

# **A Comprehensive Approach to Ultrasound**

## **Education in Emerging Countries**

Diagnostic ultrasound is a rapidly developing medical imaging technology that is widely used in both industrialized and developing countries. For certain applications, ultrasound has replaced other commonly utilized radiographic modalities as the method of choice and it is well established as the primary diagnostic imaging modality in obstetrics and gynecology. Ultrasound equipment tends to be less expensive and more widely available than other medical imaging equipment and does not use ionizing radiation. The World Health Organization recommends that all medical students should receive an introduction to the principles and uses of US. General physicians should receive further Level I training to enable them to perform and interpret basic ultrasound exams, and specialty training should be available to those interested in focusing their careers in ultrasound practice. This combination of factors including low cost and sustainability has resulted in the proliferation of ultrasound units and, in some cases, their use by individuals without proper training.

In the early stages of US education in the United States training was largely through apprenticeship with a mentor or expert in the field. As use of US expanded, increasing numbers of academic and commercial short-course programs became available to meet the growing need. As the field became more established, US training was incorporated into formal medical education programs (radiology, cardiology, obstetrics & gynecology etc.) at both the residency and fellowship levels. Today, there is a wide array of educational resources available to US practitioners throughout North America, Europe and Australia, ranging from conferences and short courses to globally available Internet-based resources. In Latin America some countries provide specialized US training to newly qualified physicians, as well as advanced specialization programs, and national societies offer extensive educational content as part of their society meetings. A similar pattern characterizes other industrialized regions of the world. However, in emerging countries the picture is often quite different. Training resources may be limited or unavailable. Even if donated instrumentation is accessible, the operator-dependent nature of ultrasound imaging and the lack of trained individual to utilize available instrumentation may result in poor quality diagnoses. This lack of trained operators may lead to abandonment of ultrasound in favor of more costly but less operator-dependent diagnostic modalities.

In 1992 the Jefferson Ultrasound Research and Education Institute (JUREI) was established to consolidate and strengthen the Thomas Jefferson University education and research programs in ultrasound. A major focus of JUREI was development of programs that could address the needs of physicians and sonographers in the United States as well as emerging nations and underserved regions of the world. In 1993 the World Health Organization designated JUREI as a WHO Collaborating Center for Continuing and General Education in Diagnostic Ultrasound. More than 1,000 individuals attend JUREI education programs at the Institute in Philadelphia, PA each year. However, it was apparent from the beginning of JUREI that there was a need to reach out to a much wider audience, particularly in regions where resources were few or absent. To address this need we developed the program called "Teaching the Teachers". The program consists of an intensive 3-month training program for physicians, mostly radiologists, who have the potential to become teachers in their home countries. Grant funding to support the program has been received over the past decade from US-AID, the Open Society Institute, and more recently, from the Radiological Society of North America. Programs have been conducted for groups from Eastern Europe, sub-Saharan Africa and, in 2004, for the Caribbean and Central and South America. The program works closely with government agencies and national societies in the beneficiary regions to identify outstanding candidates. The selected trainees come to Philadelphia to participate in the training program. All of the selected candidates have already established their capabilities in ultrasound, but lack the experience and resources to establish and successfully operate an educational program that will serve substantial

numbers of trainees in their home country. The program at JUREI concentrates on expanding the diagnostic and teaching skills of the trainees, and on providing them with the intellectual and physical tools needed to be successful in establishing and operating a training program.

An important component of the JUREI Teaching the Teachers program is quality assurance in the evaluation of the educational program itself. One tool used in this quality assurance is the "Uncued Test". This type of testing uses open-ended questions (not multiple choice) that effectively eliminate guessing. When appropriate, the questions and answers are provided in both English and the participant's native language. The individual taking the test is provided with the question booklet, and answer form and an alphabetical list of answers each of which is identified by a numeric code. To answer a question the individual must select the correct answer from the list and enter the code on the answer sheet. This permits machine-scoring of the test and rapid analysis of the test results. Although the Uncued Test is more difficult than the multiple choice test, it permits rapid development of a large number of questions, provides consistency in testing methodology and minimizes concern over test security. A comprehensive uncued test is administered to program participants at the beginning of their program, at the end and 6 months after returning to their home countries. This testing methodology emphasizes recall and problem-solving capabilities and is more similar to real clinical situations encountered by physicians than the multiple choice type of test. It also enhances long-term retention of information and allows us to provide enhanced feed-back to participants and rapid modification of the program content to address identified needs of each participant. Results of the testing process on 113 individuals from 22 countries shows post program improvement of the mean score from 34.7 to 72.6 with some variation within the subject categories. Follow-up testing showed continued improvement on the 6 month testing which indicates good retention of the acquired knowledge from the program and reinforcement of this knowledge through application to the individual's practice (Figure 1).

Following graduation from the program, participants have returned to their home countries to establish educational centers based on the JUREI model. To date, the Teaching the Teachers program has led to the establishment of over 63 ultrasound education centers affiliated with JUREI in 46 countries. In the most recent programs funded by RSNA, the basic 12-week training has been supplemented by a 4-week return visit to JUREI-Philadelphia to further assist the trainees in establishing their own training programs. These visits are scheduled so that the participants can also attend the RSNA Annual Conference in Chicago where they are able to participate in courses relevant to their practice needs. In cooperation with the Global Ultrasound Equipment Donation Foundation, the RSNA sponsored participants selected as Affiliate Center directors also received a donated Acuson 128XP ultrasound system (Siemens Medical Solutions) complete with multiple transducers. New Affiliate Centers are now being established in 8 locations throughout sub-Saharan Africa as a result of this program (Figure 2)

As the JUREI Global Affiliate Center Network matures, we are seeing some of the older Centers now developing their own network of sub-affiliate centers within their home country. JUREI periodically provides the Affiliate Centers with new teaching materials, and waives all tuition charges for Center faculty who wish to study at JUREI Philadelphia. Through e-mail and the Internet JUREI maintains contact with the Centers and provides a forum for sharing of information on Center programs and events, and sharing of successful teaching strategies. Center directors and faculty are frequent visitors at JUREI Philadelphia. In larger countries such as China, additional centers have been added in order to more effectively meet the educational needs of ultrasound practitioners. (Figure 3)

The JUREI Teaching the Teachers program is closely coordinated with the Global Ultrasound Equipment Donation Foundation, chaired by Dr. Goldberg. This non-profit foundation has received donations of more than 300 ultrasound

machines from General Electric Medical Systems and Siemens Medical Solutions. Working with Carelift and Assist International to facilitate delivery and installation of the equipment, the Foundation has been able to provide equipment to many areas where high-quality ultrasound services were lacking. (Figure 4), (Figure 5 a and b), (Figure 6 a and b)

Today, the Jefferson Ultrasound Research and Education Institute under the direction of Dr. Goldberg continues to expand its outreach to the global ultrasound community through the Global Affiliate Center Network. In addition to his work at Jefferson, Dr. Goldberg coordinates the efforts of the Global Equipment Donation Foundation and of ICEAF, the International Certification and Educational Accreditation Foundation, a non-profit foundation that provides competency testing for physicians in regions where a formal competency recognition system is not already in place. ICEAF is currently delivering testing in Asia, South America, and the Middle East. A listing of ICEAF certificate holders and more information on ICEAF are available on the SonoWorld web site at <http://www.SonoWorld.com>

Throughout his career, Dr. Goldberg has brought a global orientation to his educational efforts, with his focus always on supporting delivery of quality ultrasound services to patients throughout the world. Physicians who use diagnostic ultrasound and their patients will continue to benefit from Dr. Goldberg's achievements for many years into the future. Diagnostico Journal salutes Dr. Barry B. Goldberg as a pioneer in ultrasound education.