



Vascular Access Guidelines: Summary, Rationale, and Controversies

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Dialysis vascular access management in the United States changed significantly after National Kidney Foundation-Kidney Disease Outcome Quality Initiative (NKF-KDOQI) clinical practice guidelines were first published in 1997. The Centers for Medicare and Medicaid Service adopted these guidelines and in collaboration with the End-Stage Renal Disease Networks established the Fistula First Breakthrough Initiative (FFBI) in 2003 to improve the rate of arteriovenous fistula use over arteriovenous graft and central venous catheter in the dialysis population. The implementation of guidelines and FFBI has led to a significant increase in the arteriovenous fistula use in the prevalent dialysis population. The guidelines are criticized for being opinion based and often impractical. Over the past 2 decades, the patient population undergoing dialysis has become older with complex comorbidities and challenges for creating an ideal vascular access. Advancing knowledge about access pathophysiology, improved treatment options, and improved process of care with team approach model point toward diminishing relevance of few of the existing guidelines. Moreover, several guidelines remain controversial and may be leading to clinical decisions that may be unfavorable to the patients. The review discusses the historical aspect of vascular access care in the United States and evolution of current practice standards and controversies surrounding few of these guidelines in the current time.

Tech Vasc Interventional Rad 20:2-8 Published by Elsevier Inc.

KEYWORDS Vascular access, Vascular access guidelines, K/DOQI, Arteriovenous fistula, Arteriovenous graft, Central venous catheter

Introduction

The most recent United States Renal Data System data report 661, 648 patients with prevalent end-stage renal disease at the end of 2013¹ with relative plateauing of incident patients since 2010. Among incident patients, the highest growth rate has been found in the group greater than 75 years of age (1580/million/y) followed by in a group ranging 64-74 years of age (1260/million/y). The

incidence and prevalence rate among African Americans is 3 times higher when compared with Whites.

Vascular access remains both a lifeline and a “weak link” for patients receiving hemodialysis (HD) therapy. The 3 most common types of vascular access used in clinical practice are arteriovenous fistula (AVF), arteriovenous graft (AVG), and central venous catheters (CVC). All major society guidelines recommend AVF as the preferred long-term vascular access to provide HD. AVF is preferred over AVG and CVC because it provides better patient^{2,3} and access survival⁴ owing to fewer access-related complications such as infections² and endovascular interventions,^{4,5} thus making it cost effective.

Historical Perspective

In the early 1990s, the predominant vascular access used in the prevalent HD population in the United States was AVG⁶ with AVF use of 30%.⁷ In 1997, the National Kidney

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Foundation (NKF)/Dialysis Outcomes Quality Initiative (DOQI) developed evidence and expert opinion–based guidelines to improve patient and vascular access outcomes. Two key recommendations proposed were— (1) increase the number of AVF placed in the incident HD population to at least 50%⁸ and (2) emphasis on early detection of access dysfunction. In early 2000, the Dialysis Outcomes and Practice Patterns study, which compared vascular access use between the United States of America and rest of the world, revealed that AVF use in the prevalent population was 24% when compared with 80% in Europe⁹ and 15% vs 66%, respectively, in the incident population. The CVC use in the United States of America was double as compared with Europe (60% vs 31%, respectively). In an effort to increase AVF creation, the Centers for Medicare and Medicaid Service partnered with 18 End-Stage Renal Disease Networks and started the National Vascular Access Improvement Initiative in 2003, which was renamed as FFBI in 2005. The “change concepts” developed by FFBI (Table 1) has led to increase in AVF rate in the prevalence population to 62.5% by 2013.¹⁰

Paradoxically, however, 80% of incident dialysis patients (which has not changed much since 2005) still initiate dialysis with a catheter whereas only 17% (up from 12% in 2005) initiate dialysis with AVF and 3% with AVG.¹⁰ The success of AVF creation in the prevalent HD population did not translate well to the incident population because of various hurdles that were recognized over the past decade. A high rate of CVC use in the incident HD population continues to remain a challenge. A high primary AVF failure rate⁵ and elderly population with multiple comorbidities¹¹ have been cited as some of the hurdles in achieving the target set by FFBI. In 2013, a more pragmatic goal of having a functional fistula in suitable patients with emphasis on reducing CVC use and duration has led to transition of FFBI to Fistula First Catheter Last (FFCL). The incident rates for AVF, AVG, and CVC were 19.5%, 4.8%, and 71.6%, respectively, whereas the prevalent rates were 63%, 17.6%, and 17%, respectively, in 2015¹² (Fig.). The current FFCL goals for vascular access use are AVF prevalence rate of 68%, 50%

functioning AVF in incident patients, and <10% CVC use.

Current Practice Standards in the United States

A vascular team approach is essential to achieve a well-functioning AVF. Vessel preservation, vessel selection, and surgical techniques play key role in the early planning stages of AVF creation. Once AVF is created, close monitoring and timely intervention are essential to salvage a failing AVF.

Generally followed practice pattern based on K/DOQI and FFBI recommendations are:

- early referral to a nephrologist (preferably when estimated glomerular filtration rate falls <30 mL/min),
- vessel preservation in the upper extremities (both arteries and veins),
- preservation of central veins,
- perioperative vessel mapping for ideal site selection,
- using skilled and experienced surgical team, and
- adequate follow-up evaluation within 4–6 weeks of surgery to identify early maturation failure.

Early Referral to a Nephrologist

United States Renal Data System data have clearly shown that early referral to a nephrologist can lead to successful creation of an AVF before the need for HD. Unfortunately, the task of educating the primary care team, improving process of care, and system wide hurdles continue to pose challenges in improving the referral process, despite recognizing the benefits.

Preserving Peripheral and Central Veins

The role of patient education to increase awareness, avoiding venipunctures of the forearm and upper arm veins, avoiding peripherally inserted central catheters (PICC) and midline catheters can help preserve the

Table 1 Change Concepts Adopted by Fistula First Initiative (Adapted With Permission From www.esrdncc.org)

1	Routine Continuous Quality Improvement (CQI) review of vascular access
2	Timely referral to Nephrologist
3	Early referral to surgeon for “AVF only” evaluation
4	Surgeon selection based on best outcomes and ability to provide access services
5	Full range of surgical approaches to AVF evaluation and placement
6	Secondary fistula placement in patients with AVGs
7	AVF placement in patients with catheters where indicated
8	AVF cannulation training
9	Monitoring and maintenance to ensure adequate access function
10	Education of caregivers and patients
11	Outcome feedback to guide practice
12	Modify hospital systems to detect CKD and promote AVF planning and placement
13	Support patient efforts to live the best possible quality of life through self-management

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