

PART III

**ECHOCARDIOGRAPHY LABORATORY
OPERATIONS**

**ADULT TRANSESOPHAGEAL
ECHOCARDIOGRAPHIC (TEE) TESTING**

SECTION 1
Instrumentation

STANDARD - Primary Instrumentation

1.1 Cardiac Ultrasound Systems

Ultrasound instruments utilized for transesophageal echocardiographic studies (TEEs) must include the echocardiographic imaging system requirements, as outlined in the ICAEL *Standards for Adult Transthoracic Echocardiography Testing*, Part II, Section 1, Instrumentation.

1.2 Transesophageal Ultrasound Transducer

- A) Transesophageal ultrasound transducers must be those manufactured for the ultrasound system of the laboratory.
- B) Transesophageal ultrasound transducers must incorporate biplane or multiplane imaging capabilities.

SECTION 2
Indications, Ordering Process and Scheduling

STANDARD - Indications

2.1 Transesophageal echocardiographic testing is performed for appropriate indications¹.

- 2.1.1 Verification of the indication: A process must be in place in the laboratory for obtaining and recording the indication. Before a study is performed, the indication must be verified and any additional information, including pertinent clinical history, needed to direct the examination should be obtained.¹

STANDARD - Ordering Process and Scheduling

2.2 Transesophageal echocardiographic studies are appropriately ordered and scheduled.

2.2.1 Ordering process: The TEE order and/or requisition must clearly indicate the type of study to be performed, reason(s) for the study and the clinical question(s) to be answered. The order/requisition must be present in the medical record of the patient.

2.2.2 Definition of procedure types and protocols

A) In general, a TEE should be performed to answer clinical questions that cannot be answered by transthoracic imaging. A TEE study is one that examines all of the cardiac chambers, valves and great vessels from multiple imaging planes, and then uses the information to completely define any recognized abnormalities. This study must include appropriate Doppler interrogation of all cardiac valves and structures (e.g., pulmonary veins and atrial appendage) and provide any hemodynamic data felt to be of importance for patient care.

2.2.3 Scheduling: Sufficient time must be allotted for each study according to the procedure type. The performance time allotted for an uncomplicated, complete study (outside of the OR) is estimated to be 45 to 60 minutes, with an additional 15 to 30 minutes for complicated studies from patient encounter to departure. Sufficient time must be included in the scheduling process for the adequate post-procedure monitoring of the patient, especially if light anesthesia is utilized.

A) An urgent TEE study should be performed in the next available time period.

B) An emergent or stat TEE study must be performed as soon as possible, preempting routine studies.

C) Availability for emergencies: Qualified personnel and equipment must be available for urgent or stat studies outside of normal working hours in inpatient facilities or where appropriate.

SECTION 3

Elements and Components of Examination Performance

STANDARD - Training

3.1 Transesophageal echocardiography is a semi-invasive procedure, which, if performed incorrectly, can lead to serious harm to patients and therefore, must be performed by appropriately trained personnel.

- 3.1.1 All performing physicians must be adequately trained and experienced to perform and interpret the study. ²
- 3.1.2 All assisting sonographers and nurses must be adequately trained and validated as competent in procedures and policies for assisting in semi-invasive procedures.

STANDARD - Elements of Examination Performance

3.2 Examination performance must include proper technique.

- 3.2.1 Elements of study performance include, but are not limited to:
 - A) Transducer insertion.
 - B) Optimization of equipment gain and display settings.
 - C) Utilization of appropriate Doppler technique and measurements.
 - D) Optimization of image orientation to enhance Doppler display.
 - E) Performance of a 2-D/Doppler transesophageal examination according to the laboratory specific and appropriate protocol that incorporates all views and imaging planes mandated by the *ICAEL Standards* (3.3.6) (in any sequence).

- 3.2.2 Elements of study quality include, but are not limited to:
 - A) Demonstration of cardiac structure and function.
 - B) Evaluation of atrial and ventricular septal integrity.
 - C) Evaluation of left atria and left atrial appendage.
 - D) Evaluation of ascending aorta, descending aorta and aortic arch.
 - E) Delineation of the details of valvular anatomy.
 - F) Optimal recording and evaluation of Doppler flows.
 - G) Adherence to the laboratory specific and appropriate protocol (except for sequence).
 - H) Imaging of at least one right and one left pulmonary vein, with Doppler when appropriate.

STANDARD - Components of Transesophageal Echocardiograms

3.3 Transesophageal echocardiograms must be comprehensive and include standard components.

- 3.3.1 Technical personnel: Due to the complexity of the TEE study, appropriate technical personnel must be available to assist the performing physician. These personnel may include a sonographer and a nurse. The duties of these individuals include, but are not limited to: preparing the patient for the test, assisting the physician with the ultrasound equipment, monitoring the patient during and after the examination, and the administration of anesthetic medication as allowed by law.
- 3.3.2 Preparation of the patient: To perform TEE studies safely, appropriate safety guidelines must be in place. Patients must have a functioning intravenous access in place. Cardiac monitoring with standard telemetry leads must be utilized. Instrumentation to monitor the blood pressure and oxygen saturation of the patient before, during and after the examination must be available, as well as oxygen with appropriate delivery devices if needed. During the use of conscious sedation there must be methods in place to assess the patients level of consciousness pre procedure and throughout the procedure. All procedures must be explained to the patient and/or the parents or guardians of those unable to give informed consent. Consent must be obtained in a manner consistent with the rules and regulations required by the hospital or facility. Suctioning equipment must be available.
- 3.3.3 Monitoring the patient: During the procedure, the vital signs and medical stability of the patient must be periodically evaluated and recorded. The development of instability in either the vital signs or comfort of the patient must be addressed by the performing physician. Laboratory guidelines for the monitoring of patients who receive intravenous anesthetic agents are required. These written guidelines must be in place and available for all laboratories where TEEs are performed. A list of peri-procedural complications must be maintained.
- 3.3.4 Recovery of the patient: Prior to discharge from the TEE lab, the patient must be monitored for a sufficient amount of time to assure that no complications have arisen either from the procedure or the medication administered. The patient and/or the family must be instructed on any post-procedure care that the physician feels is necessary. Information should be given to outpatients that will allow them to contact the performing physician or physician on call should complications arise after patient discharge. A list of post-procedural complications must be maintained.

- 3.3.5 Components of the examination: A protocol must be in place that defines the standard components of the TEE examination. Indications for performance of a TEE examination must be included. A complete TEE and TEE-Doppler examination includes standard views from multiple planes including views of all cardiac structures and selected extracardiac structures.
- 3.3.6 The complete examination must include the following standard views while allowing for patient tolerance and safety:
- A) Gastric short axis and long axis views.
 - B) Standard 2 and 4 chamber views.
 - C) Short and long axis views of the aortic valve with appropriate Doppler.
 - D) Multiple imaging planes of the mitral valve with appropriate Doppler.
 - E) Multiple imaging planes of the tricuspid valve with appropriate Doppler.
 - F) Longitudinal view of the pulmonic valve with appropriate Doppler.
 - G) Multiple imaging planes of the right atrium, left atrium and left atrial appendage with appropriate Doppler.
 - H) In cases of suspected cardiac source of emboli, appropriate use of contrast methods to evaluate for the presence of intracardiac shunting.
 - I) Multiple imaging planes of the atrial septum and foramen ovale with appropriate Doppler.
 - J) Imaging of the pulmonary veins with appropriate Doppler, when mitral regurgitation is present.
 - K) Long axis views of the ascending, descending and transverse arch of the aorta.
 - L) Long axis views of the main pulmonary artery and proximal portions of the right and left pulmonary arteries.
 - M) Images of the proximal inferior and superior vena cava.
 - N) Imaging of the pericardial space and pericardium.

3.4 Transesophageal Echocardiogram report components:

Adult transesophageal echocardiography reporting must be standardized in the laboratory. All physicians interpreting echocardiograms in the laboratory must agree on uniform diagnostic criteria and a standardized report format.

3.4.1 The report must accurately reflect the content and results of the study. The report must include, but may not be limited to:

A) A report header must include, but may not be limited to:

- The date of the study
- The name and/or identifier of the laboratory
- The name and/or identifier of the patient
- The date of birth and/or age of the patient
- The primary indication for the study
- The name of the performing physician
- The name of the ordering physician and/or identifier

The information must be sufficient to allow for the identification and retrieval of previous studies on the same patient.

B) Report text must include

- Medication used for the procedure
- Complications of procedure
- Components of procedure, i.e color flow Doppler, PW/CW Doppler

C) Report text must include comments on:

- Left Ventricle
- Right Ventricle
- Right Atrium
- Left Atrium
- Left Atrial Appendage
- Interatrial Septum
- Mitral Valve
- Aortic Valve
- Tricuspid Valve
- Pulmonic Valve
- Pericardium
- Aorta

Note: If any structure is not well visualized this should be noted.

D) Summary of pertinent findings

- E) Reports must be typewritten, include a physician signature line (including the name of the interpreting physician) and be manually or electronically signed by the interpreting physician.

3.5 Cleansing of the TEE transducer

Published guidelines exist for the appropriate care and cleansing of the TEE transducer.³ These guidelines must be followed, except in circumstances where the recommendations of the manufacturer differ, but are equivalent. Every effort must be made to adhere to appropriate infectious disease standards to prevent the transmission of disease.

SECTION 4 Procedure Volumes

STANDARD - Procedure Volumes

4.1 The annual procedure volume must be sufficient to maintain proficiency in examination performance and interpretation.

A laboratory should perform a minimum of 50 transesophageal echocardiographic studies annually. Each member of the medical staff should perform a minimum of 50 transesophageal echocardiographic studies annually. The total volume of studies interpreted and performed by each medical staff member may be combined from sources other than the applicant laboratory. Competency in the performance and interpretation may be present with fewer numbers of studies. Lower volumes than those recommended here, however, should not dissuade a laboratory that is otherwise compliant with the *ICAEL Standards* from applying for accreditation.

Bibliography:

1. ACC/AHA/ASE 2003 Guideline Update for the Clinical Application of Echocardiography, Cheitlin, M. et al, Journal of the American College of Cardiology, 2003;42:954-70
2. Quinones et al., ACC/AHA Clinical Competence Statement on Echocardiography Journal of the American College of Cardiology 2003;41:687-708
3. “Standard Practice for Cleaning and Disinfection of Flexible Fiberoptic and Video Endoscopes Used in the Examination of the Hollow Viscera.” The American Society for Testing and Materials, F1518-94, pp 854-859).