
Guidelines for Echocardiography

Summary of Penultimate Statement

Philippine Heart Association, Council on Echocardiography, Philippine Society of Echocardiography

STEERING COMMITTEE MEMBERS

HOMOBONO B. CALLEJA, MD, *Chairman*

ADOLFO B. BELLOSILLO, MD, *Vice-Chairman*

ROMEO J. SANTOS, MD, *Vice-Chairman*

Joel M. Abanilla, MD
Eugene B. Reyes, MD
Eduardo S. Caguioa, MD
Adoracion N. Abad, MD
Raul D. Jara, MD
Jaime F. Cayetano, Jr., MD
Marietta M. Crisostomo, MD

Norbert Lingling D. Uy, MD
Felix Eduardo R. Punzalan, MD
Nelson S. Abelardo, MD
Loewe O. Go, MD
Marcelo R. Esguerra, MD
Ana Luisa M. Javier, MD
Benjamin G. Luna, MD

Mary Ong-Go, MD
Edgardo E. Ortiz, MD
Eleanor A. Lopez, MD
Mariano B. Lopez, MD
May Ann S. Lao, MD
Manuel B. Zacarias, MD

TASK FORCE MEMBERS

Guidelines for Echocardiographers

Convenors/Facilitators:

Felix Eduardo R. Punzalan, MD
Mary Ong-Go, MD

Panel Members:

Joel M. Abanilla, MD
Nelson S. Abelardo, MD
Adolfo B. Bellosillo, MD
Homobono B. Calleja, MD
Lerma R. Noval, MD
Edgardo E. Ortiz, MD
Romeo J. Santos, MD
Norbert Lingling D. Uy, MD
Marcelo R. Esguerra, MD

Guidelines for Training Programs

Convenors/Facilitators:

Loewe O. Go, MD
Eugene B. Reyes, MD

Panel Members:

Berwyn Viannely F. Flores, MD
Aurora S. Gamponia, MD
Raul D. Jara, MD
Geoffrey G. Dy, MD
Maita S. Senadrin, MD
Mariano B. Lopez, MD
Leonardo Warren S. Rondilla, MD

Guidelines for Echo. Laboratory

Convenors/Facilitators:

Eduardo S. Caguioa, MD
Eleanor A. Lopez, MD

Panel Members:

Adoracion N. Abad, MD
Robert A. Palileo, MD
Arnold T. Pasia, MD
Cheryl P. Peralta, MD
Gregorio G. Rogelio, MD
Crisostomo Z. San Jose, MD

Guidelines for Echo. Technologist

Convenors/Facilitators:

Jaime F. Cayetano, MD
Ana Luisa M. Javier, MD

Panel Members:

Ma. Delta A. Canela, MD
Marietta M. Crisostomo, MD
Aurelia G. Leus, MD
Myla S. Supe, MD

Panel Members:

Roland L. delos Reyes, MD
Benjamin G. Luna, MD
Manuel B. Zacarias, MD
Edwin S. Tucay, MD
Ms. Teresita Quan
Ms. Agnes Tigno
Ms. Rosario Aguja

Technical Research Committee

Chairman:

Felix Eduardo R. Punzalan, MD,

Members:

Eugene B. Reyes, MD
Loewe O. Go, MD
Eduardo S. Caguioa, MD
Jaime F. Cayetano, Jr., MD

Research Assistant:

Divine Grace M. Valencia, PTRP

I. Introduction

In 1953, Dr. Inge Edler, a cardiologist, and Dr. Hertz, a physicist, borrowed a commercial ultrasonoscope that was used in detecting flaws in steel for shipbuilding to image the heart. They were able to identify the posterior wall of the left ventricle. This was followed successively by diagnosing mitral stenosis, myxoma of the left atrium and aortic stenosis. They called this imaging examination “ultrasound cardiography.” Today we simply know it as – “echocardiography.”

The legacy of this amazing innovation and collaboration of 2 professionals from different disciplines brings to life the passion for excellence in helping the sick of mankind. In the last 50 years the progress of echocardiography has surpassed other cardiac imaging technologies for portability, safety and availability; universality of purpose for diagnosis, etiologic and functional assessment; guide for decision making medical, surgical or interventional at point of care; and monitoring for follow-up and research studies.

The following “guidelines for echocardiography” is a distillation of the finest collaboration among the Philippine Heart Association, Council on Echocardiography chaired by Dr. Mary Ong-Go under the presidency of Dr. Romeo Santos, the Philippine Society of Echocardiography (PSE) under the leadership of Dr. Joel Abanilla, the Steering Committee of PSE and the Task Force composed of foot soldiers representing various ranks of highly spirited echocardiographers and echo technologists.

These guidelines are focused on:

1. Clinical competency of echocardiographers
2. Contents of training programs for echocardiographers
3. Organization, operation and management of an echocardiographic laboratory
4. Competency of and training programs for echocardiography technologists

Quality patient care is our business. It is our sincerest hope that crafting these guidelines shall not have been in vain. In the words of Dr. William Lower, one of the 4 founders of Cleveland Clinic, I quote: “a patient is the most important person in our work; he is not dependent on us – we are dependent on him. A patient is not an interruption of our work – he is the purpose of it; he is not an outsider to our business – he is part of it. A patient is a person and it is our job to satisfy him.”

H.B. Calleja

Chairman, Steering Committee

II. Clinical Competency Guideline for Echocardiographers in the Performance and Interpretation of Echocardiograms

An echocardiographer must satisfy the following:

1. An echocardiographer must be a physician who has completed 3 years of cardiology training in an institution accredited by the Philippine College of Cardiology/Philippine Heart Association.
2. An echocardiographer must possess basic knowledge of ultrasound physics, cardiovascular anatomy, physiology, pathology and technical aspects of the examination.
3. An echocardiographer must acquire level 3 competence. *A cardiologist who had achieved level 2 competence may interpret Transthoracic Echo only.*

4. For adult cardiology, level 3 competence is acquired by undergoing 1 year research fellowship in echocardiography post cardiology training.

III. Guideline for Training Programs in the Performance and Interpretation of Echocardiographic Procedures

These guidelines are primarily directed to training programs and trainees performing echocardiographic examinations.

A. General Standards

1. Fellowship training in echocardiography should include instructions in:
 - Basic aspects of ultrasound physics
 - Technical aspects of the examination

Guidelines for Echocardiography

- (transducer manipulation and ultrasound system adjustments)
- Anatomy and physiology of normal cardiovascular system
- Recognition and understanding of the pathophysiology of acquired and congenital heart disease

2. This training should be integrated closely with other aspects of adult cardiovascular medicine including inpatient and outpatient clinical care, electrocardiography, other noninvasive imaging, cardiovascular catheterization and intervention, surgery, and pathology.

B. Training Center

1. The training center at the minimum should have the following modalities of echocardiography: transthoracic (TTE), diagnostic and intraoperative transesophageal (TEE), and stress (exercise and pharmacologic) echocardiography. For centers offering training in pediatric echocardiography, fetal and neonatal echocardiography should be available¹. (Please refer to Pediatric echo guidelines)
2. The training center should be under direct supervision of at least 3 qualified echocardiographers of level 3 competence.
3. The training center should recognize the operator-dependent and interactive nature of the echocardiographic examination and should emphasize the ability to perform hands-on examination independently with on-line interpretation of results.
4. The training center should be staffed with highly skilled echocardiography technologists.
5. The training center should actively pursue research in echocardiography.

C. Training Program

1. The training program should provide exposure to the wide spectrum of acquired and congenital heart diseases and perform at least 3,000 studies per

year to give trainees an adequate variety of experience.

2. The training program must have equipment with the capability for comprehensive transthoracic, transesophageal, and stress echocardiography, including M-mode and 2D imaging, pulsed and continuous-wave Doppler echocardiography, color flow imaging and tissue Doppler.
3. The training program should document the involvement of fellows in echocardiographic studies by requiring them to keep a logbook of their procedures.
4. The training program should provide 3 levels of training in echocardiography. These levels are based on cumulative duration of training, and number of comprehensive 2-D and Doppler TTE studies performed and interpreted (Table 1).
 - Level 1 – Minimal introductory training necessary for all adult cardiologists to understand the basic principles, indications, applications, and technical limitations of echocardiography and interrelation with other diagnostic methods. This level does not qualify a trainee to perform echocardiography or interpret echocardiograms independently
 - Level 2 – Minimum recommended training to provide knowledge and experience necessary to perform and interpret resting TTEs in adults independently under supervision of Level 3 trainor/director. Exposure to or training in TEE and stress echo may be acquired, but to become fully competent in these techniques, the completion of Level 3 training and supervised performance of the required number of specialized procedures are necessary (see Table 2).
 - Level 3 – Recommended training to achieve a high level of expertise that would enable

Table 1. Summary of training requirements for echocardiography

Level	Cumulative Duration (mos.)	Minimal Number of TTEs Performed	Minimum Number of TTEs Interpreted	TEE and Stress Echo
Level 1 ¹	2-3	75	150	No
Level 2 [†]	6	150 (75 add'l)	300 (150 add'l)	No
Level 3	18 (1 yr add'l)	300 (150 add'l)	750 (450 add'l)	Yes

(Footnotes)

¹ Acquired during 3 year adult cardiology training; TTE-transthoracic echocardiography

one to serve as director of an echocardiography laboratory and trainer of echocardiography technologists and echocardiographers. Training should include exposure to administrative aspects of running an echocardiographic laboratory and documented experience in echocardiographic research, as well as awareness of new and evolving techniques (e.g. Tissue Doppler Imaging, Harmonic Imaging, Contrast Echocardiography etc.)

5. The training program should have a laboratory that performs at least 500 TEE studies per year. Technical expertise needed to perform may be acquired in a lower-volume setting, but the lower number of cases limits the trainee's exposure to critical and unusual abnormalities that are uniquely identified by TEE. Although minimum number of TEE procedures are listed in Table 2, it is highly recommended that continued training for an additional 50 studies be done to achieve Level 3 expertise and prepare the trainee for the full range of pathologies encountered in the clinical practice of TEE (diagnostic and intraoperative TEE).
6. Training program should evaluate proficiency and ensure completion of training requirements by:
 - Daily observation of the ability of the trainee to perform and interpret echocardiographic examinations during hands-on and reading sessions
 - Scheduled practical and/or written examinations
 - Regular review of the trainee's logbook of echocardiographic procedures
 - Documenting research output submitted (especially of Level 3 trainees)

IV. Guideline for Setting Up, Operating and Maintaining an Echocardiography Laboratory in the Performance of Echocardiographic Procedures in Clinical and Academic Setting

1. An Echo Laboratory is either a training or a clinical echo laboratory. *A training echo laboratory is involved in teaching/ training research fellows in addition to doing echo examinations while a clinical echo laboratory is strictly a non-teaching/non-training facility where echocardiographic examinations are done for cardiac diagnosis and guide for treatment.*
2. *Head*
The head of a Training Echo Laboratory/ Clinical Echo Laboratory should have completed Level 3 training.
3. *Reader*
 - 3.1. All readers and trainors in a Training Echo Laboratory should have completed Level 3 training.
 - 3.2. All readers of a Clinical Echo Laboratory should have completed at least Level 2 training, but preferably Level 3.
 - 3.3. All readers of special procedures must have completed Level 3 training.
Special Procedures refer to the following: Tee, stress echo, myocardial contrast, tissue doppler, tissue harmonics and such other techniques or modalities that may be applicable in the future.
4. *Echocardiography Technologists*
Echocardiography technologists of clinical or training echo laboratories should be:
 - 4.1. Qualified and competent according

Table 2. Training requirements for performance and interpretation of TEE and stress echo

Component	Objective	Approximate Caseload
LEVEL 2: General TTE	Background knowledge and skills	300 interpreted 150 performed
LEVEL 3 ¹ :		
Esophageal intubation	TEE probe introduction	25
TEE examination	Skills in performance & interpretation	50
Stress echo study	Skills in performance & interpretation	100(Footnotes)

¹ Must have completed level 2 training requirements

Guidelines for Echocardiography

- to the definition of Task Force on Training
- 4.2. Should have Basic Life Support training from a PHA recognized body
5. *Nurse*
In a clinical laboratory doing special procedures, it is recommended that a nurse should be present during the procedure.
6. *Machines*
- 6.1. Dedicated (machine and software) cardiac Doppler Echo Machines for both clinical and training echo laboratories
- 6.2. Basic requirements for training and clinical echo laboratories are: M-Mode, 2DEcho, Pulse, Continuous wave and Color Flow Doppler
- 6.3. In addition, a training echo laboratory should have: TEE, Stress echo
- 6.4. Optional requirements for clinical echo laboratory are: TEE, Stress Echo
- 6.5. For Pediatric Echocardiography basic requirements for a training echo laboratory are the following: M-Mode, 2DEcho, Pulse, Continuous wave and Color Flow Doppler, Neonatal, Fetal and Pediatric Echocardiography, Pediatric TEE*
7. *Other Equipment/Supplies*
- 7.1. For training echo laboratory, all necessary equipment for special procedures should be present.
- 7.2. The following must be present in both clinical and training echo laboratories: E- cart, (adult and pediatric) cardiac monitor, defibrillator, pulse oximeter, suction apparatus, oxygen tank and delivery system, and pediatric isolette.
8. *Laboratory Maintenance*
- 8.1. Laboratory maintenance should follow the standard requirements established by law and of the establishment where the laboratory

is situated.

- 8.2. Machine maintenance should be according to the manufacturer's recommendations.

9. *Laboratory Set-up*

All laboratories should provide the basic personnel and amenities to ensure comfort, convenience, safety and privacy of the patient.

V. Competency Guideline for Echocardiography Technologist in the Performance of Echocardiographic Procedures

The education and accreditation of echocardiography technologists are extremely important to the future of echocardiography. This is to ensure the appropriate professional status of competent practitioners and to enhance the standards of practice in echocardiography.

1. *Specific goals for Echocardiography Technologist Education*
- 1.1. Define the responsibilities of an echocardiography technologist
- 1.2. Provide recommendation for educational training program
- 1.3. Provide recommendation for on the job orientation and continuing education.
2. *Responsibilities of an Echocardiography Technologist*
- 2.1. Have a detailed understanding of cardiothoracic anatomy, physiology, hemodynamics, basic tomographic anatomy and pathophysiology.
- 2.2. Have a complete understanding of the physical properties of ultrasound, the operation and care of diagnostic instruments and the bioeffects of ultrasound.
- 2.3. Obtain high quality diagnostic recordings of cardiac ultrasonography images and Doppler hemodynamic data.
- 2.4. Obtain pertinent clinical information from the patient, referring physician, patient's record and pertinent laboratory data.
- 2.5. Work under the supervision of an echocardiographer.
- 2.6. Qualified to perform cardiopulmonary

resuscitation.

3. *Recommended Educational Training Program for Echocardiography Technologist*

3.1. Basic Qualification

The echocardiography technologist must be a graduate of Medical School, Nursing, Radiology, Physical Therapy or Medical Technology Course.

3.2. Training

The echocardiography technologist must undergo a basic training course for a period of 6 months (fulfilling total of 800 hours) which includes:

3.2.1. Assisting in the performance of:	
Routine 2DED Study	240 hours
Bedside 2DED	80 hours
DSE/Stress Echo	40 hours
TEE	Minimum of 10
	TEE patients/month
Pediatric ECHO	120 hours

3.2.2. Hands on Scanning must have 320 hours, which should include:

- 3.2.2.1. Minimum of 40 patients/month (2DE, M Mode imaging, Spectral and color flow Doppler recordings)
- 3.2.2.2. Minimum of 10 Stress Echo patients/month
- 3.2.2.3. Minimum of 5 intraop/intraprocedural surface echo patients/month

3.2.3. Attendance to didactic lectures to be given by Echocardiographers, Clinical Research Fellows, Pediatric and Adult Cardiology Fellows, and Senior Echocardiography technologists.

Didactic lectures will cover the following:

- Cardiac anatomy and Physiology including pulmonary artery and proximal aorta, superior and inferior venae cavae
- Basic 12 lead ECG
- Transducers and instrumentations
- Basic principles of ultrasound, acoustics and Doppler
- Standard views in Echocardiography
- 2DE, M-Mode, Doppler, Color imaging and Tissue Doppler
- Echocardiography of common heart diseases
- Special Procedures (Contrast Echo, Stress Echo and TEE)
- Strength and Pitfalls of Echo
- Medical Ethics and Legal issues
- Basic Life Support
- Total Quality Management

3.3. The echocardiography technologist must pass a Written and Practical Examination to be given by an accredited body designated by the PHA/PSE.

4. *Recommended Practice Orientation for the Echo Echocardiography Technologist*

It is recommended that the echocardiography technologist stay updated on the continuing advances in echocardiography. He/She must earn 150 CME units of echocardiography related topics over a period of 3 years.

Acknowledgements

The authors wish to thank Merck, Inc. and Ms. Consuelo Javier for the invaluable support accorded this project.