



# Will ultrasound scanners replace the stethoscope?

Cheap, portable ultrasound scanners are changing the way doctors examine and diagnose their patients. **Marc Wittenberg** explores the benefits and possible pitfalls

**U**ltrasonography has long been used to monitor the progress of pregnancies. But over the past decade machines have become cheaper, more reliable, and highly portable with the result that general practitioners and specialists are increasingly using them to make on the spot diagnoses of many conditions without having to consult an imaging expert.

Ultrasound machines use variation in the way that high pitched sound waves penetrate different tissues to generate images. The technique is popular because patients are not exposed to the risks of ionising radiation associated with computed tomography or radiography. It is also now cheap, costing £56 (€69; \$95) for a scan of more than 20 minutes compared with £217 for a three area magnetic resonance imaging scan according to the latest NHS tariffs.<sup>1</sup>

The latest portable machines produce images that are almost the same quality as that of the larger machines; and they are easy to use, durable, and cost as little as £5000. The result is that doctors in all sorts of fields are starting to use them and, with a growing body of literature supporting their use in the developing world,<sup>2</sup> the World Health Organization now recommends them as a primary diagnostic tool in low resource environments.

## Rising demand

The number of ultrasound examinations performed by imaging experts has increased on average by 5.2% every year for the past 10 years, according to Department of Health data. The Centre for Workforce Intelligence, commissioned by the Department of Health to provide data for long term workforce planning, projects a 45% increase in demand for ultrasonography by 2025 as a result of population ageing and the growing popularity of this kind of scanning.<sup>3</sup>

Yet over the decade up to January 2014, the number of radiographers only increased by 22 percent.<sup>4</sup>

The Royal College of Radiologists' (RCR) workforce census in 2011 found that there were 200 unfilled consultant posts in the UK. At the time, there were only 4.5 consultants per 100 000 population, far below the ratio in other European countries topped by Denmark with 18.9 clinical radiologists per 100 000 population in 2008.<sup>5</sup>

Nigel Thomson, professional officer at the Society and College of Radiographers says the shortage in the UK "is not a new problem but is becoming more acute as the demand for ultrasound grows."

The RCR recommended in 2012 that an additional 60 radiologists would need to be trained per year over the following five years to meet demand. There is no similar workforce planning for sonographers. "There is no statutory registration for sonographers," says Thomson. "This makes it difficult to assess the

numbers we have and means that we have no central assessment of future workforce needs."

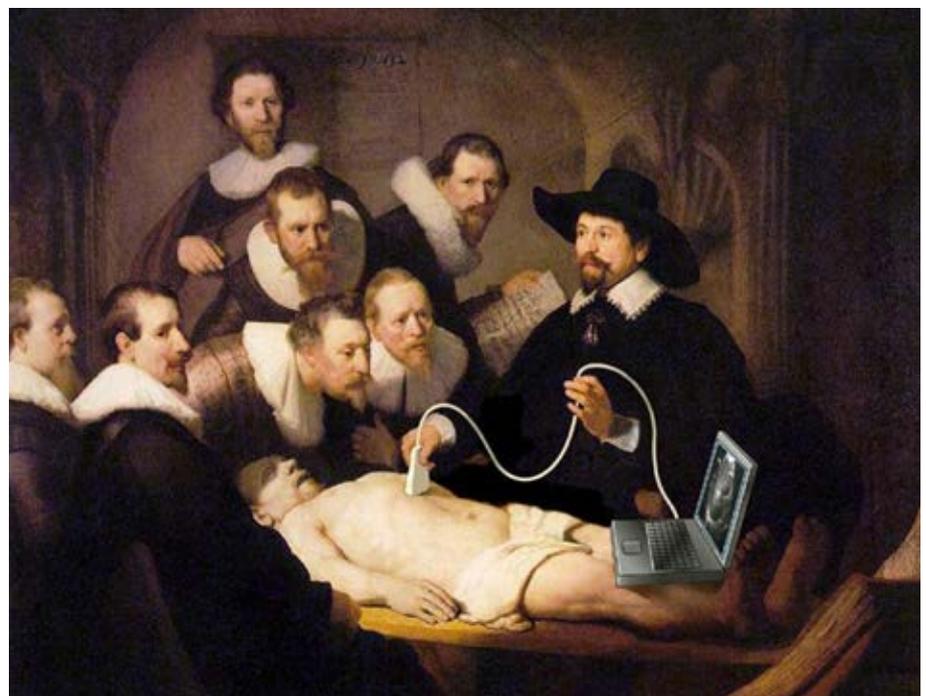
Meanwhile waiting lists for expert ultrasonography are already under great strain. The percentage of patients in England waiting more than six weeks for non-obstetric ultrasonography increased by nearly 20% from January 2013 to January 2014. In Wales, data for the first month of 2014 showed that 31% of patients had been waiting longer than eight weeks.<sup>6</sup>

## DIY scanning

So are point of care scans using portable ultrasound scanners the answer? And are some authorities already relying on this rather than investing in imaging experts and expensive larger machines?

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clinical sense and that they will eventually become a standard tool that every doctor carries, replacing the stethoscope as the symbol of the profession.

“Point of care ultrasound has completely changed our practice,” says Stuart Maitland-Knibbs, a GP and clinical lead at Corby Urgent Care Centre, who mainly uses it to diagnose potentially life threatening conditions such as ruptured abdominal aortic aneurysms. “It is an incredibly useful tool, which allows timely diagnosis and enables onward referral and treatment. It has made a big impact on patient care.”

Richard Wakefield, senior lecturer in rheumatology at the University of Leeds, was one of the first in his specialty to use point of care ultrasonography. He says that it has revolutionised his practice: “It enables me to make confident, early diagnoses and monitor the effects of treatment, especially in inflammatory arthritis.”

Using a portable scanner also helps physicians performing invasive procedures such as placing a central venous line, joint injections, and thoracocentesis.<sup>7</sup> Wakefield explains: “As a clinician, I like to know that as I am inserting a needle into a patient, it is in the right place and not causing any damage.”

Yet, as with the stethoscope when it was first invented, there is concern that ultrasound machines should be used only by those trained to use them.

**Questions over training**

The European Federation of Societies for Ultrasound in Medicine in Biology’s minimum training requirements argue that medical ultrasonography is “fraught with scope for diagnostic error.”<sup>8</sup>

Although point of care ultrasonography may offer faster diagnosis, it is not necessarily better diagnosis, according to Deborah Levine, chair of the American College of Radiology Ultrasound Commission. “Although people regard ultrasound as low risk because it avoids exposure to x rays, there are risks to the patient from false positive diagnoses that generate additional procedures or tests, and false negatives that miss potentially serious pathology.”

“The biggest issue with point of care ultrasound,” says Peter Cavanagh, vice-president of the RCR, “is that the images obtained with a portable ultrasound machine are usually not stored, and a decision is made at the time by the clinician doing the scan.”

Where the more sophisticated machines used by imaging experts automatically record multiple images for future reference, portable ultrasound machines only record an image

**PROS AND CONS OF ULTRASONOGRAPHY**

- Ultrasound takes clear images of muscle, soft tissue, fluid and bone surfaces, but it is not good at penetrating bone or air. This limits its use within the skull, chest and abdomen
- Ultrasound has no known long term side effects, but it has a more limited scope than other imaging methods. There are limits to the depth of penetration that can be achieved, so images of structures deep inside the body can be difficult to capture, particularly in obese patients
- Ultrasound provides instant images and can be used at the bedside for rapid diagnosis, whereas other imaging methods take time to process. Ultrasound images can be saved or printed for reference, but, unlike magnetic resonance imaging scans and computed tomograms, performance and interpretation of images such as the one below are much more dependent on the skill and experience of the operator



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on request. Even if a doctor prints or saves one or two images for the record (and most do not) anyone later reviewing the diagnosis does not have the full picture. “It’s a bit like seeing someone’s holiday photos as opposed to a video,” said Cavanagh.

Physicians in many medical specialties are thought to be using point of care scanning, but the scale on which this is happening is not yet clear: these scans are not systematically recorded in the way that scans performed by imaging experts are.

There are “no data out there for us to know who is performing ultrasounds apart from radiologists and obstetricians who have to go through a certification process,” says Sveta Alladi, clinical fellow at Health Education England.

“What we know is mostly anecdotal so we don’t know what the true extent of the risk is,” she said.

“There should be no clinicians using ultrasound outside a proper governance system,” says Cavanagh. This is a view backed up by the National Ultrasound Steering Group of the British Medical Ultrasound Society, which recommended in 2008 that local clinical governance boards are established to oversee the training, supervision, and audit of all providers of ultrasound imaging services.<sup>9</sup> So far that recommendation has not been taken up.

The RCR says that ultrasound training for medical non-radiologists should be to the same standard as for radiologists, albeit restricted to the relevant area of their clinical expertise. Wakefield agrees. “If you want to be like a radiologist, you need to train and be governed like a radiologist.”

This view is echoed by Levine. “Patient safety should be central, and providers should ensure that ultrasound users are adequately trained and that this is maintained through adequate audit and quality assurance systems.”

With time and the right support though, it may be that attitudes to who should be using ultrasound scanners may relax, much as they have for the stethoscope. When it was invented its use was initially restricted to experts (doctors). “Today,” says Cavanagh, “you are just as likely to see a stethoscope hanging around the neck of a paramedic, nurse, or midwife.”

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