

Chapter 3: Vascular Access

- In 2015, 80% of patients were using a catheter at hemodialysis (HD) initiation (Figure 3.1).
- At 90 days after the initiation of HD, 68.5% of patients were still using catheters. (Figure 3.7.a).
- Arteriovenous (AV) fistula use at HD initiation rose from 12% to 17% over the period 2005-2015 (Figure 3.1).
- The percentage of patients using an AV fistula or with a maturing AV fistula at HD initiation increased from 28.9% to 33.4% over the same period (Figure 3.1).
- Seventeen percent of patients used an AV fistula exclusively at dialysis initiation. This increased to 65% by the end of one year on HD, and to 72% by the end of two years (Figure 3.7.a).
- The proportion of patients with an AV graft for vascular access was 3% at HD initiation, 15% at one year after initiation, and 16% at two years (Figure 3.7.a).
- At one year after HD initiation, 80% of patients were using either an AV fistula or AV graft without the presence of a catheter. By two years, this number rose to 88% (Figure 3.7.a).
- By May 2016, 62.7 % of prevalent dialysis patients were using an AV fistula (Figure 3.6).
- Of AV fistulas placed between June 2014 and May 2015, 35.9% of failed to mature sufficiently for use in dialysis. Of those that did mature, the median time to first use was 111 days (Table 3.7).
- Patient age is a factor contributing to success with AV fistula; with younger age, the percent of AV fistulas that successfully matured was higher and the median time to first use was somewhat shorter (Table 3.7).

Introduction

Clinical practice guidelines recommend an autogenous arteriovenous (AV) fistula as the preferred vascular access for hemodialysis (HD; National Kidney Foundation, 2006). Central venous catheters (hereafter, catheter[s]) have been associated with the highest risks of death, infection, and cardiovascular events, compared to other types of vascular access. Patients with a usable AV fistula exhibit the lowest risks for these events (Ravani et al., 2013). Interestingly, recent data suggests that the comorbidities collinear with the catheter, rather than direct complications, may be partially responsible for this difference (Ravani et al., 2017; Brown et al., 2017).

The international Dialysis Outcomes and Practice Patterns Study (DOPPS) highlighted the fact that with respect to vascular access, dialysis practices in the United States (U.S.) lagged behind other industrialized countries (Pisoni et al., 2002; Goodkin et al., 2010; Robinson et al., 2010). In large part, these international comparisons served as impetus for

implementation of the Fistula First Breakthrough Initiative (FFBI) by the Centers for Medicare & Medicaid (CMS; Vassalotti et al., 2012). Over the next decade, a gradual but steady increase in AV fistula placement efforts followed in the U.S., such that the proportion of prevalent HD patients using an AV fistula rose from 32% in 2003 to 63% by 2014 (USRDS, 2016).

A robust debate continues as to whether an AV fistula should remain the access of first choice for every dialysis patient, with recent attention paid to the length of time and effort AV fistula creation can consume in certain higher risk populations (Lee et al., 2015; Hall et al., 2017). An AV fistula is considered optimal because of its potential for durability, lower risk of infection, and reduced need for intervention to ensure patency. However, recent focus has shifted somewhat toward tailoring the most appropriate access for individual patients, based upon their clinical situation, patient characteristics, life expectancy, preference, and other factors. Further

prospective studies and clinical trials will determine whether this approach will indeed prove superior.

A landmark clinical trial where maturation of an AV fistula was a secondary outcome revealed the high prevalence of failure of newly placed fistulas never coming to use (Dember et al., 2008). Between primary surgical failures and maturation failures, 33.8% of AV fistula placements in the U.S. are unsuccessful (USRDS, 2016). Rigorous evaluation of the many potential factors underlying this phenomenon is necessary to ensure primary surgical success and subsequent optimal maturation of the AV fistula. In this regard, patients may benefit should surgical training programs further emphasize skill in AV fistula placement (Saran et al., 2008; Goodkin et al., 2010).

Many additional factors likely influence successful AV fistula placement, including patient motivation for access placement, timeliness of referrals for nephrology care and placement, and institutional and payer support for pre-ESRD care and coordination of dialysis access placement and maintenance. These suggest that a systematic, multilevel approach is required for ensuring optimal vascular access for every HD patient (Huber, 2015).

The above considerations and other salient issues make it imperative to track carefully and comprehensively the current and future trends in vascular access placements, related practices, and outcomes. Despite the emphasis on improving AV fistula success rates, at the time of their initial dialysis 80.3% of patients used a catheter (USRDS, 2016). Well-coordinated pre-dialysis care during the critical transition period to ESRD may be the key to future improvements in this suboptimal practice pattern.

In this chapter, we describe patterns of vascular access use among incident and prevalent dialysis

patients by patient characteristics and geographic region, over the last decade. In addition, we explore national variation in time-to-first-use of AV fistulas after placement, as a surrogate for AV fistula maturation.

Methods

This chapter examines and reports data from the Centers for Medicare & Medicaid Services (CMS). Details of this data source are described in the [Data Sources](#) section of the [ESRD Analytical Methods](#) chapter.

See the Chapter 3 section of [Analytical Methods Used in the ESRD Volume](#) section of the [ESRD Analytical Methods](#) chapter for an explanation of the analytical methods used to generate the study cohorts, figures, and tables in this chapter. Downloadable Microsoft Excel and PowerPoint files containing the data and graphics for these figures and tables are available on the [USRDS website](#).

Vascular Access Use at Initiation of Hemodialysis

In 2015, 80% of patients were using a catheter at HD initiation, a rate that has changed only marginally since 2005. Figure 3.1 shows that in 2015, 61.9% of patients incident to ESRD had neither an AV fistula nor AV graft in place or maturing at their first outpatient HD session. This rate peaked at 65.5% in 2008, and has remained relatively stable since 2012 at near 60%. Over the last several years, there has been a relatively small absolute increase in AV fistula use at HD initiation, rising from 12.3% in 2005 to 17.0% in 2015. Over the same period, the percentage of patients with either an AV fistula or a maturing AV fistula increased from 28.9% to 33.4%.

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