

EAE recommendations for training, competence, and quality improvement in echocardiography

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on behalf of the European Association of Echocardiography**

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European Association of Echocardiography recommendations for training, competence, and quality improvement in echocardiography

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The purpose of this document is to provide **the requirements for training and competence** in echocardiography, to outline **the principles of quality measurement** and to recommend a set of measures for improvement, with the ultimate goal of **raising the standards of echocardiographic practice in Europe.**

The ESC Core Curriculum defines the different levels of competence on several diagnostic techniques and states the level expected for a given area of subject matter.

Level I - experience on selecting the appropriate diagnostic modality and interpreting results. **This level does not include performing the technique** (e.g. advanced methods of imaging, such as Cardiac Magnetic Resonance, CMR);

Level II - practical experience, but **not as independent operator** (the trainee has assisted in or performed the procedure under the guidance of a supervisor);

Level III - is able to **independently perform the procedure unaided** (for the general cardiologist this includes TTE).

The ESC Core Curriculum for the general cardiologist.

<http://www.escardio.org/education/coresyllabus/Pages/core-curriculum.aspx>

General aspects of training in echocardiography

Table 1 Basic knowledge for competence in echocardiography

Ultrasound physics and biological effects
Principles of echocardiographic image formation and blood flow/ tissue velocity measurements
Machine settings and instrumentation handling for an optimal image quality
Normal cardiovascular anatomy, including possible normal variants
Pathological changes in cardiovascular anatomy in different disease states
Normal cardiovascular physiology and fluid dynamics of normal blood flow
Pathological changes in blood flow in different disease states
Indications, contraindications, and appropriateness criteria
Alternative diagnostic techniques for any given situation
Potential complications (e.g. for TEE, stress echo, and contrast procedures)

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The EAE Core Syllabus:

<http://www.escardio.org/communities/EAE/education/Pages/core-syllabus.aspx>

Training levels

The EAE recommends **two levels of expertise** for training in echocardiography: basic, and advanced.

The basic level is meant to be **achieved by every general cardiologist** who uses echocardiography to take clinical decisions about patient management.

The advanced level is addressed to cardiologists **undertaking echocardiography as their main subspecialty**, who should be able to perform comprehensive echo examinations and provide pertinent information allowing other clinicians to address patient management.

Training duration

A six months full-time training fellowship in echocardiography is the minimum recommended training period to achieve the basic level of expertise in TTE. Training time should be time-tabled and protected.

Competence at an advanced level implies an additional training period in echocardiography of at least six months.

Training duration and number of studies

The advanced level training in echocardiography is reserved for trainees who already have the basic level, but who want to engage in **more complex TTE studies** and also to be able to **perform TEE and stress echocardiography independently**.

The figures mentioned below represent a consensus view among the writing committee members, derived from practical experience. **Case mix** is critically important.

Table 2 Training requirements to achieve basic and advanced level of competence

Echocardiographic technique	Minimum number of examinations performed to become competent	Level of competence	Minimum number of examinations performed/year to maintain competence
TTE	350 (basic)	III	Reasonable exposure
	750 (advanced)	III	100 ^a
TEE	75 (advanced)	III	50
Stress echocardiography	100 (advanced)	III	100

The training programme

The trainee should follow a **structured training programme** to address the learning objectives.

The training programme should include **practical training, theoretical educational activities**, and ideally **research activities**.

It has to be **comprehensive** and should include **development of appropriate behaviors and attitudes**.

For consistency, it is recommended that the programme is completed in a single, accredited center, able to cover the training requirements.

The training center

The echocardiography laboratories in which training is undertaken **should fulfill the EAE recommendations**, preferably those for an advanced level.

In particular, **the commitment of training staff is vital for training quality**. The trainer should be available to supervise, criticize, and correct the performance and interpretation of echo studies, and to promote the active participation of trainees in research activities.

Ideally, there should be **joint educational programmes** that rotate fellows who are training in cardiovascular medicine, among echocardiography, nuclear cardiology, CMR and CT, if these are available.

Specific training recommendations

- **Adult transthoracic echocardiography**
- **Transesophageal echocardiography**
 - **Stress echocardiography**
- **Echo in adults with congenital HD**
 - **Contrast echocardiography**

Competence levels for echocardiographers

Basic

Echocardiography

(corresponds to the ESC Core Curriculum requirements for General Training for Cardiologists)

Level III in General Adult TTE

Level I in TEE

Level I in Stress Echo

Advanced

Echocardiography

(appropriate for cardiologists with subspecialty interest in echocardiography)

Level III in General Adult TTE

Level III in Complex Adult TTE

Level III in TEE

Level III in Stress Echo

Competence. Accreditation

Competence is measured in a combination of 3 ways:

- 1 - **evidence by trainers and supervisors**
- 2 - **knowledge based assessments** (exams)
- 3 - evidence of **practical ability** (log books and practical exams)

1. Evidence by trainers and supervisors:

ideally by **Directly Observed Procedural Skills** (DOPS) assessment

- the supervisor should hold national or EAE accreditation

2. Knowledge based assessment (the exam)

EAE accreditation candidates will undertake a multiple choice question (MCQ) examination:

- 100 items testing theoretical knowledge**
- 50 items testing the ability to interpret images from echo studies**

3. Evidence of practical ability

The practical element for EAE accreditation consists of submission of a log book of cases performed by the candidate within a 12 months period after passing the written exam.

The case mix is proscribed to cover the range of pathologies normally seen.

Maintenance of individual competence.

Reaccreditation

The basic **requirements for EAE re-accreditation in TTE:**

- 250 studies per year and 40 hours of CME
(High volume applicants), or
- 100 studies per year and 50 hours of CME
(Low volume applicants)

Laboratory accreditation

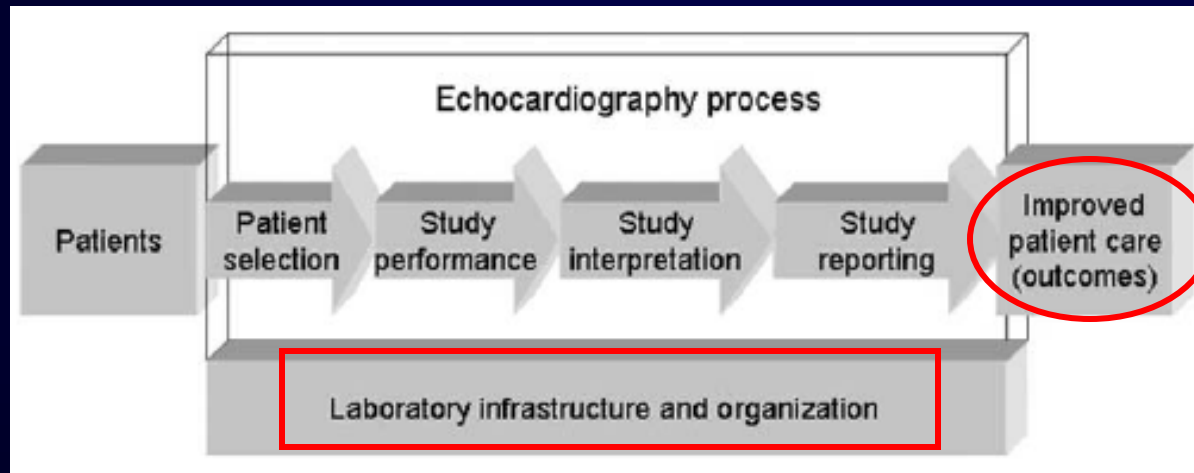
The main areas assessed are:

- Facilities (environment and equipment)
- Work flow
- Education and training
- Quality assurance

The EAE requires candidates to undertake **a supervised programme of training in a suitable echo laboratory** and to demonstrate **knowledge through a written exam and skill through submission of a log book** of echo study reports.

Quality improvement - principles

- **Laboratory infrastructure** (accreditation)
- **Patient selection** (appropriateness)
- **Study performance**
(diagnostic quality, patient' safety)
- **Interpretation** (accuracy and reproducibility)
- **Reporting** (completeness, timelines)



Quality improvement programme - approach

Divide the professionals working in the echo laboratory into **task groups**

- Start by **analyzing simple parameters** (e.g. caseload, cardiologist and sonographer qualifications) and **reviewing the recommendations** listed in this document.
- Next, task groups should be organized to assess the various components of the framework. **Methods and quality measures should be tested** to monitor the different areas and specific problems should be identified.
- **Suggest and test solutions to problems** and implement those which have been proven effective over time.