American Society of Echocardiography Recommendations for Quality Echocardiography Laboratory Operations

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Ensuring a high level of quality in echocardiography is a primary goal of the American Society of Echocardiography (ASE). Establishing a definition of quality in cardiovascular imaging has been challenging, and there has been limited agreement on quality standards for imaging. Quality can be measured as adherence to established guidelines for the use of a technology to ensure patient satisfaction and outcomes. However, specific criteria to ensure quality must be established for each phase of the process, from considering a test for a patient to incorporating the results of the test appropriately into patient care. The purpose of this report is to provide a framework for echocardiographic quality assessment and improvement. Because this report builds on prior ASE efforts in this arena, some of the recommendations have been presented before.[1] Because this document establishes guidelines in the various components of quality in echocardiographic imaging services, the initial goal is to highlight general recommendations for minimum quality standards and provide some numerical or threshold values for compliance. Thus, the standards recommended in this document are realistic goals for the average practitioner. Although these recommendations focus on adult echocardiography, most are applicable or can easily be modified for pediatric, fetal, and intraoperative echocardiography. Objective studies linking quality measures in echocardiography to outcomes are frequently lacking, and thus statements expressed in this document are based primarily on expert opinion.

The committee used the "dimensions of care" framework for cardiac imaging reported recently.[2,3] This model divides the process of clinical echocardiography into the laboratory structure and the imaging process. The imaging process can be further separated into five areas that may influence patient outcome: patient selection, image acquisition, image interpretation, results communication, and the incorporation of results into care. In all of these domains, distinct benchmarks of quality can be established.

LABORATORY STRUCTURE

The laboratory structure can be divided into a minimum of four components: the physical laboratory, the equipment, the sonographer, and the physician. The ASE has previously addressed the issue of quality of the laboratory, sonographers, and physicians in its proposed local coverage determination (http://www.asefiles.org/LCD.pdf).

Physical Laboratory

Existing echocardiography laboratories should be accredited by the Intersocietal Commission for the Accreditation of Echocardiography Laboratories. New laboratories should have processes for moving the laboratories toward laboratory accreditation by submitting applications within 2 years of the onset of operation. The ASE recognizes that the process of lab accreditation is resource intensive and may require the commitment of additional personnel.

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Abbreviations

ASE = American Society of Echocardiography

CQI = Continuous quality improvement

LV = Left ventricular

LVEF = Left ventricular ejection fraction

RV = Right ventricular

TEE = Transesophageal echocardiographic

TTE = Transthoracic echocardiographic

Laboratory accreditation alone, however, is not sufficient, as there are facets of laboratory operation and needs for laboratory policies that are not currently addressed by the laboratory accreditation process of the Intersocietal Commission for the Accreditation of Echocardiography Laboratories. For example, in addition to the typical methods for requesting an echocardiographic study, a mechanism should be in place for ordering urgent echocardiographic studies and for communicating the urgency of studies to the laboratory staff members and interpreting physicians. This mechanism should be understood by all ordering physicians. Sufficient support staff members should be available to assist with scheduling and reporting of studies and to ensure the timely relay of results to ordering clinicians. Sufficient laboratory staff members must be able to recognize and respond to common medical emergencies and have competency in basic life support skills.

The laboratory space must have the necessary sanitizing equipment, ranging from a designated room to perform high-level disinfection of transesophageal echocardiographic (TEE) probes to necessary cleansing products for the transthoracic echocardiographic (TTE) transducers, ultrasound machines, and beds. Sinks and approved hand cleaners must be readily available in each area in which echocardiography is performed.

Equipment

The equipment available for the performance of echocardiographic procedures must be capable of performing two-dimensional, M-mode, and color and spectral (both flow and tissue) Doppler imaging. The display must be able to identify the institution, patient name, and date and time of study. The electrocardiogram and depth or flow velocity calibrations must be present on all displays. The machines should have the capability to display other physiologic signals, such as phases of respiration. If the laboratory performs stress echocardiography, a sufficient number of machines must have software that allows split-screen and quad-screen display for simultaneous image comparison. Transducers that can provide high-frequency and low-frequency imaging, as well as a dedicated nonimaging continuous-wave Doppler transducer, must be available for transthoracic imaging.[1] Pediatric laboratories must have transducers that cover the proper frequency range for high-resolution imaging of patients of the variety of sizes present in the pediatric population. Transesophageal imaging probes should be multiplane. All machines should have harmonic imaging capabilities and other instrument settings to enable the optimization of both standard and contrast-enhanced ultrasound exams.

Each machine must also have a digital image storage method that should be compatible with Digital Imaging and Communications in Medicine standards.[4] Study images must be maintained for the time period mandated for medical record retention in individual states.

Contrast agents and intravenous supplies should be available for staff members to use for patients who are difficult to image. Echocardiographic imaging beds, which include a drop-down portion of the mattress to facilitate apical imaging, are recommended. Equipment required to treat medical emergencies, including oxygen, suction, and "code" carts, must be available.

The accuracy of all laboratory imaging equipment should be tested, and laboratories should adhere to manufacturers' recommendations regarding preventive maintenance. The results of this testing and all service records for all equipment must be maintained in the laboratory.

Sonographer

Each sonographer should achieve and maintain minimum standards in education and credentialing within 2 years of the start of employment. This includes the initial education required to be eligible for credentialing exams and the continuing education required to ensure competency, maintain credentials, and become familiar with the latest technologies. Credentialing can be as a registered diagnostic cardiac sonographer through the American Registry of Diagnostic Medical Sonographers or as a registered cardiac sonographer through Cardiovascular Credentialing International. For sonographers who perform pediatric or fetal echocardiography, the minimum standard includes more specialized credentials. Some sonographers may be required to have a work experience component prior to eligibility for credentialing exams, and so it is recognized that laboratories may employ some sonographers who may not yet have credentials. However, in such circumstances, a credentialed sonographer should be immediately available to provide supervision. A majority of the echocardiographic studies in a laboratory should be performed by a credentialed sonographer, and a majority of the sonographers should have appropriate cardiac sonographer credentials. The laboratory should demonstrate a process aimed at having all sonographers credentialed. Local or state requirements, including licensure, may also exist for sonographers and must be fulfilled.

Physician

All physicians independently interpreting echocardiograms must have a minimum of level II training in TTE imaging as defined by the American College of Cardiology/American Heart Association/American College of Physicians-American Society of Internal Medicine Task Force on Clinical Competence in Echocardiography or its equivalent and must meet annual criteria to maintain that competence.[5] Those who trained prior to the incorporation of this level of training in fellowship programs must have achieved adequate training through an experience-based pathway and must meet annual criteria for maintaining competence.[5] Demonstration of special competency and board certification through passing a National Board of Echocardiography examination is desirable. Each laboratory should have a physician director who has completed level III training in echocardiography.[6] If this is not feasible, a combination of level II training and current certification from the National Board of Echocardiography is acceptable, though less desirable.

The different types of echocardiographic studies will require different levels of physician supervision. For diagnostic tests billed to the Centers for Medicare and Medicaid Services, specific levels of physician supervision are mandated. Currently there are three categories determined by the Centers for Medicare and Medicaid Services: those requiring "general supervision" (a physician provides general oversight and need not be on site), those requiring "direct supervision" (a physician must be in the office suite and immediately available), and those requiring "personal supervision" (a physician must be in the room). The physician lab director must ensure that the