Flow Sheet* to monitor your progress. You can take this flow sheet with you when you visit your doctor. Other important things you can do include:

- **Control diabetes**

If you have diabetes, keep your blood glucose levels as close to normal as possible. Along with taking your medications as prescribed, keep your weight under control and exercise regularly. Your doctor should routinely test whether your kidneys are functioning properly.

- **Control high blood pressure (hypertension)**

High blood pressure causes kidney damage and will also cause kidney function to deteriorate more quickly. Control your high blood pressure to 130/80. Work with your doctor to find the anti-hypertension medications that work best for you. Keep your weight under control, exercise regularly, and reduce your salt intake to help keep your blood pressure at a healthy level.

- **Lead a smoke free life**

To help prevent kidney disease, stop smoking and avoid exposure to second hand smoke.

- **Eat well**

If you have CKD, it is important to have a diet that meets your nutritional needs. Learn how proper food choices can help you. Talk to a nutritionist or dietitian about a food plan that is right for you. Be aware that certain foods can cause kidney function to deteriorate more quickly. A diet that is too high in protein can cause problems.

- **Exercise and control your weight**

Exercising regularly is one of the best things you can do to improve your overall health. Exercise helps you to lower your blood sugar and blood pressure, achieve a healthy weight, improve your heart and lung health, and improve your physical, mental and emotional well being.

- **Do not overuse over-the-counter drugs**

Prolonged and frequent use of anti-inflammatory and anti-pain medications can damage your kidneys. Talk to your doctor or pharmacist to find out how to use non-prescription medication that won't damage your kidneys.

- **Reduce stress**

Recognize that it may take time to adjust to CKD – so be patient and set realistic goals. Keep involved in the pleasures, activities and responsibilities of daily life and share your feelings with family and close friends. Consider joining a support group.

Resources for People with Chronic Kidney Disease

Kidney Foundation of Canada (BC Branch)

Tel: 604 736-9775 (Vancouver area)
1 800 567-8112 (elsewhere in BC)
Fax: 604 736-9703
Email: info@kidney.bc.ca

The Kidney Foundation has patient support groups in many areas of BC as well as educational material and offers short term financial assistance for those in need.

The *Living with Kidney Disease* patient manual produced by The Kidney Foundation of Canada is an important educational reference for people living with kidney disease. The manual is available in English & French on the Kidney Foundation web site:

www.kidney.ca/publications-eng.htm

It is also available in English, French, Chinese, Italian, Portuguese & Punjabi from the BC Branch.

BC Provincial Renal Agency (BCPRA)

Tel: 604 875-7340
Email: bcpra@bcpra.ubc.ca

The BC Provincial Renal Agency is a collaborative of renal health professionals who coordinate the care of patients with kidney disease in BC.

BC Health Guide

Information on kidney disease can be found in the BC HealthGuide Online at www.bchealthguide.org or in the BC HealthGuide Handbook provided free to households throughout the province. The 24-Hour BC HealthGuide NurseLine puts you in touch with a Registered Nurse any time day or night just by calling one of the following numbers:

Local calling within Greater Vancouver:	604 215-4700
Toll-free elsewhere within BC:	1 866 215-4700
Deaf and hearing-impaired toll-free province wide:	1 866 TTY-4700

