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### Handheld Echocardiography: Easy as Child's Play?



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Portable echocardiography has the capacity to identify defects with comparable accuracy to standard machines, to change diagnoses and treatment and has facilitated early discharge in up to 50% of patients. While these figures may depend on the nature and profile of the patients screened and the skills available, in principal it validates the increased potential for patient care. This article discusses the potential applications of echocardiography to improving the efficiency and delivery of healthcare and the potential pitfalls that may be encountered.

#### Echocardiography in a Critical Care Setting

Starting with a patient's journey before arrival during and after the emergency room, portable echocardiography has proven successful. In the Coronary Care Unit (CCU) in particular, it is not surprising that in the hands of cardiologists, portable devices could be used to assess areas such as left ventricular ejection fraction and pericardial effusions. This helps to prognosticate and triage patients to the most appropriate therapy immediately and reduce the immediate burden on departmental echocardiography.

Most studies in this area have confirmed that portable echo almost inevitably changes or at least consolidates clinical decisions made at the bedside. Portable machines have also been used effectively in environments such as the catheter lab where assessment of cardiac tamponade is often challenging and similar devices have been shown to correctly address 90% of clinical questions in the ICU. This is particularly surprising since the investigations were performed by ICU physicians in patients that are traditionally regarded as challenging for standard echocardiography.

#### Echocardiography & Screening

An increasing role for echocardiography pertains to the screening of patients for occult or mildly symptomatic conditions for the prevention of disease. These investigations can be performed either in the community, at designated health screening centres or in hospitals. Moreover, the echocardiography can be combined with electrocardiography and biomarkers (e.g. BNP).

However, a characteristic feature of these screening programmes is the general trend to less direct involvement by doctors and a greater responsibility placed on sonographers.

A number of studies have shown the potential for such screening activities. One study showed that portable echocardiography was far superior to the clinical examination alone, almost doubling the number of cardiac anomalies detected (detecting ~70% of all such abnormalities and ~80% of all major abnormalities).

Similar studies have confirmed that in community screening, portable echocardiography is as accurate as standard departmental echocardiography in detecting cases of ventricular dysfunction and left ventricular hypertrophy. These programmes have therefore been demonstrated to be of significant clinical value, and are being rolled out in a number of clinical centres.

#### Effectiveness

Applications for portable echocardiography are diverse and immediate. However enduring question are; whether these scans approximate to those from standard departmental studies, whether they have a significant impact on patient treatment by more accurate prognostication, whether they lead to substantial changes in treatment and in outcome and finally whether they are cost-effective.

With respect to the first question, scans approximate to departmental scans under optimal conditions. The latter proviso is not insignificant as there is often a tendency to perform portable echos in suboptimal settings or in a more focused manner which will inevitably increase the rate of errors or omissions. Portable machines are now so advanced that the GE Vivid I and the Sonosite Micromax have tissue Doppler imaging and almost identical capacities to large departmental machines.

With respect to the second question, portable echocardiography does have the capacity to prognosticate, change treatment and potentially outcome. Finally, with respect to cost-effectiveness, studies have confirmed that portable echo can confer major time and cost savings. For limited or focused studies, portable machines have been shown to confer substantial time, cost and hospital clinic and bed-occupancy savings. Although precise cost calculations are heavily context dependant, at least in general cardiology, portable echocardiography approximately halved

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the price of an echo from 132 to 75 Euros.

#### **Training Still a Contentious Issue**

While there is excitement that increasingly portable machines which will become ever more available to practitioners, will mean major advances in patient care, there is genuine concern that harm may be inflicted upon patients by untrained or inadequate physicians/sonographers.

The question remains – what is adequate training? This question is complicated by the fact that different practitioners require different levels of proficiency and support for their different applications.

At present, the American Society of Echocardiography (ASE) require an exacting 150 portable exams, in line with the exacting requirements of standard echo accreditation. The rationale behind this approach is that portable echo may be even harder than standard echo to interpret and that the practitioner may often be unsupported or have to make decisions in real time.

The British Society of Echocardiography (BSE) has also recently developed a structured approach to accreditation. Detractors from such accreditation procedures have suggested that non-cardiologists may not be able to achieve such numbers in a practical time period and that many of the skills can be “learnt on the job” so long as adequate support and attention to the limitations of the technique are noted. Support for the latter position has come from studies with medical students showing that a carefully designed short training programme can permit students to make assessments of specific echo parameters rapidly and efficiently. Ultimately, the easy availability and power of this technology suggests that there will be rapid dissemination irrespective of these two polarised positions.

To ensure patient care is not compromised, ideally, the accreditation programmes of the ASE and BSE should be heeded. It is at least essential to have attended some form of formal training programme with a handheld component. The operator should make diligent attempts to spend time with an experienced sonographer and to operate in a department with support, with respect to imaging and reporting. Ultimately, it is essential that the operator document the report of the imaging clearly and emphasise the fact the study was a portable study with the implicit limitations. This will be particularly robust if the study is recorded for later retrieval if necessary.

#### **Conclusion**

While the future is bright for these machines, in order for them to entirely full fill their potential a concerted effort of cooperation will be needed from cardiologists, sonographers, and other physicians such as ancillary medical staff to ensure that patient care is not compromised. In this way, real-time cost-effective studies will improve immediate patient care, reduce waiting times and ultimately reduce costs.

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