

Interview with Petros Nihoyanno- poulos: Improving efficiency with point of care ultrasound

Dr Petros Nihoyannopoulos

is the current President of the British Society of Echocardiography and head of the Echocardiography unit at Hammersmith Hospital, London. He is also heavily involved in training medical and technical staff and is the author of over 120 peer-reviewed publications and more than 20 book chapters.

Petros Nihoyannopoulos was interviewed by Clive Weston, Editor, Cardiology News.

At least a million people are suspected to have heart failure each year and NICE has recommended that each of them should have access to an echocardiographic study. However, this means that many departments, already overworked, are exceeding their capacity, and waiting lists are creeping up.

Echocardiography is currently a most cost-effective and widely used imaging tool in Cardiology. Open-access and community echo services are springing up around the country. Readers may remember an article (Oct/Nov 2001) on a GP-run echo service in Poole organised by Strat Liddiard. In Swansea, the local Primary Care Group has instituted a technician-run/GP supervised community echo service, though this has resulted in further pressure on staffing the acute hospitals. Hopefully, a system of 'sieving' requests using a combination of ECG, chest X-ray and natriuretic peptide estimation, may reduce requests from primary care. However, there are also plenty of requests for such scans generated from within the hospital. Some units have responded by 'rationing' scans through systems that require a consultant to sign the request form, or by introducing agreed and explicit criteria prior to acceptance onto the 'echo list'.

Here, I talk to Petros Nihoyannopoulos, Reader in Cardiology at the National Heart and Lung Institute, Imperial College London and Director of the Echocardiography Unit at Hammersmith Hospital, about the central role point of care (POC) ultrasound in alleviating pressures on cardiac ultrasound services.

Do you feel that the (seemingly endless) increasing use of echocardiography is justified? We seemed to get by reasonably well before the widespread use of cardiac ultrasound.

There are probably are some unjustified referrals, but we are probably stuck with these levels of demand for an echo service. My own unit currently handles over 5,000 scheduled examinations per year. While physical examination remains the cornerstone of an initial evaluation of the patient with suspected cardiovascular disease, it is not without its problems. Even after training, investigators have noted inadequacies in examination skills, in particular auscultation. Echo and Doppler studies have also underlined the shortcomings of physical exams in many cardiac conditions, particularly in the early stages of disease. Echocardiography can provide much more information than simple physical examination and allows for rapid confirmation of cardiac abnormalities (e.g. shunts, valvular disease, ventricular hypertrophy, cavity dilation, pericardial effusion). In addition, it often allows a specific diagnosis to be made there and then.

It is not therefore surprising that the echocardiography unit receives numerous requests for its services from all departments within the hospital. This is a nationwide problem. The diagnostic power of echocardiography to visualise and collect quantitative, functional and haemodynamic data means that echocardiography departments across the country are overwhelmed with such requests.

Can you describe your rationale for introducing the 'Point of Care' solution?

It really comes down to us making better use of the resources available to us. We were receiving lots of requests and doing the best we could. Nevertheless, using cart-based, expensive ultrasound machines for every examination of patients with suspected cardiac conditions put a considerable strain on the echocardiography department.

In an effort to manage our limited resources more effectively, we have adopted a radical approach. Clinicians on the wards now have access to a SonoSite SonoHeart Elite, a high-resolution battery or AC current-powered Point of Care (POC) ultrasound with excellent grey-scale and colour blood flow imaging capabilities.

A number of cardiac conditions can be diagnosed and followed up adequately with a short examination at the bedside or in the outpatient clinics, complementing the clinical examination. This uses only a fraction of the capabilities of our highly sophisticated and expensive systems. Instead of using a £100,000 cart-based machine, a POC ultrasound that costs a tenth of this can often give us an instant answer to the clinical question, freeing up both technicians and equipment for the more comprehensive studies that really need the larger machines. For example, registrars out on the wards can screen for conditions such as heart failure or systolic murmurs and pericardial effusions using the POC machines. If results are negative, then there is no need to refer the patient to the echocardiography unit, saving us valuable time and resources.

Do you feel that such portable 'Point of Care' devices will replace traditional, more expensive, echo machines?

No. I'd like to emphasise that POC ultrasound is not a replacement for cart-based machines, but instead a valuable clinical aid to the cardiologist. Point of Care ultrasound carried out by registrars should not be considered as an echocardiographic examination as such, but rather as an additional means of improving clinical assessment. We could call it an "echoscope". The larger, high-end machines are still essential for full echocardiographic examinations, such as the comprehensive assessments of cardiac and valve function, full haemodynamic assessment with estimation of intracardiac pressures and detailed functional assessment of the heart muscle. These more complex machines, however, should ideally not be used for scanning normal patients. Our department allocates one hour per patient for examinations using the cart-based systems. It seems particularly wasteful of time if the initial assessment can be carried out in only ten minutes using POC ultrasound. Using the high-end machines in this manner is rather like buying a Ferrari and only using it to drive a few miles to work each day in first gear.

That's a good analogy, and one that I'll remember next time I'm in my Ferrari! Do you have any evidence that the use of the 'echoscope' is leading to fewer referrals, rather than simply allowing those who would not have otherwise been referred to the department to have an ultrasound examination on the ward? How many formal departmental examinations do you think could be avoided?

I can use the example of our Care of the Elderly Department, where one of my colleagues has been using the SonoSite system to screen patients for abnormalities of ventricular function. He has commented on the clarity of the images and has been able to print these off using a laser printer. I know that he's been using Continuous Wave Doppler as a tool to obtain preliminary information concerning left ventricular diastolic function. Such basic haemodynamic measurements can be performed promptly.

I have noticed that significantly fewer patients have been referred from his department to the Echocardiography Department. If this pattern was extended throughout the hospital, I estimate that up to 1000 'unnecessary' referrals could be avoided, freeing up our high-end echo equipment and specialists for around 20% more complex studies each year.

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Do you envisage the POC system being used throughout the hospital, or simply in specialist areas?

Yes, there is potential for use on all wards and outpatient areas. Having the SonoHeart in casualty, for example, would mean that Specialist Registrars could look at the left ventricular function of a breathless patient or evaluating segmental wall motion in a patient who has chest pain, as part of a policy to rule out a myocardial infarction. Used properly, portable 'ultrasound stethoscopes' can provide a reliable check on basic cardiac function, eliminating a number of doubts and allowing cardiac abnormalities to be excluded with great certainty. Improved harmonics have led to improvements in image quality, particularly for difficult to image patients.

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Machines such as SonoSite's SonoHeart are ideal for taking a 'quick look' inside the chest as an extension of the clinical examination. Rather than just guessing heart function indirectly from the clinical signs alone or ECG, physicians can now use these hand-held echo instruments like ultrasound stethoscopes to comprehend the anatomy, observe ventricular contraction and relaxation, and view the valves, all in real time. Accurate measurement of

chamber dimensions and wall thickness is also possible.

While POC ultrasound clearly cannot replace the full echo studies, there is evidence that they compare favourably from a number of studies of focused examinations. For example, work carried out by Professor Roelandt at the Thoraxcentre in Rotterdam suggests that expanding routine physical examinations to include POC ultrasound significantly strengthens diagnostic accuracy. This was published in the International Journal of Intensive Care in 2001. Using POC ultrasound, in the absence of blood flow turbulence, cardiac disorders could be excluded with a high degree of certainty on the basis of normal structure and functional findings. This ability to rule out disorders is ideal for rapid screening and allowed Professor Roelandt's group to avoid unnecessary referrals. In turn, this means that they were able to make more cost-effective use of expensive diagnostic imaging facilities.

Who do you feel should be using these portable devices? Are they the sort of equipment that can be utilised by all clinicians?

As now, the likely users will be clinicians (not necessarily cardiologists) and technicians. I would like to see every ward in the hospital having access to a POC ultrasound instrument, though this will have implications for training. Although these portable machines are easy to use, have good resolution and image quality and therefore tremendous diagnostic power, it is essential that clinicians and technicians receive adequate training before using the technology. It is vital that clinicians new to echocardiography spend time learning how to image patients, mainly on larger machines, and are accredited, prior to making clinical decisions based upon point of care echocardiography. For existing users, it doesn't take very long to adjust to the heart being depicted on a smaller screen. Most importantly, for new users, whenever there is any doubt at all, further echo/Doppler examination must be requested and expert advice sought.

The advantages of the system are the accessibility of a technology that both takes the pressure off over-used cart-based systems and gives front-line clinicians a quick and simple diagnostic tool at the patient's bedside. Used appropriately, these new 'ultrasound stethoscopes' will relieve pressure on echocardiography, leading to more efficient and cost-effective ways of working.