Table of Revisions

Description of Profession

II. Program Goals
Appropriateness of Goals and Learning Domains
Minimum Expectations

III. Resources
Clinical Affiliations
Program Director Qualifications
Concentration Coordinator Qualifications
Clinical Coordinator Responsibilities
Clinical Coordinator Qualifications
Medical Advisor Qualifications
Diagnostic Medical Sonography Faculty and Instructional Staff
Didactic Faculty
Clinical Faculty
Related Professions Faculty
General Education Curriculum
Common Core Curriculum
Curriculum for Each Concentration
Student Evaluation Documentation

Appendix B, Part I: Common Core Curriculum
Demonstrate knowledge and application of ergonomic techniques.
Demonstrate knowledge and application of types and methods of infection control.
Demonstrate knowledge and application of patient care.
Demonstrate comprehension and application of medical ethics and law.
Demonstrate comprehension and application of medical and sonographic terminology.

Obtain, interpret, document, and communicate relevant information related to sonographic examinations.

Demonstrate awareness of roles and responsibilities of healthcare professions to effectively communicate and collaborate in the healthcare environment.

Identify and evaluate anatomic structures.

Demonstrate knowledge of clinical disease processes with application to sonographic and Doppler patterns.

Demonstrate knowledge, comprehension, and application of image production and optimization.

Demonstrate knowledge, comprehension, and application of biological effects.

Demonstrate knowledge of the components required for implementing a quality control and improvement program.

Demonstrate awareness of resources for professional development.

Demonstrate performance of clinical competencies

Appendix B, Part II: Adult Cardiac Learning Concentration Curriculum

Identify anatomy, anatomic variants, and sonographic appearances of normal cardiac structures.

Demonstrate knowledge of normal and cardiovascular physiology and hemodynamics.

Demonstrate knowledge of mechanisms of disease, cardiovascular pathophysiology, and hemodynamics, sonographic technique, measurements, quantitative principles, and Doppler patterns in both the normal heart and with cardiac disease.

Demonstrate knowledge and applications of the indications, utility, limitations, and technical procedures for related echocardiographic studies.

Demonstrate knowledge, application, and proficiency in the use of quantitation principles applied to echocardiographic images and flow data.

Awareness of scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.
Demonstrate performance of clinical competencies

Appendix B, Part III: Pediatric Cardiac Learning Concentration Curriculum

Identify anatomy, anatomic variants, and sonographic appearances of normal and abnormal cardiac structures (adult, pediatric, and fetal).

Demonstrate knowledge of normal cardiovascular physiology and hemodynamics.

Demonstrate knowledge of cardiovascular pathophysiology (embryology of congenital abnormalities, mechanisms of acquired disease), and hemodynamics, sonographic technique, measurements, quantitative principles, and Doppler patterns in both the normal heart and with cardiac disease.

Demonstrate knowledge and applications of the indications, utility, limitations, and technical procedures for related echocardiographic studies.

Demonstrate knowledge, application, and proficiency in the use of quantitation principles applied to echocardiographic images and flow data.

Demonstrate knowledge and application of clinical cardiology as appropriate to the fetus and patients with congenital heart disease (CHD).

Awareness of scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.

Appendix B, Part IV: Abdominal Learning Concentration Curriculum

Identify anatomy, relational anatomy, anatomic variants, and sonographic appearances of normal anatomical structures.

Demonstrate knowledge of the physiology, pathophysiology, sonographic technique, measurements, sonographic appearances, and Doppler patterns in both normal and abnormal structures.

Demonstrate knowledge in sonographic guided procedures.
Evaluate scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.

**Performance of Clinical Competencies**

Demonstrate proficiency in the technique and application

**Appendix B, Part V: Breast Learning Concentration Curriculum**

Identify anatomy, congenital and developmental variants, and sonographic appearances of normal breast structures.

Demonstrate knowledge of the physiology and pathophysiology in both normal and abnormal breast structures.

Demonstrate knowledge of the sonographic technique, measurements, sonographic appearances, integration of data, and Doppler patterns in both normal and abnormal breast structures.

Demonstrate knowledge in interventional and intraoperative procedures.

Evaluate scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.

Demonstrate knowledge of treatment options.

Demonstrate performance of clinical competencies

**Appendix B, Part VI: Musculoskeletal Learning Concentration Curriculum**

Define and describe sonographic characteristics of the components of the musculoskeletal system.

Demonstrate knowledge of the anisotropic effect and the ability to distinguish this artifact from normal variants and pathology.

Identify anatomical structures, nerves and vascular supply, normal sonographic appearances, normal Doppler patterns, measurements (and contralateral comparison when applicable), and changes with dynamic assessment.

Demonstrate knowledge of the physiology, pathophysiology, sonographic technique, measurements, sonographic appearances, and Doppler patterns in musculoskeletal injuries and disease processes.

Identify sonographic and Doppler patterns in clinical diseases, injury, and post-surgical changes that may occur in the following categories.
Demonstrate knowledge in sonographic guided procedures

Evaluate scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses

Demonstrate performance of clinical competencies

Appendix B, Part VII: Obstetrics and Gynecologic Learning Concentration Curriculum

Identify anatomy, anatomic variants, and sonographic appearances of normal structures of the female pelvis.

Identify anatomy, anatomic variants, and sonographic appearances of normal maternal, embryonic, and fetal anatomic structures during the first, second, and third trimesters.

Demonstrate knowledge of pathology, physiology, pathophysiology, sonographic technique, measurements, sonographic appearances, and Doppler patterns in gynecologic disease processes.

Demonstrate knowledge of pathology, physiology, pathophysiology, sonographic technique, sonographic appearance, measurements, and Doppler patterns in obstetric abnormalities.

Demonstrate knowledge and understanding of the role of the sonographer in performing interventional/invasive/advanced procedures.

Evaluate scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.

Demonstrate clinical competency through performance of sonographic examinations of the gravid and non-gravid pelvis with both transabdominal and endocavitary transducers, and Doppler/M-mode display modes, according to practice parameters established by national professional organizations and the protocol of the clinical affiliate/clinical education centers.

Demonstrate performance of clinical competencies

Appendix B, Part VIII: Vascular Learning Concentration Curriculum

Demonstrate knowledge of anatomy and anatomic variants of the cardiovascular system.

Demonstrate knowledge of normal and abnormal peripheral vascular physiology and hemodynamics.
Demonstrate knowledge of mechanisms of vascular diseases, vascular pathophysiology, and hemodynamic effects.

Demonstrate knowledge of sonographic appearances, sonographic techniques, measurements, and Doppler flow characteristics in both normal and abnormal vascular structures.

Demonstrate knowledge physiologic vascular testing principles and techniques.

Demonstrate knowledge and application in the use of quantitative principles applied to vascular testing.

Demonstrate knowledge in ultrasound-guided procedures.

Demonstrate knowledge of the role of ultrasound for evaluation of vascular surgical procedure or interventions, including role in planning, intra-procedural guidance/technical evaluation, and/or post-procedure assessment.

Evaluate scanning protocol and modification(s) based on patient-specific factors.

Demonstrate knowledge and application of quality assurance and statistical tests used in a vascular laboratory.

Demonstrate performance of clinical competencies

Demonstrate proficiency in technique
Standards and Guidelines
for the Accreditation of Educational Programs in
Diagnostic Medical Sonography


American College of Cardiology Foundation
American College of Radiology
American College of Obstetricians and Gynecologists
American Institute of Ultrasound in Medicine
American Society of Echocardiography
American Society of Radiologic Technologists
Society of Diagnostic Medical Sonography
Society for Vascular Surgery
Society for Vascular Ultrasound

Joint Review Committee on Education in Diagnostic Medical 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 Joint Review Committee on Education in Diagnostic Medical Sonography (JRC-DMS).

These accreditation Standards and Guidelines are the minimum standards of quality used in accrediting programs that prepare individuals to enter the Diagnostic Medical 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), Joint Review Committee on Education in Diagnostic Medical Sonography (JRC-DMS), and the American College of Cardiology, American College of Radiology, American College of Obstetricians and Gynecologists, American Institute of Ultrasound in Medicine, American Society of Echocardiography, American Society of Radiologic Technologists, Society of Diagnostic Medical Sonography, Society for Vascular Surgery, and Society for Vascular Ultrasound cooperate to establish, maintain and promote appropriate standards of quality for educational programs in diagnostic medical sonography 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 diagnostic medical sonography programs. On-site review teams assist in the evaluation of a program’s relative compliance with the accreditation Standards.
Description of Profession

Diagnostic medical sonography is a multi-specialty profession comprised of abdominal sonography, breast sonography, cardiac sonography, musculoskeletal sonography, obstetrics/gynecology sonography, vascular sonography, and other emerging clinical areas. These diverse areas all use ultrasound as a primary technology in their daily work.

The diagnostic medical sonographer is an individual who provides patient care services using ultrasound and related diagnostic procedures. The diagnostic medical sonographer must be educationally prepared and clinically competent as a prerequisite to professional practice. Demonstration and maintenance of competency through certification by a nationally recognized sonography credentialing organization is the standard of practice in sonography, and maintenance of certification in all areas of practice is endorsed.

The diagnostic medical sonographer functions as a delegated agent of the physician and does not practice independently.

Diagnostic medical sonographers are committed to enhanced patient care and continuous quality improvement that increases knowledge and technical competence.

Diagnostic medical sonographers use independent, professional and ethical judgment, and critical thinking to safely perform diagnostic sonographic procedures.

The diagnostic medical sonographer generally performs the following:

- Obtain, review, and integrate pertinent patient history and supporting clinical data to facilitate optimum diagnostic results;
- Perform appropriate procedures and record anatomic, pathologic, and/or physiologic data for interpretation by a physician;
- Record, analyze, and process diagnostic data and other pertinent observations made during the procedure for presentation to the interpreting physician;
- Exercise discretion and judgment in the performance of sonographic and/or other diagnostic services;
- Demonstrate appropriate communication skills with patients and colleagues;
- Act in a professional and ethical manner;
- Facilitate communication and education to elicit patient cooperation and understanding of expectations, and responds to questions regarding the sonographic examination.

Included in this document are education standards that apply to the following learning concentrations:

- Adult Cardiac
- Pediatric Cardiac
- Abdominal
- Breast
- Musculoskeletal
- Obstetric and Gynecologic
- Vascular

I. Sponsorship
A. Sponsoring 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 must be 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 institution as described in I.A.

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

C. Responsibilities of Sponsor

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

II. Program Goals

A. Program Goals and Outcomes

There must be a written statement of the program’s goals and learning domains 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.

Advisory committee meetings may include participation by synchronous electronic means.

C. Minimum Expectations

The program must have the following goal(s) defining minimum expectations:

- “To prepare competent entry-level adult cardiac sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains” and/or
- “To prepare competent entry-level pediatric cardiac sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains” and/or
- “To prepare competent entry-level abdominal sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains” and/or
- “To prepare competent entry-level breast sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains” and/or
• “To prepare competent entry-level musculoskeletal sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains” and/or
• “To prepare competent entry-level obstetric and gynecologic sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains” and/or
• “To prepare competent entry-level vascular 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
1. Program Resources
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.

Support Staff should be available to provide counseling or referral for problems that may interfere with the student’s progress through the program. Guidance should be available to assist students in understanding course content and in observing program policies, and practices.

2. Clinical Affiliations
   a. For all affiliations students must have access to adequate numbers and types of examinations that are proportionally distributed by pathologic processes encountered in the delivery of diagnostic medical sonography for the learning concentration(s) being offered.

   Programs should provide students with a variety of patient care settings in which sonographic procedures are performed on in-patients and outpatients. These settings may include the following: Ambulatory care facilities, Specialty centers, Emergency/trauma, Intensive/critical/coronary care, Surgery, Angiography/cardiac catheterization.

   The number of students assigned to the clinical affiliate/clinical education center should be determined by a student/clinical staff ratio not greater than one student to one appropriately credentialed sonographer.

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 be responsible for
      1) the structure and daily operation of the program;
      2) organization, administration, periodic review and evaluation, continued development, and effectiveness of program curricula; and
      3) ensuring the effectiveness of all clinical affiliates/clinical education centers is maintained.

   b. Qualifications
      The Program Director must:
      1) be an appointed faculty member or institutional equivalent;
2) possess a minimum of a Bachelor’s Degree;
3) possess the appropriate credential(s) specific to one or more of the concentration(s) offered.
4) be proficient in educational theories and techniques, supervision, instruction, evaluation, and guidance;
5) have obtained a minimum of two years of full-time (35 hours/week), or equivalent, professional clinical experience as a credentialed sonographer.

A master’s degree is preferred.

Educational theories and techniques may be demonstrated by documentation of completed college courses, seminars, or in-service sessions on topics including, but not limited to, learning theory, curriculum design, test construction, teaching methodology, or assessment techniques.

2. Concentration Coordinator
   a. Responsibilities
      The Concentration Coordinator reports to the Program Director, and must be designated and responsible for the instruction, curriculum, student evaluation, and assessment for the concentration(s) in which the Program Director does not possess the appropriate credential(s).
   b. Qualifications
      Concentration Coordinator must:
      1) be an appointed faculty member or institutional equivalent;
      2) an academic degree no lower than an associate’s degree and at least equal to that for which the graduates are being prepared;
      3) possess the appropriate credential(s) specific to the concentration(s) that they coordinate;
      4) be proficient in educational theories and techniques, supervision, instruction, evaluation, and guidance;
      5) have obtained a minimum of two years of full-time (35 hours/week) or equivalent, professional clinical experience as a credentialed sonographer in the concentration being coordinated.

      Educational theories and techniques may be demonstrated by documentation of completed college courses, seminars, or in-service sessions on topics including, but not limited to, learning theory, curriculum design, test construction, teaching methodology, or assessment techniques.

3. Clinical Coordinator
   Programs must have a faculty member designated as the Clinical Coordinator.
   a. Responsibilities
      The Clinical Coordinator must:
      1) be responsible for coordinating clinical education with didactic education as assigned by the program director;
      2) evaluate and ensure the effectiveness of clinical experiences for the concentration(s) students are enrolled in;
      3) provide coordination, instruction, and documented evaluation and progression of student clinical performance for the achievement of the required clinical competencies.
   b. Qualifications
      The clinical coordinator(s) must:
      1) be an appointed faculty member or institutional equivalent;
      2) an academic degree no lower than an associate’s degree and at least equal to that for which the graduates are being prepared;
      3) possess the appropriate credential(s) specific to the concentration(s) that they coordinate;
4) be proficient in educational theories and techniques, supervision, instruction, evaluation, and guidance;
5) have obtained a minimum of two years of full-time (35 hours/week) professional clinical experience as a credentialed sonographer.

Educational theories and techniques may be demonstrated by documentation of completed college courses, seminars, or in-service sessions on topics including, but not limited to, learning theory, curriculum design, test construction, teaching methodology, or assessment techniques.

4. Medical Advisor
   a. Responsibilities
      The Medical Advisor must provide guidance that the medical components of the didactic and clinical curriculum meet current acceptable performance standards.

   b. Qualifications
      The Medical Advisor must be a licensed physician, certified by an American Board of Medical Specialties (ABMS), with relevant experience and knowledge in diagnostic medical sonography.
      
      The medical advisor should participate in goal determination, curriculum development and outcomes assessment.

5. Diagnostic Medical Sonography Faculty and Instructional Staff
   Didactic faculty, clinical faculty, and clinical instructors must possess the appropriate credentials for the learning concentration(s) they teach and assess.
   
   All faculty must be familiar with program goals, be able to demonstrate the ability to develop an organized plan of instruction and evaluation.

   a. Didactic Faculty
      1) Responsibilities
         The faculty must be responsible for providing didactic content, evaluation of students, documentation of progress, and periodic review of course content.

         2) Qualifications
         The faculty must be qualified by education and experience, and be effective in teaching the subjects assigned.

   b. Clinical Faculty
      1) Responsibilities
         Clinical faculty must be responsible for coordination and evaluation of clinical education in the concentration(s) for which the Clinical Coordinator does not possess the appropriate credentials.

         2) Qualification
         The faculty must be qualified by education and experience, and be effective in assessing and documenting progression of clinical skills.

   c. Clinical Instructor(s)
      Clinical Instructor(s) must be identified for each clinical affiliate.

         1) Responsibilities
         A clinical instructor must be available to students whenever they are assigned to a clinical setting, provide appropriate clinical supervision and be responsible for student clinical evaluation.

         2) Qualifications
The clinical instructor must have the appropriate credential in the concentration(s) they are evaluating the student’s performance and documentation of the required clinical competencies.

6. Related Professions Faculty
   a. Responsibilities
   Related professions faculty must provide curriculum content for general and foundational knowledge required of an entry level sonographer.
   
   b. Qualifications
   1) possess a minimum of a master’s degree in the related field; and
   2) be knowledgeable in course content and effective in teaching their assigned subjects, and capable through academic preparation, training and experience to teach the courses to which they are assigned.

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. General Education Curriculum
   Basic medical science and interpersonal communication education is required as a foundation for the clinical role of the diagnostic medical sonographer. Educational content must be sequenced appropriately for development of necessary skills to progress to sonography specific coursework. The following general education must include:

   - anatomy and physiology
   - mathematics (ex: algebra, statistics)
   - general physics
   - communication skills

2. Common Core Curriculum
   The program must demonstrate by comparison that the curriculum offered meets or exceeds the content and competencies specified in Appendix B Part I.

3. Curriculum for Each Concentration
   The program must demonstrate by comparison that the curriculum offered for the concentration(s) meets or exceeds the content and competencies specified in Appendix B Part II – Part VIII.

4. Master Plan
   The master plan of education must be sufficiently detailed to provide for continuity, delivery, and ongoing evaluation of the program.

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 (Outcomes) 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.

Records indicating the number and type of procedures performed by the student, the examination findings, the extent of student supervision, and the level of involvement of the student in scanning/performance must be maintained and must document that all students are afforded equitable clinical experiences to achieve program required competencies for the learning concentration(s) offered.

Documents or electronic equivalent used for determination of progression of learning and achievements must specify the sonographer who is conducting the evaluation through inclusion of name, signature and their credentials.

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 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 (NCQA) or American National Standards Institute (ANSI). Participation and pass rates on national credentialing examination(s) performance may be considered in determining whether or not a program meets the designated threshold, provided the credentialing examination(s) or alternative examination(s) offered by the same credentialing organization, is/are available to be administered prior to graduation from the program. Results from said alternative examination(s) may be accepted, if designated as equivalent by the same organization whose credentialing examination(s) is/are so accredited.

2. Outcomes Reporting
The program must periodically submit to the JRC-DMS 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 JRC-DMS 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

Diagnostic Medical Sonography
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 graduation, policies for student leave of absence, exposure to blood borne
pathogens, communicable diseases, and pregnancy, 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 accordance with
federal and state statutes, rules, and regulations. There must be a faculty grievance procedure
made known to all paid faculty.

A procedure should be established for determining that a student's health will permit him or her to
meet the documented technical standards of the program.

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.

The program must ensure voluntary and prudent use of students or other human subjects for
non-clinical scanning. Students’ grades and evaluations must not be affected by participation or
non-participation.

Students should be informed of and have access to the health care services provided to all other
students of the institution.

D. Student Records
Satisfactory records must be maintained for student admission, advisement, counseling, and
evaluation. 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/JRC-
DMS in a timely manner. Other substantive change(s) to be reported to JRC-DMS within the time
limits prescribed include:

1) Changes in clinical affiliates
2) Added or deleted learning concentrations
3) Change in key personnel
4) Institution's mission or objectives if these will affect the program
5) Addition or deletion of courses that represent a significant departure in content or in
   method of delivery
6) Degree or credential level
7) Substantial change in clock or credit hours for successful completion of a program or in
   the length of a program
8) Addition or changes of satellite campus, distance education programs, or location
   (campus) where core curriculum DMS coursework is delivered.

Diagnostic Medical Sonography
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, role, and responsibilities between the sponsor and that entity.

*The delineation of responsibilities should include student supervision, benefits, liability and financial arrangements, if any. The agreement should include a clause to protect students and to ensure due process.*

An affiliate is an institution having adequate resources to provide a broad range of appropriate clinical education opportunities for students.

*A clinical education center is a diagnostic department, division, or other designated part of a clinical affiliate having adequate resources to provide clinical education opportunities for students. Multiple clinical education centers may be identified within a clinical affiliate.*
Appendix A

Application, Maintenance and Administration of Accreditation

A. Program and Sponsor Responsibilities

1. Applying for Initial Accreditation

a. The chief executive officer or an officially designated representative of the sponsor completes a “Request for Accreditation Services” form. The “Request for Accreditation Services” form can be found online via the CAAHEP website at www.caahep.org. The form can be completed on-line and submitted directly to the JRC-DMS via the CAAHEP website (preferred); completed on-line, printed, signed and mailed to the JRC-DMS; or it can be printed as a blank form, completed, signed and mailed to:

JRC-DMS
6021 University Blvd. Suite 500
Ellicott City, MD 21043

Note: There is no CAAHEP fee when applying for accreditation services; however, individual committees on accreditation may have an application fee.

b. The program undergoes a comprehensive review, which includes a written self-study report and an on-site review.

The self-study instructions and report form are available from the JRC-DMS. The on-site review will be scheduled in cooperation with the program and JRC-DMS once the self-study report has been completed, submitted, and accepted by the JRC-DMS.

2. Applying for Continuing Accreditation

a. Upon written notice from the JRC-DMS, the chief executive officer or an officially designated representative of the sponsor completes a “Request for Accreditation Services” form.

The “Request for Accreditation Services” form can be found online via the CAAHEP website at www.caahep.org. The form can be completed on-line and submitted directly to the JRC-DMS via the CAAHEP website (preferred); completed on-line, printed, signed and mailed to the JRC-DMS; or it can be printed as a blank form, completed, signed and mailed to:

JRC-DMS
6021 University Blvd. Suite 500
Ellicott City, MD 21043

b. The program may undergo a comprehensive review in accordance with the policies and procedures of the JRC-DMS.

If it is determined that there were significant concerns with the on-site review, the sponsor may request a second site visit with a different team.

After the on-site review team submits a report of its findings, the sponsor is provided the opportunity to comment in writing and to correct factual errors prior to the JRC-DMS forwarding a recommendation to CAAHEP.

3. Administrative Requirements for Maintaining Accreditation

a. The program must inform the JRC-DMS and CAAHEP within a reasonable period of time (as defined by the JRC-DMS and CAAHEP policies) of changes in chief executive officer, dean of health professions or equivalent position, and required program personnel (Refer to Standard III.B.).
b. The sponsor must inform CAAHEP and the JRC-DMS of its intent to transfer program sponsorship. To begin the process for a Transfer of Sponsorship, the current sponsor must submit a letter (signed by the CEO or designated individual) to CAAHEP and the JRC-DMS that it is relinquishing its sponsorship of the program. Additionally, the new sponsor must submit a “Request for Transfer of Sponsorship Services” form. The JRC-DMS has the discretion of requesting a new self-study report with or without an on-site review. Applying for a transfer of sponsorship does not guarantee that the transfer of accreditation will be granted.

c. The sponsor must promptly inform CAAHEP and the JRC-DMS of any adverse decision affecting its accreditation by recognized institutional accrediting agencies and/or state agencies (or their equivalent).

d. Comprehensive reviews are scheduled by the JRC-DMS in accordance with its policies and procedures. The time between comprehensive reviews is determined by the JRC-DMS and based on the program’s on-going compliance with the Standards, however, all programs must undergo a comprehensive review at least once every ten years.

e. The program and the sponsor must pay JRC-DMS and CAAHEP fees within a reasonable period of time, as determined by the JRC-DMS and CAAHEP respectively.

f. The sponsor must file all reports in a timely manner (self-study report, progress reports, annual reports, etc.) in accordance with JRC-DMS policy.

g. The sponsor must agree to a reasonable on-site review date that provides sufficient time for CAAHEP to act on a JRC-DMS accreditation recommendation prior to the “next comprehensive review” period, which was designated by CAAHEP at the time of its last accreditation action, or a reasonable date otherwise designated by the JRC-DMS.

Failure to meet any of the aforementioned administrative requirements may lead to administrative probation and ultimately to the withdrawal of accreditation. CAAHEP will immediately rescind administrative probation once all administrative deficiencies have been rectified.

4. Voluntary Withdrawal of a CAAHEP-Accredited Program

Voluntary withdrawal of accreditation from CAAHEP may be requested at any time by the Chief Executive Officer or an officially designated representative of the sponsor writing to CAAHEP indicating: the desired effective date of the voluntary withdrawal, and the location where all records will be kept for students who have completed the program.

5. Requesting Inactive Status of a CAAHEP-Accredited Program

Inactive status may be requested from CAAHEP at any time by the Chief Executive Officer or an officially designated representative of the sponsor writing to CAAHEP indicating the desired date to become inactive. No students can be enrolled or matriculated in the program at any time during the time period in which the program is on inactive status. The maximum period for inactive status is two years. The sponsor must continue to pay all required fees to the JRC-DMS and CAAHEP to maintain its accreditation status.

To reactivate the program, the Chief Executive Officer or an officially designated representative of the sponsor must notify CAAHEP of its intent to do so in writing to both CAAHEP and the JRC-DMS. The sponsor will be notified by the JRC-DMS of additional requirements, if any, that must be met to restore active status.

If the sponsor has not notified CAAHEP of its intent to re-activate a program by the end of the two-year period, CAAHEP will consider this a “Voluntary Withdrawal of Accreditation.”
B. CAAHEP and Committee on Accreditation Responsibilities – Accreditation

Recommendation Process

1. After a program has had the opportunity to comment in writing and to correct factual errors on the on-site review report, the JRC-DMS forwards a status of public recognition recommendation to the CAAHEP Board of Directors. The recommendation may be for any of the following statuses: initial accreditation, continuing accreditation, transfer of sponsorship, probationary accreditation, withhold accreditation, or withdraw accreditation.

The decision of the CAAHEP Board of Directors is provided in writing to the sponsor immediately following the CAAHEP meeting at which the program was reviewed and voted upon.

2. Before the JRC-DMS forwards a recommendation to CAAHEP that a program be placed on probationary accreditation, the sponsor must have the opportunity to request reconsideration of that recommendation or to request voluntary withdrawal of accreditation. The JRC-DMS reconsideration of a recommendation for probationary accreditation must be based on conditions existing both when the committee arrived at its recommendation as well as on subsequent documented evidence of corrected deficiencies provided by the sponsor.

The CAAHEP Board of Directors’ decision to confer probationary accreditation is not subject to appeal.

3. Before the JRC-DMS forwards a recommendation to CAAHEP that a program’s accreditation be withdrawn or that accreditation be withheld, the sponsor must have the opportunity to request reconsideration of the recommendation, or to request voluntary withdrawal of accreditation or withdrawal of the accreditation application, whichever is applicable. The JRC-DMS reconsideration of a recommendation of withdraw or withhold accreditation must be based on conditions existing both when the JRC-DMS arrived at its recommendation as well as on subsequent documented evidence of corrected deficiencies provided by the sponsor.

The CAAHEP Board of Directors’ decision to withdraw or withhold accreditation may be appealed. A copy of the CAAHEP “Appeal of Adverse Accreditation Actions” is enclosed with the CAAHEP letter notifying the sponsor of either of these actions.

At the completion of due process, when accreditation is withheld or withdrawn, the sponsor’s Chief Executive Officer is provided with a statement of each deficiency. Programs are eligible to re-apply for accreditation once the sponsor believes that the program is in compliance with the accreditation Standards.

Any student who completes a program that was accredited by CAAHEP at any time during his/her matriculation is deemed by CAAHEP to be a graduate of a CAAHEP-accredited program.
Appendix B Part I
Common Core Curriculum

Learning Competencies Common to Each Concentration

Demonstrate knowledge and application of ergonomic techniques.
- Industry standards and OSHA guidelines
- Types of work related musculoskeletal injuries (MSI)
- Best practices for prevention
- Personal fitness
  - Daily exercises in the workplace
  - Supports, tools, and devices
  - Patient positioning
  - Equipment and accessories (machine, tables, chairs, monitor)
  - Transducer
  - Workstation/work area(s)
  - Lighting
  - Workload
- Role of Administration in prevention of MSI
- Role of Sonographer in prevention of MSI

Demonstrate knowledge and application of types and methods of infection control.
- Personal and patient
  - Standard precautions
  - Isolation procedures
  - Aseptic and sterile technique
- Environment
  - Equipment
  - Transducer cleaning and disinfection
  - Accessories

Demonstrate knowledge and application of patient care.
- Compliance with program and clinical education facility policies and procedures
- Patient Bill of Rights
- Patient directives
- Anticipate and be able to respond to the needs of the patient:
  - Demonstrate age related and cultural competency
  - Demonstrate appropriate care in clinical environments outside of the sonography lab
- Transport and transfer of patients
- Special considerations
  - Oxygen
  - Intravenous lines/pumps
  - Urinary catheters
  - Drainage tubes
  - Evaluation of patient
- Vital signs
- Color
- Skin integrity
- Clinical history
- Proper patient positioning and draping
- Comfort
- Privacy
- Protocols for IV insertion and injection with use of contrast enhanced imaging
- Basic pharmacology as related to the concentration
- Contrast media
- Life-threatening situations and implement emergency care as permitted by employer

procedure, including the following:
  - Pertinent patient care procedures
Principles of psychological support

Emergency conditions and procedures

First aid and resuscitation techniques

Reporting and documentation of incidents and/or adverse reactions

Demonstrate comprehension and application of medical ethics and law.

- Patient's right to privacy based on applicable legal and regulatory standards
- HIPAA
- Electronic documentation and transmission
- Terminology related to ethics, values, and morals
- Types of law
- Risk management
- Medical malpractice liability coverage
- Informed consent
- Documentation of clinical incidents
- Professional scope of practice and clinical standards
- Professional code of ethics

Demonstrate comprehension and application of medical and sonographic terminology.

- Definitions, abbreviations, symbols, terms, and phrases
- Correlating diagnostic and imaging procedures
- Sonographic appearances

Obtain, interpret, document, and communicate relevant information related to sonographic examinations.

- Clinical information and historical facts from the patient and the medical records, which may impact the diagnostic examination.
  - Clinical signs and symptoms
  - Laboratory tests
  - Imaging and diagnostic procedures
  - Oral and/or written summary of sonographic findings.
- Deviation from practice parameters for the sonographic examination as required by patient history or initial findings
- Interval changes from a previous examination
- Examination findings that require immediate clinical response and notify the interpreting physician.

Identify and evaluate anatomic structures.

- Sectional anatomy
- Relational anatomy
- Normal sonographic appearances of tissue, muscles and skeletal structures
- Differentiation of normal from abnormal sonographic findings

Demonstrate awareness of roles and responsibilities of healthcare professions to effectively communicate and collaborate in the healthcare environment.

- Team development
- Conflict resolution
- Interprofessional communication and education

Demonstrate knowledge of clinical disease processes with application to sonographic and Doppler patterns.

- Iatrogenic
- Degenerative
- Inflammatory
- Traumatic
- Neoplastic
- Infectious
815  ●  Obstructive
816  ●  Congenital
817  ●  Metabolic
818  ●  Immunologic
819
820  **Demonstrate knowledge, comprehension, and application of image production and optimization.**
821  ●  Sound production and propagation
822  ●  Interaction of sound and matter
823  ●  Instrument options and transducer selection
824  ●  Principles of ultrasound instruments and modes of operation
825  ●  Operator control options
826  ●  Physics of Doppler
827  ●  Principles of Doppler techniques
828  ●  Methods of Doppler flow analysis
829  ●  Hemodynamics of blood flow
830  ●  Contrast enhanced imaging
831  ●  Acoustic artifacts
832  ●  Emerging technologies (3-D, elastography, strain)
833  ●  Image storage devices
834
835  **Demonstrate knowledge, comprehension, and application of biological effects.**
836  ●  In-vitro and in-vivo ultrasound effects
837  ●  Exposure/equipment display indices
838  ●  Generally accepted maximum safe exposure levels
839  ●  ALARA principle
840     ○  Mechanisms that affect the mechanical and thermal indices
841     ○  Techniques to decrease the mechanical and thermal indices
842
843  **Demonstrate knowledge of the components required for implementing a quality control and improvement program.**
844  ●  Lab accreditation
845  ●  Credentialing organizations
846  ●  Equipment operation and maintenance
847     ○  Phantom testing
848     ○  Records maintenance
849
850  **Demonstrate awareness of resources for professional development.**
851  ●  Professional organizations and resources
852  ●  Professional journals and on-line resources
853  ●  Continuing education conferences
854  ●  Clinical conferences, lectures, and in-house educational offerings
855  ●  Recent developments in sonography
856  ●  Research statistics and design
857
858  **Demonstrate performance through clinical competencies**
859  ●  Use of proper ergonomics
860  ●  Safety and infection control
861  ●  Obtain and apply clinical history
862  ●  Oral and written communication
863  ●  Image optimization techniques
864  ●  ALARA
865  ●  Professionalism
866  ●  Document sonographic findings for communication with interpreting physician
867  ●  Finalize examination for permanent storage
868  ●  Process for reporting of critical findings
The above competency skills can be embedded within the specific scanning competencies.
Appendix B, Part II

Adult Cardiac Concentration Curriculum

Identify anatomy, anatomic variants, and sonographic appearances of normal cardiac structures.
- Embryology and fetal cardiac development
- Cardiac chambers and septation
- Coronary artery anatomy and distribution
- Pulmonary artery and venous return
- Relationships of cardiac chambers and great vessels
- Valve anatomy and function

Demonstrate knowledge of normal and cardiovascular physiology and hemodynamics.
- Ventricular function, including influence of loading conditions and measurement of cardiac output
- Electrophysiology and exercise physiology

Demonstrate knowledge of mechanisms of disease, cardiovascular pathophysiology, and hemodynamics, sonographic technique, measurements, quantitative principles, and Doppler patterns in both the normal heart and with cardiac disease.
- Valvular heart disease
- Prosthetic heart valves
- Ventricular dysfunction
- Ischemic cardiac disease
- Cardiomyopathy
- Pericardial disease
- Congenital heart disease
- Cardiac endocarditis, neoplasms and masses
- Cardiac trauma
- Pulmonary vascular disease
- Diseases of the aorta and great vessels
- Cardiac assist devices
- Heart transplant
- Intracardiac shunt
- Intracardiac pressures
- Systemic diseases
- Systemic and pulmonary hypertension
- Common arrhythmias and conduction abnormalities

Demonstrate knowledge and applications of the indications, utility, limitations, and technical procedures for related echocardiographic studies.
- Transthoracic echocardiography
- Stress echocardiography
- Transesophageal echocardiography
- Intraoperative echocardiography
- Enhanced cardiac ultrasound (transpulmonary agents, agitated saline, contrast media)
- IV administration techniques
- Three-dimensional echocardiography
- Echo-guided procedures
- Strain echocardiography
- Speckle tracking
- Cardiac ultrasound respirogram
- Pharmacology
Demonstrate knowledge, application, and proficiency in the use of quantitation principles applied to echocardiographic images and flow data.

- Standard M-mode, two-dimensional, and Doppler measurements and calculations
- Knowledge and understanding of normal and abnormal values for M-mode, two-dimensional and Doppler echocardiography
- Evaluation of normal and abnormal systolic and diastolic ventricular function
- Evaluation of the severity of valve stenosis and regurgitation
- Evaluation of normal and abnormal prosthetic valves, assist devices and interventional procedures

Awareness of scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.

- Indications and contraindications
- History and physical examination
- Related imaging, laboratory, and functional testing procedures
  - Chest X-ray
  - Angiography and cardiac catheterization
  - Electrocardiography, electrophysiologic studies, Holter monitoring
  - Stress testing
  - Radionuclide studies
  - Tomographic imaging procedures (CT, MRI)
  - Adult interventions (for intracardiac shunt, valvular heart disease, assist devices, aortic disease)
- Clinical differential diagnosis
- Role of ultrasound in patient management
- Effects of pharmacotherapy on echocardiographic findings

Demonstrate performance of clinical competencies

Demonstrate clinical competency through performance of adult cardiac sonography, according to practice parameters established by national professional organizations and the protocol of the clinical affiliate/clinical education centers.

Clinical competencies must include evaluation and documentation of:

- Identification of anatomical and relational structures
- Differentiation of normal from pathological/disease process
- Image optimization and measurement techniques with:
  - 2D imaging
  - M-mode
  - Spectral Doppler: PW, CW and Tissue Doppler
  - Color flow Doppler
  - Use of non-imaging CW Doppler transducer
- Adult cardiac sonography competencies
  - Complete transthoracic echocardiogram – Normal
  - Complete transthoracic echocardiogram – Systolic dysfunction
  - Complete transthoracic echocardiogram – Diastolic dysfunction
  - Complete transthoracic echocardiogram – Aortic valve and aortic root pathology
  - Complete transthoracic echocardiogram – Mitral valve pathology
  - Complete transthoracic echocardiogram – Right heart pathology
  - Complete transthoracic echocardiogram – Cardiomyopathy
  - Complete transthoracic echocardiogram – Pericardial pathology
  - Complete transthoracic echocardiogram – Prosthetic valve (normal and abnormal)
  - Complete transthoracic echocardiogram – Coronary artery disease (acute coronary artery disease and chronic coronary artery disease)
  - Complete transthoracic echocardiogram – Enhanced echocardiography (agitated saline, contrast agents)
  - Complete transthoracic echocardiogram – Cardioembolic source evaluation (normal and abnormal)
Transesophageal echocardiography – Instrumentation of equipment (assist)

The above list can be completed as individual clinical competencies or can be incorporated with other organs as part of a limited or complete examination.

Demonstrate proficiency in technique and application of:

(The following examinations or principles can be demonstrated in a clinical setting or in a simulated environment.)

- Quantitative principles applied to echocardiographic images and flow data
- Stress echocardiography – exercise (treadmill and/or bicycle stress).
- Stress echocardiography – pharmacologic
Appendix B, Part III

Pediatric Cardiac Concentration Curriculum

Identify anatomy, anatomic variants, and sonographic appearances of normal and abnormal cardiac structures (adult, pediatric, and fetal).

- Embryology and fetal cardiac development
- Cardiac chambers and septation
- Valve anatomy and dynamics
- Coronary artery anatomy
- Relationships of cardiac chambers and great vessels
- Mediastinal structures
- Arch anatomy
- Pulmonary artery and venous anatomy
- Systemic venous return

Demonstrate knowledge of normal cardiovascular physiology and hemodynamics.

- Electrophysiology
- Fetal circulation
- Transitional physiology
- Ventricular function (systolic and diastolic)
- Pulmonary and systemic circulation
- Exercise physiology

Demonstrate knowledge of cardiovascular pathophysiology (embryology of congenital abnormalities, mechanisms of acquired disease), and hemodynamics, sonographic technique, measurements, quantitative principles, and Doppler patterns in both the normal heart and with cardiac disease.

- Congenital heart disease (CHD)
  - Situs abnormalities
  - Defects in cardiac septation
  - Abnormalities in atrial-ventricular connections
  - Ventricular hypoplasia
  - Ventricular Inflow anomalies
  - Abnormalities in ventriculoarterial connection
  - Ventricular outflow anomalies
  - Abnormalities within cardiac chambers
  - Vascular abnormalities (arterial and venous)
  - Abnormalities within thorax
  - Abnormal vascular (arterial and venous) connections
  - Postoperative repair/treatment
  - Diseases of the aorta and great vessels
  - Valvular abnormalities
  - Pericardial abnormalities

- Acquired heart disease
  - Valvular heart disease
  - Ischemic cardiac disease
  - Cardiomyopathy
  - Pericardial disease
  - Cardiac endocarditis, neoplasms and masses
  - Cardiac trauma
  - Pulmonary vascular disease
  - Systemic and pulmonary hypertension
  - Infection of native structures and devices
Demonstrate knowledge and applications of the indications, utility, limitations, and technical procedures for related echocardiographic studies.

- Stress echocardiography
- Transesophageal echocardiography
- Intraoperative echocardiography
- Enhanced cardiac ultrasound (agitated saline)
- IV administration techniques
- Three-dimensional echocardiography
- Echo-guided procedures
- Strain echocardiography
- Targeted obstetric exam

Demonstrate knowledge, application, and proficiency in the use of quantitation principles applied to echocardiographic images and flow data.

- Standard M-mode, two-dimensional, and Doppler measurements and calculations (normalized based on body surface area, and/or other biometric measurements for the fetus)
- Knowledge and understanding of normal and abnormal values for M-mode, two-dimensional and Doppler echocardiography
- Evaluation of normal and abnormal systolic and diastolic ventricular function
- Evaluation of the severity of valve stenosis and regurgitation
- Knowledge of normal and abnormal sonographic appearances of peripheral vascular anatomy (i.e., branches of pulmonary artery, branches of aortic arch)
- Calculation of Qp:Qs ratio
- Miscellaneous measurements specific to patient history

Demonstrate knowledge and application of clinical cardiology as appropriate to the fetus and patients with congenital heart disease (CHD).

- Relationship of echocardiography to history and physical examination (including indications for echocardiography) - diagnostic approach to CHD
- Acquired heart disease and noncardiac disease and effects of systemic diseases on cardiovascular anatomy and physiology
- Differential diagnosis as it relates to the echocardiographic examination
- Cardiac arrhythmias
- Genetic syndromes and chromosomal anomalies associated with CHD
- Cardiovascular surgery and interventional cardiology
- Post-operative repair evaluation
- Current and future approaches to caring for the fetus, pediatric and adult patient with CHD

Awareness of scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.

- Indications and contraindications
- History and physical examination
- Related imaging, laboratory, and functional testing procedures
  - Chest X-ray
  - Angiography and cardiac catheterization
  - Electrocardiography, electrophysiologic studies, Holter monitoring
  - Stress testing
  - Radionuclide studies
  - Tomographic imaging procedures (CT, MRI)
- Fetal/Pediatric/Adult interventions for congenital heart disease
- Clinical differential diagnosis
- Role of ultrasound in patient management
- Pharmacology
Demonstrate performance of clinical competencies

Demonstrate clinical competency through performance of pediatric cardiac sonography according to practice parameters established by national professional organizations and the protocol of the clinical affiliate/clinical education centers.

Clinical competencies must include evaluation and documentation of:

- Identification of anatomical and relational structures
- Differentiation of normal from pathological/disease process
- Image optimization and measurement techniques with:
  - 2D imaging
  - M-mode
  - Spectral Doppler: PW, CW and Tissue Doppler
  - Color flow Doppler
  - Use of non-imaging CW Doppler transducer

- Pediatric cardiac sonography competencies
  - Complete transthoracic pediatric echocardiography examinations - Normal
  - Complete transthoracic pediatric echocardiography examinations - Abnormal
  - Complete transthoracic echocardiogram – Patent foramen ovale and atrial septal defect
  - Complete transthoracic echocardiogram – Ventricular septal defect
  - Complete transthoracic echocardiogram – Patent ductus arteriosus
  - Complete transthoracic echocardiogram – Detailed coronary artery origins (anomalous or normal)
  - Complete transthoracic echocardiogram – Conotruncal defect
  - Complete transthoracic echocardiogram – Left heart structural heart disease
  - Complete transthoracic echocardiogram – Right heart structural heart disease
  - Complete transthoracic echocardiogram – Valvular disease
  - Complete transthoracic echocardiogram – Cardiomyopathy
  - Complete transthoracic echocardiogram – Pericardial disease
  - Complete transthoracic echocardiogram – Repaired structural heart disease
  - Transesophageal echocardiography – Instrumentation of equipment (assist)
  - Fetal echocardiogram assessment – Situs
  - Fetal echocardiogram assessment – Four chamber view
  - Fetal echocardiogram assessment – Three vessel view
  - Fetal echocardiogram assessment – Ductal and Aortic Arch

The above list can be completed as individual clinical competencies or can be incorporated with other organs as part of a limited or complete examination.

Demonstrate proficiency in the technique and application of:

(The following examinations or principles can be demonstrated in a clinical setting or in a simulated environment.)

- Quantitation principles applied to echocardiographic images and flow data
- Calculation of Qp:Qs ratio
Appendix B, Part IV

Abdominal Learning Concentration Curriculum

Identify anatomy, relational anatomy, anatomic variants, and sonographic appearances of normal anatomical structures.

- Abdominal wall
- Adrenal glands
- Aorta and branches
- Biliary system
- Gastrointestinal tract
- Great vessels and branches
- Liver
- Lung/pleura
- Lymphatic system
- Pancreas
- Peritoneal and retroperitoneal cavities
- Spleen
- Urinary tract
- Extremity (e.g.: popliteal fossa)
- Neck (thyroid, parathyroid, salivary, lymph nodes, masses)
- Penis
- Prostate
- Scrotum
- Soft-tissue

Demonstrate knowledge of the physiology, pathophysiology, sonographic technique, measurements, sonographic appearances, and Doppler patterns in both normal and abnormal structures.

- Abdominal wall (hernia)
- Adrenal glands
- Aorta and branches
- Biliary system
- Gastrointestinal tract (e.g.: appendix, bowel, bowel wall, intussusception, pyloric stenosis)
- Great vessels and branches
- Liver
- Lung/pleura (e.g.: thoracentesis, effusion, empyema)
- Lymphatic system
- Organ transplant
- Pancreas
- Peritoneal and retroperitoneal cavities
- Spleen
- Urinary tract
- Extremity (e.g.: Baker’s cyst, foreign body)
- Neck (thyroid, parathyroid, salivary, lymph nodes, masses)
- Penis
- Prostate
- Scrotum
- Soft-tissue (e.g.: foreign body, lipoma, edema, hematoma)

Demonstrate knowledge in sonographic guided procedures.

- Role of sonographer
- Clinical information (e.g.: imaging, lab values)
- Informed consent
- Procedural time out
- Transducer guidance
- Sterile set up
- Pre and post procedural documentation
Evaluate scanning protocol and modification(s) based on the sonographic findings and the
differential diagnoses.

- Indications and contraindications
- History and physical examination
- Related imaging, laboratory, and functional testing procedures
- Clinical differential diagnosis
- Contrast enhanced imaging
- Role of ultrasound in patient management

Demonstrate performance of clinical competencies

Demonstrate clinical competency through performance of sonographic examinations of the
abdomen and superficial structures, according to practice parameters established by national
professional organizations and the protocol of the clinical affiliate/clinical education centers.

Clinical competencies must include evaluation and documentation of:

- Identification of anatomical and relational structures
- Differentiation of normal from pathological/disease process
- Image optimization techniques in gray scale
- Image optimization techniques in Doppler (where applicable)
- Measurement techniques
- Abdominal and superficial competencies
  - Aorta/IVC
  - Biliary system
  - Liver
  - Pancreas
  - Spleen
  - Kidneys
  - Bladder
  - Pleural space
  - Sonographic guided procedure (assistance)
  - Thyroid
  - Scrotum

The above list can be completed as individual clinical competencies or can be incorporated with other
structures/techniques as part of a limited or complete examination.

Demonstrate proficiency in the technique and application of:

(The following examinations can be demonstrated in a clinical setting or in a simulated environment.)

- Doppler abdominal vasculature
- Gastrointestinal tract (e.g.: appendix, bowel, pylorus, stomach)
Identify anatomy, congenital and developmental variants, and sonographic appearances of normal breast structures.

- Areolar complex/nipple
- Fibrous planes
  - Skin
  - Subcutaneous fat
  - Mammary zone
  - Retromammary space
  - Muscle layers
  - Rib cage and intercostal muscles
- Cooper's ligaments
- Ductal system
- Vasculature
  - Arterial
  - Venous
- Lymph nodes
- Amastia
- Amazia
- Athelia
- Polymastia
- Polythelia
- Nipple inversion/flattening
- Early ripening
- Age-related sonographic changes of breast tissue and its components

Demonstrate knowledge of the physiology and pathophysiology in both normal and abnormal breast structures.

- Embryologic development
- Normal blood flow patterns within the breast and its components
- Lymphatic drainage
- Age-related development of the breast to involution
- Male breast
- Effect of pregnancy
- Lactation
- Infectious processes
- Neoplasms
  - Cystic
  - Benign
  - Malignant
- Trauma

Demonstrate knowledge of the sonographic technique, measurements, sonographic appearances, integration of data, and Doppler patterns in both normal and abnormal breast structures.

- Scan planes (longitudinal/transverse, radial/antiradial)
- Scan techniques (palpation, standoff pad, fremitus)
- Patient position (supine, oblique, upright)
- Imaging techniques (quadrants, clock face)
- Image labeling/distance from nipple
- Image optimization
- Artifacts
- Implants
- Lymph node assessment
- Postoperative biopsy site
- BI-RADS assessment categories
Demonstrate knowledge in interventional and intraoperative procedures.
- Role of sonographer in ultrasound guided procedures and sentinel lymph node biopsy
- Clinical information (Ex: imaging, lab values)
- Informed consent
- Procedural time out
- Transducer guidance
- Sterile set up
- Pre and post procedural documentation
- Sonography assisted procedures

Evaluate scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.
- Indications and contraindications
- History and physical examination
- Related imaging, laboratory, and functional testing procedures
  - Correlation with mammography
  - BIRADS
  - Correlation with MRI
  - Correlation with Nuclear Medicine
- Clinical differential diagnosis
- Role of sonography in patient management
- Elastography
- 3-D/4-D

Demonstrate knowledge of treatment options.
- Medical
- Surgical
- Brachytherapy

Demonstrate performance of clinical competencies

Demonstrate clinical competency through performance of sonographic examinations of the breast, according to practice parameters established by national professional organizations and the protocol of the clinical affiliate/clinical education centers.

Clinical competencies must include evaluation and documentation of:
- Identification of anatomical and relational structures
- Differentiation of normal from pathological/disease process
- Image optimization techniques in gray scale
- Image optimization techniques in Doppler (where applicable)
- Measurement techniques (where applicable)
- Breast competencies
  - Breast - complete
  - Breast - targeted
  - Breast with lymph node evaluation
  - Breast with cystic lesion
  - Breast with solid lesion
  - Breast with intravascular lesion (Doppler evaluation)
  - Breast with implant
  - Breast interventional procedure – FNA
  - Breast interventional procedure – core biopsy
  - Breast interventional procedure – needle localization
  - Breast elastogram
The above list can be completed as individual clinical competencies or can be incorporated with other structures/techniques as part of a limited or complete examination.
Appendix B, Part VI
Musculoskeletal Learning Concentration Curriculum

Define and describe sonographic characteristics of the components of the musculoskeletal system.

- Bursae
- Cartilage
- Fascia
- Fat pads
- Ligaments
- Muscles
- Retinaculum
- Tendons
- Nerves
- Lymph nodes
- Types of joints

Demonstrate knowledge of the anisotropic effect and the ability to distinguish this artifact from normal variants and pathology.

Identify anatomical structures, nerves and vascular supply, normal sonographic appearances, normal Doppler patterns, measurements (and contralateral comparison when applicable), and changes with dynamic assessment.

- Abdominal wall
- Shoulder
- Upper arm
- Elbow
- Forearm
- Wrist
- Hands
- Fingers
- Hip (to include groin and pelvis)
- Upper leg (Thigh)
- Knee
- Lower leg (Calf)
- Ankle
- Foot
- Toes

Demonstrate knowledge of the physiology, pathophysiology, sonographic technique, measurements, sonographic appearances, and Doppler patterns in musculoskeletal injuries and disease processes.

- Abdominal wall
- Shoulder
- Upper arm
- Elbow
- Forearm
- Wrist
- Hands
- Fingers
- Hip (to include groin and pelvis)
- Upper leg (Thigh)
- Knee
- Lower leg (Calf)
- Ankle
- Foot
Identify sonographic and Doppler patterns in clinical diseases, injury, and post-surgical changes that may occur in the following categories.

- Bone pathology (fractures and erosions)
- Cartilage
- Crystal deposits
- Cystic structures
- Fluid collections
- Foreign bodies
- Hernias
- Infections
- Joint effusions
- Joint laxity/altered function
- Ligament pathology and tears
- Masses/neoplastic processes
- Muscle pathology and tears
- Neuromas
- Nerve pathology and entrapment
- Soft tissue pathology
- Subcutaneous abnormalities
- Synovitis
- Synovial proliferation
- Tendon pathology, tears, and calcifications
- Vascular malformations

Demonstrate knowledge in sonographic guided procedures

- Role of sonographer
- Clinical information (Ex: imaging, lab values)
- Informed consent
- Procedural time out
- Transducer guidance
- Sterile set up
- Pre and post procedural documentation
- Procedures (therapeutic and/or diagnostic)
  - Ablation
  - Aspiration
  - Platelet-Rich Plasma (PRP) Injection
  - Dry needling
  - Biopsy
  - Nerve mapping
  - Nerve block
  - Surgical planning

Evaluate scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses

- Indications and contraindications
- History and physical examination
- Related imaging, laboratory, and functional testing procedures
- Clinical differential diagnosis
- Role of ultrasound in patient management

Demonstrate performance of clinical competencies
Demonstrate clinical competency through performance of sonographic examinations of the musculoskeletal system, according to practice parameters established by national professional organizations and the protocol of the clinical affiliate/clinical education centers.

Clinical competencies must include evaluation and documentation of:

- Identification of anatomical and relational structures
- Differentiation of normal from pathological/disease process
- Image optimization techniques in gray scale
- Image optimization techniques in Doppler (where applicable)
- Dynamic or provocative maneuvers
- Musculoskeletal competencies
  - Abdominal wall
    - Valsalva maneuver to assess for ventral hernia
  - Shoulder
    - Biceps subluxation – Rotate arm in external and internal rotation
    - Supraspinatus impingement – Arm abduction
    - Acromioclavicular joint – Cross-arm maneuver
    - Posterior labrum – Rotate arm in external and internal rotation
  - Elbow
    - Ulnar nerve subluxation (posterior and medial evaluation)—Flexion and extension
    - Ulnotrochlear joint—Valgus stress
  - Radiocapitellar joint—Varus stress
  - Wrist
    - Extensor carpi ulnaris (ECU) subluxation – Pronation to supination
  - Hands & Fingers
    - Trigger finger—Flexion & extension
    - Stenner lesion—Valgus stress of ulnar collateral ligament
  - Hip (to include groin and pelvis)
    - Valsalva maneuver when to assess for inguinal or femoral hernia
    - Iliopsoas snapping—hip flexion with external rotation and abduction (frog-leg position) followed by hip extension and internal rotation
    - Iliotibial band snapping—hip flexion and extension or symptom driven dynamic maneuver
  - Knee
    - Anterior – Flexion and extension to evaluate the patellar tendon
    - Lateral – Lateral compartment joint space (varus stress)
    - Ankle
    - Lateral – Peroneal tendon subluxation evaluation during eversion circumduction
    - Medial – Dorsiflexion and inversion to check for tibialis posterior tendon instability
    - Posterior – Dorsiflexion/plantar flexion to evaluate the Achilles tendon
  - Foot
    - Dorsiflex the 2-4 metatarsophalangeal joint (MTP) to evaluate tendon movement, integrity of the plantar plate, and for plantar tears

The above list can be completed as individual clinical competencies or can be incorporated with other structures/techniques as part of a limited or complete examination.
Appendix B, Part VII
Obstetrics and Gynecologic Learning Concentration Curriculum

Identify anatomy, anatomic variants, and sonographic appearances of normal structures of the female pelvis.
- Pelvic muscles
- Pelvic vasculature
- Peritoneal spaces
- Reproductive organs
- Suspensory ligaments

Identify anatomy, anatomic variants, and sonographic appearances of normal maternal, embryonic, and fetal anatomic structures during the first, second, and third trimesters.

1st trimester structures
- Gestational sac
- Embryonic pole
- Yolk sac
- Fetal cardiac activity
- Uterus
- Cervix
- Adnexa
- Pelvic spaces
- Multiple gestations (zygocity, chorionicity, amnionicity)

2nd and 3rd trimester fetal and maternal structures
- Intracranial anatomy
- Face
- Thoracic cavity
- Heart
- Abdomen
- Abdominal wall
- Spine
- Extremities
- Placenta
- Umbilical cord
- Cervix
- Amniotic fluid
- Ovaries
- Multiple gestations (zygocity, chorionicity, amnionicity)

Demonstrate knowledge of pathology, physiology, pathophysiology, sonographic technique, measurements, sonographic appearances, and Doppler patterns in gynecologic disease processes.
- Inflammatory processes
- Congenital anomalies (e.g., vaginal, Mullerian duct, chromosomal)
- Benign uterine/adnexal masses
- Malignant uterine/adnexal masses
- Contraceptive devices
- Infertility procedures
- Post-partum

Demonstrate knowledge of pathology, physiology, pathophysiology, sonographic technique, sonographic appearance, measurements, and Doppler patterns in obstetric abnormalities.
- First trimester complications
- Congenital anomalies
• Genetic syndromes
• Growth abnormalities
• Multiple gestation complications
• Viability
• Amniotic fluid
• Placenta
• Umbilical cord
• Fetal monitoring
• Effects of maternal conditions

Demonstrate knowledge and understanding of the role of the sonographer in performing interventional/invasive/advanced procedures.
• Infertility procedures
• Fetal therapy
• Three-dimensional obstetric and gynecologic sonography
• Sonohysterography

Evaluate scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.
• Indications and contraindications
• History and physical examination
• Related imaging, laboratory, and functional testing procedures
• Clinical differential diagnosis
• Role of sonography in patient management

Demonstrate performance of clinical competencies

Demonstrate clinical competency through performance of sonographic examinations of the gravid and non-gravid pelvis with both transabdominal and endocavitary transducers, and Doppler/M-mode display modes, according to practice parameters established by national professional organizations and the protocol of the clinical affiliate/clinical education centers.

Clinical competencies must include evaluation and documentation of:
• Identification of anatomical and related structures
• Differentiation of normal from pathological/disease process
• Image optimization techniques in gray scale
• Image optimization techniques in Doppler and M-mode (where applicable)
• Knowledge of ALARA
• Measurements as applicable

• GYN competencies:
  o Vagina/Cervix/Uterus
  o Posterior and anterior cul-de-sac
  o Adnexa, including ovaries and fallopian tubes
  o Pelvic suspensory structures

• Obstetrical competencies:
  o 1st trimester obstetric structures:
    ▪ Gestational sac
    ▪ Embryonic pole
    ▪ Yolk sac
    ▪ Uterus
    ▪ Cervix
    ▪ Adnexa
    ▪ Pelvic spaces
    ▪ Fetal cardiac activity (m-mode or cineloop)
  o 2nd and 3rd trimester fetal structures:
    ▪ Intracranial anatomy
    ▪ Face
- Thoracic cavity
- Heart
- Abdomen
- Abdominal wall
- Spine
- Extremities
- Placenta
- Umbilical cord
- Amniotic fluid
- Fetal cardiac activity (m-mode or cineloop)
- Cervix
- Adnexa
- Biophysical profile

The above list can be completed as individual clinical competencies or can be incorporated with other structures/techniques as part of a limited or complete examination.
Appendix B, Part VIII
Vascular Learning Concentration Curriculum

Demonstrate knowledge of anatomy and anatomic variants of the cardiovascular system.
- Heart
  - Chambers
  - Valves
  - Vessels
- Pulmonary circulation
- Vessel structure
  - Arteries
  - Veins
  - Capillaries
- Aorta and branches
- Cerebrovascular (extra-cranial and intra-cranial)
- Hepatoportal venous
- Mesenteric arterial system
- Peripheral arterial (upper and lower extremities)
- Peripheral venous (upper and lower extremities)
- Renal vessels
- Vena cava and iliac veins

Demonstrate knowledge of normal and abnormal peripheral vascular physiology and hemodynamics.
- Principles of pressure, flow, and resistance
- Pulsatile flow
- Laminar and non-laminar flow patterns
- Poiseuille’s law
- Bernoulli’s principle
- Reynold’s number
- Cardiac influence on flow
- Occlusive diseases
- Collateral circulation
- Exercise and hyperemia
- Systemic diseases and other conditions
- Venous physiology, valve function, calf pump

Demonstrate knowledge of mechanisms of vascular diseases, vascular pathophysiology, and hemodynamic effects.
- Aneurysm and pseudoaneurysm
- Arterial embolism
- Arteriovenous fistulae and shunts
- Atherosclerosis
- Congenital anomalies
- Fibromuscular dysplasia
- Genetic disorders
- Iatrogenic injury
- Infection
- Intimal hyperplasia
- Ischemia
- Neoplasia
- Organ transplantation
- Pharmacologic alterations
- Portal hypertension
- Systemic hypertension
- Trauma
- Vascular entrapment and extrinsic compression
- Vascular malformations
- Vasculitis
- Vasospastic disorders
- Venous thromboembolism
- Venous valvular disorders (venous insufficiency)

Demonstrate knowledge of sonographic appearances, sonographic techniques, measurements, and Doppler flow characteristics in both normal and abnormal vascular structures.
- Aorta and branches
- Cerebrovascular (extra-cranial and intra-cranial)
- Hepatoportal venous
- Mesenteric arterial system
- Peripheral arterial (upper and lower extremities)
- Peripheral venous (upper and lower extremities)
- Renal vessels
- Vena cava and iliac veins

Demonstrate knowledge physiologic vascular testing principles and techniques.
- Continuous wave and pulse Doppler
- Pressure measurements, including ankle/brachial index
- Pneumoplethysmography (pulse volume recording)
- Segmental pressure and waveform analysis
- Exercise treadmill testing
- Photoplethysmography (PPG), arterial and venous
- Air plethysmography, venous
- Laser Doppler, including skin perfusion pressure measurements

Demonstrate knowledge and application in the use of quantitative principles applied to vascular testing.
- Acceleration time
- Ankle/brachial pressure ratios
- Aorta/renal ratios
- Area and diameter reduction measurements
- Digit/brachial indices
- Velocity change across stenosis for grading arterial lesions
- Pulsatility index
- Resistive index
- Segmental pressures (including digits)
- Velocity ratios
- Venous reflex time
- Volume flow

Demonstrate knowledge in ultrasound-guided procedures.
- Role of sonographer
- Clinical information (e.g. prior imaging, indication for procedure, relevant laboratory values)
- Informed consent
- Procedural time out
- Sterile technique
- Pre- and post-procedure documentation
- Superficial vein ablation
- Use of thrombin injection for pseudoaneurysm treatment

Demonstrate knowledge of the role of ultrasound for evaluation of vascular surgical procedure or interventions, including role in planning, intra-procedural guidance/technical evaluation, and/or post-procedure assessment.
- Angioplasty
- Atherectomy
- Coil embolization
- Dialysis fistula/graft
- Embolectomy
- Endarterectomy
- Endovascular aortic aneurysm repair (EVAR)
- Endovenous ablation
- Inferior vena cava filter
- Patch angioplasty
- Stents
- Synthetic grafts
- Thrombolysis and thrombectomy
- Trans-jugular intrahepatic porto-systemic shunt
- Vein bypass grafts

Evaluate scanning protocol and modification(s) based on patient-specific factors.
- History (including indication, prior vascular procedures)
- Physical examination and assessment of patient-specific factors
- Contraindications
- Related imaging, laboratory, and functional testing procedures
- Clinical differential diagnosis
- Role of ultrasound in patient management
- Pharmacology

Demonstrate knowledge and application of quality assurance and statistical tests used in a vascular laboratory.
- Correlations of clinical findings and other imaging examinations
- Accuracy
- Sensitivity
- Specificity
- Positive predictive value
- Negative predictive value
- Quality improvement program components (including test appropriateness, evaluation of technical quality and compliance with protocols)

Demonstrate performance of clinical competencies

Demonstrate clinical competency through performance of sonographic examinations of the vascular system according to guidelines established by national professional organizations and the protocol of the clinical affiliates/clinical education centers.

Clinical competencies must include evaluation and documentation of:
- Identification of anatomical and relational structures
- Differentiation of normal from pathological/disease process
- Image optimization in gray scale, color Doppler and Spectral Doppler
- Measurement techniques
- Vascular competencies:
  - Brachial systolic and diastolic blood pressure by auscultation
  - Ankle/brachial pressure measurements with Doppler flow detector and calculation
  - Extracranial cerebrovascular including vertebral vessels
  - Aortoiliac duplex
  - Upper extremity arterial duplex
  - Lower extremity arterial duplex
  - Upper extremity venous duplex
  - Lower extremity venous duplex
  - Lower extremity venous insufficiency testing
Demonstrate proficiency in technique of:

(The following examinations can be demonstrated in a clinical setting or in a simulated environment.)

- Evaluation of vasospasm
- Intracranial cerebrovascular (transcranial Doppler)
- Upper extremity and digital physiologic testing (VPR, segmental pressures, CW Doppler)
- Palmar arch
- Lower extremity and digital physiologic testing (VPR, segmental pressures, CW Doppler)
- Lower extremity exercise testing
- Vessel mapping
- Visceral vascular (renal artery, mesenteric/splanchnic, hepatoporal)