

# Is the stethoscope about to become extinct?

## Medical **ULTRASOUND** comes of age.

*A national leader in the effort to expand the use of medical ultrasound, Alfred Z. Abuhamad, MD, compares a full-size ultrasound machine with a hand-held unit.*



At 54 years old, Pete thought he was in the best shape of his life. But a sudden pain down his left arm and shortness of breath forced him to dial 911. Within five minutes, a paramedic was using a handheld ultrasound to get a closer look at Pete's heart.

That iconic image of a doctor with a stethoscope may soon become a distant memory, as more and more, ultrasound becomes the go-to technology of choice for health professionals around the globe. Seventy years after an Austrian doctor first used it as a diagnostic tool, ultrasound is finally coming of age.

Touted as the "stethoscope of the future" for its ability to provide real-time diagnostic information, ultrasound's increasing portability and affordability are making it more practical and feasible than ever. The American Medical Association (AMA) has even acknowledged the trend, recently affirming for the first time that "ultrasound imaging is a safe, effective and efficient tool when utilized by, or under the direction of, appropriately trained physicians."

Alfred Z. Abuhamad, MD, Professor and Chair of Obstetrics and Gynecology (Mason C. Andrews Chair), and a long-time ultrasound pioneer, says the AMA resolution is a major step forward for a technology whose potential is only now being realized.

“Ultrasound has some important advantages over other imaging tools,” says Dr. Abuhamad, who also is national president of the American Institute of Ultrasound in Medicine, a sponsor of the AMA resolution. “From a safety perspective, ultrasound uses no ionizing radiation, so it is safer. From a cost perspective, it is less expensive than MRI (magnetic resonance imaging) or CT (computed tomography). And from a clinical perspective, it is at least as effective as other imaging modalities in many cases.” Dr. Abuhamad is helping lead the charge to encourage practitioners and payers to consider ultrasound before other diagnostic tools in appropriate situations. “There are gaps in knowledge of ultrasound on the health-care team,” he says. “As a society, we are trying to fill those gaps and help the medical community understand the many situations in which using ultrasound first may be of value.”

## A Brief History

The roots of ultrasound technology can be traced to ancient Greece, where Pythagoras developed a “sonometer” for measuring musical sounds.

By World War I, the French were building a device capable of detecting submerged enemy submarines, the precursor to modern sonar. But it was not until the 1940s that Austrian neurologist Karl Dussik became the first physician to use super-fast sound waves in medical diagnosis.

“I would say that we are still in the infancy of introducing the widespread use of ultrasound in clinical practice,” says Barry J. Knapp, MD, Associate Professor and Emergency Ultrasound Fellowship Director. “Until recently, the scope and focus have been very narrow. But in the hands of more physicians, ultrasound is going to be an even more powerful tool.”

## Multiple Applications

Most people realize that ultrasound can be used to get a better look at the heart and babies in the womb. But EVMS Critical Care Specialist and Professor of Internal Medicine, Alexander B. Levitov, MD, says few understand the true scope of ultrasound’s potential.

“Ultrasound technology is virtually omnipotent in that it can be used for every disease process, with the exception of a few

psychological disorders,” says Dr. Levitov, who has written two books on the subject. Dr. Levitov says ultrasound’s versatility, safety, portability and affordability have helped bring it to such remote locales as the Mt. Everest base camp, the battlefields of the Middle East and the space station. As units become even more portable and cost-effective, ultrasound is also becoming ubiquitous in hospitals, clinics and even at patient bedsides.

“Ultrasound is truly changing the paradigm of how we diagnose and treat patients,” Dr. Knapp says. In partnership with ultrasound manufacturer SonoSite, he is leading a major study on the value of ultrasound in the hands of emergency medical service (EMS) providers. Through this study, close to 90 EMS providers within the city of Norfolk can obtain and transmit vital ultrasound data in cases of cardiac arrest or major trauma.

“Ultrasound machines have traditionally sat in the radiology suite or in the OBGYN department,” Dr. Knapp says. “But it is clear to us in emergency medicine that having more information on the clinical status of patients before they even reach the emergency department could be a huge benefit not only to EMS providers but also to emergency physicians.”

In the emergency department, ultrasound can be used to diagnose bleeding in internal organs in trauma victims as well as check the status of vital organs like the heart and aorta. It’s also valuable in diagnosing problems in numerous other areas of the body, such as in the eyes, muscles and bones.

Ultrasound is used to provide real-time guidance in placing a central line or performing needle biopsy and can even perform functions sometimes thought to be the sole domain of radiation-based imaging systems, such as identifying broken bones. This can be especially valuable in poor or remote areas and for pediatric patients for whom exposure to ionizing radiation can increase the risk of leukemia and lymphoma later in life.

## A Bright Future

EVMS is taking a leadership role in advancing the everyday use of the technology. That effort includes building ultrasound into the school’s curricula. Students are learning its value early in medical school by using advanced new equipment — including 30 units approximately the footprint of a smart-phone —

provided through a grant from GE. Their experience with the devices, both during medical school and later in clinical practice, will become the subject of a research study in collaboration with GE. “We are one of the first adopters of what is going to become a trend in medical education,” Dr. Abuhamad says. “Our hope is that these students will think about ultrasound when they need an imaging technology in clinical practice. They will understand its benefits and limitations and will know how to order it appropriately.” And that knowledge will come just in time. Although all three doctors acknowledge that widespread acceptance of ultrasound will depend in part on changes in insurance reimbursement, Dr. Knapp predicts a bright future for the technology.

*“I would not be surprised if, in 20 or 30 years, there is an ultrasound machine in every physician’s office.”*



*Seconds count during a medical emergency. Emergency physician Barry Knapp, MD, is studying how the use of portable ultrasound equipment during transport to the hospital impacts patient outcomes. Here, he demonstrates use of ultrasound in an ambulance.*



*First-year medical students use handheld ultrasound units to practice finding toys embedded in gel designed to mimic human tissue.*

