A Global Perspective on Dialysis Access

Ingemar A. Davidson, MD, PhD, discusses the differences in end-stage renal disease treatment around the globe and how practitioners can join forces to provide the best care possible.

What are some of the differences in dialysis access practices between the United States and other countries? What are the similarities?

First of all, I would like to note at the onset of this discussion that most of the world population has no access to renal replacement therapy (RRT), including dialysis. Specifically, yes there are important differences between dialysis practices in the United States and elsewhere. Although there are statistics available, most of them are estimates due to a lack of reliable data in many countries and societies. Available data also usually date back to 2005 to 2006. Statistics for 2011 and beyond are then based on projections and trends. The global end-stage renal disease (ESRD) epidemiology can be found in Wolfgang Meichelboeck's extensive work. His recent presentation at the Vascular Access Society meeting in Istanbul, Turkey, on May 5 and 6, 2011, can be downloaded from the Vascular Access Society Web site at www.vascularaccesssociety.com.

Some marked differences among countries in terms of the prevalence and incidence between Western societies are shown in Table 1.[1] Interestingly, there are similar large differences within North America, which is highlighted by the fact that there is more than twice the incidence of RRT in the United States compared to Canada. The highest incidence of 418 new RRT patients per million population annually is found in Taiwan, exceeding that of 363 in the United States. The global enormity of this epidemic in terms of cost, human suffering, and the ethical and moral implications is difficult to grasp.

One of the lowest RRT rates is found in Holland at approximately 100 new annual cases per million population, and in contrast to other countries, is not increasing (Table 2).[2]

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The global marked differences are multifactorial and likely reflect socioeconomics, cultural and religious beliefs, obesity rate, tobacco use, diet and food quality, level of exercise, and genetic factors, to mention a few. Hence, it appears that for the majority of ESRD patients, the condition is caused by personal decisions or lifestyle and is therefore, in theory, preventable or could be delayed.[3] Clearly, such preventive measures fall under government and public policy domain, most notably the use of tobacco and prevention of obesity and type 2 diabetes.

What policies in the United States or in other countries seem to promote or inhibit optimal care of dialysis patients?

Given the differences in "market forces" between countries in Europe and even within the United States, European patients seem to dialyze at lower machine flow rates and use more native vein arteriovenous fistulas (AVFs) than in the United States. This reflects cultural and economic structures with commercial dialysis companies driving the flow rate and shorter dialysis treatment sessions to increase the unit efficiency in the United States.

Also, in Europe, hemodialysis access cannulation is likely to be performed by a nurse—a circumstance that may influence access longevity. This statement fits the Japanese ESRD situation even better. On the positive side, the United States performs more renal transplants than

TABLE 1. DIFFERENCES AMONG SOME COUNTRIES FOR SELECT ESRD MEASURED STATISTICS[a]

	United States	Canada	Japan	Germany	Sweden	Italy	Taiwan
Prevalence per million	1,563	965	1,857	998	800	1,022	2,226
Incidence per million	351	154	267	194	122	161	418
Incidence of DM (%)	45.6	35	41.9	34.2	24.9	16.2	44.4
PD (%)	7.8	18.9	3.7	5.1	23.7	10.4	9.3
Transplant per million	57.6	32.3	< 1	30	41.5	30.1	NA
Mortality rate	20.7	14	9.7	NA	NA	NA	NA
BMI > 25 (%)	63	47	21	60	20	40	NA

[a]Data were derived from the USRDS 2006 Annual Data Report[1] and the USRDS 2010 Annual Data Report.[2]
Abbreviations: BMI, body mass index; DM, diabetes mellitus; NA, not available; PD, peritoneal dialysis.

most other countries, except for Singapore. In contrast, Japan's transplant rate is < 1 per million population annually. This fact will certainly affect the mortality rate because patients who are selected for transplant tend to be younger and medically less comorbid (Table 1).[1]

What can be done to improve interdisciplinary coordination of all caregivers in the United States who participate in decisions regarding dialysis?

This is a major challenge and brings me to the deeper mission and purpose of medical professionalism. It is similar to what the aviation industry has done to increase safety. To make all aspects of ESRD safe, we have to adopt an interdependent way of thinking. Every stakeholder has to have an adequate knowledge base and necessary skill sets specified for his or her job description. Even more importantly, we must have an attitude of wanting to do the right thing, and remove self-protecting borders and fences. We must learn to communicate under stress and train in how to compassionately deliver bad news.

One such training tool is PERCS (Program to Enhance Relational and Communication Skills). The Simulation Training in Vascular Access meeting in Milan, Italy, on November 4 and 5, 2011, will include a session on PERCS with trained actors as patients and video recording of real health care individuals' communication skills followed by debriefing. For example, when given the correct and factual information, up to 40% of patients and family members would choose peritoneal dialysis, and a significant number of elderly and severely comorbid individuals would decide not to initiate RRT.

What are the challenges currently facing the interventional community in terms of dialysis access?

There is much discussion about which type of access is best. I am specifically referring to the Fistula First Breakthrough Initiative (FFBI), which is promoting native vein fistulas as the best and preferred access in almost every patient. In my view, this is the wrong way of thinking. No access type, site, nor device is inherently better, and their use should not be mandated by individuals or even authorities such as the Centers for Medicare & Medicaid Services.

By doing the right thing for each individual patient at all times by all caretakers, each access decision will be right at that specific time. This "right" decision is based on numerous influences, such as the patient's socioeconomic and educational level, the skill sets of the different team members, the resources at the institution, and the patient's comorbidities.

The complexity of this ("right") decision-making process is emphasized by sheer statistics. If one considers 15 possible anatomical surgical access sites on each of two sets of extremities and then adding approximately 20 patient influences, we will have > 300 options for establishing access. Along this line of thinking, Dr. Charmaine Lok of Toronto and colleagues have developed a scoring system or a risk equation to predict the failure rate of a native fistula.[4] This scoring system works well as a guide for young individuals in training. The more gray-haired expert still "outscores" this risk equation formula (CE Lok, oral communication, May 2011).

TABLE 2. NEW RRT PATIENTS PER MILLION POPULATION ANNUALLY[a]

	United States	Australia	Taiwan	Holland	Canada
2001	334	98	368	101	159
2002	338	97	395	102	158
2003	342	100	407	103	152
2004	346	97	405	105	154
2005	351	109	404	103	160
2006	363	115	418	100	166

[a]Data were derived from the USRDS 2006 Annual Data Report.[1]

Are there any new or upcoming devices/grafts that you think will affect the quality of care that dialysis patients receive?

With the ESRD population getting older, more graft dialysis access material will be needed despite the FFBI claim of the contrary. The new Carmeda BioActive Surface technology (Carmeda AB, Upplands Väsby, Sweden [a subsidiary of Gore & Associates, Flagstaff, AZ]), in which heparin is bonded to the expanded polytetrafluoroethylene surface for extended times, has increased graft patency by 15% to 20% in the Propaten graft (Gore & Associates).[5] This technology is also employed in the Acuseal graft (Gore & Associates), which is currently being investigated in a United States multicenter study but is available in Europe by CE Mark approval.

If this concept becomes a reality, the central line catheter rate could dramatically decrease, improving RRT quality. Finally, the new Hybrid graft (Gore & Associates) with end graft-to-end vein anastomosis creation and using a unique deployment technology would potentially eliminate the common complication of anastomotic hyperplasia, making expanded polytetrafluoroethylene grafts more attractive, especially in the aging dialysis population.

What effect will Medicare bundling have on those providing dialysis services? On the patients?

Bundling, if applied correctly, may be a good thing. It will force people to work together, think interdependently, and become team players by removing borders between specialties. This concept is often referred to as "one-stop shopping." The common "patchwork" with independent scheduling, including separate billing for each service, is inefficient, time consuming, and encourages unnecessary procedures; just because a procedure step is billable and the technology is available, that alone may not justify doing it.

Are there any updates regarding dialysis access simulation technology and/or the further adoption of its use?

Dialysis access simulation training is becoming the accepted way to train physicians. The learning curve must be moved out of the operating suite. The old slogan, "See one, do one, teach one," is over. Now we say, "See one, practice 200 in simulation, then do one competently in the operating room before teaching one." Many of the simulation principles already developed by the Fundamentals of Laparoscopic Surgery are applicable in dialysis access procedures.[6]

At the Controversies in Dialysis Access meeting last year, the computerized balloon angioplasty and stenting interventional radiology simulator was introduced with great enthusiasm. The ultrasound-guided hemodialysis cannulation training with a deep and superficial segment of graft using the turkey breast or leg simulation model has received much interest from the dialysis nursing community. This homemade turkey simulator was developed by our Italian colleagues Drs. Mauro Pittiruti and Dan Biasucci.

At the Vascular Access Society of the Americas Practicum this past May, human cadaver arm and live pig models served as simulation models for surgical training purposes. Customized dialysis access simulation training is being developed in collaboration with the Tulane Center for Medical Simulation in New Orleans and MITIE (Methodist Institute for Technology, Innovation, and Education) in Houston, Texas.

What is your strategy for promoting dialysis access maturation? What is your first-line approach to salvage these accesses in cases of nonmaturation?

The first strategy is not to place a native vein fistula that is not likely to mature. If the AVF is not useable, then look for the possible etiology, starting with ultrasound examination and including volume flow. Then, depending on your center's sophistication, angioplasty with or without stenting is the likely next step. In some cases, the entire AVF will be transformed to an internal graft ("graftula"). Surgical revisions offer many options depending on local anatomic pathology.

Do you routinely use imaging for hemodialysis access maturation and maintenance?

Preoperative evaluation of the vascular system is an absolute measure for successful hemodialysis access outcome and maturation. The most cost-effective imaging method is Duplex ultrasound performed by the operating surgeon or at least in his or her presence. In most cases, the subclavian vein can be assessed by ultrasound. When in doubt, a venogram (or in rare cases, computed tomographic angiography) may clarify complex anatomy in chronic dialysis patients with a failing access.

When might it be appropriate to implement lower extremity dialysis access options, such as an external iliac arteriovenous graft or femoral artery-saphenous vein graft/fistula?

The lower extremity access procedures fall into the "exotic" category. Few centers have adequate experience. If possible, these cases should be reserved for patients who may receive a transplant in the future and be performed by someone with such expertise before using iliac vessels.

What do you believe is the key to reducing access site infections?

Several measures affect the access infection rate. In the ideal world, patients and the cannulation personnel use sterile techniques including gloves, face masks, and gowns, as surgeons do in the operating suite. Also, as I previously mentioned, access cannulation should be done under direct ultrasound guidance, and nurses and technologists must be trained and certified in this technique.

Rotating the cannulation site is not common practice. Long segments of available access are commonly not used, limiting the longevity of the access. Instead, aneurysm creation is classic, resulting in fragile skin infection and, sometimes, fatal bleeds. Early infections are usually related to the surgical technique. ■

Ingemar A. Davidson, MD, PhD, is Professor of the Department of Surgery at the University of Texas Southwestern Medical Center and Parkland Memorial Hospital in Dallas, Texas. He has disclosed that he is a paid consultant to Afssaps and is Co-course Director of Controversies in Dialysis Access, for which he receives an honorarium. Dr. Davidson may be reached at (214) 645-7670; drd@ingemardavidson.com.

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