

# Guidelines for Physician Training in Pediatric Echocardiography

## Recommendations of the Society of Pediatric Echocardiography Committee on Physician Training\*

Richard A. Meyer, MD, Chairman, Donald Hagler, MD, James Huhta, MD,  
Jeffery Smallhorn, MD, Rebecca Snider, MD, and Roberta Williams, MD, *Cincinnati, Ohio,  
Rochester, Minn., Houston, Tex., Toronto, Ontario, Canada, Ann Arbor, Mich., and  
Los Angeles, Calif.*

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### **GENERAL CONSIDERATIONS**

We recognize in concept the Guidelines for Optimal Physician Training in Echocardiography recommended by the American Society of Echocardiography; however, physicians performing and interpreting echocardiograms of pediatric patients should be clearly acquainted and confident with all aspects of pediatric echocardiography. Echocardiography should be performed under the direction of physicians who have mastered all aspects of the pediatric echocardiographic examination and interpretation. This document does not address training in fetal echocardiography. It is felt that a separate cooperative training program in obstetrics and pediatric cardiology is necessary for this aspect of pediatric echocardiography and will be dealt with at a future time.

Unlike electrocardiography, echocardiography is an operator-dependent examination demanding instantaneous and continuous interpretative assessment as well as a high level of technical skill. It requires continuous adjustment of the transducer and the instrument based on recognition of any given pattern by the operator. Unless the nature and significance of various echo patterns are immediately recognized, they will usually not be adequately recorded, and an examination of diagnostic quality may not be obtained. Additionally, errors in technique may mask important information or introduce factitious findings. Thus, physicians responsible for the echocardiographic examination must have both interpretative and technical confidence if results are to be optimal.

Just the ability to interpret the echocardiogram independently is not considered adequate for the optimal application of echocardiography as a noninvasive diagnostic procedure. Physicians must also be

thoroughly trained in the performance of the examination themselves in order to obtain adequate information for accurate diagnosis and recognition of spurious echoes or artifacts.

Each echocardiographic examination should attempt to answer the clinical question and also should be conducted with an eye toward detecting clinically unsuspected disease, thus giving the patient the full potential of the study. This necessitates intensive tutorial experience.

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### **FUNDAMENTAL REQUIREMENTS**

Physicians responsible for recording and interpreting echocardiograms in pediatric patients should have (1) a thorough understanding of the acoustic and technical principles of ultrasound instrumentation and its proper and safe use; (2) a thorough knowledge of cardiac anatomy, physiology, hemodynamics, and pathology of acquired and congenital heart diseases of the young and the ability to conceptualize three-dimensional spatial relationships in functioning cardiac structures; (3) the ability to understand the limitations and proper application of the various modalities of echocardiography (which would include M-mode, two-dimensional, pulsed and continuous-wave Doppler and color flow, contrast, stress echo, or any new technology that would develop), and (4) a *working knowledge* of clinical pediatric cardiology to facilitate correlation with the echocardiographic examination and record.

These guidelines are suggestions and recommendations that deal with the level and amount of training, the curriculum involved, and the site of training for physicians who wish to competently perform and interpret pediatric echocardiograms independently. Training for performance and interpretation of echocardiography is optimally done through a formal postgraduate training program with an established

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echocardiographic laboratory and a designated director. The object of the training program and its curriculum is to allow the physician-trainee to assume a working knowledge of the acoustical and technical principles of echocardiography and to acquire the technical skills necessary to perform these examinations. It is essential that the physician-trainee develop the ability to recognize and interpret variations of normal as well as abnormal patterns. Familiarity with varying patterns will enable the physician to rapidly provide differential diagnoses for the assumed pathologic processes. This implies that the echocardiographer should be capable of assessing cardiac structures, dimensions, and dynamics; quantifying ventricular function; determining flow velocities, pressure gradients, severity of regurgitation, and volumes; detecting and measuring shunts; and timing cardiac events. Finally, the training program should be ideally structured to allow the trainee to see and explore the spectrum of diagnostic challenges offered to the physician-echocardiographer in all areas of an active hospital-based practice.

#### **LEVEL AND AMOUNT OF TRAINING**

It is realized that the development of proficiency in the examination and interpretation of the echocardiographic test depends on the skill, previous training and knowledge of the physician-trainee, the number of patients studied, and the ability of the supervisor. Performing and observing a specified number of studies alone may not ensure adequate exposure and training. However, because of the increasing complexity of echocardiography and low incidence of many lesions, physician-trainees need enough time in an active echocardiographic laboratory, under the direction of an established and experienced pediatric cardiologist echocardiographer, to mature and develop accurate interpretative skills. This applies to physicians in formal training and postcardiology fellowship training who did not receive formal training in pediatric echocardiography.

Therefore, to achieve a minimal level of competence, to operate echocardiographic instrumentation and equipment such as off-line analyzers, and to possess enough technical and interpretative skills that permit diagnosis of the most straightforward congenital and acquired defects, it is suggested that at least 3 months be spent in the echocardiographic laboratory performing at least 200 complete echocardiographic studies, of which half are done on patients younger than 1 year. This physician-trainee would still require close supervision by the director.

For the physician-trainee to acquire adequate interpretative and technical confidence, so as to act independently with minimal supervision by the director, it is suggested that at least 6 months be spent in the echocardiographic laboratory performing and interpreting at least 400 complete echocardiographic studies during the fellowship training, of which half are done on patients younger than 1 year.

Finally, to become independent and achieve a level of confidence that would enable the physician trainee to direct and assume responsibility for training other physicians and directing a laboratory, it is recommended that at least 12 months be spent in an echocardiographic laboratory performing and interpreting at least 750 complete echocardiographic studies. In addition, the knowledge and skills needed to run an echocardiography laboratory would be acquired.

All training should take place under the direction of an established pediatric cardiologist echocardiographer who oversees the performance and interpretation of all echocardiograms.

Physicians who are beyond their formal fellowship training period should attempt to obtain part-time ongoing training equivalent to that obtained during fellowship. This may be accomplished in various short blocks of time under the supervision of an experienced pediatric cardiologist echocardiographer.

#### **SITE OF TRAINING**

The echocardiographic training should be obtained in an established pediatric echocardiographic laboratory under the direction of a full-time pediatric cardiologist echocardiographer. This laboratory should be located within an active pediatric cardiology center. This center should have both inpatient and outpatient services, a neonatal critical care nursery, an active cardiothoracic surgical service, and cardiac catheterization/angiography laboratory. This echocardiographic laboratory should perform enough studies per year to provide the physician-trainee or trainees with the required number of complete echocardiographic examinations to become competent at the different levels. It is further expected that such a pediatric cardiology center would hold regular hemodynamic and pathologic conferences that permit correlation of echographic findings and interpretation during the formal training period. The trainees should frequently compare their echocardiographic results with those presented in scientific publications and at various scientific meetings.