Commission on Accreditation of Allied Health Education Programs

Standards and Guidelines
for the Accreditation of Educational Programs in Advanced Cardiovascular Sonography

Standards initially adopted in 2012; revised in 2016, 20XX

Adopted by the

American Society of Echocardiography
Society of Diagnostic Medical Sonography
Committee on Accreditation for Advanced Cardiovascular Sonography
and
Commission on Accreditation of Allied Health Education Programs

The Commission on Accreditation of Allied Health Education Programs (CAAHEP) accredits programs upon the recommendation of the Committee on Accreditation for Advanced Cardiovascular Sonography (CoA-ACS).

These accreditation Standards and Guidelines are the minimum standards of quality used in accrediting programs that prepare individuals to enter the advanced cardiovascular sonography profession. Standards are the minimum requirements to which an accredited program is held accountable. Guidelines are descriptions, examples, or recommendations that elaborate on the Standards. Guidelines are not required, but can assist with interpretation of the Standards.

Standards are printed in regular typeface in outline form. Guidelines are printed in italic typeface in narrative form.

Preamble

The Commission on Accreditation of Allied Health Education Programs (CAAHEP), the Committee on Accreditation for Advanced Cardiovascular Sonography (CoA-ACS), the American Society of Echocardiography (ASE), and the Society of Diagnostic Medical Sonography (SDMS) cooperate to establish, maintain and promote appropriate standards of quality for educational programs in the advanced cardiovascular sonography profession and to provide recognition for educational programs that meet or exceed the minimum standards outlined in these accreditation Standards and Guidelines. Lists of accredited programs are published for the information of students, employers, educational institutions and agencies, and the public.

These Standards and Guidelines are to be used for the development, evaluation, and self-analysis of advanced cardiovascular sonography programs. On-site review teams assist in the evaluation of a program’s relative compliance with the accreditation Standards.

Description of the Profession

The profession of Adult Echocardiography Advanced Cardiovascular Sonographer (ACS): 1) assists staff sonographers to assess cases that require 2D, Doppler, advanced measurements, contrast, strain, and 3D; 2) reviews studies that have been performed by the staff sonographer in preparation for review by the supervising cardiologist; 3) provides in-service education for staff sonographers of new methods that are to be incorporated in
the echocardiographic examination; 4) ensures that the necessary echocardiographic data is obtained based on the clinical history and presentation; and 5) establishes quality assurance measures to maintain the highest standard of care of a laboratory by closely monitoring sonographer performance and identifying training needs.

The ACS is a highly skilled professional qualified by education, experience and certification to provide the above services. The ACS works directly under physician supervision, applying clinical knowledge to the echocardiography exam to ensure that all information is obtained from the exam to answer the clinical question.

I. Sponsorship

A. Sponsoring Educational Institution

A sponsoring institution must be at least one of the following:

1. A post-secondary academic institution accredited by an institutional accrediting agency that is recognized by the U.S. Department of Education, and authorized under applicable law or other acceptable authority to provide a post-secondary program, which awards a minimum of a certificate at the completion of the program.

2. A hospital or medical center or other governmental medical service, which is accredited by a healthcare accrediting agency or equivalent that is recognized by the U.S. Department of Health and Human Services, and authorized under applicable law or other acceptable authority to provide healthcare, which awards a minimum of a certificate at the completion of the program.

3. A branch of the United States Armed Forces, which awards a minimum of a certificate at the completion of the program.

B. Consortium Sponsor

1. A consortium sponsor is an entity consisting of two or more members that exists for the purpose of operating an educational program. In such instances, at least one of the members of the consortium must meet the requirements of a sponsoring educational institution as described in I.A.

2. The responsibilities of each member of the consortium must be clearly documented in a formal affiliation agreement or memorandum of understanding, which includes governance and lines of authority.

C. Responsibilities of Sponsor

1. The Sponsor must ensure that the provisions of these Standards and Guidelines are met.

2. The Sponsor must ensure that the graduates of the program have obtained or will obtain a minimum of a bachelor’s degree, and a cardiac sonography or vascular specialist/technologist entry-level technical credential upon completion of the program.

The student entering the program should hold a bachelor’s degree and an entry-level technical credential in sonography.

II. Program Goals

A. Program Goals and Outcomes

There must be a written statement of the program’s goals and learning domains (cognitive, psychomotor, affective) consistent with and responsive to the demonstrated needs and expectations of the various communities of interest served by the educational program. The communities of interest that are served by the program must include, but are not limited to: students, graduates, faculty, sponsor administration, employers, physicians, and the public.
Program-specific statements of goals and learning domains provide the basis for program planning, implementation, and evaluation. Such goals and learning domains must be compatible with the mission of the sponsoring institution(s), the expectations of the communities of interest, and nationally accepted standards of roles and functions. Goals and learning domains are based upon the substantiated needs of health care providers and employers, and the educational needs of the students served by the educational program.

B. Appropriateness of Goals and Learning Domains
The program must regularly assess its goals and learning domains. Program personnel must identify and respond to changes in the needs and/or expectations of its communities of interest.

An advisory committee, which is representative of at least each of the communities of interest named in these Standards, must be designated and charged with the responsibility of meeting at least annually, to assist program and sponsor personnel in formulating and periodically revising appropriate goals and learning domains, monitoring needs and expectations, and ensuring program responsiveness to change.

The annual advisory committee meeting need not be face-to-face, but can include participation by synchronous electronic means.

C. Minimum Expectations
The program must have the following goal defining minimum expectations: "To prepare competent entry-level Advanced Cardiovascular Sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains."

Programs adopting educational goals beyond entry-level competence must clearly delineate this intent and provide evidence that all students have achieved the basic competencies prior to entry into the field.

Nothing in this Standard restricts programs from formulating goals beyond entry-level competence.

III. Resources
A. Type and Amount
Program resources must be sufficient to ensure the achievement of the program’s goals and outcomes. Resources must include, but are not limited to: faculty; clerical and support staff; curriculum; finances; offices; classroom, laboratory, and, ancillary student facilities; clinical affiliates; equipment; supplies; computer resources; instructional reference materials; and faculty/staff continuing education.

Each clinical affiliate must be an accredited echocardiography laboratory or have a majority of cardiac sonography or vascular specialist/technologist entry-level technical credentialed sonographers.

B. Personnel
The sponsor must appoint sufficient faculty and staff with the necessary qualifications to perform the functions identified in documented job descriptions and to achieve the program’s stated goals and outcomes.

1. Program Director
   a. Responsibilities
      The Program Director must:
      1) ensure achievement of the program’s goals and outcomes, and
      2) be responsible for all aspects of the program, including the organization, administration, continuous review, planning, development and general effectiveness of the program, and
provide supervision, administration and coordination of the instructional staff in the academic and practical phases of the education program.

b. **Qualifications**
   The Program Director must:
   1) Possess proficiency in curriculum development; and must meet at least one of the following:
   2) Possess a Baccalaureate degree and an ACS credential; or
   3) Possess a minimum of a Master’s degree and be a credentialed sonographer in the discipline that is offered; or
   4) Be a physician board certified in the discipline that is offered.

2. **Medical Advisor**
   a. **Responsibilities**
      The Medical Advisor(s) must provide guidance to ensure that the clinical and didactic components of the curriculum meet currently acceptable performance standards.
   b. **Qualifications**
      The Medical Advisor(s) must be a licensed physician (MD or DO), board certified in cardiology and echocardiography.

3. **Faculty and Instructional Staff**
   a. **Responsibilities**
      In classrooms, laboratories, and all applied instructional settings where a student is assigned, there must be a qualified instructor who is clearly designated as liaison(s) to the program to provide instruction, supervision, and timely assessment of the student’s progress in meeting program requirements.
   b. **Qualifications**
      Instructors must be one of the following:
      1) a licensed physician (MD or DO) with board certification in the subject matter of his/her assigned subject(s), or
      2) an individual with an earned doctorate degree in the subject matter of his/her teaching responsibilities, or
      3) an individual who has graduated from a CAAHEP accredited ACS program, or
      4) an individual with an advanced sonographer credential with a minimum of a baccalaureate degree.

C. **Curriculum**
   The curriculum must ensure the achievement of program goals and learning domains.
   Instruction must be an appropriate sequence of classroom, laboratory, and clinical activities.
   Instruction must be based on clearly written course syllabi that include course description, course objectives, methods of evaluation, topic outline, and competencies required for graduation.

   1. The curriculum for the ACS must include the following content:
      a. Advanced cardiovascular hemodynamics/pathophysiology
      b. Acquired cardiovascular disease
      c. Congenital cardiovascular disease
      d. Medical and surgical treatment of cardiovascular disease (by disease)
      e. Advanced echocardiography modalities
      f. Comparative imaging analysis (angiography, nuclear cardiology, cardiac CT and cardiac MRI)
      g. Research methods and biostatistics
Advanced Cardiovascular Sonography 20xx

Introduction to clinical trials research and IRB requirements

Cardiovascular Pharmacology

Physics and Instrumentation

Patient Assessment

Instructional techniques for the adult learner

Upon successful completion of the program, the graduate must have demonstrated the following competencies:

a. Perform preliminary assessment of the echocardiographic study with a preliminary findings worksheet for the interpreting physician

b. Develop a quality assurance policy/program

c. Provide and present a literature review summary with case presentation or original research on new echocardiographic technology

d. Present technology integration strategies

e. Monitor the staff sonographers' performance of echocardiographic studies with written assessments that outline advice for performing improved imaging

Additional related subjects should include Health Administration and Business, Interpersonal skills, Evidence Based Medicine/Appropriateness Criteria, Professional Standards and Ethics.

The curriculum should include the content in Appendix B listed under each of the content headings.

D. Resource Assessment

The program must, at least annually, assess the appropriateness and effectiveness of the resources described in these Standards. The results of resource assessment must be the basis for ongoing planning and appropriate change. An action plan must be developed when deficiencies are identified in the program resources. Implementation of the action plan must be documented and results measured by ongoing resource assessment.

IV. Student and Graduate Evaluation/Assessment

A. Student Evaluation

1. Frequency and purpose

Evaluation of students must be conducted on a recurrent basis and with sufficient frequency to provide both the students and program faculty with valid and timely indications of the students' progress toward and achievement of the competencies and learning domains stated in the curriculum.

2. Documentation

Records of student evaluations must be maintained in sufficient detail to document learning progress and achievements.

B. Outcomes

1. Outcomes Assessment

The program must periodically assess its effectiveness in achieving its stated goals and learning domains. The results of this evaluation must be reflected in the review and timely revision of the program.

Outcomes assessments must include, but are not limited to: national credentialing examination(s) performance, programmatic retention/attrition, graduate satisfaction, employer satisfaction, job (positive) placement, and programmatic summative measures. The program must meet the outcomes assessment thresholds.

"Positive placement" means that the graduate is employed full or part-time in the profession or in a related field; or continuing his/her education; or serving in the military. A related field is one in which the
individual is using cognitive, psychomotor, and affective competencies acquired in the educational program.

“National credentialing examinations” are those accredited by the National Commission for Certifying Agencies (NCCA) or American National Standards Institute (ANSI).

2. Outcomes Reporting

The program must periodically submit to the CoA-ACS the program goal(s), learning domains, evaluation systems (including type, cut score, and appropriateness), outcomes, its analysis of the outcomes, and an appropriate action plan based on the analysis.

Programs not meeting the established thresholds must begin a dialogue with the CoA-ACS to develop an appropriate plan of action to respond to the identified shortcomings.

V. Fair Practices

A. Publications and Disclosure

1. Announcements, catalogs, publications, and advertising must accurately reflect the program offered.

2. At least the following must be made known to all applicants and students: the sponsor’s institutional and programmatic accreditation status as well as the name, mailing address, web site address, and phone number of the accrediting agencies; admissions policies and practices, including technical standards (when used); policies on advanced placement, transfer of credits, and credits for experiential learning; number of credits required for completion of the program; tuition/fees and other costs required to complete the program; policies and processes for withdrawal and for refunds of tuition/fees.

3. At least the following must be made known to all students: academic calendar, student grievance procedure, criteria for successful completion of each segment of the curriculum and for graduation, and policies and processes by which students may perform clinical work while enrolled in the program.

4. The sponsor must maintain, and make available to the public current and consistent summary information about student/graduate achievement that includes the results of one or more of the outcomes assessments required in these Standards.

The sponsor should develop a suitable means of communicating to the communities of interest the achievement of students/graduates (e.g. through a website or electronic or printed documents).

B. Lawful and Non-discriminatory Practices

All activities associated with the program, including student and faculty recruitment, student admission, and faculty employment practices, must be non-discriminatory and in accord with federal and state statutes, rules, and regulations. There must be a faculty grievance procedure made known to all paid faculty.

C. Safeguards

The health and safety of patients, students, faculty, and other participants associated with the educational activities of the students must be adequately safeguarded.

All activities required in the program must be educational and students must not be substituted for staff.

D. Student Records

Satisfactory records must be maintained for student admission, advisement, counseling, and
Grades and credits for courses must be recorded on the student transcript and permanently maintained by the sponsor in a safe and accessible location.

E. **Substantive Change**
The sponsor must report substantive change(s) as described in Appendix A to CAAHEP/CoA in a timely manner. Additional substantive changes to be reported to the CoA-ACS within the time limits prescribed include:
1. Change in accreditation of a clinical affiliate.
2. Additions or deletions of clinical affiliates.

F. **Agreements**
There must be a formal affiliation agreement or memorandum of understanding between the sponsor and all other entities that participate in the education of the students describing the relationship, roles, and responsibilities of the sponsor and that entity.
APPENDIX B

Curriculum for Educational Programs in Advanced Cardiovascular Sonography

A. Advanced Cardiac Hemodynamics/Pathophysiology

1. Cardiac Cycle
   A) Generation of action potentials
   B) Electrical activation of the heart
   C) Mechanical sequence of events
      i. Pressure curves for ventricles, atria and great arteries
      ii. Left ventricular volume curve
      iii. Valve movements and heart sounds
      iv. Pressure-Volume loops: normal

2. Determinants of Ventricular Function
   A) Stroke volume, cardiac index and ejection fraction
   B) Ventricular strain
   C) Control of myocardial contractile performance
      i. Preload and Starling’s curves
      ii. Afterload and Afterload-Velocity curves
      iii. Contractility
      iv. Pressure-Volume loops: altered preload, afterload and contractility
   D) Diastolic Function
      i. Relaxation
      ii. Compliance/Stiffness

3. Autonomic Nervous System
   A) Anatomy of the sympathetic and parasympathetic systems
   B) Distribution and properties of autonomic receptors
   C) Cardiovascular responses evoked by agonists and antagonists of the autonomic nervous system

4. Reflex and Humoral Control of the Circulation
   A) Baroreceptor reflexes
   B) Renin-Angiotensin-Aldosterone
   C) Anti Diuretic Hormone
   D) Cardiac Natriuretic Peptides

5. Vascular Flow, Including Coronary Blood Flow
   A) Relationship between blood viscosity and hematocrit
   B) Relationship between blood viscosity and flow rate (shear stress)
   C) Turbulence; Reynolds Number
   D) Flow, pressure, resistance relationship and Poiseuille’s Law
      i. Autoregulation
      ii. Mechanical factors
      iii. Metabolic factors (myocardial oxygen demand)
      iv. Neural factors
      v. Pharmacologic agents
      vi. Coronary flow reserve

6. Valvular Heart Disease
   A) Pathophysiology of aortic and mitral stenosis
      i. Geometric valve area and effective orifice area
      ii. Blood velocity and pressure gradient
      iii. Pressure curves
      iv. Effects on chambers
   B) Pathophysiology of aortic and mitral regurgitation
      i. Regurgitant orifice area and regurgitant volume
      ii. Pressure curves
      iii. Effects on chambers
7. Exercise Physiology
   A) Cardiovascular responses to upright aerobic exercise
      i. Oxygen uptake, heart rate, stroke volume, cardiac output and A-V O2 difference
      ii. Effects of training
   B) Cardiovascular responses to supine exercise
   C) Cardiovascular responses to isometric exercise

B. Acquired Cardiovascular Disease
   1. Valvular Heart Disease
   2. Prosthetic Valve Disease
   3. Ischemic Heart Disease
   4. Cardiomyopathy
   5. Pericardial Disease
   6. Cardiac Trauma
   7. Cardiac Neoplasm’s and Masses
   8. Radiation Heart Disease
   9. Diseases of the Aorta

C. Congenital Cardiovascular Disease
   1. Embryology and fetal cardiac development - Segmental approach
   2. Cardiac chambers and septation
   3. Valve anatomy and dynamics
   4. Coronary artery anatomy
   5. Relationships of cardiac chambers and great vessels
   6. Mediastinal structures

D. Medical and Surgical Treatment of Cardiovascular Disease
   1. Prosthetic Valve
   2. Balloon Valvuloplasty
   3. Intraoperative evaluation
   4. Use of TEE for hemodynamic monitoring
   5. Transcatheter aortic valve implantation
   6. Mitral repair
   7. Closure of prosthetic paravalvular leaks
   8. Post-procedure follow-up
   9. Transcatheter interventions
   10. Surgical options in cardiomyopathy
   11. Myocardial Biopsy
   12. Pericardiocentesis
   13. Device closure of septal defects

E. Advanced Echocardiographic Modalities
   1. Contrast Echocardiography
   2. Indication
   3. Physical interaction of contrast agents
   4. Administration
   5. Technique
   6. Myocardial Perfusion
      A) Triggered
      B) Realtime
   7. Contrast vascular applications
   8. 3D
9. 3D Quantification
10. Image Acquisition
11. Triplane Imaging
12. Full Volume
13. 3D Volume Imaging
14. Heart Failure Assessment
15. Cardiac Resynchronization
   A) Eligibility and Advantages
   B) Types of conduction delays
   C) Biventricular Pacing
   D) Echocardiographic Assessment of Synchrony and Dysynchrony
   E) Methods of Optimization
   F) Protocols for Treatment
16. Strain

F. Comparative imaging analysis (angiography, nuclear cardiology, cardiac CT and cardiac MRI)
   1. Coronary angiography and physiology
   2. Cardiac physiology and pathophysiology
   3. Rest and exercise electrocardiography
   4. Exercise physiology
   5. Pharmacology of standard cardiovascular drugs
   6. Patient safety
   7. Cardiopulmonary resuscitation and treatment of other cardiac emergencies
   8. Pharmacology and physiology of commonly used stress agents such as dipyridamole, adenosine, and dobutamine
   9. Clinical outcomes assessment
   10. Radiation and magnet safety
   11. Radiopharmaceuticals
   12. Nuclear cardiology diagnostic tests and procedures protocols
   13. General cardiology
   14. Indications for ordering imaging studies
   15. Appropriateness
   16. Image Interpretation
   17. Pitfalls in interpretation and clinical application of imaging modalities
   18. Patient risk stratification
   19. Specificity, sensitivity, diagnostic accuracy, utility in assessing prognoses and interventions
   20. Costs associated with different imaging modalities
   21. Sources of artifacts in various cardiac imaging, including motion, arrhythmias, and metal objects in MRI
   22. Cardiology imaging contrast agents side effects
   23. Clinical utility of all cardiology imaging modalities
   24. Hemodynamic assessment by various imaging modalities
   25. Coronary artery imaging
   26. Role of complementary imaging modalities in various conditions including CAD, myocardial diseases, valvular heart disease, diseases of the aorta, congenital heart disease

G. Research Methods and Biostatistics
   1. Research Methods
      A) Population Surveys
      B) Hypothesis Testing
      C) Outcomes Research
      D) Randomized versus Nonrandomized
      E) Blinded versus Nonblinded (Single, double, triple)
      F) Simulations
   2. Biostatistics
A) Probability
B) Data distribution types
C) Concepts of Inference
D) Inference for single samples
E) Inference for two samples
F) Inference for proportions
G) Regression and correlation
H) Analysis of Variance (ANOVA)
I) Nonparametric statistical methods

H. Introduction to clinical trials research and IRB requirements
1. Responsibilities and Organization
2. Specific Clinical Trials Design
3. Clinical Trial Study Protocols
4. Clinical Sites
5. Statistical Analysis
6. Data Handling and Management
7. Quality Assurance
8. Regulatory Considerations
9. IRB application process
10. Subjects training

I. Cardiovascular Pharmacology
1. Antihypertensives
2. Diuretics
3. ACE Inhibitors
4. Angiotensin Receptor Blockers
5. Beta Blockers
6. Calcium Channel Blockers
7. Antiarrhythmics
8. Antiplatelet/Anticoagulants
9. Chronotropic Agents
10. Inotropic agents
11. Nitrates
12. Local Anesthetics
13. Vasopressors

J. Physics and Instrumentation
1. Advanced hemodynamics
2. Advanced principles of Doppler ultrasound
3. Spectral analysis and color flow imaging
4. Strain/Strain rate and torsion imaging
5. 3D (TTE and TEE)
6. Harmonics
7. Contrast agents
8. Biological effects
9. Image acquisition and storage
10. Quality control
11. Equipment selection
12. Image optimization
13. Recent advances in technology and ultrasound techniques

K. Patient Assessment
1. Patient Historical Assessment
2. Physical Exam with incorporation of hemodynamic information
3. **Chart Review**

L. **Instructional techniques for the adult learner**