RenalDigest

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Scarborough Hospital's 6th annual **Renal Day**, held May 13, 2006, was a great success. An impressive list of speakers addressed many aspects of chronic kidney disease (CKD) that satisfied the audience of 150 nephrology nurses, dieticians, community nurses, long-care nurses, general practitioners, and nephrologists.

In keeping with the day's focus, "Issues in Renal Patient Care Management," the presentations were largely patient-centred. Indeed, the importance of the patient in managing his or her own care—particularly patients on dialysis—was highlighted by Denise LeBlanc, Patient Care Manager of the Renal Dialysis Unit at the Scarborough Hospital (TSH), in her presentation, "Whose Disease Is It, Anyway?" As was discussed in the Spring '06 issue of *Renal Digest*, patient empowerment has an extremely positive effect on patient outcomes and quality of life.

In his opening remarks, Dr. Paul Tam, Director of TSH's Regional Dialysis Program, indicated that this annual event would be growing. In 2007, **Renal Day** will be held jointly with delegates from the York Central and Credit Valley Hospital dialysis programs, headed by Dr. Bharat Nathoo and Dr. George Wu, respectively.

Dr. Janet Roscoe and Dr. Robert Ting, nephrologists at TSH, gave presentations which highlighted the link between chronic kidney disease (CKD) and cardiovascular disease (CVD). Their presentations formed the basis of the articles in this issue of *Renal Digest*.

Renowned nephrologist Dr. Dimitrios Oreopoulos (Toronto Western Hospital) discussed the application of the principles of Continuous Quality Improvement to dialysis units to be able to anticipate and respond to increased patient demands, to increase adaptability to staff shortages, and to comply with tighter regulations. He also discussed future initiatives for peritoneal dialysis (PD).

Break-out sessions covered a wide range of topics, including:

The day ended with a panel of three renal patients, including Brian Quinlan, a renal transplant recipient who we met in the spring issue of *Renal Digest*. Brian, along with Peter Casey, who receives in-hospital dialysis, and Joyce Herzog, who we meet in this issue, fielded questions from the audience on various aspects of living with end-stage renal disease.

Chronic Kidney Disease and Cardiovascular Risk

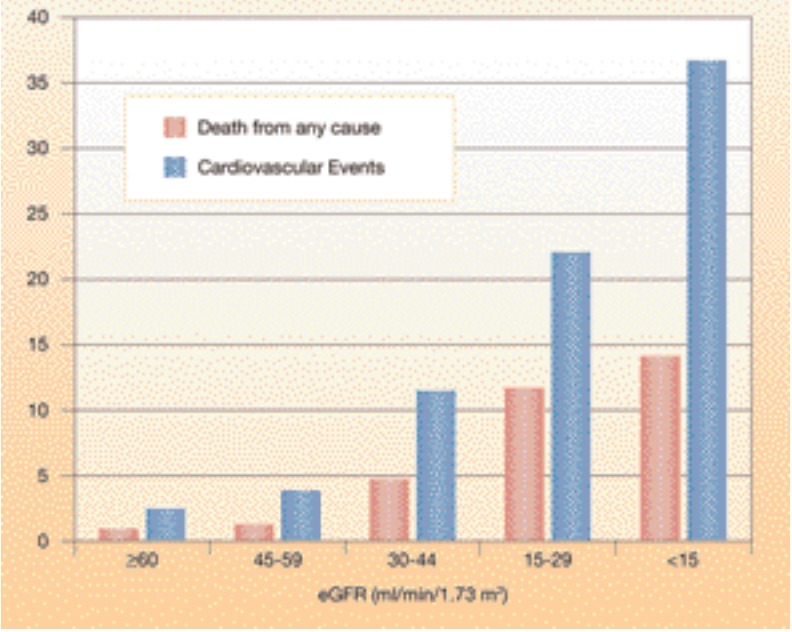
Robert Ting, MD
The Scarborough Hospital

Chronic kidney disease (CKD) is a major risk factor for end-stage renal disease and premature death, and it is well established that CKD significantly increases the risk of cardiovascular disease (CVD).[1] But at what stage of CKD does the risk become substantial?

It turns out that even mild renal insufficiency (S_{Cr} ≥124 µmol/L) should be considered an important cardiovascular risk factor. Moreover, even in the absence of classic CVD risk factors (hypertension, diabetes, and microalbuminuria), patients with renal disease have an increased risk for CVD.[2]

Even minor reductions in e-GFR significantly increase cardiovascular risk.[3]

FIGURE 1. Age-Standardized Rates of Death from Any Cause and Cardiovascular Events According to Estimated GFR (eGFR)[3]



Decreases in the estimated glomerular filtration rate (eGFR) increase the risk of death from any cause and cardiovascular events (Figure 1). Importantly, the presence of CKD that does necessitate dialysis (*i.e.*, eGFR ≥15 ml/min/1.73 m^2) still significantly increases cardiovascular risk in a non-linear fashion. CVD risk increases sharply even at eGFR values <45 ml/min/1.73 m^2, which includes Stage 3 CKD patients. Again, only a minor reduction in eGFR leads to an increased risk (Table 1).[3]

But why does CKD increase CVD risk? The eGFR, used to stage CKD severity, is associated with increased levels of inflammatory factors, abnormal apolipoprotein levels, increased plasma homocysteine levels, enhanced coagulability, anemia, left ventricular hypertrophy, increased arterial calcification, endothelial dysfunction, and arterial stiffness. As yet, it is unknown how these and other factors interact to increase CVD risk in CKD patients.[3]

Vascular calcification, common in CKD patients, may affect almost every artery, including coronary arteries, and contribute to CVD risk. Hyperphosphatemia and increased oxidative stress may be involved in the intimal and medial calcification of coronary arteries. Hyperphosphatemia, especially when serum phosphorus levels are above 1.78 mmol/L, plays a major role in vascular calcification by passive and active processes. By increasing the calcium-phosphate product, hyperphosphatemia leads to direct deposition of calcium salts in arteries and cardiac valves. A significant relationship between inflammation and vascular calcification in patients with CKD has also been reported.[4]

Chronic volume overload is a major cardiovascular stressor in patients with end-stage renal disease. In the long term, the deleterious effects of volume overload largely depend on the fact that the hemodynamic burden activates a series of adaptive processes that profoundly modify the structure of the myocardium. Higher numbers of fibroblasts and macrophages are commonly present in the volume-overloaded failing heart.[5]

It has recently been established that metabolic syndrome is a strong and independent risk factor for CKD.[1] Metabolic syndrome is defined by five criteria (Table 2). It is well known that presence of metabolic syndrome significantly increases CVD and diabetes risk and leads to increased mortality from CVD and all causes.[1,6]

When it comes to CKD risk, the higher the number of metabolic syndrome components a patient has, the higher the risk for CKD and microalbuminuria (Figure2). Although we now know that metabolic syndrome increases the risk of CKD—and CVD, by extension—studies need to be done to determine the effect of preventing or treating metabolic syndrome on CKD risk.

Abdominal obesity doubles the risk for CKD.[1]

TABLE 1. Adjusted Hazard Ratio for Death from Any Cause, Cardiovascular Events, and Hospitalization According to eGFR[3]

eGFR*	Death from Any Cause	Any Cardiovascular Event	Any Hospitalization
≥60†	1.0	1.0	1.0
45-59	1.2	1.4	1.1
30-44	1.8	2.0	1.5
15-29	3.2	2.8	2.1
<15	5.9	3.4	3.1

*ml/min/1.73 m^2 †Reference group

TABLE 2. Clinical Identification of the Metabolic Syndrome*[6]

Risk Factor	Defining Level
Abdominal obesity	
Men	Waist circumference >102 cm
Women	Waist circumference >88 cm
Triglyceride level	≥1.7 mmol/L
HDL-C level	
Men	<1.0 mmol/L
Women	<1.3 mmol/L
Blood pressure	≥130/85 mm Hg
Fasting glucose level	>6.1 mmol/L

*Criteria: ≥3 risk factors

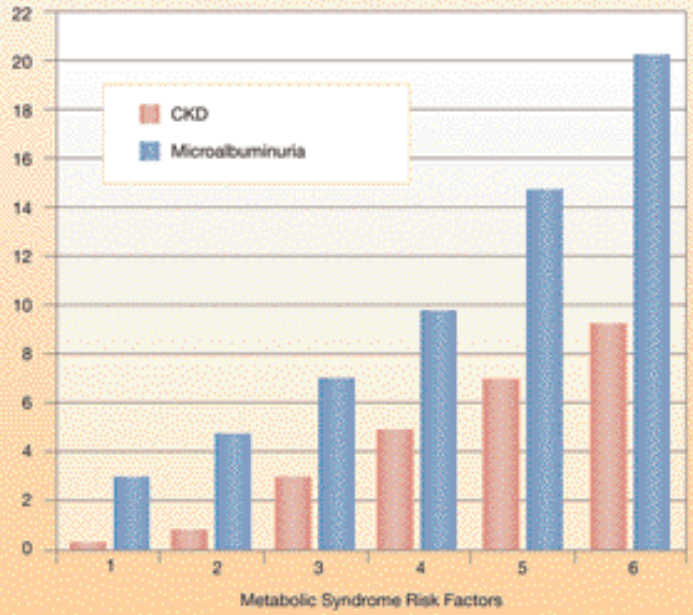
Genest *et al.*, 2003

For example, abdominal obesity doubles the risk for developing CKD. Therefore, abdominal obesity might be an important modifiable risk factor for CKD as well as diabetes and CVD.[1]

The most important classic risk factors for CKD and microalbuminuria are diabetes and hypertension. Just as only a small decrease in eGFR can increase CVD risk, even mildly increased blood pressure (≥130/85 mm Hg) or serum glucose levels (≥6.1 mmol/L) are associated with an increased risk for CKD and microalbuminuria.[1]

In the next article in this issue, *Congestive Heart Failure, Kidney Disease, and Dialysis*, Dr. Janet Roscoe discusses the link between congestive heart failure (CHF), CKD, and anemia as well as the management of CHF patients using dialysis.

FIGURE 2. Prevalence of CKD and Microalbuminuria by Number of Metabolic Syndrome Components[1]



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Metabolic risk is a strong and independent risk factor for CKD.[1]

Congestive Heart Failure, Kidney Disease, and Dialysis

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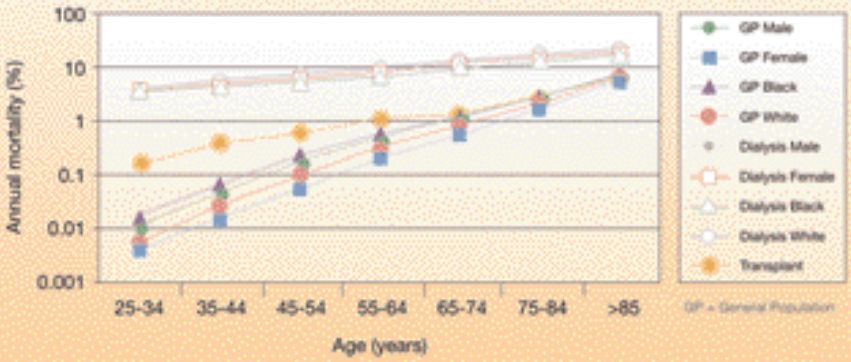
Heart failure is the final common pathway for many diseases that affect the heart. Just as many conditions contribute to kidney failure and end-stage renal disease (ESRD), a variety of heart conditions can lead to congestive heart failure (CHF). Increases in the incidence of CKD in developed counties parallel those in the incidence of CHF, and treatment costs and initial survival and death rates are very similar between the two diseases.[1] Patients with CHF generally have very poor quality of life and the prognosis is comparable to that of many types of cancer.[2]

CHF is important to nephrologists because it is an important cause of cardiac morbidity and mortality in CKD and dialysis patients. CHF also appears to be an important cause of anemia and of the progression of CKD to dialysis. Poorly-managed CHF worsens and contributes to anemia and deterioration of renal function.[3]

Causes of CHF

The top three causes of CHF—coronary disease/atherosclerosis, diabetes mellitus, and hypertension—are also the top three causes of ESRD. CHF is often a comorbidity of ESRD and cardiovascular mortality in ESRD is extremely high (Figure 1).[1,4] CHF can be an important contributor to the onset of CKD and it has been suggested that CHF is the strongest predictive risk factor for ESRD.[5]

FIGURE 1. Cardiovascular Mortality: General Population versus Dialysis Population[1]



CKD and CVD share the same three main causes—coronary disease, diabetes, and hypertension.

The Cardio-Renal Anemia Syndrome

Anemia is seen in CKD, dialysis patients, CHF, and renal transplantation and can lead to progressive cardiac failure and kidney damage. In fact, CHF may be an important factor in the development of anemia and the progression of CKD and anemia in CHF patients is an independent risk factor for mortality.[3]

The cardio-renal anemia syndrome depicts a vicious circle between CHF, CKD, and anemia in which each of these conditions can both *cause* and *be caused by* the others (Figure 2). Together, CHF, CKD, and anemia increase the probability of ESRD or death by 300%.[5] Because CHF, CKD and anemia are so intimately linked, aggressive treatment of CHF and control of the associated anemia may prevent the progression of both CKD and CHF.[3]

Management of CHF

In the earliest stage of CHF, the treatment goal is to prevent heart remodelling, mainly by controlling risk factors. Early intervention reduces the incidence of CHF by 30 to 50%; treatment of hypertension, hyperlipidemia, and diabetes mellitus are critical.[6] Treatment of CHF can also help to stabilize CKD.[5]

In advanced stages of CHF, the aims are to improve survival, slow disease progression, alleviate symptoms, and minimize risk factors. Lifestyle modification, including sodium restriction, weight monitoring, and medication, becomes critical.[6]

Anemia in dialysis patients increases the probability of recurrent and *de novo* CHF and hospitalization and mortality.[3] Treatment of anemia with drugs such as erythropoietin may be very helpful in the management of CKD patients and help prevent CHF.[5]

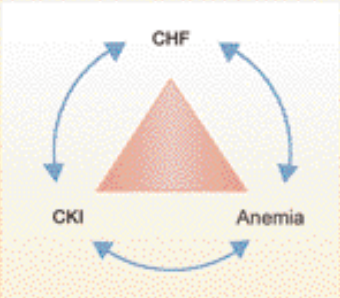
Pharmacological Treatment

Diuretics—especially loop diuretics—are usually first-line therapy for CHF patients. In some patients, edema persists even with continued diuretic therapy. This has been termed diuretic resistance and leads to excess sodium and fluid retention.[7]

Various combinations of drugs, including ACE inhibitors, beta-blockers, and angiotensin receptor blockers, are used to decrease pre-load and/or after-load and to improve inotropy in CHF patients. ACE inhibitors can lead to reduced glomerular filtration rate (GFR) and decreased efferent glomerular arteriolar resistance.[8]

Together, CHF, CKD, and anemia increase the risk of ESRD or death by 300%.[5]

FIGURE 2. The Cardio-Renal Anemia Syndrome[5]



CHF = congestive heart failure
CKI = chronic kidney insufficiency

TABLE 1. Advantages of CAPD in CHF Treatment[10]

• CAPD is continuous and not intermittent
• Lactate in CAPD exerts little hemodynamic effect
• Electrolyte shifts are minimal
• Acidosis rarely occurs
• Improved fluid balance
• Enables continuation of treatment (medical or surgical)
• Fluid can be removed continuously; minimal effects on blood pressure
• Technique is relatively simple; can be done at home
• Anesthesia is not required

Dialysis

Uncontrolled CHF is often associated with rapid decline in renal function. About 50% of patients with CHF also have CKD and about 44% of renal dialysis patients have CHF.[3] Therefore, management of CKD patients should also include management of CHF and its symptoms.

Ultrafiltration (UF) can improve cardiac performance by decreasing preload or removing some negative inotropic substance. With CHF, the kidneys are prompted to retain salt and water, causing edema, which increases the workload of the heart.[9]

Dialysis can be used successfully in advanced stages of CHF to reduce water retention and the heart's workload. While reported survival has still been relatively short, quality of life is much improved.[8] Both hemodialysis (HD) and peritoneal dialysis (PD) have been used in the treatment of CHF. A few studies have found that continuous ambulatory PD (CAPD) offers distinct advantages over HD in treating CHF, particularly in patients refractory to drug treatment (Table 1).[10]

Peritoneal Dialysis

As early as 1949, the use of PD for the treatment of severe cardiomyopathy was investigated. Today, PD is the UF treatment of choice for long-term ambulatory management of patients with refractory CHF and offers several advantages (Table 2).[11]

About 50% of CHF patients have CKD and about 44% of dialysis patients have CHF.[3]

For example, NYHA Class IV HF patients—who are not candidates for heart surgery or transplantation—can be managed using PD and their quality of life can be improved. In some CHD patients, PD has been shown to significantly reduce hospitalization time and the number of medications required. Because CAPD can be done on an outpatient basis, significant cost savings can be realized.[10]

If CHF is a key factor in the progression of CKD and anemia, early detection and treatment of heart damage and CHF should improve cardiac function and CHF as well as anemia and CKD. This means that treating CHF without treating the anemia will not slow the progression of CHF or CKD, and treating anemia without managing the CHF will not be effective in the management of CKD.[5]

CKD causes anemia but the CKD patient may have no outward symptoms of CHF; therefore, diagnosis of CHF in renal patients is often not made. Ultimately, the progression of underlying CHF increases the damage done to the kidneys.[3]

PD can reduce hospitalization and drug requirements in CHF patients.[10]

TABLE 2. Benefits of PD in the Treatment of CHF

- Restoration of diuretic responsiveness[12]
- Improvement in NYHA classification[10,13-15]
- Decreased plasma volume[12,16]
- Improved electrolyte balance[12,16]
- Reduced venous pressure[12]
- Improved cardiac/renal dynamics[14]
- Improved left ventricular ejection fraction[15]

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Patient Empowerment: A Success Story

Joyce Herzog was the first patient from the Scarborough Hospital (TSH) to go on home hemodialysis (home hemo). She has been on home hemo for over a year now and is a strong supporter of it. However, she remains one of only two patients currently doing home hemo through TSH. She would advise newly-diagnosed end-stage renal disease patients to seriously consider this treatment modality.

Q Was getting kidney disease a surprise to you?

Not at all. I have a long family history of polycystic kidney disease. My mother died of kidney disease and my twin brother was on dialysis for about 10 years before he passed away. I also have a cousin on my mother's side who started dialysis at age 30. I was diagnosed about 30 years ago with polycystic kidney disease, so I always knew that there was a strong possibility that I would end up on dialysis.

Q How long have you been on dialysis?

Altogether, I've been on dialysis for almost three years. That includes hospital hemo, peritoneal dialysis, and home hemo. I've been on home hemo for over a year now, and I love it. It works very well for me.

Q What was it like to be the charter member of the home hemo club at TSH?

It was a very positive learning experience for everyone. The medical staff was absolutely marvelous to work with. They still are. They came to my home to set me up with the machine, and we worked together to make the whole program work. I can still reach someone 24/7 if I have problems with my home hemo.

Q You are very positive about home hemo. What do you like about it?

Lots of things. First of all, it's very convenient. I don't have to travel to and from the hospital. Going to the hospital for dialysis was pretty much a whole-day affair, because by the time I travelled there and had my treatment, the total time was about seven hours, three days a week.

I can do home hemo on my own schedule, still three times a week, and be comfortable in my own home. The process takes about three and a half hours, so it cuts the time needed for the whole process in about half compared to hospital hemo.

Home hemo has given me a really good understanding of what is going on when I do my dialysis and it makes me feel like I'm actively involved in my own treatment.

Q Can you travel while on home hemo?

Yes! My husband and I have been on a 12-day Caribbean cruise since I have been on dialysis! In fact, there were 11 other dialysis patients on the cruise. I had dialysis five times—every second day—on that cruise, and the nurses and the doctor were wonderful. They ran three shifts a day.

My husband and I also get away regularly to our cottage on weekends during the summer. If I start my dialysis early Friday morning, say six o'clock, we can be away by noon and I'm good for the weekend.

Q What advice would you give to CKD patients facing or currently on dialysis?

I think a lot of people don't want to deal with the needles. Everything else about home hemo appeals to them, but having to actually stick themselves with the needles turns them off. My experience has been great, and I would encourage any patient to strongly consider home hemo.

Joyce has taken her need for dialysis in stride. She and her husband, Steve, plan to travel to Puerto Vallarta, México, in March of 2007.

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