Ultrasound in medical education

Ultrasound is a type of energy that can be used in medicine for both making diagnoses and treating patients. Like the sound of a voice, a person uses air passing across the vocal cords to produce noises that travel to a person's ear and these mechanical waves are heard by the ear and brain as sounds. Sound has a frequency that is dependent on the inner ear and seashell like piece of anatomy called the cochlea. This structure in humans is tuned into frequencies, waves per second, called hertz ranging from 20-20,000 Hertz. Bats and dolphins use high frequency sound waves to send out signals to bounce off structures to allow them to echo locate various obstacles and help them survive. Frequencies greater than 20,000 Hertz outside of human hearing is called Ultrasound, while those frequencies less than 20 hertz are called infrasound.

Medical students are eager to learn ultrasound and become facile using these tools.

Scientists in the 19th century developed materials and devices that could allow electricity to stimulate certain materials like quartz to send off ultrasound waves. This idea began to take off in the 20th century as early SONAR used sound waves to echo locate submarines under the ocean.

These same principles guide the ultrasound machines many patients have seen in the doctor's office for looking at babies in pregnant women.

The ultrasound machines, like older computers, were very large and not readily available. As the technology improved, the pictures became clearer, the devices got smaller, and the many other uses besides looking at babies increased.

Traditionally there were many uses for ultrasound from different providers like cardiologists to look at the heart, radiologists to look at internal organs and obstetricians to look at babies. As the devices came down in price, became smaller, and began to be used by surgeons, emergency

physicians and those in intensive care, the uses for ultrasound increased. Now, the devices can fit in your hand like a smart phone. As more clinicians can use ultrasound to help patients, how do we make sure they know how to use these devices? Training students in medical school has happened in the late 20th and early 21st century.

A senior student practicing in a skills lab to obtain a picture of the heart. The image is displayed on the machine and projected to a plasma screen in a skills lab setting.

This process takes time as medical educators have not routinely embraced this major change to how they teach medical students to become doctors. More and more research is showing how ultrasound can be used to teach anatomy of the human body, the function of the heart and blood vessels, and the ability to locate fluid in the body where it is not supposed to be. Ultimately, every medical student will get early ultrasound training and be able to use this tool in medical school so when they graduate, they can use it to help patents. Many disease cause fluid and/or air to collect in the body where it should not be. Ultrasound is a tool like sonar that can find this fluid or air and help the doctor make early diagnosis and help the patient. The future is a choice and when we examine the many things that ultrasound can and has done, it becomes clear that it can help patients. Now the key is to train all physicians to use this tool so they are ready for a future with even better technology, and fight the battle of human disease. The technology continues to improve yet the major challenge is not advancement in the tool, but the leaders in medicine committing to investing time and resources to train doctors to use ultrasound.

David P. Bahner *M. D., RDMS*
Professor of Emergency Medicine
Ultrasound Director, Fellowship Director
Department of Emergency Medicine, The Ohio State University

Publication

Ultrasound in medical education: listening to the echoes of the past to shape a vision for the future.

Lane N, Lahham S, Joseph L, Bahner DP, Fox JC

Eur J Trauma Emerg Surg. 2015 Oct