Kidney360

Global Dialysis Perspective: Canada

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KIDNEY360 1: 115–118, 2020. doi: https://doi.org/10.34067/KID.0000462019

Introduction

Canada is a federation of ten provinces and three territories, and health care is primarily a provincial responsibility. The provinces, therefore, have substantial autonomy in health care delivery but are required to follow the basic tenets of the 1967 Canada Health Act as a condition for receiving essential health care transfer payments from the federal government. These conditions include the key requirement that all essential medical services have a single public payer, and therefore, no private insurance systems are allowed to fund such services. Therefore, neither dialysis providers nor physicians can directly charge patients for dialysis care, and conversely, patients cannot pay extra to see a particular nephrologist or attend a particular dialysis unit. This is uniquely restrictive compared with other countries (1).

Health care funds come from provincial tax revenues and from federal transfer payments. Exclusively public funding does not exclude private provision of health care, and indeed, most Canadian physicians are self-employed and reimbursed "fee for service" by provincial governments. Hospital care is delivered by "not for profit" hospitals that are nominally independent, but they are funded by the provincial ministries of health (1).

Dialysis Providers

The delivery of maintenance dialysis services described here will be primarily on the basis of the model used in Ontario, the most populous province with 40% of the entire population. Key points of difference from other provinces will be noted however.

Maintenance dialysis is almost entirely provided by Renal Programs based in "not for profit" government-funded hospitals. These range from large academic centers associated with medical schools to modest-sized community hospitals. These Renal Programs typically provide in-center hemodialysis (HD), home peritoneal dialysis (PD), and often, home hemodialysis (HHD) as well as outpatient and inpatient nephrology. Most academic Renal Programs have an associated kidney transplant unit. Many of the Renal Programs operate in a "hub and spoke" model, with the hub being in the main hospital and the spokes being smaller satellite HD units that are located in medium or small community hospitals in suburbs and towns. A small but growing proportion of the satellite HD units is in leased areas in office blocks or shopping malls. Patients in satellite HD units usually receive physician care from nephrologists who work in the hub Renal Program. For example, in Ontario, there are 27 Renal Programs treating 12,000 patients on maintenance dialysis. Between them, the 27 Renal Programs deliver HD at approximately 100 sites. All 27 also provide PD, and 22 provide HHD, but only 6 provide kidney transplantation (2).

"Private for profit" dialysis providers or "Large Dialysis Organizations" scarcely exist in Canada. Provincial governments have up to now shown little interest in contracting out dialysis services to "private for profit" providers. There is no published polling data. but it is this author's impression that many nephrologists and advocacy groups would be skeptical about their introduction on the basis of adverse publicity concerning the experience in the United States (3).

Nephrologists

Nephrologists are generally paid "fee for service" by provincial ministries for care of patients on maintenance dialysis. The fees are negotiated between provincial ministries and provincial medical associations (1).

Historically, fees for center HD were markedly higher than those for home or satellite-based modalities on the notion that center HD was a procedure, and this is still the case in some of the smaller provinces. In Ontario, Alberta, and Quebec, there has been over the past two decades a switch to modality-independent physician fees, sometimes called a "dialysis capitation fee," to avoid any incentive for physicians to keep patients on expensive center HD (4).

In provinces that retain differentially higher fees for center HD, there is typically a requirement to see the patient during every HD treatment. In those with modality-independent capitation fees, there is typically no specific requirement to see patients at a certain frequency, but in practice, patients on center HD would be seen at least once a week and more frequently if needed (Table 1). Patients on home dialysis in both reimbursement systems are generally seen every 1–2 months if stable and more frequently if not.

Nephrologists in Canada are perceived as relatively well paid compared with other internal medicine specialists, and the specialty remains popular.

Dialysis Funding

The funding model for Renal Programs providing dialysis varies by province, but in all cases, the funding

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Table 1. Basic information on chronic dialysis in Canada

No. of patients on chronic dialysis in country[a]	22,100
Incidence rate of ESKD pmppa[a]	202
Prevalent rate of ESKD pmppa[a]	790 (dialysis only); 1350 (including transplant)
Mean age of incident patients,[a] yr	63
Prevalent patients on home dialysis,[a] %	25 (20 PD and 5 HHD)
Location of dialysis units	Mainly hospital based
Economic model for dialysis units	Not for profit
Reimbursement per HD[b]	US$251[b]
Staffing in HD units	Mainly registered nurses
Typical patient-to-nurse ratio	3:1
Average duration of HD session, h	3–4
Proportion of patients on HD using fistula, graft, and catheter[c]	36% fistula, 5% graft, 59% catheter
No. of times patient on HD seen by nephrologist	Once a week
Nephrologist reimbursement model for dialysis	Fee for service—mainly modality independent

pmppa, per million population per year; PD, peritoneal dialysis; HHD, home hemodialysis; HD, hemodialysis.
[a]On the basis of Canadian Registry 2016 data, which exclude Quebec from where data are not available (Quebec accounts for 22% of the Canadian population).
[b]On the basis of Ontario HD "bundle."
[c]Data from Ontario Renal Network 2017.

comes from the provincial Ministry of Health or from a provincial renal agency set up by that ministry (5). In Ontario, hub hospitals receive funds through a volume-based modality-dependent formula, with different rates or "bundles" for conventional center HD, frequent center HD, long-duration nocturnal center HD, conventional HHD, frequent HHD, continuous ambulatory PD, and automated PD (Table 2) (6). This contrasts with the modality independent "bundles" in the United States. The funding is on the basis of estimated costs of each modality as delivered in typical centers in that province. Dialysis "bundles" in Ontario include costs of staffing, supplies, and laboratory tests but not HD machines, medications, physician fees, or access procedures, which are all separately funded.

In most other provinces, there is no modality-based funding formula, and hospitals fund dialysis services out of the global budget that they receive from the Ministry of Health. This model is, therefore, not volume based and can make it challenging to deal with growth.

Medications are not publicly funded, except those for children, people aged 65 or over, and those on disability or in public welfare programs. Adult patients without insurance typically do receive some public funding if their medications costs exceed an income-related deductible (1). Erythropoietic agents are easily available to patients on dialysis. Access to more expensive phosphate binders and cinacalcet is more limited, and typically, only publicly funded if particular criteria have been met. For example, in Ontario, for noncalcium phosphate binders to be publicly funded, serum phosphate must exceed 1.8 mmol/L (5.6 mg/dl) on two separate occasions, and there must also be two episodes of hypercalcemia (serum calcium >2.65 mmol/L [10.6 mg/dl]), coronary artery calcification on imaging, or calciphylaxis. For cinacalcet to be funded, there must be refractory symptomatic hyperparathyroidism with serum parathyroid hormone >88 pmol/L (830 pg/ml), and the patient must either be unfit for parathyroidectomy or be awaiting transplant. These criteria are slightly stricter than those in international guidelines but consistent with an evidence-based medicine approach (7,8).

ESKD Incidence and Prevalence

Data on ESKD is collected by the federally funded Canadian Organ Replacement Register, and an annual report is issued (9). Data collection is not tied to funding in all provinces, and therefore, data may not be complete. In particular, the province of Quebec has not submitted data in recent years, and therefore, calculations for Canada exclude the province that accounts for 23% of the Canadian population.

Incidence of ESKD in Canada is approximately 200 new patients per million population per year (pmppa), although there is variation by province, with higher rates in Manitoba, Newfoundland, and Ontario and lower rates in British Columbia, Alberta, and Quebec (9). These differences are partly related to the proportion of the provincial population that is of "First Nations" or aboriginal origin. First Nations people account for 5% of the Canadian population and have about three times higher rates of ESKD largely driven by diabetic kidney disease and aggravated by high levels of socioeconomic deprivation (10). Other factors that may

Table 2. Ontario Renal Network annualized modality "bundles"

Modality	Center HD	Frequent Center HD (>4 Times Weekly)	Long-Duration Center HD (>15 h Weekly)	Home HD	Frequent HHD (>4 Times Weekly)	Continuous Ambulatory PD	Automated PD
Canada $	51,278[a]	85,408	85,408	23,130[b]	35,593[b]	29,096[c]	38,145[c]
US $	39,191[a]	65,276	65,276	17,678[b]	27,203[b]	22,238[c]	29,153[c]

[a]Equivalent to Canada $329 or US $251 per HD treatment for a three times weekly HD regimen.
[b]Canada $2300 (US $1758) in year 1 for training.
[c]Canada $11,400 (US $8713) in year 1 for training.

explain differences in provincial incidence rates include age variation, socioeconomic factors, geography, immigration patterns, and degree of urbanization. Growth in ESKD incidence has been notably less after compared with before the year 2000. The mean age of patients with incident ESKD has been stable for many years at about 64 years, and about 40% have ESKD due to diabetes (9).

Prevalence of ESKD is rising faster than incidence due to improved survival, and it is typically about 1350 pmppa when transplants are included and 800 pmppa when only those on maintenance dialysis are counted (9).

Canada's ESKD incidence rate is notably lower than that of the United States, but it is higher than that in most Northern and Western European countries and similar to that seen in the more affluent countries of Eastern Europe and Latin America (11).

Modality Distribution

Canada is a high user of home dialysis by international standards (11). The percentage of patients on PD is about 20%, and another 4%–5% do HHD. This is less than was the case 25 years ago when center HD capacity was constrained and PD use exceeded 35%. Home dialysis use is strongly promoted by provincial governments in part due to lower costs (12,13). However, there is no mandatory home dialysis first policy, and HD capacity is not severely limited; therefore, there is great variation in use by province, ranging from 30% in British Columbia to 9% in Newfoundland (9). There is a long history of innovation in both PD and HHD, and outcomes seem to be relatively good, with initial survival rates exceeding those on center HD in many studies (13–15).

HD Practices

Canadian HD practices are strongly influenced by evidence-based medicine and by cost containment. Novel, more expensive practices are not typically accepted without such evidence. Center HD units in Canada typically run three shifts a day, and most patients are treated three times a week. Typical duration is 3–4 hours per treatment driven by urea clearances, which are routinely measured. As many as 10% of patients on HD in some centers dialyze four or more times weekly, most often due to high interdialytic fluid gains but also due to a belief that more frequent HD leads to better outcomes (14). A smaller number do HD twice weekly as part of an incremental HD strategy or due to patient insistence or nonadherence. Some HD units run a nocturnal shift for patients wanting HD duration of 5–6 hours.

High-flux membranes are now universal, and dialyzer reuse has become uncommon. High blood flows of 400 ml/min are commonplace. Most units do not limit ultrafiltration rates. Hemodiafiltration is relatively uncommon.

A striking feature of Canadian HD is the high frequency of central venous catheter use in prevalent patients (Table 1). This is close to 60% in Ontario, for example, and overall, Canada has one of the highest rates internationally (2). This was initially driven by long wait times for fistula construction and by high failure rates, but there is now a widespread loss of belief in the superiority of fistulas over catheters, particularly for older frailer patients. Reported catheter bacteremia rates of under 0.2 per 1000 patient days and patient preference to have catheters in an era of person-centered care are other big factors in the decline of fistula use (16). There are no financial penalties for high catheter rates. The absence of any rise in HD mortality rates has been reassuring (9).

Historically, HD units in Canada have been staffed by registered nurses who are usually unionized and well paid by international standards. Staffing ratios of one nurse for every two patients were previously frequent. Fiscal constraints and nursing shortages have, however, led to recent changes. Staffing ratios of one to three patients are now common, and there has been some substitution of registered nurses with "practical nurses" or nursing assistants who have less training and lower salaries. Nonclinical tasks previously done by nurses are increasingly performed by lower-paid patient service associates. However, the use of such staff to needle fistulas, such as in the United States, is rare.

Social workers and dietitians are required and available to all patients on dialysis, and reimbursement takes this requirement into account. However, most provinces do not mandate specific provider-to-patient ratios, and fiscal pressures have led to a perceived shortage of sufficient allied health support in many centers. Nurse practitioners with qualifications in nephrology are employed by hospitals as "physician extenders," but this is largely confined to dialysis units in academic centers.

Home Dialysis Practices

Cycler use is predominant in patients on PD, and it is increasingly driven by lifestyle rather than medical indications. Clearance targets drive PD prescription practices but less so than in HD. Incremental strategies are increasingly used (17). Icodextrin is widely used, but normal pH "biocompatible" solutions are not, partly due to higher cost and uncertain evidence.

Assisted PD is increasingly used with government-funded home care nurses and support workers available to help patients who are unable to do their own PD and whose relatives are unable to assist them (18). This is typically done using automated PD with the visiting nurse or support worker setting up the cycler and sometimes, connecting the patient. In Ontario, about 20%–25% of patients on PD are typically receiving assisted PD at any given time. This increases the cost of PD, but on average, it is still substantially less than that of center HD (6,18).

HHD is popular in Canada but has plateaued at about 4%–5% of the dialysis population (9). About half of patients on HHD receive more than three treatments per week, and many do short daily or slow nocturnal HD (14). Some provinces have funding formulas for these more intense forms of HHD (6).

First Nations Populations

As already mentioned, people of First Nations origin have very high rates of ESKD. About one third of this population live remotely, often on reserves (10). Many of these people are relatively close to small satellite HD units, where costs

per treatment are often high (19). Others are not, and if home dialysis is unsuccessful or contraindicated, people with ESKD in these remote areas may need to relocate to an urban center with consequent social dislocation. Telemedicine is increasingly widely used to deliver renal care to people living remotely with CKD and ESKD.

Future Challenges

Although growth rates in maintenance dialysis nationwide are <20 years ago, the growth in the general population in cities has led to HD capacity problems in major urban centers, such as Toronto, Vancouver, Montreal, and Winnipeg. This is exacerbated by health care budget constraints and the high cost of real estate in these cities. It has led to greater emphasis on home dialysis, transplantation, and conservative care and more discussion about ESKD prevention, but it has also raised the issue of a possible role for private capital in construction of dialysis units.

Author Contributions

P. Blake conceptualized the study, was responsible for the investigation, methodology, validation, and writing of the original draft of the manuscript, and reviewed and edited the manuscript.

Disclosures

P. Blake reports other from Ontario Renal Network in Ontario Health and personal fees from Baxter Global outside the submitted work. This includes being contractually employed as Medical Director of a government agency called Ontario Renal Network operating inside a broader government agency called Ontario Health and having received occasional speaking honoraria from Baxter Global for talks given outside Canada.

References

1. Fierlbeck K: *Health Care in Canada: A Citizen's Guide to Policy and Politics*, 1st Ed., Toronto, University of Toronto Press, 2011
2. Ontario Health: Ontario Renal Network. 2019. Available at: https://www.ontariorenalnetwork.ca/en. Accessed October 28, 2019
3. Gander JC, Zhang X, Ross K, Wilk AS, McPherson L, Browne T, Pastan SO, Walker E, Wang Z, Patzer RE: Association between dialysis facility ownership and access to kidney transplantation. *JAMA* 322: 957–973, 2019
4. Mendelssohn DC, Langlois N, Blake PG: Peritoneal dialysis in Ontario: A natural experiment in physician reimbursement methodology. *Perit Dial Int* 24: 531–537, 2004
5. Woodward GL, Iverson A, Harvey R, Blake PG: Implementation of an agency to improve chronic kidney disease care in Ontario: Lessons learned by the Ontario Renal Network. *Healthc Q* 17 [SP]: 44–47, 2015
6. Manns B, Agar JWM, Biyani M, Blake PG, Cass A, Culleton B, Kleophas W, Komenda P, Lobbedez T, MacRae J, Marshall MR, Scott-Douglas N, Srivastava V, Magner P: Can economic incentives increase the use of home dialysis? *Nephrol Dial Transplant* 34: 731–741, 2019
7. Ministry of Health Ontario: Exceptional access: Program reimbursement criteria for frequently requested drugs, 2019. Available at: http://www.health.gov.on.ca/en/pro/programs/drugs/docs/frequently requested_drugs.pdf. Accessed December 29, 2019
8. Ketteler M, Block GA, Evenepoel P, Fukagawa M, Herzog CA, McCann L, Moe SM, Shroff R, Tonelli MA, Toussaint ND, Vervloet MG, Leonard MB: KDIGO 2017 clinical practice guidelines for the diagnosis, evaluation and treatment of chronic kidney disease–mineral and bone disorder (CKD-MBD). *Kidney Int Suppl* 7: 1–59, 2017
9. Canadian Institute for Health Information: Organ replacement in Canada; CORR annual statistics, 2018. Available at: https://www.cihi.ca/en/organ-replacement-in-canada-corr-annual-statistics-2018. Accessed October 21, 2019
10. Jiang Y, Osgood N, Lim HJ, Stang MR, Dyck R: Differential mortality and the excess burden of end-stage renal disease among first Nations people with diabetes mellitus: A competing-risks analysis. *CMAJ* 186: 103–109, 2014
11. United States Renal Data Systems: 2018 Annual data report. Chapter 11. International comparisons. 2018. Available at: https://www.usrds.org/2018/view/v2_11.aspx. Accessed October 25, 2019
12. Oreopoulos DG, Coleman S, Doyle E: Reversing the decreasing peritoneal dialysis (PD) trend in Ontario: A government initiative to increase PD use in Ontario to 30% by 2010. *Perit Dial Int* 27: 489–495, 2007
13. Krahn MD, Bremner KE, de Oliveira C, Dixon SN, McFarlane P, Garg AX, Mitsakakis N, Blake PG, Harvey R, Pechlivanoglou P: Home dialysis is associated with lower costs and better survival than other modalities: A population-based study in Ontario, Canada. *Perit Dial Int* 39: 553–561, 2019
14. Lindsay RM, Leitch R, Heidenheim AP, Kortas C; London Daily/Nocturnal Hemodialysis Study: The London Daily/Nocturnal Hemodialysis Study–study design, morbidity, and mortality results. *Am J Kidney Dis* 42[Suppl 1]: 5–12, 2003
15. Yeates K, Zhu N, Vonesh E, Trpski L, Blake P, Fenton S: Peritoneal dialysis and hemodialysis are associated with similar outcomes for end-stage renal disease in Canada. *Nephrol Dial Transplant* 27: 3568–3575, 2012
16. Blake PG, Quinn RR, Oliver MJ: The risks of vascular access. *Kidney Int* 82: 623–625, 2012
17. Ankawi GA, Woodcock N, Jain AK, Garg AX, Blake PG: The use of incremental peritoneal dialysis in a large contemporary peritoneal dialysis population. *Can J Kidney Health Dis* 3: 2054358116679131, 2016
18. Oliver MJ, Quinn RR, Richardson EP, Kiss AJ, Lamping DL, Manns BJ: Home care assistance and the utilization of peritoneal dialysis. *Kidney Int* 71: 673–678, 2007
19. Ferguson TW, Zacahrias J, Walker R, Collister D, Rigatto C, Tangri N, Komenda P: A economic assessment model of rural and remote datellite hemodialysis units. *PLoS One* 10: e0135587, 2015