Transcranial Doppler ultrasonography

Background

Transcranial Doppler ultrasonography (TCD) is a safe, noninvasive procedure for assessing or monitoring blood circulation within the brain. TCD works by directing high-frequency sound waves that cannot be heard at blood vessels in the head. The ultrasound waves are reflected back from the red blood cells moving through the blood vessels. The frequency at which these waves are reflected back from the red blood cells indicates how fast the blood is flowing through the blood vessels. The difference between the transmitted signal frequency and the reflected signal frequency, called the Doppler frequency shift, is used to calculate the velocity of blood flow through the blood vessels.

TCD is done with either one or two probes placed against the skin. The examiner spreads a clear gel on the areas of the head where the probe will be placed. Usually, the probes are placed on the temple, on the base of the skull at the back of the neck, and over the closed eyelid. The examiner systematically locates the major blood vessels of the brain and records these signals. A physician who has been trained in reading TCD studies then interprets the results.

TCD has established value for the following clinical applications:

- Detection and evaluation of the hemodynamic effects of severe stenosis or occlusion of the extracranial and major basal intracranial arteries
- Detection and serial evaluation of cerebral vasospasm complicating subarachnoid hemorrhage
- Evaluation of invasive therapeutic interventions for cerebral arteriovenous malformation
- Evaluation of top intracranial hemodynamic abnormalities in patients with suspected brain death

There is also strong evidence that the clinical application of TCD is effective in preventing ischemic stroke in children with sickle cell anemia.

Involved specialties

Neurologists, neurosurgeons, cardiovascular surgeons, anesthesiologists, radiologists, emergency medicine physicians, and other physicians who have the appropriate training and experience in performing/interpreting TCD studies.
The American Society of Neuroimaging (ASN) is an international, professional organization representing neurologists, neurosurgeons, neuroradiologists, and other neuroscientists who are dedicated to the advancement of techniques used to evaluate the nervous system.

The ASN administers a certification examination in neurosonology, which is designed to assess a physician’s ability to apply knowledge, concepts, and principles of neuroimaging that constitute the basis of safe and effective patient care. The examination is intended for those physicians who, through several years of training and experience in this neuroimaging modality, have acquired enough of a foundation in the basic principles and clinical interpretation of neurosonology to be able to interpret studies independently.

To be eligible for the neurosonology examination, candidates must meet and provide documentation of the following criteria:

- A valid medical license or equivalent
- Board certification or eligibility in an American Board of Medical Specialties (ABMS)-recognized specialty
- Completion of 40 continuing medical education (CME) American Medical Association (AMA) Category 1 credits in ultrasound or completion of a full-time fellowship
- Verification of performance/interpretation of at least 100 studies under supervision for each component to be tested (e.g., TCD and carotid)

The American Academy of Neurology (AAN) publishes Guidelines for Credentialing in Neuroimaging, which is endorsed by the ASN. In these guidelines, the AAN states that in addition to completing a neurology residency–training program and possessing a valid unrestricted medical license, physicians should complete basic training in each specific neuroimaging modality they perform and interpret. Included in the training for each of the modalities should be the following topics: physics, biologic effects and instrumentation, anatomy, pathology, pathophysiology, technique, indications, interpretation, and quality control.

Specific training criteria

- When the neurologist’s residency or fellowship program includes formal training in the basic principles and clinical application of the neuroimaging modality, the neurologist needs no additional basic training.
• When formal training was not included in the neurologist’s residency or fellowship program, the neurologist should provide verification to the credentialing organization that he or she has completed a course(s) for a minimum number of hours covering the specific topics listed above. The Accreditation Council for Continuing Medical Education (ACCME) should approve this training for credit in Category 1 of the AMA’s Physician Recognition Award. Forty hours is the minimum number of hours required for training in neurosonology.

Practical experience in neuroimaging
• When the neurologist’s residency or fellowship training program includes verifiable training in neuroimaging, the neurologist should have documentation of involvement in the performance/interpretation of at least 100 studies (for each modality or technique) under the supervision of a qualified specialist.
• When formal training was not included in the neurologist’s residency or fellowship program, the neurologist should have documentation of the interpretation of at least 100 neurosonology studies under supervision.

For continuing competence, the AAN states that after initial training, the neurologist who interprets/performs neuroimaging studies should participate in the following programs:
• Annually in Category I, ACCME-approved CME programs in the neuroimaging disciplines he or she practices. At least 25 hours every five years is recommended.
• In an ongoing quality assurance or improvement program for the laboratory or facility to which he or she is associated.

The Intersocietal Commission for the Accreditation of Vascular Laboratories (ICAVL) publishes Essentials and Standards for Accreditation in Noninvasive Vascular Testing. In this document, the ICAVL details the qualifications that physicians should have for interpreting/performing clinical studies that include TCD studies.

According to the ICAVL, physicians must demonstrate an appropriate level of training and experience by meeting one or more of the following:
• Formal training, which is the completion of a residency or fellowship that includes appropriate didactic and clinical vascular laboratory experience as an integral part of the program.

Positions of other interested parties

ICAVL
For TCD studies, the physician should have experience in interpreting a minimum of 100 cases while under supervision. The formal training experience must be documented in a letter from the director of the training program verifying the areas of testing and the extent of the training and experience.

- Informal (or self-study) training, which involves appropriate training and experience for proper qualifications to interpret noninvasive vascular laboratory studies. This can be achieved through formal accredited postgraduate education. A minimum of 40 hours of relevant Category I CME credit must be acquired within a three-year period.

At least one-half of these hours must be met with courses specifically designed to provide knowledge of the techniques, limitations, accuracies, and methods of interpretation of the noninvasive vascular laboratory test the physician will interpret. The remaining hours may be dedicated to appropriate clinical topics relevant to vascular laboratory testing. Documentation of the CME courses with a listing of the content must be submitted. At least eight of these hours must be applicable to each of the testing areas to be interpreted.

In addition to formal didactic studies, the physician must acquire a minimum of eight hours of supervised practical experience observing or participating in testing procedures, preferably in an accredited laboratory, for each area of testing for which the physician will interpret. The practical experience must include all areas of testing for which the physician is applying. This experience must be documented in a letter from the medical director of the laboratory where the practical experience was obtained.

For TCD studies, the physician should document interpretation of a minimum of 100 cases while under the supervision of a physician who has already met the ICAVL criteria.

- Established practice, which considers that training and experience is appropriate for a physician who has worked in a vascular laboratory for at least three years and has interpreted a minimum of 300 TCD cases.

For CME, the ICAVL states that physicians must show evidence of maintaining current knowledge by participation in CME courses that are relevant to vascular testing. To be relevant, the course content must address the principles, instrumenta-
According to Charles H. Tegeler, IV, MD, professor of neurology and medical director of the neurosonology laboratory at the Wake Forest University School of Medicine in Winston-Salem, NC, any physician who has fulfilled the requirements for training and experience in interpreting TCD studies should be allowed to read them. Training should include such topics as physics, biologic effects and instrumentation, indications, and quality control as well as TCD interpretations that are supervised by qualified physicians.

Tegeler recommends that medical staff administrators who want specific criteria for privileging TCD practitioners should look at the guidelines of organizations such as the ASN, the AAN, and the ICAVL. “The position of these groups is that there are three training tracks for competency in interpreting TCD studies,” he says.

The tracks are formal training in a residency or fellowship program, informal training in a CME program, or training and experience in practice. The generally agreed upon number of cases is a minimum of 100 supervised studies or, in the track of practice experience, a minimum of 300 cases in the past three years. Both the AAN and ICAVL, he adds, mention that certification in neurosonology by the ASN is an excellent tool to document extra training and experience.

For continuing competence, Tegeler considers that interpreting 100 TCD studies a year is a reasonable number to allow practitioners to maintain their edge. They should also recognize that there’s an ongoing need for CME. “The ICAVL recommendation of 15 CME hours every three years seems fair,” he says.

The following draft criteria are intended to serve solely as a starting point for the development of an institution’s policy regarding this procedure.

**CRC draft criteria**

- **Basic education**: MD or DO
- **Minimum formal training**: Applicants must have completed one of the following training tracks:
• An Accreditation Council for Graduate Medical Education (ACGME)/American Osteopathic Association (AOA)-accredited residency or fellowship program, which included supervised training in TCD performance/interpretation
• An ACCME-approved CME program that included supervised training in TCD performance/interpretation
• Three years of practice experience, which included the performance/interpretation of 300 TCD studies

**Required previous experience:** Applicants must be able to demonstrate that they have performed/interpreted at least 100 TCD studies in the past 12 months.

Note: A letter of reference should come from the director of the applicant’s TCD training program. Alternatively, a letter of reference regarding competence should come from the medical director of the vascular laboratory or from a supervisor who is credentialed in vascular technology at the institution where the applicant most recently practiced.

### Reappointment

Reappointment should be based on unbiased, objective results of care according to the organization’s existing quality assurance mechanisms.

Applicants must be able to demonstrate that they have maintained competence by showing evidence that they performed/interpreted at least 100 TCD studies annually over the reappointment cycle.

In addition, continuing education related to neurosonology and performing/interpreting TCD studies should be required.

### For more information

For more information regarding this procedure, contact:

**American Academy of Neurology**
1080 Montreal Avenue
Saint Paul, MN 55116
Telephone: 651/695-2717
Fax: 651/695-2791
Web site: www.aan.com

**American Society of Neuroimaging**
5841 Cedar Lake Road, Suite 204
Minneapolis, MN 55416
Telephone: 952/545-6291
Fax: 952/545-6073
Web site: www.asnweb.org
Clinical Privilege White Papers Advisory Board

Publisher/Vice President: Suzanne Perney sperney@hcpro.com
Executive Editor: Dale Seamans dseamans@hcpro.com
Managing Editor: Edwin B. Niemeyer eniemeyer@attbi.com

James F. Callahan, DPA
Executive vice president and CEO
American Society of Addiction Medicine
Cherry Chase, MD

Sharon Fujikawa, PhD
Clinical professor, Dept. of Neurology
University of California, Irvine Medical Center
Orange, CA

John N. Kabalin, MD, FACS
Urologist/Laser surgeon
Scottskuff Urology Associates
Scottskuff, NE

John E. Krettek Jr., MD, PhD
Neurological surgeon
Vice president for medical affairs
Missouri Baptist Medical Center
St. Louis, MO

Michael R. Milner, MMS, PA-C
Senior physician assistant consultant
Phoenix Indian Medical Center
Phoenix, AZ

Beverly Pybus
President
The Beverly Group
Georgetown, MA

Richard Sheff, MD
Vice president of consulting and education
The Greeley Company,
a division of HCPro, Inc.
Marblehead, MA

The information contained in this document is general. It has been designed and is intended for use by hospitals and their credentials committees in developing their own local approaches and policies for various credentialing issues. This information, including the materials, opinions, and draft criteria set forth herein, should not be adopted for use without careful consideration, discussion, additional research by physicians and counsel in local settings, and adaptation to local needs. The Credentialing Resource Center does not provide legal or clinical advice; for such advice, the counsel of competent individuals in these fields must be obtained.

Reproduction in any form outside the recipient’s institution is forbidden without prior written permission. Copyright 2003 HCPro, Inc., Marblehead, MA 01945.
Privilege request form
Transcranial Doppler ultrasonography

In order to be eligible to request clinical privileges in TCD, an applicant must meet the following minimum threshold criteria:

- **Basic education:** MD or DO

- **Minimum formal training:** Applicants must have completed one of the following training tracks:
  - An ACGME/AOA-accredited residency or fellowship program, which included supervised training in TCD performance/interpretation
  - An ACCME-approved CME program that included supervised training in TCD performance/interpretation
  - Three years of practice experience, which included the performance/interpretation of 300 TCD studies

- **Required previous experience:** Applicants must be able to demonstrate that they have performed/interpreted at least 100 TCD studies in the past 12 months.

- **References:** A letter of reference should come from the director of the applicant’s TCD training program. Alternatively, a letter of reference regarding competence should come from the medical director of the vascular laboratory or from a supervisor who is credentialed in vascular technology at the institution where the applicant most recently practiced.

- **Reappointment:** Reappointment should be based on unbiased, objective results of care according to the organization’s existing quality assurance mechanisms.

  Applicants must be able to demonstrate that they have maintained competence by showing evidence that they performed and/or interpreted at least 100 TCD studies annually over the reappointment cycle.

  In addition, continuing education related to neurosonology and performing/interpreting TCD studies should be required.

I understand that by making this request I am bound by the applicable bylaws or policies of the hospital, and hereby stipulate that I meet the minimum threshold criteria for this request.

Physician’s signature: __________________________________________

Typed or printed name: _________________________________________

Date: _________________________________________________________