

## Catheter First: The Reality of Incident Hemodialysis Patients in the United States

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It is well-known that the use of hemodialysis (HD) central venous catheters (CVCs) is complicated by bloodstream infections (BSIs), central venous stenosis, catheter thrombosis, metastatic infections, and septic emboli, and their

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use has a negative impact on morbidity and mortality.<sup>1</sup> Although initiatives such as Fistula First,<sup>2</sup> Fistula First Catheter Last,<sup>3</sup> National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF-KDOQI) guidelines,<sup>4</sup> and other proposals have focused on CVC avoidance, with a resultant decline in CVC use among prevalent patients, CVC use in incident HD patients in the United States has not significantly improved over the past 2 decades, remaining at 80%.<sup>5-7</sup>

In this issue of *Kidney Medicine*, Kazakova et al<sup>5</sup> report a retrospective cohort study examining the incidence of hospitalization for BSI in 2,353 patients (aged  $\geq 67$  years) who initiated maintenance HD between January 1, 2011, and December 31, 2012, stratified according to the prevalent vascular access type at HD initiation: fistula, CVC, or graft. All patients had Medicare coverage before initiating dialysis and Medicare primary fee-for-service insurance coverage after initiating HD. Despite Medicare coverage, CVCs were used by 79.5% of patients at HD initiation as compared with fistulas in 17.2% and grafts in 3.3%. CVCs had the highest risk for BSI (29.3%), followed by grafts (23.4%) and fistulas (10.1%). Importantly, during the next year, only 50% of patients initiating dialysis with a CVC transitioned to a fistula or graft.<sup>5</sup>

This study confirms a glaring lack of progress, with the persisting high use of CVCs at dialysis initiation complicated by a high risk for BSI. The reasons for the lack of improvement are multifactorial and include patient preference, barriers to care, difficulty of timing dialysis initiation, and a disjointed health care system. The startling reality that CVC use in the United States is unchanged among incident HD patients despite a national goal to decrease their use points to the possibility that systemic barriers have created a culture that favors using CVCs. This catheter culture is evident when comparing US and international data. The United States continues to lag behind most European countries and Japan, where arteriovenous fistula (AVF) use in incident HD patients is 2 to 3 times greater.<sup>6</sup> Unfortunately, a culture is not something easily changed by individual initiatives, but rather requires a collaborative effort from a variety of stakeholders.

Several investigators, including Kazakova et al, suggest that a lack of predialysis nephrology care may be an

important contributor to high CVC use. However, 2012 to 2014 Dialysis Outcomes and Practice Patterns Study (DOPPS) data indicate that although 69% of patients saw a nephrologist 4 or more months before end-stage kidney disease, 57% of these patients still initiated dialysis with a catheter.<sup>6</sup> Thus, even among patients with adequate time for access placement and maturation, a majority still begin dialysis with a CVC, suggesting that the use of CVCs in incident dialysis patients is due to more than just a lack of timely referral to nephrologists.

Nephrologists may be reluctant to place a permanent access due to the uncertainty as to when or even if a patient may progress to dialysis because of the possibilities of improvement in kidney function, lack of progression, transplant, or death.<sup>3</sup> A uniform policy, such as that advocated by Fistula First to have HD access in all patients below a certain estimated glomerular filtration rate, does not address the trade-off of having a permanent access at dialysis initiation versus placement of an access in patients who will never need dialysis or in whom access complications may occur before dialysis use. Improved risk prediction in advanced chronic kidney disease might increase rates of incident fistulas and grafts by providing more certainty about timing of access placement.

Financial barriers also play a role in CVC use among incident HD patients. A lack of insurance coverage in the predialysis period may preclude placement of a permanent access in a substantial proportion of patients. In 2010, members of an expert panel convened to develop vascular access quality metrics by the Centers for Medicare & Medicaid Services independently recommended expanding Medicare coverage to patients with advanced chronic kidney disease and to patients at initiation of dialysis instead of delaying it to 3 months after initiating HD for the purpose of vascular access creation.<sup>8</sup> The fact that CVC use decreased from 56% to 24% from 1996 to 2010 in prevalent HD patients who have Medicare coverage while the use of CVCs in incident patients has been unchanged illustrates the enormous impact that expanded Medicare coverage may have.<sup>8</sup> Despite this panel's recommendations being published in 2011, none of these changes have been implemented since and CVC use among incident HD patients remains at 80%.<sup>7</sup>

Another potential factor contributing to the high incidence of CVC use is the skill of the surgeon. In the Kazakova et al study, 20% of patients initiating dialysis with a CVC had prior fistula placement, which suggests that some of the CVC use could be attributed to fistula maturation failure.<sup>5</sup> A recent study by Shahinian et al<sup>9</sup> outlines the wide distribution of AVF maturation rates among surgeons

and highlights the characteristics of those with the greatest success. They found that the maturation rate varied greatly from 0% to 100%, with a median of 59%. Moreover, 6.9% (174) of surgeons were significantly below the median with a success rate of 23%, and 9.7% (243) were significantly above the median with an average success rate of 85%. Importantly, they found a positive correlation between surgeons with the highest AVF volume and rates of successful AVF maturation.<sup>9</sup> Part of alleviating the culture of catheter use would be for nephrologists to track surgical outcomes and preferentially refer patients to the physicians most likely to create a successful fistula.

Recent studies have looked at patient preferences as a potential barrier to permanent access placement. Patient preference for CVCs has been shown by the international DOPPS data to have a higher influence in the United States, further illustrating a CVC culture.<sup>6,10</sup> For a patient, a CVC may be more cosmetically acceptable and involves no painful large-bore needle sticks, no surgery, and no post-dialysis bleeding with potentially long wait times for access hemostasis after an already long dialysis session. Patient preference for CVCs strongly correlates with older age, sex, and prior experience using a catheter, the latter of which reinforces the importance of avoiding CVC exposure in incident dialysis patients altogether.<sup>10</sup> However, many patients are not fully aware that CVCs are the vascular access type with the highest risk for infection and are not made fully aware of the risks and benefits of different access types.<sup>6</sup> Nephrologists need to do a better job of educating patients with advanced chronic kidney disease to alter this culture of patient preference if the CVC epidemic is to change in the next decade; otherwise the pattern of the last 20 years will be repeated.

Another potential factor contributing to an increased risk for BSIs in patients initiating dialysis with a CVC is prolonged time from fistula creation to initial cannulation. The United States has the longest time to first AVF cannulation of all DOPPS countries, and it has remained largely unchanged from DOPPS I (1996-2001) to DOPPS 5 (2012-2014). The United States has a median time to first AVF cannulation of 98 days versus 25 to 96 days in Japan and European countries (Japan, 25 days; Germany, 41 days).<sup>6,11</sup> The proportions of fistulas cannulated within 1 month of creation are 50% in Europe, 74% in Japan, and only 2% in the United States.<sup>12</sup> Although this difference may be related to the use of lower HD blood flow rates in Japan, European countries use blood flow rates similar to those in the United States. These differences may reflect a culture in the United States in which cannulation is postponed due to unsupported concerns about adverse consequences on access survival or dialysis staff cannulation skills.<sup>12</sup>

Earlier cannulation could mean shorter CVC dependence or even avoidance, but adverse effects of earlier cannulation on fistula survival could result in increased CVC use. Data are mixed: some studies have found greater risk for fistula thrombosis and failure when cannulated before 1 month after creation,<sup>13,14</sup> while others have shown that

cannulation after 2 weeks had no adverse consequences compared with later cannulation.<sup>15</sup> The NKF-KDOQI guidelines recommend cannulation 4 to 6 weeks after AVF creation.<sup>16</sup> Randomized trials are needed to guide practice by confirming the safety of earlier cannulation.<sup>17</sup>

Despite all the reasons given, there is frankly no excuse for the culture of CVC use in US incident HD patients. As a world leader in innovation and health care, the United States should be ahead of, not behind in, the care of our patients with kidney disease. Although Fistula First,<sup>2</sup> Fistula First Catheter Last,<sup>3</sup> and other national initiatives have improved AVF use and CVC nonuse in prevalent HD patients, it has done little to improve CVC use in incident dialysis patients during the past 2 decades. Addressing the need for timely referral to nephrologists, educating patients about their best access option while addressing their preferences, and removing financial barriers that hinder a patient's ability to get the best access by a skilled and experienced practitioner to change the culture of incident CVC use will require high-level collaboration among primary care physicians, nephrologists, surgeons, dialysis nurses, payers, and patients.

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