

# The use of echocardiography in acute cardiovascular care: Recommendations of the European Association of Cardiovascular Imaging and the Acute Cardiovascular Care Association

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## Abstract

Echocardiography is one of the most powerful diagnostic and monitoring tools available to the modern emergency/critical care practitioner. Currently, there is a lack of specific European Association of Cardiovascular Imaging/Acute Cardiovascular Care Association recommendations for the use of echocardiography in acute cardiovascular care. In this document, we describe the practical applications of echocardiography in patients with acute cardiac conditions, in particular with acute chest pain, acute heart failure, suspected cardiac tamponade, complications of myocardial infarction, acute valvular heart disease including endocarditis, acute disease of the ascending aorta and post-intervention complications. Specific issues regarding echocardiography in other acute cardiac care scenarios are also described.

## Keywords

Acute cardiovascular care, critically ill patients, echocardiography, recommendations

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## Introduction

Echocardiography is one of the most powerful diagnostic and monitoring tools available to the modern emergency/critical care practitioner, and the provision of echocardiography is fundamental to the management of patients with acute cardiovascular disease. Echocardiography can provide important information throughout the whole patient pathway, having been shown to change therapy in 60–80% patients in the pre-hospital setting, improve diagnostic accuracy and efficiency in the emergency room, reveal the aetiology of unexplained hypotension in 48% of medical intensive care patients and provide information additional to that obtained from the pulmonary artery catheter. Echocardiography is now included in the universal definition of acute myocardial infarction, and in international guidelines regarding the management of cardiac arrest. In the critical care setting echocardiography can be used to measure/monitor cardiac output and to determine abnormalities of cardiac physiology and coronary perfusion, as well as providing more standard anatomical information related to diagnosis. Although the potential scope of echocardiography is evident, specific recommendations for its use in acute cardiac care are currently lacking from the European Association of Cardiovascular Imaging (EACVI) and the Acute Cardiovascular Care Association (ACCA). In this document, we describe the practical applications of echocardiography in patients with acute cardiovascular conditions, in particular with acute chest pain, acute heart failure, suspected cardiac tamponade, complications of myocardial infarction, acute valvular heart disease including endocarditis, acute disease of the ascending aorta and post-intervention complications. Specific issues regarding echocardiography in different acute cardiovascular care scenarios are also described. The full version of this paper with Tables and Figures is available online.

## Specific imaging considerations

The numerous challenges of imaging in the acute setting are well-documented, and consist of a number of factors including patient habitus, supine/prone positioning, positive pressure ventilation, lung injury and related features (pneumothorax/pneumo-mediastinum), trauma (head and neck, thoracic) and the presence of lines/dressings and/or drains. Further, the echocardiographic data must be interpreted in the context of the acutely/critically ill patient, thus incorporating a number of factors that are not normally considered by the echocardiographic practitioner. Additionally, there may be time critical factors that further challenge the echocardiographer – for example in cardiac arrest.

The choice of imaging modality in the acutely/critically ill patient population will depend upon not only the sensitivity and specificity of the modality for a given potential diagnosis, but will also include the risks of transportation, including to potentially remote parts of the hospital (i.e. for

computed tomography or cardiac magnetic resonance). For this reason echocardiography, performed as a point-of-care imaging technique, is particularly important in acute cardiovascular care.<sup>1</sup>

## Level of competence

Performing transthoracic (TTE) or transoesophageal echocardiography (TOE) and interpreting images in patients with acute/critical cardiac conditions requires a level of competence and training of the operator *at least* equivalent to the level necessary to perform elective studies.<sup>2</sup> The experienced echocardiographer will generally use the two techniques (TTE and TOE) interchangeably in order to obtain the information required. The operator must take into account the pathophysiological status of the patient, frequently with rapidly changing haemodynamic support, and synthesise all information to provide the relevant guidance to the attending physician. For performing TOE studies and advanced echocardiography techniques, operators should fulfil advanced echocardiography training requirements,<sup>2</sup> and undergo specialised additional training in undertaking studies in the acute setting. Since echocardiographic examinations in patients with an acute cardiovascular condition are frequently requested as urgent/emergency, it is suggested that all such studies should be supervised by an expert cardiologist with advanced level of competence in echocardiography<sup>3</sup> and experienced in performing and interpreting echocardiography in the acute/critical care setting.

Competence can be formally assessed through a certification process. Currently, individual certification for various echocardiographic modalities is offered by the EACVI.<sup>4</sup> Both individual competence and the competence of the team, facilities and appropriate logistics acknowledged by successful EACVI laboratory accreditation<sup>5</sup> are likely to guarantee high-standard service in all echocardiographic modalities and clinical settings, including echocardiography in acute cardiovascular care. In encompassing acute/critical care echocardiography, the certification process therefore supports the concept of echocardiography ‘without walls’, mirroring the patient-centric approach which is pivotal to acute/critical care medicine.

It is recognised that Focus Cardiac Ultrasound (FoCUS) may be helpful in selected cases, but it should be emphasised that EACVI in general strongly advocates systematic training in echocardiography and emergency echocardiography.<sup>6</sup> Specific training and certification is recommended for all users of FoCUS and pocket-sized imaging devices, with the exception of cardiologists who are certified for TTE according to national legislation.<sup>7</sup> This FoCUS certification should be limited to the clinical questions that can potentially be answered in such settings. The echocardiographic examination with the current generation of pocket-size imaging devices does not allow performance of, nor replacement of, a

complete echocardiogram,<sup>7</sup> and their limitations must therefore be recognised.

### Conflict of interest

The authors declare that there is no conflict of interest.

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