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Summary: The initiation of dialysis is a challenging time of transition for patients, families, and their supporters. Patients with exposure to a comprehensive chronic kidney disease clinic may have had education and subsequent decision making regarding dialysis modality and access; however, many patients with or without prior education will require an urgent start to dialysis, requiring quick decisions regarding dialysis modality and access. In many countries, hemodialysis (HD) using a central venous catheter (CVC) is the most common initial renal replacement modality and dialysis access. Multiple factors, both remedial and non-remedial, contribute to this including late referral, rapid decrease in kidney function, delay in delivery or acceptance of education, and decision making and other system delays. Recent use of urgent peritoneal dialysis as the initial dialysis modality has resulted in decreased exposure to CVCs and in-center HD. This article addresses the current state of incident dialysis access, recent trends toward urgent peritoneal dialysis start, and opportunities to avoid the use of CVCs for HD when appropriate, with a focus on considering dialysis access as a critical component of the end-stage kidney disease life-plan, which requires consideration of future modalities and access when making the choice of the initial dialysis access.

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In Canada, 5,333 patients started renal replacement therapy (RRT) in 2013 (rate per million population (RPMP) 152), with 77% receiving hemodialysis (HD), 20% receiving peritoneal dialysis (PD), and the remaining receiving a pre-emptive transplant. Approximately 80% of patients initiated HD with a central venous catheter (CVC), and 33% of patients starting HD were identified as being referred late, defined by a patient who did not see a nephrologist within 3 months of dialysis initiation. This contrasts with only 7% late referrals among those starting peritoneal dialysis. There has been very little change in rates by modality over the past 10 years, whereas use of a CVC to initiate dialysis has increased from 73% in 2004.¹ In the United States in 2013, 88.2% of patient requiring RRT started HD, 9% received PD, and the remaining patients had pre-emptive transplants.² A decade after

the promotion of Fistula First, 80% of incident HD patients still initiated dialysis with a CVC.³

Although the arteriovenous (AV) fistula is recommended by guideline groups as the first and preferred vascular access for HD,^{4,5} there has been much debate about the appropriate HD access for both the initiation and maintenance of dialysis, especially in the frail elderly, patients with a limited life span, inadequate vessels, and in patients transitioning to PD or transplantation.^{6–10} Patients with limited life expectancy (<6 mo), likely will not benefit from a fistula, and an AV graft or CVC may be more appropriate.⁷ This debate has expanded further to include urgent peritoneal dialysis, with avoidance of the use of a CVC and its associated risks of infection and central venous stenosis, preservation of residual renal function, and reduced costs, among other benefits.^{11–13}

This article neither continues the debate nor defends a position but rather identifies the key strategies to develop a modality and access plan, informed by the patient's individualized risk versus benefit, with consideration of the patient's and family's lifestyles, values, beliefs and preferences, and health care resources.¹⁴

CHRONIC KIDNEY DISEASE EDUCATION AND MODALITY/ACCESS CHOICE

A recent meta-analysis highlighted that modality decisions are highly personal and strongly influenced by patient and family values, the context of their life, and a desire for minimal lifestyle intrusiveness.¹⁵ The focus now needs to be on patient and family preparation, knowledge of different RRT modalities, the lifestyle

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implications of those choices, and decision support to ensure timely and appropriate decisions are made in advance of dialysis initiation.

Education is the key to making informed decisions for all aspects of a patient's care and there is strong evidence it influences patient choice for dialysis modality and access.¹⁶ In the Treatment Options Program study, patients who received a standardized approach to education on modality and access options had greater use of home dialytic therapies and more patients also were using an AV access at HD initiation.¹⁷

Many jurisdictions now have established CKD or predialysis clinics, which use a systematic approach to education on RRT modality selection and dialysis access based on patient preference and risk assessment. However, in Canada, access to a predialysis clinic is not perceived as a barrier for care of CKD patients, however, failure to make decisions about dialysis modality and access remains a significant barrier for patients.¹⁸ In one jurisdiction, almost 50% of patients started dialysis without documentation of a preferred modality choice, despite more than an average of 26 months of nephrology follow-up evaluation.¹⁹ Patients without a preferred modality generally started their first RRT on in-center HD (68%) and also were less likely to have an AV access creation (50%) than those who had a documented preferred modality. This highlights that it is not only education but other factors that also impact decision making. One such key factor is a patient's readiness to make a decision; this readiness consequently influences the outcome of initial modality and access.²⁰ Recently, patients' behavioral state of change (ie, their readiness to make decisions about dialysis), identified that doctors explaining modality options and patients' higher dialysis knowledge scores were associated positively with decision making. Further data highlight the importance of patient decision aids in providing support for patient modality choice.²¹ Progressive implementation of an education process with decision aids resulted in 50% of patients starting with PD, mirroring the patient's intended modality and access choice. In fact, initiation of dialysis using the patient's intended or preferred modality and access of choice may be the preferred metric in a patient-centered model of care. This realignment of care will be permitted only if the current metrics, focusing on performance targets of home dialysis and fistula use, change to metrics focusing on the process and preferences of individual patients.

The timing of this key education and decision support remains a challenge for the patient and the health care team. As described in our recent review,¹⁴ there is evidence to support use of a defined care pathway, identifying the estimated glomerular filtration rate levels and/or rate of CKD progression for patient

education, referral to surgeons, and access creation. Provision of vascular access education at a higher estimated glomerular filtration rate and earlier creation can lead to timely dialysis access placement and may improve patient outcomes, but must be considered carefully (detailed later).²² In all cases, however, information about the importance of vessel preservation, to avoid injury to the planned and subsequent future vessels to be used for vascular access, is important to provide to the patient and care provider. Several jurisdictions have developed tools, such as "Save my veins" bracelets to remind patients to protect their vessels, because kidney function decline is not always predictable. Less is known about the timing for PD access; however, several programs provide urgent-start PD, with initiation of PD within days of the PD catheter insertion, as discussed in detail later. Providing the appropriate education and support for each patient can take at least 6 months. The time required will differ for each patient, highlighting the need for the health care provider to fully examine the patient's and family's needs and their readiness to receive and process information. Once appropriately timed and sufficient background is provided to make an informed decision regarding their choice of dialysis modality, the subsequent access type (CVC versus AV graft versus fistula versus PD catheter) then can be planned; if a fistula is a feasible option, additional time is needed for maturation.

The idea of a "life plan and life line for a lifetime" has been coined.⁶ This concept encompasses a continuum-of-care model for CKD and transitions to end-stage kidney disease. Its goal is to optimize RRT modality choices, considering the patient's lifespan, their current state, future life goals, preferences, social support, and functional status and system resources. This plan is best coordinated through a multidisciplinary team approach involving the primary care provider, nurse/access coordinator, nephrologists, surgeon, radiologists, patient, and family for choosing and creating the dialysis modality and access suitable for the patient and their lifestyle.²³

INCIDENT HEMODIALYSIS ACCESS

Effective initiation of HD requires a reliable vascular access. Unfortunately, the ideal vascular access remains elusive, with all forms of vascular access at risk of access dysfunction, surgical and percutaneous interventions, and infection, all contributing to significant morbidity and mortality. Multiple observational studies have indicated that mature fistulas are a more durable vascular access and are associated with lower morbidity and mortality rates compared with AV grafts and catheters. In a recent systematic review and meta-analysis²⁴ there was an 18% and 53% increase in

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