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Examination Overview

RCS
Registered Cardiac Sonographer

Courtesy Saint Francis Hospital and Medical Center

Registered Cardiac Sonographer (RCS)

This Examination Overview is meant to assist you as a prospective candidate of the Registered Cardiac Sonographer (RCS) credentialing program. It provides an overview of the Qualification Requirements and Examination Content. For more details on CCI policies, the testing process, and procedures to submit an application, please visit www.cci-online.org to view or download the Applicant Handbook. **Examination fee is $365 USD and all exam fees include a $100 USD non-refundable filing fee.**

Qualification Requirements

All applicants must meet the following criteria:

1. Have a high school diploma or general education diploma at the time of application.
2. Fulfill one (1) of the qualifications of the exam for which you are applying. See qualifications listed in the tables below.
3. Provide typed documentation to support the qualification prerequisite under which you are applying. Required documentation for each qualification prerequisite is listed below. CCI reserves the right to request additional information.

Qualification Prerequisite (All applicants must fulfill one of the following)	Supporting Documentation
RCS1 Two years of full-time or full-time equivalent work experience in cardiac ultrasound. The applicant must have participated in a minimum of 600* cardiac ultrasound studies at the time of application. In the verification letter, the medical director(s) must confirm the number of studies performed during the applicant's employment. **Effective June 30, 2023, the RCS1 qualification prerequisite will be sunset. First-time RCS applicants applying on or after July 1, 2023 must select from the qualification prerequisites listed below.**	**RCS1** Employment Verification Letter (must confirm the number of studies performed during the applicant's employment)
RCS235 A graduate of a diploma, associate, or baccalaureate academic program in health science (including, but not limited to, cardiovascular technology, ultrasound, radiologic technology, respiratory therapy, or nursing) **AND** One year full-time or full-time equivalent work experience in cardiac ultrasound (echocardiography) **AND** Performance of a minimum of 600* cardiac ultrasound studies in their career, which is defined as work experience and/or clinical experience gained during a formal educational program. In the verification letter(s) the medical and/or program director(s) must confirm the number of studies performed during the applicant's employment and/or during the academic program.	**RCS235** Completion certificate and/or educational transcript **AND** Employment Verification Letter **AND/OR** Clinical Experience Letter (only required for applicants submitting verification of the number of studies completed during a formal educational program)
RCS4 Applicant must be a graduate of a programmatically accredited program** in cardiac ultrasound (echocardiography).	**RCS4** Completion certificate and/or educational transcript **AND** Student Verification Letter *Students applying to take examination prior to graduation will be required to submit this documentation.*
RCS5 A graduate of a NON-programmatically accredited program in cardiac ultrasound (echocardiography) which has a minimum of one year of specialty training and includes a minimum of 800 clinical hours in the specialty in which the examination is being requested. IMPORTANT: If an individual's clinical hours were completed after graduation or if the hours are not a requirement for their educational program, then those hours WOULD NOT count toward the 800-hour minimum under qualification RCS5. All clinical hours must be earned in a setting in which patients are being tested or medically treated.	**RCS5** Completion certificate and/or educational transcript **AND** Student Verification Letter **AND** Clinical Experience Letter *Students applying to take examination prior to graduation will be required to submit this documentation.*
RCS6 Active ultrasound credential holder with six (6) months of full-time or full-time equivalent work experience in cardiac ultrasound. The applicant must have participated in a minimum of 100 cardiac ultrasound studies* at the time of application. In the verification letter, the medical director(s) and/or clinical supervisor must confirm the number of studies performed during the applicant's employment and/or during the academic program.	**RCS6** Copy of wallet card showing date earned and active through date of ultrasound registry credential **AND** Employment Verification Letter (must confirm the number of studies performed during the applicant's employment). **AND/OR** Clinical Experience Letter (only required for applicants submitting verification of the number of studies completed during a formal educational program)

* If an individual's studies were conducted during a formal educational program, then those studies completed WOULD count toward the minimum cardiac ultrasound studies under qualifications RCS235 and RCS6.

** An accredited program is accredited by an agency recognized by the Council for Higher Education Accreditation (CHEA), United States Department of Education (USDOE), or Canadian Medical Association (CMA) that specifically conducts programmatic accreditation for cardiovascular technology, diagnostic cardiac sonography, or vascular technology.

Publication Date: June 2022. This document supersedes all documentation previously released.

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Examination Matrices

These examination matrices are provided to illustrate the general distribution of questions and the relative weight or emphasis given to a skill or content area on the examination.

Matrix for Exams Administered before January 23, 2023

Content Category	Approx. % of Exam
A. Preparing for Echocardiographic Procedure	5%
B. Performing Echocardiographic Imaging	23%
C. Evaluating Echocardiographic Findings	49%
D. Completing Post-Procedural Activities	7%
E. Applying the Physics of Ultrasound	16%
TOTAL	**100%**

Matrix for Exams Administered after January 23, 2023

Content Category	Approx. % of Exam
A. Preparing for Echocardiographic Procedure	5%
B. Performing Echocardiographic Imaging	24%
C. Evaluating Valvular Echocardiographic Findings	25%
D. Evaluating Anatomy, Physiology, and Hemodynamics	29%
E. Applying the Physics of Ultrasound	13%
TOTAL	**100%**

Task List – before January 23, 2023

The task list below describes the activities that a Registered Cardiac Sonographer is expected to perform on the job. All examination questions are linked to these tasks.

Task List for Exams Administered before January 23, 2023

Duties and Tasks		Approx. % of Exam
A	**Preparing for Echocardiographic Procedure**	**5%**
1	Verify echocardiographic order	
2	Prepare echocardiographic patient	
3	Prepare echocardiographic equipment	
B	**Performing Echocardiographic Imaging**	**23%**
1	Perform 2D echo	
2	Perform M-mode	
3	Perform color Doppler	
4	Perform spectral Doppler	
5	Perform contrast echocardiography	
6	Perform exercise echocardiography	
7	Perform pharmacological echocardiography	
8	Assist with transesophageal echocardiography	
C	**Evaluating Echocardiographic Findings**	**49%**
1	Identify normal anatomy, physiology, and hemodynamics	
2	Evaluate cardiac chambers	
3	Evaluate heart failure	
4	Evaluate cardiomyopathies	
5	Evaluate diastolic function	
6	Assess ischemic heart disease	
7	Assess aortic valve	
8	Assess mitral valve	
9	Assess tricuspid valve	
10	Assess pulmonic valve	
11	Evaluate pericardial disease	
12	Evaluate great vessels	
13	Evaluate diseases of the aorta	
14	Evaluate pulmonary hypertension	
15	Evaluate cardiac masses	
16	Recognize congenital heart disease	
D	**Completing Post-Procedural Activities**	**7%**
1	Transfer echocardiographic data	
2	Document echocardiographic findings	
3	Communicate with healthcare team	
4	Provide post-examination instructions	
E	**Applying the Physics of Ultrasound**	**16%**
1	Identify properties of ultrasound waveforms	
2	Recognize artifacts	
3	Identify properties of transducers	
4	Optimize resolution	
5	Optimize frame rate	
6	Optimize Doppler waveforms	
7	Optimize color Doppler	
8	Optimize 2D image	
TOTAL		**100%**

Task List – after January 23, 2023

The task list below describes the activities that a Registered Cardiac Sonographer is expected to perform on the job. All examination questions are linked to these tasks.

Task List for Exams Administered after January 23, 2023

Duties and Tasks		Approx. % of Exam
A	**Preparing for Echocardiographic Procedure**	**5%**
A	Performing Non-Imaging Responsibilities	
1	Review patient's clinical history	
2	Review patient's prior studies	
3	Verify echocardiographic order	
4	Maintain ergonomic safety	
5	"Prepare patient for echocardiographic exam (e.g., position patient, explain procedure, provide post-procedural instructions)"	
6	Prepare a report of echocardiographic findings for the reading physician	
7	Communicate significant echocardiographic findings	
B	**Performing Echocardiographic Imaging**	**24%**
1	Perform 2D transthoracic echocardiography	
2	Perform M-mode	
3	Perform color Doppler	
4	Perform spectral Doppler	
5	Perform contrast echocardiography (i.e., ultrasound enhancing agent)	
6	Perform agitated saline studies	
7	Perform exercise echocardiography	
8	Perform pharmacological echocardiography	
9	Perform non-ischemic stress echocardiography	
10	Assist with transesophageal echocardiography	
11	Perform strain imaging	
12	Perform 3D TEE imaging	
13	Perform 3D TTE imaging	
C	**Evaluating Valvular Echocardiographic Findings**	**25%**
1	Assess aortic valve structure and function	
2	Assess aortic valve stenosis	
3	Assess aortic valve regurgitation	
4	Assess mitral valve structure and function	
5	Assess mitral valve stenosis	
6	Assess mitral valve regurgitation	
7	Assess tricuspid valve structure and function	
8	Assess tricuspid valve stenosis	
9	Assess tricuspid valve regurgitation	
10	Assess pulmonic valve structure and function	
11	Assess pulmonic valve stenosis	
12	Assess pulmonic valve regurgitation	
13	Assess prosthetic valves	
14	Assess valvular endocarditis	
D	**Evaluating Anatomy, Physiology, and Hemodynamics**	**29%**
1	Evaluate cardiac chambers and structures	
2	Evaluate cardiomyopathies	
3	Evaluate diastolic function	
4	Evaluate systolic function	
5	Assess ischemic heart disease	
6	Evaluate pericardial disease	
7	Evaluate great vessels	
8	Evaluate diseases of the aorta	
9	Evaluate pulmonary hypertension	
10	Evaluate cardiac masses	
11	Recognize congenital heart disease	
12	"Recognize implanted devices (e.g., ICD, pacemaker, LAA occluder, closure devices, mechanical support)"	
13	Evaluate strain imaging	
14	Evaluate cardiac hemodynamics	
15	Evaluate infiltrative disease	
E	**Applying the Physics of Ultrasound**	**13%**
1	Identify properties of ultrasound waveforms	
2	Recognize artifacts	
3	Optimize resolution	
4	Optimize frame rate	
5	Optimize spectral Doppler waveforms	
6	Optimize color Doppler	
7	Optimize 2D image	
8	Optimize 3D image	
9	Optimize contrast image	
TOTAL		**100%**

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Knowledge List

The list below describes general areas of knowledge that are needed in order to perform the tasks identified. This knowledge will apply across multiple tasks.

Basic Life Support (BLS)
Basic math skills (formulas, exponents, decimals, scientific notation)
Basic pharmacology
Cardiac abnormalities
Cardiac embryology
Cardiovascular anatomy
Electrophysiology
General anatomy
Hemodynamics
HIPAA (Health Insurance Portability and Accountability Act)
History and physical
Medical ethics
Medical terminology
Pathophysiology
Physiologic maneuvers
Physiology
QA procedures
Recognize basic cardiac anatomy obtained using other imaging modalities
Safety practices for patients and staff
Ultrasound instrumentation
Ultrasound physics
Ultrasound modalities:
- 3-D
- Doppler (spectral, tissue, and color)
- Contrast
- M-mode
- Stress testing (pharmacological and physiologic)
- TEE

Universal precautions/infection control

Sample Questions

1. **Which component of an ultrasound transducer helps reduce the continued vibration of the piezoelectric crystal?**
   a. Outer casing
   b. Matching layer
   c. Backing material
   d. Piezoelectric crystals
2. **Which one of the following imaging planes should be used to planimeter the mitral valve area in a patient with rheumatic mitral stenosis?**
   a. Apical 4-chamber
   b. Subcostal 4-chamber
   c. Parasternal short axis
   d. Right parasternal long axis
3. **During the holding phase of the Valsalva maneuver, which of the following occurs?**
   a. Increased cardiac output
   b. Decreased intrathoracic pressure
   c. Increased venous return to the heart
   d. Decreased venous return to the heart
4. **The most common benign primary tumor of the heart is a**
   a. myxoma.
   b. teratoma.
   c. melanoma.
   d. angiosarcoma.

Answers

1. c 2. c 3. d 4. a

RCS References

The textbooks listed below are intended as recommended resources when preparing for examination. You may have previous or later editions of these or other references available that also present acceptable coverage of the subject matter. Any general text in cardiovascular techniques and evaluation, and cardiac patient care and management may be used. It is not necessary to use all of the texts identified. They are provided as suggestions only. CCI does not endorse or recommend any third-party review course or material.

1. Anderson, Bonita. *Echocardiography: The Normal Examination and Echocardiographic Measurements*. Echotext, Australia.
2. Anderson, Bonita. *A Sonographer's Guide to Assessment of Heart Disease*. Echotext Pty Ltd, Australia.
3. Armstrong, William F. and Ryan, Thomas. *Feigenbaum's Echocardiography*. Philadelphia: Wolters Kluwer Health/ Lippincott Williams & Wilkins.
4. Bonow, Robert O., Libby, Peter, Mann, Douglas L., Tomaselli, Gordon F., and Zipes, Douglas P. *Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine*. Elsevier.
5. Edelman, Sidney K. *Understanding Ultrasound Physics*. Woodlands, Tex.: ESP Ultrasound.
6. Kremkau, Frederick W. *Sonography Principles and Instruments*. St. Louis, Mo.: Elsevier/Saunders.
7. Cane, Garvan C., Oh, Jae K., Seward, J. B., and Tajik, A. Jamil. *The Echo Manual*. Philadelphia: Wolters Kluwer.
8. Otto, Catherine M. *Textbook of Clinical Echocardiography*. Philadelphia, PA: Saunders/Elsevier.

Online Self-Assessment Practice Examinations are available for purchase for self-evaluation purposes. It is important to note that the results of the self-assessment exam do not guarantee or indicate individual success on the CCI exam, nor should the self-assessment serve as the only means for preparing for the CCI examination. **To order the self-assessment examinations online visit www.cci-online.org.**

CCI Applicant Handbook is required reading prior to applying for a CCI exam. Included is important information regarding the application policies, CCI procedures, and the testing process. **Download at www.cci-online.org/applicanthandbook.**