

Original Article

Haemodialysis vascular access problems in Canada: results from the Dialysis Outcomes and Practice Patterns Study (DOPPS II)

David C. Mendelssohn¹, Jean Ethier², Stacey J. Elder³, Rajiv Saran^{4,5}, Friedrich K. Port³ and Ronald L. Pisoni³

¹Division of Nephrology, Humber River Regional Hospital and University of Toronto, Weston, ON, Canada

²Centre Hospitalier de l'Université de Montréal, Montreal, QC, Canada, ³University Renal Research and Education Association, Ann Arbor, MI, ⁴Division of Nephrology, Kidney Epidemiology and Cost Center, Ann Arbor, MI and ⁵Department of Veterans Affairs Medical Center and Division of Nephrology, University of Michigan, Ann Arbor, MI, USA

Abstract

Background. The optimal vascular access for chronic maintenance haemodialysis (HD) is the native arteriovenous fistula (AVF). Vascular access practice patterns are reported for a Canadian cohort of patients from the Dialysis Outcomes and Practice Patterns Study (DOPPS II).

Methods. DOPPS II is a prospective, observational study in 12 countries, including Canada. A representative random sample of 20 Canadian HD facilities and patients within those units were studied during 2002–2004. Canadian results were compared with those found in Europe and the USA.

Results. AVF use in Canadian prevalent (53%) and incident (26%) patients was lower than Canadian guidelines recommend (60%), and lower than in Europe [prevalent (74%), incident (50%)]. Despite 85% of Canadian HD patients having seen a nephrologist for >1 month prior to starting dialysis, central venous catheter use in Canada (33% in prevalent patients, 70% in incident patients) was much higher than in Europe (prevalent 18%, incident 46%) and slightly higher than in the USA (prevalent 25%, incident 66%). This pattern is contrary to the preferences of Canadian medical directors and vascular access surgeons. The typical time from referral until permanent vascular access creation is substantially longer in Canada (61.7 days) than in Europe (29.4 days) or the USA (16 days). This longer delay time and higher catheter use in Canada may be a consequence of the significantly lower number of access surgeons per 100 HD patients in Canada (2.9)

compared with the USA (8.1) and Europe (4.6). Furthermore, the median hours per week devoted to vascular access-related surgery per 100 patients is substantially lower in Canada (0.027 h) compared with the USA (0.082 h) and Europe (0.059 h).

Conclusion. These findings suggest that Canadian chronic HD patients often rely on central venous catheters for vascular access, despite their known association with numerous detrimental outcomes in HD. Nephrologists, vascular access surgeons, interventional radiologists, other physicians and health care funding bodies must be more broadly educated about the priority of AVF creation as the preferred vascular access for chronic HD patients. They must work together to secure both the human and financial resources and other health care system enhancements to increase AVF creation rates in a timely manner.

Keywords: arteriovenous fistula; arteriovenous grafts; central venous catheters; DOPPS; haemodialysis; vascular access

Introduction

Chronic maintenance haemodialysis (HD) requires stable and repetitive access to the intravascular compartment in order to deliver high rates of blood flow to the extracorporeal circuit. In order to achieve the best possible patient outcomes in HD, it is widely accepted that the optimal vascular access device is the arteriovenous fistula (AVF). The Canadian Society of Nephrology (CSN) Vascular Access Guidelines, published in 1999, state clearly that for patients requiring chronic HD, the preferred type of access is a native AVF [1]. Similar guidelines have been published

Correspondence and offprint requests to: D. C. Mendelssohn, Humber River Regional Hospital, 200 Church St. Room 2024, Weston, Ontario M9N 1N8, Canada.
Email: dmendelssohn@hrrh.on.ca

in other countries [2]. Other HD access devices are available, such as synthetic AV grafts and central venous catheters, but are known to have more problems with flow, morbidity and increased cost compared with the AVF [3,4]. Indeed, several recent studies show that there is a gradient of patient mortality risk by access type, with the highest risk observed with central venous catheters, and the lowest risk with AVFs [5–7].

The Dialysis Outcomes and Practice Patterns Study II (DOPPS II) is a prospective, observational study of HD patients and facilities in 12 countries, including Canada. Vascular access outcomes are among the major study outcomes under investigation. The objective of DOPPS is to determine practice patterns that are associated with better patient outcomes, through the examination of variations in practice patterns around the world.

While comparison of one country's outcomes relative with other countries' outcomes was not intended at the initiation of the DOPPS, there are instances where detailed, country-specific analysis may be critical to expose problems in dialysis delivery systems and to catalyse system improvements. This analysis of vascular access practices in Canadian patients participating in DOPPS II from 2002 to 2004 is one such example, and indicates that the multiple physician providers and health care resources may not be in alignment.

Methods

DOPPS II is a prospective, observational study of HD treatment and patient outcomes at 320 HD units and >12 400 HD patients in 12 countries: Australia/New Zealand, Belgium, Canada, France, Germany, Italy, Japan, Spain, Sweden, the USA and the UK. DOPPS II is an extension and expansion of the seven-country DOPPS I. The methodology has been described in detail previously [8,9], and several vascular access papers have been published recently based on DOPPS I data in which Canada was not a participating country [10–16].

For DOPPS II, a random sample of dialysis units was selected in each country to be representative of the types of dialysis units and geographic regions of each country. This particular investigation includes the countries of Canada, Belgium, France, Germany, Italy, Spain, Sweden, the UK and the USA. The number of randomly selected dialysis units from each of these countries was: 20 in Canada, Belgium, France, Germany, Italy, Spain, Sweden and the UK, and 80 from the USA (total $n = 240$ facilities). Each unit contributed a random sample of 20–40 prevalent HD patients, and up to 15 incident HD patients. Vascular access data were collected for each patient at entry into the study and updated whenever an event related to vascular access occurred. Information collected included type of access, placement location, creation date, date of first use (single or double needle cannulation) and dates of failure, infections and procedures. In addition, the medical director at each participating facility completed a written questionnaire about local practice patterns, including vascular access preferences and practices. Similarly, incident patients completed a written questionnaire concerning their

feelings about their health, their kidney disease, the effects of kidney disease on their lives and satisfaction with care. Finally, a vascular access surgery questionnaire was completed by the primary access surgeon at most DOPPS facilities, and assessed vascular access practices, training and opinions. For this particular investigation, vascular access surgery questionnaires were completed for 16 facilities in Canada, 86 in Europe (Belgium, France, Germany, Italy, Spain, Sweden and the UK) and 36 in the USA. All DOPPS II data were collected during 2002–2004. Comparisons for this study were made between Canadian, European and US DOPPS II data. 'Europe' indicates here the seven European DOPPS countries.

Vascular accesses were classified as one of six types: native AVF, synthetic graft, bovine graft (not used in Canada), tunnelled central venous catheter, untunnelled temporary catheter or other. Temporary catheters were defined as any type or brand of uncuffed, percutaneously placed central vein catheter. In the analyses in which AVFs were compared with grafts, synthetic and bovine grafts were combined together.

This analysis describes the type of vascular access in use for the cross-section of all patients enrolled at the start of the study (prevalent), and for new (incident) patients enrolled any time during the study. Incident patient vascular access use was restricted to patients who had their first dialysis treatment for end-stage renal disease (ESRD) within 5 days of enrolment into the DOPPS. For this incident patient cohort, the access in use at study enrolment was considered the access used at the patient's initial HD treatment.

Sample means and distributions were calculated by country for each characteristic of interest. Statistical comparisons were made between means of country groups using mixed linear regression for continuous variables and logistic regression for dichotomous variables. Mixed linear regression models involving patient-level data accounted for facility clustering effects by using a random effects model, and an exchangeable correlation matrix was applied in the logistic models using the generalized estimating equation procedure. All analyses were performed using SAS version 8.2 (SAS Institute, Cary, NC).

Results

The demographics of patients in DOPPS II in Canada, Europe and the USA are shown in Table 1. In most respects, Canadian patients have characteristics that are similar to patients in Europe and the USA. The demographic profile of the Canadian DOPPS II cohort is similar to the profile of the entire Canadian HD population as reported by the Canadian Organ Replacement Registry [17]. Regarding patient co-morbidity, the prevalence of coronary artery disease (55%) and diabetes (41%) in Canadian HD patients falls between that of HD patients in the USA and Europe. However, the burden of co-morbidity among Canadian HD patients is as great or greater than in patients in the USA and Europe regarding congestive heart failure, peripheral vascular disease, hypertension, cerebrovascular disease and certain other cardiovascular diseases (e.g. atrial fibrillation, arrhythmia, cardiac arrest, left ventricular hypertrophy, pericarditis or valvular heart disease).

Table 1. Demographics and co-morbidities of haemodialysis patients from Canada, Europe and the USA participating in DOPPS II (*n* = 6805)

Characteristics	Canada (<i>n</i> = 601)	Europe (<i>n</i> = 3944)	USA (<i>n</i> = 2260)
Mean age (years)	62.2	63.4	61.5
% Male	58	58	55
% Diabetes	41	26**	52**
% Coronary artery disease	55	44**	61*
% Congestive heart failure	43	24**	40
% Other cardiovascular disease	47	40	31**
% Peripheral vascular disease	34	28.5*	29.5
% Cerebrovascular disease	20	17	19
% Hypertension	90	74**	88

Cross-section, 2002–2003.

*Significantly different from Canada, weighted to account for facility sampling fraction, *P* = 0.01–0.04; ***P* < 0.01.

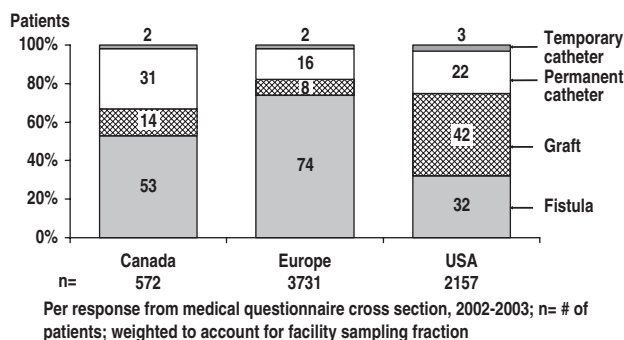


Fig. 1. Vascular access use among prevalent HD patients in Canada, Europe and the USA in DOPPS II, 2002–2003 (*n* = 6460). From data collected on a prevalent cross-section of HD patients at 252 dialysis units participating in DOPPS during 2002–2003 from Canada, Europe (France, Germany, Italy, Spain, Sweden and the UK) and the USA. Sample weights were employed to account for the differing proportions of patients sampled in each facility.

Figure 1 shows a comparison of vascular access types in prevalent HD patients in Canada, Europe and the USA. Canada’s AVF utilization (53%) is higher than that in the USA (32%), but lower than that in Europe (74%). Of concern, Canada’s usage of temporary and permanent catheters (33%) is higher than that seen in Europe (18%) and the USA (25%).

Care of patients before dialysis is reflected in part by the analysis of vascular access types used by HD patients at the initiation of dialysis and is shown in Figure 2. These results indicate that only 26% of Canadian HD patients and 18% of patients in the USA start dialysis with an AVF compared with 50% of incident HD patients using an AVF in Europe. Catheters accounted for 70% of all vascular access use by Canadian HD patients when initiating HD, compared with 46% in Europe and 66% in the USA. This high use of catheters among new ESRD patients in Canada was not due to a switch from peritoneal dialysis, as <1% of these patients had been on continuous ambulatory peritoneal dialysis (CAPD) prior to HD therapy. High catheter use was seen in

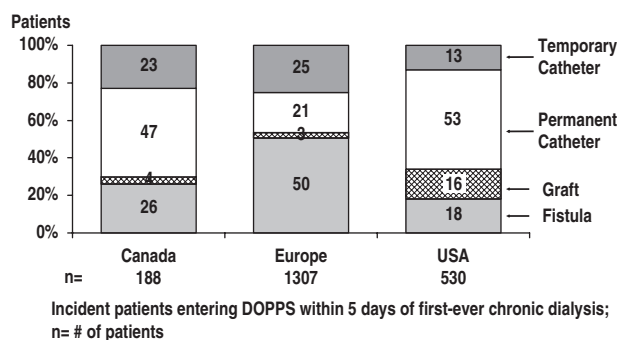


Fig. 2. Vascular access use among new ESRD (incident) patients in Canada, Europe and the USA in DOPPS II, 2002–2004 (*n* = 2025). Analysis included incident patients who entered DOPPS within 5 days of their first ever chronic HD treatment.

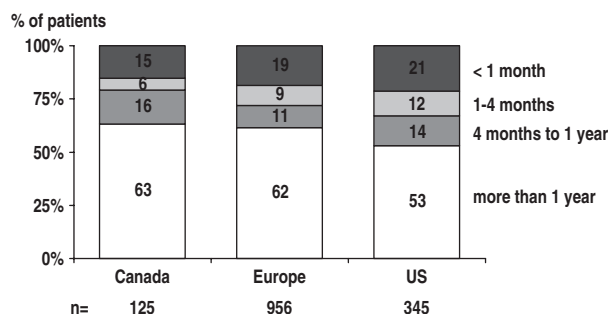


Fig. 3. Percent of incident patients seeing a nephrologist at times prior to ESRD: Canada, Europe and USA. Analysis is based on response to a questionnaire by incident patients who entered DOPPS within 90 days after their first ever chronic HD treatment.

new ESRD patients in Canada despite 85% of these patients reporting having seen a nephrologist for >1 month before starting dialysis, and 79% having seen a nephrologist >4 months prior to ESRD (Figure 3). Indeed, the patterns of referral seen in Canada are not very different from those seen in the USA or Europe (Figure 3).

Dialysis unit medical directors reported the typical timing of permanent vascular access creation for new HD patients, and the results are shown in Figure 4. Once again, Canada’s practice is better than that of the USA, but not as good as Europe’s. Vascular access creation >8 weeks prior to initiation of HD reportedly occurs only 33% of the time in Canada, 33% in Europe and 23% in the USA. Medical directors in Canada (100%), Europe (100%) and the USA (92%) reported that for new patients initiating HD in their units, the preferred type of permanent vascular access was the native AVF.

Vascular access surgeons were asked to estimate the average time from referral to the initial vascular access evaluation and from that initial evaluation until the first permanent vascular access creation. Responses are shown in Figure 5. The average time required for both of these steps towards AV access creation is 62 days for Canada, 29 days for Europe and 16 days for the USA. The analysis of either median or mean time from

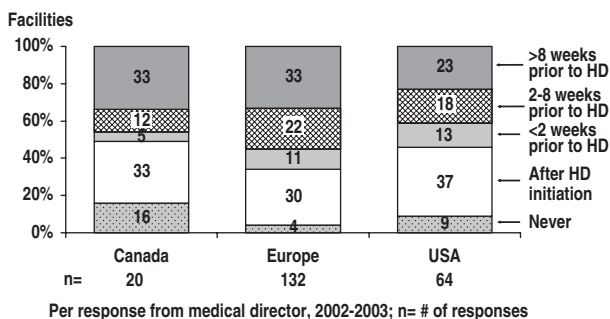


Fig. 4. Medical directors' estimation of typical timing for creating a permanent vascular access in new HD patients in Canada, Europe and the USA (*n* = 216 facilities). The estimate of timing was reported by each facility's medical director during 2002–2003 for the prior year for new ESRD patients entering the facility. Permanent vascular access included native arteriovenous fistula, synthetic graft or bovine graft.

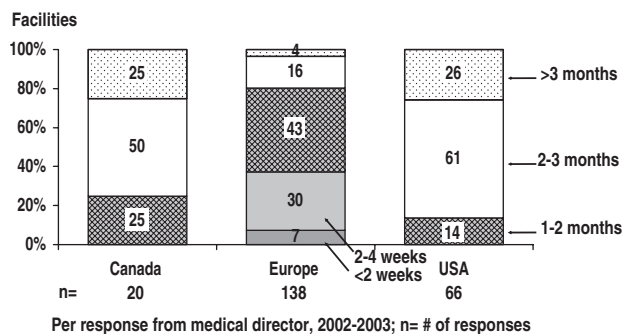


Fig. 6. Typical number of days after surgical creation that new arteriovenous fistulae (AVFs) are cannulated for the first time in Canada, Europe and the USA. The length of time until first AVF cannulation was reported by each dialysis unit's medical director. Values shown by country represent the mean value for DOPPS II facilities in each country region (*n* = 224 facilities).

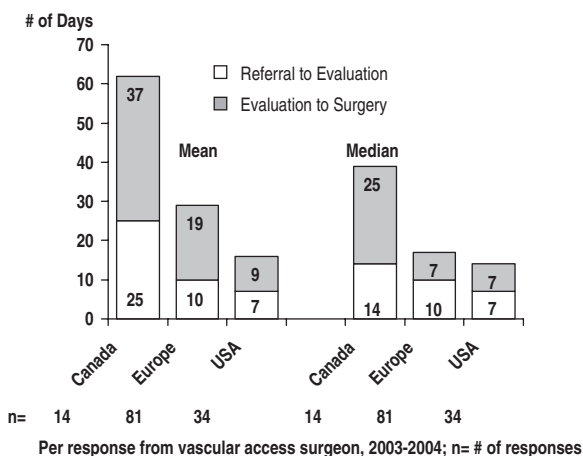


Fig. 5. Vascular access surgery survey responses: mean and median number of days from access referral until the surgeon's initial evaluation and from the surgeon's initial evaluation until permanent vascular access creation in Canada, Europe and the USA. Average estimated time reported by the main vascular access operator from each facility performing at least 1 h of vascular access-related surgery per week. Permanent vascular access included native arteriovenous fistula, synthetic graft or bovine graft (*n* = 129 facilities).

referral until initial surgical evaluation indicated that the amount of time required from referral until surgical evaluation for access placement usually took 2–4 times longer in Canada than in the USA or Europe. Note that all Canadian centres had access to a vascular access surgeon.

Vascular access surgeons were also asked to state their preferred strategy for placing a permanent vascular access for patients starting HD in two or more months. Creation of an AVF was preferred by 94% of Canadian surgeons, 99% of European surgeons and 98% of American surgeons. A similar question was asked about their preferred strategy for placing an access for patients starting HD within 1 week. Canadian surgeons (100%) preferred a temporary or permanent catheter, to be followed by an AVF as the

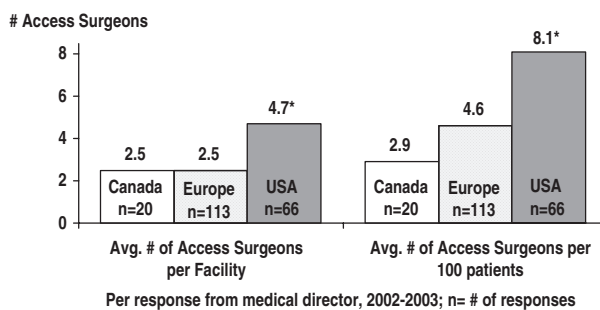


Fig. 7. Average number of vascular access surgeons per HD unit and average number of vascular access surgeons per 100 HD patients in Canada, Europe and the USA. The number of surgeons providing vascular access-related services at each participating DOPPS dialysis unit was reported by the unit's medical director. Italy was excluded from the European results due to the large proportion of nephrologists in Italy who perform the majority of vascular access surgery (*n* = 199 facilities); *significantly different from Canada, *P* < 0.0001.

method for long-term access. Fewer European (92%) and American (88%) surgeons preferred a similar strategy.

Following the creation of an AVF, a certain period of time is necessary for maturation of the AVF to occur in order for the AVF to be functional as a vascular access for HD. In Europe, >80% of medical directors indicated that the typical amount of time until an AVF is first used is within 2 months of AVF creation, whereas in Canada and the USA, 75–87% of medical directors indicated that the typical amount of time until an AVF is first used is ≥ 2 months after AVF creation (Figure 6).

Figure 7 shows the average number of access surgeons per facility and per 100 patients. The USA had the most surgical resources. Canada had a similar number of surgeons per facility as Europe, but had fewer surgeons per 100 HD patients (2.9 surgeons/100 HD patients in Canada, 4.6 in Europe, 8.1 in the USA). This variation reflects the fact that Canadian facilities are typically larger than those in Europe.

When surgeons involved in vascular access placement at DOPPS dialysis units were asked about the

Table 2. Percentage of all surgical time spent performing vascular access-related surgery in Canada, Europe and the USA, for respondents completing the DOPPS Vascular Access Surgery Questionnaire

Country (<i>n</i>)	% of surgery time spent performing vascular access-related surgery		Hours per week spent performing vascular access-related surgery		Facility size (11 151 HD patients)		No. of weekly hours of vascular access-related surgery per facility size
	Mean	Median	Mean	Median	Mean	Median	Median
Canada (16)	30%	18%	5	4	137	131	0.027
EU (92)	40%	25%	5.5	4	68*	64	0.059
USA (42)	35%	31%	9.2**	6	90*	78	0.082

Per response from vascular access surgeons; 2003–2004.

n = number of vascular access surgery questionnaire responses and performed access surgery at least 1 h per week significantly different from Canada **P* ≤ 0.0001; ***P* < 0.04.

percentage of their surgical time devoted to vascular access, the median percentage of surgical time devoted to vascular access was 18% of surgical time for vascular access in Canada, 25% in Europe and 31% in the USA (Table 2). For surgeons in Canada, Europe and the USA, a median of 16–20 h per week was spent performing surgery of any kind. For surgeons in Canada and Europe, a median of 4 h per week was spent performing vascular access-related surgery, compared with 6 h per week in the USA. However, since Canadian dialysis units are substantially larger than those in Europe and the USA, the median number of weekly hours of vascular access-related surgery per patient, for operators completing the vascular access surgery questionnaire, was 2- to 3-fold lower in Canada (0.027 h/patient/week) compared with Europe (0.059 h/patient/week) and the USA (0.082 h/patient/week).

An important point to consider in evaluating the vascular access surgery results by country is that the survey was intended to be completed by the vascular access surgeon at each participating unit, with the surgeon chosen on the basis of performing the majority of vascular access surgeries for the dialysis unit. Thus, the calculation of the percentage of weekly surgical time devoted to vascular access in each country/region, and weekly hours of vascular access surgery per 100 patients, would be expected to be lower than that shown in Table 2, if data were collected from all vascular access surgeons, as the results in Table 2 are based upon vascular surgeons performing the majority of vascular access surgeries for the dialysis unit.

Discussion

DOPPS I data, covering July 1996 to October 2000, previously have shown large differences in vascular access use in Europe compared with the USA, even after adjustment for patient mix [10]. For example, amongst prevalent patients in Europe and the USA, AVFs were used in 80 vs 24% of patients, grafts in 10 vs 58% and catheters in 8 vs 17%, respectively. The current DOPPS II study shows that these relative differences persist 3–4 years later.

The vascular access practice patterns seen in Canada are both unique and suboptimal. While the ratio of AVFs to grafts is favourable compared with the USA, the utilization of catheters in both prevalent (33%) and incident (70%) patients is disturbingly high [5–7]. Canada's utilization of catheters exceeds that seen in Europe or the USA (Figures 1 and 2). The CSN's Vascular Access Guidelines do not provide a specific target for catheter usage [1], but the American National Kidney Foundation's Kidney Disease Outcomes Quality Initiative guidelines state that <10% of prevalent chronic HD patients should be treated with a catheter [2]. Canada's utilization of AVFs (53%) falls slightly below the CSN's recommendation of >60% for prevalent patients [1].

There are complex interactions between multiple physician subgroups and health care resources that may contribute to the suboptimal vascular access practice patterns seen in the Canadian HD population. For optimal entry into a dialysis programme, patients must be referred to a nephrologist in a timely manner [18–20]. Indeed, early referral increases the likelihood of AVF utilization [21–24]. With an early referral, the nephrology team will have time to provide early and detailed information about dialysis and transplantation, in order to identify patients who will need HD vascular access when chronic kidney disease (CKD) progresses to ESRD. Once identified, nephrologists must refer these patients to the vascular access surgeon in a timely manner.

Late referral to a nephrologist has been reported as a problem in Canada in other studies [25,26], and may contribute to shortening the lead time required for CKD care. However, these current results from DOPPS II indicate that 85% of new ESRD patients in Canada had seen a nephrologist for >1 month before starting dialysis, with the great majority of these patients seeing a nephrologist for >4 months prior to starting dialysis. These results are similar to the pattern seen in Europe where the vascular access profile is better. This suggests that to a large extent the majority of Canadian CKD patients are being seen by nephrologists with sufficient lead time to arrange for the creation and maturation of an AVF. However, despite this apparently sufficient lead time, 70% of new ESRD patients in

Canada initiate HD with a catheter and only 26% with an AVF.

Referrals of patients with CKD to a nephrologist come from many sources, including family physicians, endocrinologists, cardiologists, internists, paediatricians, urologists and others. The CSN Vascular Access Guidelines call for establishment of an AVF when the patient has a creatinine clearance of 15–20 ml/min, or serum creatinine of 300–500 $\mu\text{mol/l}$ depending on the size and weight of the patient [1]. This is because there may be delays while waiting for an appointment with a vascular surgeon, delays waiting for operating room time and, finally, the maturation of a new AVF after its construction may take as long as 3 or 4 months. The current DOPPS data show that medical directors believe that only 33% of Canadian HD patients have their vascular access created >8 weeks prior to the start of dialysis (Figure 4).

DOPPS II also shows that the time from referral to permanent vascular access creation is longer in Canada than in Europe or the USA (Figure 5). Furthermore, the typical time from creation until first cannulation of an AVF appears to be substantially longer in Canada and the USA than in Europe. DOPPS I showed that earlier cannulation of some AVFs shortly after 14 days of maturation is possible and does not reduce AVF survival [12]. Canada also appears to have fewer vascular surgeons per 100 patients and fewer hours per week devoted to vascular access surgery per 100 patients. This is substantially lower in Canada than in Europe or the USA (Figure 7 and Table 2). Finally, operating room time for HD vascular access may not be protected in Canada, and elective access cases may frequently be cancelled because the operating room is needed for more urgent cases, causing further delays.

The data show that the opinions of dialysis unit medical directors and of the primary vascular access surgeons are that AVFs are the preferred dialysis access. This information further supports the notion that it is not a lack of knowledge on the part of nephrologists and vascular surgeons, but instead factors such as initial AVF cannulation practice and limited availability of vascular surgeons and surgical resources, which are the most important barriers preventing more AVF and less catheter usage in Canada.

There are circumstances where a synthetic graft is required for chronic HD. These include suboptimal arterial or venous anatomy for AVF creation. Similarly, a central catheter may be required when immediate access to the circulation is required, or when there is not sufficient time for an AVF or graft to mature. Of note, many patients with catheters become difficult or impossible to convince about going on to an AVF because they become used to a needle-free and painless initiation of HD when using a catheter. It has also been shown in the DOPPS I that both AVFs and grafts have better survival if used at the time of initiating HD, compared with their use after a patient begins HD with a catheter [11–12]. Furthermore, a

number of observational studies during the last few years using extensive case mix adjustment have each pointed to lower mortality risk for patients dialysing with an AVF. Combe *et al.* described a 35% higher mortality risk for HD patients dialysing with an untunnelled catheter compared with patients using an AVF [27]. Dhingra *et al.* reported a higher relative mortality risk for US diabetic HD patients ($n=5507$) using an AV graft [relative risk (RR)=1.41, $P<0.003$] or a central venous catheter (RR=1.54, $P<0.002$) compared with an AVF [7]. The RR of infection-related deaths was >2-fold higher for diabetic HD patients using a central vein catheter or an AV graft compared with patients using an AVF. In non-diabetic HD patients, those with a central vein catheter displayed a higher mortality risk (RR=1.70, $P<0.001$) as did to a lesser degree those with an AV graft (RR=1.08, $P=0.35$) compared with an AVF. Similarly, Xue *et al.*, in analysing mortality rates in US Medicare HD patients >66 years of age who were new to ESRD ($n=66\,595$), found that patients with a simple AVF displayed the lowest RR of death compared with those using a synthetic graft [RR=1.16, 95% confidence interval (CI) 1.08–1.24] or catheters (RR=1.70, 95% CI 1.59–1.81) [5]. Polkinghorne *et al.* applied a propensity scoring methodology to show among 3749 adults commencing HD in Australia and New Zealand that patients dialysing with a catheter or a synthetic graft displayed significantly higher relative mortality risks compared with those with an AVF [28]. In an analysis of 1084 accesses in incident US HD patients participating in the CHOICE study, Astor *et al.* found that the adjusted relative mortality risk was 1.5 (95% CI 1.0–2.2) for catheters and 1.2 (95% CI 0.8–1.8) for grafts compared with AVFs [29]. In examining vascular access as a facility practice in order to dissociate further access use from confounding by indication (patient selection), Pisoni *et al.* recently showed in DOPPS data that every 20% higher facility catheter use was associated with a 16% higher mortality risk, and every 20% higher facility AV graft use was associated with a 7% higher mortality risk when adjusted for constant facility AVF use [30]. An earlier DOPPS investigation also revealed nearly a 60% higher risk of infection-related hospitalization in facilities with >14% catheter use compared with facilities having <7% catheter use [31]. Similarly, Allon *et al.*, in analysing data from the HEMO trial, found that the frequency of hospitalization due to access-related infection was disproportionately higher among HD patients with catheters compared with grafts or fistulae [32]. All of the above findings pertaining not only to mortality and hospitalization risk, but also access survival, provide a substantial body of evidence for recommending early creation of AVFs to avoid catheter use when possible.

There are limitations inherent in any study of this nature. Prospective observational studies are not randomized controlled trials. They should be considered as hypothesis generating. Opinions expressed in the medical director, patient and vascular access surgeon surveys may not fully represent unit practices;

this limitation exists with any survey. Furthermore, the survey instruments used in this investigation may not be sensitive enough to reveal more subtle factors that drive vascular access decisions. However, in terms of prior work published from the DOPPS, the random sampling study design used in DOPPS has yielded numerous results that have been verified by Registry reports in many of the DOPPS countries. The substantially lower number of vascular access surgeons and hours devoted to vascular access surgery per 100 patients in Canada compared with the USA and Europe, coupled with relatively high catheter use among Canadian HD patients as revealed in this present analysis, suggest the need for a larger scale, comprehensive evaluation of vascular access surgical resources for HD patients in Canada.

In summary, there are no financial or other barriers to earlier referral and collaborative care in Canada, and CKD care is relatively well developed. However, contrary to the published CSN's Clinical Practice Guidelines for Vascular Access, these DOPPS data indicate that Canadian chronic HD patients rely far too often on tunnelled central venous catheters and are not reaching targets for AVF use [1]. Perhaps one reason is that these guidelines were not adequately disseminated in a way that targets the multiple physicians, administrators and government health care policy makers who must act in concert to increase the odds of a patient receiving an AVF. These non-nephrology physicians include family physicians, endocrinologists, cardiologists, internists, paediatricians, urologists, vascular and general surgeons, interventional radiologists and others. In Canada and elsewhere, these groups must work together to secure the human, capital and operating resources, as well as other health care system enhancements, to allow for a more appropriate prioritization of AVFs for chronic HD patients.

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Conflict of interest statement. None declared.

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