Carotid Artery Stenting Training: How to Ensure Preparedness and Proficiency

Dr. Kenneth Rosenfield discusses proficiencies required for performing transfemoral carotid artery stenting and how best to ensure these are met, who is responsible for training in these procedures, advice for interested operators or those who need a refresher, and the value of multidisciplinary collaboration.

In your opinion as an experienced operator, what are the proficiencies needed for performing transfemoral carotid artery stenting (TF-CAS) in 2025?

The required proficiencies really haven't evolved much since the very first multispecialty consensus recommendations on training standards and credentialing for carotid stenting, published in the early 2000s.[1-3] These recommendations addressed the clinical, cognitive, and technical skills required to perform carotid stenting in a safe and effective manner. Clinically, this means the understanding and overall management of carotid artery disease, the clinical syndromes and their diagnosis, indications and contraindications to revascularization, role of medical therapy, and, finally, the characteristics of carotid artery plaque and arch anatomy. Clinical skills include managing the potential complications of carotid disease and intervention, including stroke, myocardial infarction, and hemodynamic perturbations.

With respect to technical skills, one must have a command over vascular access issues, including how to safely obtain femoral, radial, or direct carotid access and how to ensure there are no bleeding consequences—quite frankly, this is probably the most common and significant adverse event associated with carotid stenting. Knowledge of the aortic arch is also critical and includes assessing whether the arch is safe and appropriate for percutaneous intervention and learning how to properly navigate catheters to the aortic arch and then obtain adequate support in the proximal common carotid artery to be able to perform the intervention. Guide sheath and catheter support will vary depending on whether one is using proximal or distal embolic protection or one of the newer devices that offers double filter protection. Knowledge of appropriate indications and use of available platforms is a must.

Of course, imaging provides the real-time guidance for these procedures, so one must know what projections and orthogonal angulations will best delineate the carotid artery and brain, recognizing that every patient's anatomy is different.

Knowing your equipment and what's available to you while planning the procedure is critically important. Selecting the right guidewires, guide sheaths, and guiding catheter is not necessarily intuitive. You'll need to evaluate the preprocedural images, specifically the configuration of the arch and the take-off of the carotid artery, to make sure you are choosing the right equipment. Finally, know what your devices can and cannot do: Do you need to predilate with a balloon before deploying the embolic protection device? How much calcification is present? Do you use a noncompliant or compliant balloon?

Perhaps most important is selecting the modality of cerebral embolic protection that will best suit each individual patient. It is important for operators to be familiar with all of the various devices available—including the latest iterations, which, based on the data, likely offer superior protection—and how to use them properly.

What is the best means of establishing and demonstrating that proficiency?

As is the case with many procedures, it will be somewhat challenging to assess and ensure proficiency and to prevent operators who may be less skilled from performing procedures. Granting of privileges and oversight of quality and outcomes is a local issue, and one would hope that hospital oversight committees apply rigorous standards for carotid interventions. Ideally, case selection and procedural outcomes should be evaluated in regular peer review processes. From the patients' point of view, it would be ideal to have a system whereby operators are required to demonstrate competence prior to undertaking carotid interventions. As is the case with any other procedure, physicians performing carotid intervention are accountable for their decisions and outcomes.

What do you see as the respective roles of the facility/employer, professional societies, and industry in providing, if not ensuring, operators are adequately trained before offering CAS?

Ideally, professional societies should agree upon a set of training standards, which would include the required cognitive skills (ie, knowledge base), technical skills, and clinical skills. In addition, there should be agreement regarding facilities' requirements. These were described with the initial Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, and Society for Vascular Surgery consensus recommendations published in 2005 and its update in 2016.[1-4] Another update is in the works and will be published. Built into the facilities' requirements should be a suggestion to monitor outcomes and performance by operator to ensure that standards are being upheld in terms of case selection and that treatment is of high quality.

I strongly believe that industry should share in the responsibility to ensure proper training for operators. In my opinion, this should include significant support for both formal and informal training programs. One result of the "coverage gap" has been that the newer generation of interventionalists lack sufficient training and experience with carotid stenting. That experience deficit can be easily addressed with aggressive training and mentoring programs created by societies and other organizations, such as the Multi-Specialty Carotid Alliance (the organization responsible for Centers for Medicare & Medicaid Services [CMS] reconsideration of the National Coverage Determination), and supported financially by industry. Ideally, I would love to see formal "carotid training camps" established: intensive experiential learning paired with a mentorship program where interventionalists can spend a day or two with experienced operators and scrub in on cases to enhance their judgement and skills. Call me an idealist, but it would be fantastic if all stakeholders were to collaborate to establish an idealized training pathway for carotid intervention, one that would transcend specialty lines and ensure best outcomes for patients. Given the stakes involved for patients, this should be our mandate.

What's your opinion regarding third-party certification of proficiency?

First, I am not sure which "agency" or "entity" would perform such certification. Second, it's very challenging for any outside "third party" to evaluate proficiency. In a perfect world, one could envision a group of expert operators traveling to every corner of the carotid universe to "certify" operators based on observation of technical skill and review of cases. Of course, that is not likely to materialize, nor is it pragmatic. That said, I do think that there must be some oversight, and operators need to know that someone is looking at their outcomes. Since we know in other procedural and operative medicine that such peer oversight does positively influence outcomes, hospitals with carotid operators should be encouraged to implement such programs. Perhaps the best way to ensure high quality is to develop "Centers of Excellence in Carotid Artery Disease and Cerebrovascular Disease Management," similar to what the PERT Consortium is doing in pulmonary embolism. Such programs do require resources and commitment. The bottom line is that any patient undergoing a carotid procedure, an intervention that carries significant risk, should *know with certainty* that the operator performing the intervention is properly trained, competent, certified, and has a high level of skill in this particular intervention.

What is your advice to clinicians who may have once been proficient but have had low or no TF-CAS volume in recent years? What can and should be done as a refresher?

First, they should refamiliarize themselves with the disease state and the latest equipment. Then, they should spend time with, or be mentored by, someone who has been doing a fair number of TF-CAS procedures. Of course, how much retraining is necessary depends a bit on specialty, how many TF-CAS procedures the clinician has performed in the past, and their familiarity with the devices. Even so, spending some time with more high-volume operators, even for just a few cases, provides a good refresher.

As far as learning TF-CAS de novo, I think you need to really dedicate time and energy to learn the nuances of

the procedure and spend some time with an operator who is doing these procedures. Some catheter skills are "transferable," and perhaps the learning curve could also be shortened by doing some simulation, but I do think there is no substitute for firsthand experience through mentorship and time in the interventional suite.

As a PERT (pulmonary embolism response team) pioneer, you place a high value on multidisciplinary collaboration. With TF-CAS, transcarotid artery revascularization (TCAR), carotid endarterectomy (CEA), and medical management all available and accessible options, can you speak to the training needs required to ensure understanding even those treatments one may not personally provide?

Clinicians may not be aware that if you're considering stenting (either TF-CAS or TCAR), CMS has mandated that shared decision-making must take place with the patient, wherein you describe all the available options and the risks and benefits of each. Even if you are only proficient at one of the three modalities (TF-CAS, TCAR, or CEA), you are nonetheless required by law to provide a balanced view and offer all options to your patient. Unfortunately, this isn't always being done.

As you noted, I am a big proponent of multidisciplinary collaboration. The application to CMS to expand coverage was submitted by a nonprofit group called the Multi-Specialty Carotid Alliance, which includes vascular surgeons, neurologists, neurosurgeons, neurointerventionalists, interventional radiologists, and interventional cardiologists. Members of this group have discussed the possibility of working in collaboration with professional societies to develop education and training modules that are agnostic to specialty and to implement these through a collaborative interdisciplinary program. This would also encompass a mentorship program where relatively new operators can spend time performing procedures with more high-volume operators. Especially if operators only feel comfortable with one revascularization modality, interfacing with colleagues across specialties can help inform clinicians and determine the best treatment approach for individual carotid patients.

What is your advice to operators on how best to network with colleagues from other specialties to ensure each patient is matched to the optimal therapy?

All stakeholders need to leave their egos at the door and engage with colleagues to provide the best options for their patients and obtain the best outcomes. If we can obtain great outcomes with carotid intervention and a < 1% stroke rate across the board—which I truly believe is possible—then more patients will be candidates for carotid revascularization. ■

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