

2013

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VERSION 1.1**

These training requirements apply to those who begin training on or after July 1st, 2013.

DEFINITION

Adult Echocardiography is that area of focused competence concerned with all aspects of the application of cardiac ultrasound to adult patients.

ELIGIBILITY REQUIREMENTS

In order to be eligible for the Royal College AFC-diploma in Adult Echocardiography, candidates must:

- 1) a) Be certified (or eligible for certification) in Adult Cardiology by the Royal College of Physicians and Surgeons of Canada (or equivalent certification in their country of origin);

OR

- b) Be certified (or eligible for certification) in Anesthesiology, Cardiac Surgery, Critical Care Medicine, Diagnostic Radiology, or Internal Medicine by the Royal College of Physicians and Surgeons of Canada (or equivalent certification in their country of origin). Applicants from these backgrounds, must also demonstrate a minimum of two blocks (eight weeks) of postgraduate clinical Adult Cardiology training or equivalent.

AND

- 2) Have demonstrated competence in the independent performance and interpretation of transthoracic echocardiography. Candidates must be familiar with the operation of diagnostic ultrasound equipment, have the ability to perform a comprehensive echocardiogram using motion mode (M-mode), two-dimensional (2-D), and Doppler echocardiography that is diagnostic, complete, and quantitatively accurate. They must have experience in clinical interaction with and supervision of sonographers. In general, a minimum training period of 24 weeks (6 training blocks), with the performance of 150 complete transthoracic studies and the interpretation of 450 complete quantitative transthoracic studies covering a spectrum of cardiac diseases, is required.

GOALS

Upon completion of training, an AFC diplomate is expected to function as a competent specialist in Adult Echocardiography, capable of an enhanced practice in this area of focused competence. The AFC trainee must acquire a working knowledge of the theoretical and practical basis of the discipline including its foundations in science and research. This degree of training will allow the diplomate to be an expert in echocardiography, capable of supervising an echocardiography laboratory involved in training sonographers and other medical personnel in advanced echocardiographic techniques.

The discipline of Adult Echocardiography also includes responsibility for

- selection, performance, interpretation, and appropriate communication of the findings of transthoracic, transesophageal, stress, and contrast echocardiography;
- selection of and basic familiarity with the performance and interpretation of other echocardiographic modalities (e.g., three-dimensional echocardiography);
- application of echocardiography to the performance of invasive procedures and use of transcatheter technologies;
- management of the echocardiography laboratory (echo lab); and
- advancement of the discipline of Adult Echocardiography through scholarship and education.

Diplomates must demonstrate the requisite knowledge, skills, and behaviours for effective patient-centred care and service to a diverse population. In all aspects of specialist practice, the diplomate must be able to address ethical issues and issues of gender, sexual orientation, age, culture, beliefs, and ethnicity in a professional manner.

Medical Expert

Definition:

As *Medical Experts*, Adult Echocardiography diplomates integrate all of the CanMEDS Roles, applying medical knowledge, clinical skills, and professional attitudes in their provision of patient-centered care. *Medical Expert* is the central physician Role in the CanMEDS framework.

Key and Enabling Competencies: Adult Echocardiography diplomates are able to...

- 1. Establish and maintain clinical knowledge, skills and behaviours appropriate to their practice**
 - 1.1. Apply knowledge of the clinical and fundamental biomedical sciences relevant to Adult Echocardiography
 - 1.1.1. Integrate knowledge of cardiovascular anatomy, physiology, and hemodynamics
 - 1.1.2. Describe the physical principles and instrumentation of ultrasound including M-mode, 2-D, and Doppler echocardiography (blood and tissue); harmonic imaging; transesophageal echocardiography; stress echocardiography; and contrast echocardiography

- 1.1.3. Acquire and apply knowledge of the Doppler equations employed in the echocardiography examination
 - 1.1.4. List the indications, contraindications, potential complications, strengths, limitations, and clinical utility of transthoracic, transesophageal, stress, and contrast echocardiography
 - 1.1.5. Describe new or upcoming imaging technologies and their potential role in patient care
 - 1.1.6. Contrast the strengths and limitations of echocardiographic technologies in reference to other imaging or diagnostic tools
 - 1.1.7. Describe the hazards of endoscopic procedures for the patient, operator, and assistants, and the measures appropriate to minimize such hazards
- 1.2. Describe the CanMEDS framework of competencies relevant to Adult Echocardiography
 - 1.3. Apply lifelong learning skills of the Scholar Role to implement a personal program to keep up to date, and enhance areas of professional competence
 - 1.4. Contribute to the enhancement of quality care and patient safety in Adult Echocardiography, integrating the available best evidence and best practices

2. Perform a complete and appropriate echocardiographic assessment of a patient

- 2.1. Identify the normal variants and echocardiographic appearance of cardiac structures including cardiac chambers, valves, pericardium, and major blood vessels
- 2.2. Describe common ultrasound artifacts and the identifying echocardiographic features
- 2.3. Identify the abnormal echocardiographic appearance of cardiac structures during disease
- 2.4. Identify the 2-D and Doppler echocardiography features (traditional and emerging), including quantitative techniques, to evaluate the severity of complex cardiac diseases. This includes, but is not limited to:
 - 2.4.1. Cardiac dyssynchrony
 - 2.4.2. Cardiomyopathies
 - 2.4.3. Diastolic function
 - 2.4.4. Endocarditis and its complications
 - 2.4.5. Intracardiac masses
 - 2.4.6. Left and right ventricular global and regional systolic function, structure and chamber size
 - 2.4.7. Normal and abnormal native and prosthetic valve function
 - 2.4.8. Percutaneous or surgically implanted cardiac devices
 - 2.4.9. Pericardial disease

- 2.4.10. Pulmonary artery hypertension
- 2.4.11. Thoracic aortic disease
- 2.4.12. Unrepaired and repaired congenital heart disease
- 2.4.13. Performing and interpreting, in the clinical context, comprehensive transthoracic (M-mode, 2-D, pulse- and colour-flow Doppler, continuous-wave Doppler, tissue Doppler), transesophageal, stress, and contrast echocardiography in patients with cardiovascular diseases
- 2.4.14. Correlating echocardiographic findings with the findings of other cardiac diagnostic imaging modalities, hemodynamic studies or surgical/pathological specimens

3. Demonstrate proficient and appropriate use of procedural skills, both diagnostic and therapeutic

- 3.1. Demonstrate effective, appropriate, safe, and timely performance of transthoracic and transesophageal echocardiography
- 3.2. Demonstrate effective, appropriate, and safe performance of echo-guided pericardiocentesis
- 3.3. Obtain appropriate informed consent for procedures
- 3.4. Document and disseminate information related to procedures performed and their outcomes in a clinically relevant and appropriate manner
- 3.5. Ensure adequate follow-up is arranged for procedures performed

4. Seek appropriate consultation from other health professionals, recognizing the limits of their own expertise

- 4.1. Demonstrate insight into their own limits of expertise
- 4.2. Demonstrate effective, appropriate, and timely consultation with another health professional, including consultation for complementary imaging investigation, as needed, for optimal patient care
- 4.3. Demonstrate knowledge of, and ensure necessary follow-up investigations or treatment where clinically appropriate

Communicator

Definition:

As *Communicators*, Adult Echocardiography diplomates effectively facilitate the doctor-patient relationship and the dynamic exchanges that occur before, during, and after the medical encounter.

Key and Enabling Competencies: Adult Echocardiography diplomates are able to...

1. Develop rapport, trust, and ethical therapeutic relationships with patients and families

- 1.1. Establish positive therapeutic relationships with patients and their families that are characterized by understanding, trust, respect, honesty and empathy
- 1.2. Develop a good patient relationship during the echocardiography exam, with appropriate attention to patient comfort and privacy

2. Accurately elicit and synthesize relevant information

- 2.1. Seek out and synthesize relevant information from other sources, including but not limited to patient records and additional complementary diagnostic investigations
- 2.2. Interpret the relevant questions to be answered by the echocardiography examination using information from the diagnostic requisition and initial medical evaluation

3. Convey relevant information and explanations accurately to patients and families, colleagues, and other professionals

- 3.1. Communicate the results of the examination in an appropriate and timely manner to the referring physician, and the patient

4. Convey effective oral and written information about a medical encounter

- 4.1. Maintain clear, concise, accurate, and appropriate records of clinical encounters and plans
- 4.2. Develop a written report, using appropriate terminology, summarizing all of the salient positive and negative echocardiographic findings
- 4.3. Present oral reports of clinical encounters and plans

Collaborator

Definition:

As *Collaborators*, Adult Echocardiography diplomates effectively work within a health care team to achieve optimal patient care.

Key and Enabling Competencies: Adult Echocardiography diplomates are able to...

1. Participate effectively and appropriately in an interprofessional health care team

- 1.1. Demonstrate the ability to work closely with the staff in the echocardiography laboratory, including sonographers, to assist in the study preparation and performance, and patient discharge from the laboratory

- 1.2. Demonstrate the ability to work with other echocardiographers in an effective, collegial, and professional manner
- 1.3. Interact and work with other physicians and health care professionals when performing or interpreting the echocardiography examination, in an effective, collegial, and professional manner
- 1.4. Participate in interprofessional team meetings
- 1.5. Demonstrate leadership in the echocardiography laboratory

Manager

Definition:

As *Managers*, Adult Echocardiography diplomates are integral participants in health care organizations, organizing sustainable practices, making decisions about allocating resources, and contributing to the effectiveness of the health care system.

Key and Enabling Competencies: Adult Echocardiography diplomates are able to...

1. Participate in activities that contribute to the effectiveness of their health care organizations and systems

- 1.1. Utilize echocardiography equipment, facilities, personnel, and time in an efficient manner
- 1.2. Discuss best practice guidelines with other colleagues to ensure appropriate selection of diagnostic testing in echocardiography
- 1.3. Discuss best practice guidelines with physicians and sonographers working in the echocardiography laboratory to ensure their adoption
- 1.4. Develop the interpersonal and communication skills required for directorship of an echocardiography laboratory
- 1.5. Participate in systemic quality process evaluation and improvement, including but not limited to infection control initiatives, patient safety programs, and quality assurance projects
 - 1.5.1. Promote quality assurance by discussing echocardiography exams and reports with other physicians and sonographers
- 1.6. Describe principles of health care financing, including physician remuneration, budgeting, and organizational funding

2. Manage their practice and career effectively

- 2.1. Respect and adhere to the echocardiography laboratory schedule and the patient's need for a timely examination
- 2.2. Describe how to manage an echocardiography laboratory practice, including equipment maintenance, organization of equipment purchases and other finances, management of human resources and how to write a standard operating procedure

3. Allocate finite health care resources appropriately

- 3.1. Demonstrate an understanding of the balance between effectiveness, efficiency, access, and optimal patient care in the allocation of health care resources.
- 3.2. Describe the appropriate indications, contraindications, risks, and clinical utility of various echocardiographic modalities, including transthoracic, transesophageal, stress, and contrast echocardiography

Health Advocate

Definition:

As *Health Advocates*, Adult Echocardiography diplomates responsibly use their expertise and influence to advance the health and well-being of individual patients, communities, and populations.

Key and Enabling Competencies: Adult Echocardiography diplomates are able to...

- 1. Respond to individual patient health needs and issues as part of patient care**
 - 1.1. Describe the role of echocardiography in diagnosing and managing cardiovascular disease
- 2. Respond to the health needs of the communities that they serve**
 - 2.1. Identify new and evolving echocardiography techniques and evaluate their potential utility and incremental value for improving patient care in their community

Scholar

Definition:

As *Scholars*, Adult Echocardiography diplomates demonstrate a lifelong commitment to reflective learning, and the creation, dissemination, application and translation of medical knowledge.

Key and Enabling Competencies: Adult Echocardiography diplomates are able to...

- 1. Maintain and enhance professional activities through ongoing learning**
 - 1.1. Describe the principles of maintenance of competence as they relate to adult echocardiography
 - 1.2. Continue to learn about new and evolving technologies in the field of Adult Echocardiography and understand how to adapt these innovations to current clinical care

2. Facilitate the learning of patients, families, students, residents, other health professionals, the public, and others

- 2.1. Participate in rounds or presentations on echocardiography topics or using echocardiography images
- 2.2. Participate in teaching the technical and interpretative aspects of echocardiography
- 2.3. Provide effective feedback

3. Contribute to the development, dissemination, and translation of new knowledge and practices

- 3.1. Describe the principles of research and scholarly inquiry
- 3.2. Incorporate new and established techniques into the echocardiography laboratory where appropriate

Professional

Definition:

As *Professionals*, Adult Echocardiography diplomates are committed to the health and well-being of individuals and society through ethical practice, profession-led regulation, and high personal standards of behaviour.

Key and Enabling Competencies: Adult Echocardiography diplomates are able to...

1. Demonstrate a commitment to their patients, profession, and society through ethical practice

- 1.1. Interact with patients in the echocardiography laboratory with integrity, honesty and compassion
- 1.2. Work with physicians, other health care professionals, and staff in the echocardiography laboratory in a collegial and professional manner

REQUIRED TRAINING EXPERIENCES

While it is recognized that AFC trainees achieve proficiency at varying rates, it is anticipated that a minimum of twelve months (13 training blocks) of experience in a large clinical volume laboratory will be required for AFC trainees to experience an adequate volume and spectrum of cardiovascular pathology. Achievement of AFC proficiency in Adult Echocardiography requires adequate experience in both the performance and interpretation of a variety of echocardiographic studies, which encompasses the spectrum of cardiac disease, including acquired and congenital conditions. The recommended minimum case volume to achieve expertise is highlighted in the table below.

Trainees in the Adult Echocardiography program must participate in the daily activity of the echocardiography laboratory to develop the necessary skills to independently practice echocardiography and supervise an echocardiography laboratory. The AFC trainee should

function as a consultant or reference source for sonographers, review transthoracic studies in which concerns exist, assist with additional image acquisition when necessary, and advise on additional image acquisition or quantitative analysis that may be clinically important. The AFC trainee should also function as consultants to referring physicians and participate in the management of patients identified with abnormal echocardiographic findings of varying acuity.

The various echocardiographic modalities are listed below and categorized as *required*, *recommended*, or *optional*.

Required experiences:

Transthoracic Echocardiography

The transthoracic echocardiography component of AFC training in Adult Echocardiography must provide physicians with extensive experience with common and uncommon cardiac pathologies, superior proficiency and expertise in the performance and interpretation of transthoracic echocardiography (including expertise in the use of quantitative techniques), and an understanding of and exposure to emerging technologies. Therefore, the training experience must provide AFC trainees with the capacity to perform, interpret, and report a complete and comprehensive expert transthoracic echocardiogram in a variety of disease states and conditions.

Transesophageal Echocardiography

Physicians completing AFC training in Adult Echocardiography are expected to be experts in transesophageal echocardiography with the expectation that they will function as consultants for other physicians performing echocardiography. AFC trainees are required to have expertise in the performance, interpretation, and reporting of a comprehensive transesophageal echocardiogram. It is required that proficiency also be achieved in intubated patients. This expertise must not be focused on one disease entity (e.g., potential cardioembolic source), but must include a spectrum of cardiac and aortic diseases, including but not limited to the following conditions:

- normal heart and its variants
- common artifacts
- abnormal heart rhythms
- assessment for valve repair/replacement/intervention feasibility
- cardiomyopathies
- diseases of the thoracic aorta
- endocarditis and its complications
- intracardiac masses and mimics
- intracardiac shunts
- left and right ventricular global and regional systolic dysfunction
- left atrial thrombus
- normal and abnormal native and prosthetic valve function
- transcatheter or surgically implanted cardiac devices, evaluation of function and potential suitability
- unrepaired and repaired congenital heart diseases

This case experience must encompass a spectrum of disease severity for the above, where appropriate.

AFC trainees must acquire a thorough understanding of the indications, contraindications, clinical utility, complications and management of complications related to transesophageal echocardiography, and must actively participate in the spectrum of clinical activities related to transesophageal echocardiography within the echocardiography laboratory. The recommended minimum case volume to achieve expertise in transesophageal echocardiography is given in the table below.

Stress Echocardiography

Physicians completing AFC training in Adult Echocardiography are expected to have achieved an expertise in stress echocardiography. AFC trainees must have experience in both exercise and pharmacologic stress testing (recommended minimum volume of no fewer than 20 studies per modality). The case experience must include the spectrum of potential cardiac indications, including but not limited to:

- identification of myocardial ischemia
- myocardial response to stress
- valvular heart disease
- pulmonary artery hypertension
- intracardiac gradients

AFC trainees must participate in the daily activities of the echocardiography laboratory as they relate to stress echocardiography and be involved in evaluating patients for appropriate indications, contraindications, procedural monitoring, and selection of stress protocols, depending on their specific disease process. AFC trainees must achieve proficiency in the use of contrast agents for the purpose of stress echocardiography. The expected minimum case volume to achieve proficiency in stress echocardiography is given in the table below.

Contrast Echocardiography

Physicians completing AFC training in Adult Echocardiography must have a thorough understanding of the use of contrast echocardiography, saline and non-saline, for purposes including but not limited to the following:

- chamber opacification
- optimization of Doppler signals
- identification of cardiac pathology

AFC trainees must acquire thorough knowledge of the physics of contrast echocardiography, indications and contraindications of contrast agents, optimal instrument settings, administration protocols, and the potential complications of a contrast echocardiogram, including the management of contrast reactions. AFC trainees must participate in the daily activities of the echocardiography laboratory and participate in decision-making on the use of contrast agents. Proficiency in the performance and interpretation of contrast echocardiography, including its role in stress echocardiography, is mandatory. Expected minimum case volumes to achieve proficiency in contrast echocardiography are given in the table below.

Three-dimensional Echocardiography

AFC trainees must be exposed to 3-D technology and data sets acquired using transthoracic and transesophageal platforms. These cases must include a spectrum of pathology, including native valve disease, prosthetic valves, congenital abnormalities, and an evaluation of ventricular structure and function.

Procedural Monitoring and Transcatheter Technologies

Transcatheter procedures and procedural monitoring represent established and evolving specialized techniques to treat a variety of cardiac diseases. Proficiency in echocardiographic-assisted pericardiocentesis is mandatory. In addition, the AFC trainee should have an understanding of the echocardiographic criteria for patient suitability and the echocardiographic follow-up for the following, including but not limited to:

- transcatheter atrial septal defect and patent foramen ovale closure devices
- transcatheter aortic valve procedures
- mitral valvuloplasty
- mitral regurgitation reduction devices
- periprosthetic regurgitation reduction devices
- left atrial appendage (LAA) occlusion devices

The information provided above is summarized in the following table:

Expected Minimum Time and Case Volume Requirements for Training Level

Proficiency	Expected Minimum Duration of Training blocks [weeks]*	TTE [§] Performed	TTE [§] Interpreted	Contrast Echo	TEE ^{§§} Both performed and interpreted	Stress Echo Interpreted
AFC-Echo	13 blocks [52 weeks]	150	550	20 performed; 40 interpreted	150	125

* 1 training block = 4 weeks

§ transthoracic echocardiogram

§§ transesophageal echocardiograms

Recommended experiences:

Intraoperative Transesophageal Echocardiography

Intraoperative transesophageal echocardiography is a specialized technique, requiring an understanding of intraoperative hemodynamics, surgical procedures, and potential complications of cardiac and aortic surgery. These studies need to be performed and interpreted in a timely manner and the interpretation and decisions can have immediate and profound implications for the patient. Exposure to intraoperative transesophageal echocardiography is recommended within the training program; however proficiency in

intraoperative transesophageal echocardiography is not a requirement of AFC training in Adult Echocardiography.

Three-Dimensional Echocardiography

Proficiency in the acquisition, manipulation, quantitative assessment and interpretation of 3-D echocardiography data sets is recommended, but not a requirement of AFC training in Adult Echocardiography.

Procedural Monitoring and Transcatheter Technologies

Exposure to procedural transthoracic or transesophageal echocardiography may be beneficial to an AFC trainee; however, proficiency is not a mandatory requirement (except for echo-guided pericardiocentesis).

Optional experiences:

Myocardial Perfusion Contrast Echocardiography

The role of contrast echocardiography to evaluate myocardial perfusion is evolving. Performance and interpretation of a contrast echocardiogram to evaluate myocardial perfusion is not required.

Intravascular and Intracardiac Ultrasound

Exposure to these specialized procedures may be beneficial; however, proficiency in intravascular or intracardiac echocardiography is not a mandatory requirement of AFC training in Adult Echocardiography.

This document is to be reviewed by the AFC Subcommittee in Adult Echocardiography by December 31, 2018.

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