

Ultrasound's Current Role in Medicine

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Abstract

Ultrasound (US) is a vital imaging technique that is the most widely utilised imaging modality on the planet. Although US exams require competence to be done at the highest quality levels, most physicians and medical technologists with understanding of human anatomy and physical examination skills may master basic US exams. When US is more than just a "imaging modality," but rather an integrated clinical, physical, and imaging examination in which the examiner interacts directly and intimately with the patient, it reaches its full potential. For expert training in clinical areas, specific diagnostic US knowledge is strongly encouraged. Ultrasound (US) is a vital imaging technique that is the most widely utilised imaging modality on the planet.

Keywords: Ultrasound • Point-of-care ultrasound • training

Introduction

Ultrasound is a very appealing tool for clinical diagnostics because of its lack of ionising radiation, low cost, great portability, and non-invasive nature. Ultrasound exams cost more than computed tomography (CT) and magnetic resonance imaging (MRI) (MRI). According to the World Health Organization (WHO), almost two-thirds of the global population lack access to any type of imaging [1,2]. The United States, as a front-line modality, is a vital component in any strategic strategy to fixing this massive worldwide problem due to its portability and relatively reduced purchasing and maintenance costs. Although US exams require expertise to be done at the greatest levels of quality, most physicians and medical technologists with understanding of human anatomy and physical examination abilities may master basic US exams. Hand-held devices, point-of-care ultrasound cart-based systems, and larger and more expensive high-resolution ultrasound systems with advanced features are typically used in student teaching. Standardized educational material is publicly available to aid training (e.g., the EFSUMB website) [3,4]. When US is more than just a "imaging modality," but rather an integrated clinical, physical, and imaging examination in which the examiner interacts directly and intimately with the patient, it reaches its full potential. Ultrasound has a number of advantages as an imaging tool: It has a higher spatial resolution than CT and MRI, excellent anatomical definition for superficial and many deeper structures, real-time imaging capabilities, widespread availability, and a wide range of clinical applications, including surveillance, diagnosis, disease monitoring, and intervention guidance [5]. Additionally, US emit no ionising radiation and is substantially less expensive than comparable imaging modalities such as MRI and CT, with lower purchase and maintenance costs. The belly can be evaluated by gastroenterologists and surgeons, the pelvic by gynaecologists, the heart by cardiologists [6], the mediastinum and lung by pneumologists, and other anatomical regions examined by their respective

specialists using ultrasound. Comprehensive or conventional ultrasonography is the phrase used to describe the standard manner of performing ultrasound examinations. Unlike traditional ultrasound, mobile and portable US scanners provide examiners with immediate access to clinical imaging for quick and direct solutions. The World Federation for Ultrasound in Medicine and Biology (WFUMB) has released a position paper on the current state and future prospects of point-of-care ultrasound [7]. Point-of-care ultrasound is defined by this organisation as "ultrasound performed at the bedside and interpreted directly by the treating clinician or other specialist" [8]. The authors of this editorial have inserted the qualifier "or other specialists" to recognise that clinician-performed portable US may not be viable in some circumstances (battlefields, ambulances, isolated rural clinics, etc.). Karl-Heinz Seitz [9] presents a compelling case for physician-performed US in a recent publication. "The major message of G. Rettenmaier's seminal 1976 book was that fast B-mode ultrasound constitutes a technological enlargement of physical examination known as "clinical ultrasound" and a "dialog-based examination approach". While the physician talks with the patient verbally, the probe works as a palpating hand. This enables the clinician to record a more detailed case history as well as a more specific diagnosis of the issue. The critical synthesis of imaging and symptoms enables conclusive diagnosis that would not be feasible without the use of ultrasound, clinical knowledge, and physician consultation [10]. Many, but not all, clinical practise recommendations recommend US as a first-line imaging tool or an extensive physical examination. While the European Association for the Study of the Liver (EASL) guidelines propose contrast enhanced ultrasonography for the workup and management of incidentally identified localised liver lesions, the American College of Gastroenterology (ACG) guidelines completely disregard US. In previous EFSUMB and WFUMB guidelines, the role of specific ultrasound techniques—contrast enhanced ultrasonography, elastography, and interventional ultrasound—was explored. For acceptable and evidence-based purposes, there is a need for more uniform incorporation of US in worldwide clinical practise guidelines. General practitioners, medical experts and subspecialists, radiologists, and in some countries, non-medical sonographers with formal ultrasound training, do US around the world. Both physician-performed and sonographer-performed ultrasounds are discussed here. US can be conducted as part of a routine physical examination by physicians, including general practitioners, medical specialists, and subspecialists. The services of a radiologist or sonographer are not usually necessary in this situation. Many European countries, like Germany, Italy, Romania, and others, use this type of US. Many medical specialties integrate US in their educational programmes, and specialists conduct unique US exams in their areas of specialisation. Thus, cardiologists conduct echocardiography, gastroenterologists perform hepatic and endoscopic ultrasonography, obstetricians perform obstetrical ultrasound, and endobronchial ultrasound is performed by endobronchial ultrasound. In English-speaking countries around the world, such as the United States, Canada, and Australia, radiological services are traditionally provided by physicians and sometimes by sonographers. In such cases, US is conducted as a radiological procedure comparable to CT or MRI and reported as such. Physicians or sonographers can do the evaluation in this radiological setting. The latter are highly specialised imaging techs who operate in a radiology department under the direction of one or more radiologists and have had extensive formal training and regulatory certification in ultrasound. According to the Society of Diagnostic Medical Sonography, despite their lengthy training and great procedural expertise, sonographers work as "delegated agents of the physician and do not perform independently". Sonographers in the United Kingdom, on the other hand, are independent reporting practitioners in the National Health Service (NHS). The majority of US services are conducted and reported independently by sonographers in the NHS (about 80%). Radiologists (19%) and other medically qualified practitioners (1%), respectively, do the few remaining US examinations. Since non-medical sonographers have less medical education, general knowledge, and independence than medical doctors, the position of the United States in the United Kingdom is debatable. The non-medical sonographer is unlikely to become completely self-sufficient in the face of rising healthcare costs. In other parts of the world, such as China, the sonographer is a non-radiologist physician who specialises in ultrasound. As previously said, there are numerous advantages to ultrasonography performed by a physician. Ultrasound scanning by highly skilled sonographers under the supervision of radiologists and operating within a radiology department, however, has obvious advantages.

First and foremost, this strategy improves efficiency, flexibility, and coverage. When the scanning is done by a team of skilled sonographers, a

single radiologist can fairly and accurately report over 100 ultrasound exams every day. A clinician would not be able to scan nearly as many patients as this. Furthermore, because all of the team's sonographers are capable of completing a wide range of tests involving various organ systems, exams can be scheduled flexibly based on urgency and patient convenience. Second, because all exams are performed using established institutional protocols and reviewed by radiologists, which offers a channel for feedback to the sonographers, this technique allows for standardisation and rigorous quality assurance. In addition, one of the more experienced sonographers can take on the role of personnel supervisor, organising and leading frequent quality improvement projects involving all sonographers in the department. Finally, it is important to note that sonographers have a tremendous amount of sonographic talent, experience, and competence. They gain a mastery of their trade that would be difficult to duplicate by a busy physician who handles many complex responsibilities in addition to sonography by scanning for several hours every day for many years. Third, this strategy makes it easier to get and maintain high-quality, cutting-edge scanners. Because departments frequently purchase many scanners, scanner manufacturers may offer them competitive prices, allowing them to purchase high-end scanners at reasonable prices. Furthermore, departments may have greater access to physics and technical support, either from their own staff or through the manufacturers, allowing the scanners to be maintained at peak performance levels. The most effective use of US equipment necessitates intensive education and hands-on training. One of our main objectives is to make US available to every patient who need our services. This will increase diagnostic efficiency and, potentially, patient management. Training in the United States varies widely and is influenced by a variety of factors. It is critical that US be taught from the outset of medical education, that is, in medical schools and universities, in regions where US is conducted primarily by physicians. During anatomy classes, practical teaching could commence. The usage of US student medical education is currently being reported on by WFUMB, and the papers will be published soon. Following the curriculum suggested by EFSUMB and WFUMB, physicians in training should develop their US examination abilities by following EFSUMB and WFUMB. Even radiologists who practise in areas where sonography is regularly conducted by sonographers, such as the United States, should study US. Knowledge of US scanning improves a radiologist's picture interpretation ability, allows the radiologist to interact successfully with the sonographer, and allows the radiologist to scan patients with particularly complex or puzzling anatomy or findings. As a result, US scanning is required as part of the curriculum in radiology residency programmes. It also necessitates multiple dedicated rotations on the US service, comparable to CT and MRI rotations. Finally, in areas where ultrasound is conducted by sonographers, imaging technologists with the ability and willingness to complete intensive formal training in ultrasound should learn it. When US is more than just a "imaging modality," but rather an integrated clinical, physical, and imaging examination in which the examiner interacts directly and intimately with the patient, it reaches its full potential. For expert training in clinical areas, specific diagnostic US knowledge is strongly encouraged. All medical specialty should have US education, which includes contrast enhanced US and other specialised procedures. Medical education in the United States

should begin in medical school for aspiring physicians. Point-of-care ultrasound is widely acknowledged as a realistic way to track a pregnant patient's progress from five weeks until term. Obstetricians have created global standards for diagnosis, training, and quality control in foetal imaging; comparable models should be established in other areas.

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