Focused transthoracic echocardiography and in-hospital cardiac arrest: Exploring the quality and utility of resident-obtained echocardiograms

Primary Author: Susan Herrick MD
Albany Medical Center

Co-Authors: Kevin Roberts, MD; Kirti Sahu, MBBS, MD; Nibras Bughrara, MD;

Introduction: Long-used by cardiologists to assess cardiac function and pathology in non-emergent settings, echocardiography is a rapidly growing area of interest for physicians in high-acuity fields such as anesthesiology and critical care. These physicians are using focused transthoracic echocardiography (FoTE) at the bedsides of critically ill patients to quickly assess for major potentially reversible causes of acute physiologic deterioration and respond accordingly. American Heart Association (AHA) guidelines suggest FoTE can be useful in pulseless electrical activity (PEA) arrest because it can help evaluate volume status, pericardial effusion and tamponade, pulmonary embolism, and left and right ventricular size and contractility [1]. As such, there has been a push to incorporate echocardiography into the advanced life support (ALS) protocol, and a 2007 study proposed an algorithm that incorporated FoTE into ALS; most importantly, the time to obtain the echocardiogram is under no circumstances allowed to exceed the 10-second pulse check of the ALS protocol [2]. A 2010 study assessed the utility of focused echocardiographic evaluation in life support (FEEL) in out-of-hospital cardiac arrest; the study demonstrated that FEEL was effective in distinguishing between true PEA (without wall motion) and pseudo-PEA (with wall motion) in patients undergoing cardio-pulmonary resuscitation (CPR) and useful in identifying treatable conditions such as hypovolemia and pericardial effusion [3]. In light of this, our institution’s residency program has established a course in FoTE as part of its standard PGY-3 (CA-2) training, and our study is the first to examine its use in in-hospital cardiac arrest.

Methods: All residents at our institution undergo a 4-day course in FoTE during their CA-2 year. In addition, they complete 4 hours of simulation training with 5 different PEA arrest scenarios, perform 20 complete FoTE studies under direct supervision of an attending anesthesiologist experienced in FEEL, and perform 10 more such studies under indirect supervision. Once residents have completed the course, they are able to perform FEEL on patients who are acutely hemodynamically unstable or who are in cardiac arrest and undergoing CPR throughout the hospital, ensuring that the time taken to perform the study does not exceed 10-seconds. An attending anesthesiologist is available to assist in interpreting both the quality of the images as well as the echocardiographic findings.

Results: We have collected data for 5 studies performed by our institution’s residents. Of these, 4 were performed during PEA arrest and 1 was performed during peri-arrest. All 5 studies were determined to be “good” image quality. Some of the findings identified included ventricular dysfunction, pericardial effusion, pleural effusion, and volume depletion. All 5 studies were able to either identify or at least rule-out certain causes of the arrest or peri-arrest, which helped guide further management and medical decision-making.
Discussion: Based on our results, it appears that FEEL is feasible to perform after limited training. We are continuing to collect data to explore its applicability in the inpatient setting in peri-resuscitative period, determine the incidence of potentially reversible causes of cardiac arrest or near-arrest, and document its influence on peri-resuscitative management. It is our aim that this will enhance patient care and make efficient use of available resources, and we intend for our work to serve as a pilot for a future multi-center study.

References:

