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### A Comparison of Bedside B-Type Natriuretic Peptide Versus Echocardiographic Determination of Ejection Fraction in the Diagnosis of Heart Failure

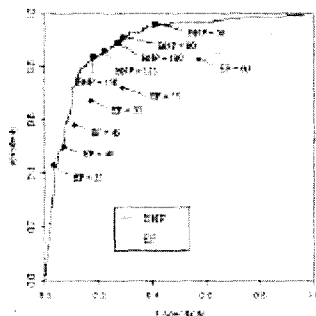
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**Background:** The emergency diagnosis of congestive heart failure (CHF) can be difficult. Echocardiography is often used to assess left ventricular (LV) function to attempt to identify patients with CHF. B-type natriuretic peptide (BNP) is an approved blood test for the diagnosis of CHF.

**Methods:** 1586 patients with acute dyspnea presenting to emergency departments underwent clinical, radiological and a point-of-care BNP assessment. CHF was adjudicated by two independent cardiologists, blinded to BNP. Of the 1586 patients, 709 underwent echocardiographic determination of LV ejection fraction (EF).

**Results:** A total of 69.4% had a final diagnosis of CHF. CHF patients were older (68.5 vs 61.6 years,  $p < 0.0001$ ), had a lower EF (39.5 vs 56.1%,  $p < 0.0001$ ) and a higher BNP (683 vs 129 pg/ml,  $p < 0.0001$ ) than patients without CHF. Area under the receiver operating characteristic curve (AUC) curve was significantly higher for BNP (0.89) than for EF (0.78); AUC difference: 0.12,  $p < 0.0001$  (Figure). Sensitivity (SE) of BNP for the diagnosis of CHF was 89%, specificity (SP) 73%, and accuracy was 84%. Values for EF  $< 50\%$  were respectively SE 67%, SP 83%, and accuracy 72%. Logistic regression analysis showed that used alone (OR=17.7) or in combination with clinical (OR=34.1), ECG and CXR data (OR=32.1), BNP remained an independent predictor of CHF.

**Conclusion:** In this population, point-of-care BNP was superior to echocardiographic determination of EF in identifying patients with CHF, regardless of the threshold value.



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### Correlation Between Troponin Values and Echocardiographic Findings in Children Following Global Ischemic Cardiac Arrest

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**Background:** Myocardial dysfunction occurs immediately after successful cardiac resuscitation. **Purpose:** To determine whether measurement of cardiac troponin in children with acute out-of-hospital cardiac arrest predicts the severity of hypoxic-ischemic myocardial injury and echocardiographic evidence of ventricular dysfunction. **Methods:** This is a prospective, observational study. Patients admitted to the Pediatric Intensive Care Unit (PICU) following an out-of-hospital cardiopulmonary arrest. Troponin measurements were obtained upon admission to the PICU, and again at 12, 24, and 48 hrs. Echocardiograms were performed within 24 hrs of admission. **Results:** 24 patients were enrolled. Survival to hospital discharge was 29% (7/24). The mean age was similar across both survivors and non-survivors. Mean downtimes were  $15.0 \pm 21.6$  min (range 3 to 63 minutes) for survivors vs  $34.6 \pm 18.5$  min (range 4 to 70 minutes) for the non-survivors ( $p = 0.02$ ). Survivors received less number of epinephrine doses compared to non-survivors ( $1.3 \pm 2.2$  vs  $2.9 \pm 1.6$ ,  $p = 0.02$ ). Only one patient required defibrillation for ventricular arrhythmia during resuscitation (non-survivor group). There is a negative association between ejection fraction and troponin measurements at 12 and 24 hrs ( $r = -0.54$ ,  $p = 0.01$  and  $r = -0.59$ ,  $p = 0.02$ , respectively). This negative association is found between shortening fraction and troponin measurements at 12 and 24 hours ( $r = -0.46$ ,  $p = 0.03$  and  $r = -0.65$ ,  $p = 0.01$ , respectively). The mean ejection fraction for survivors was higher than that of non-survivors ( $73.2 \pm 11.2$  percent versus  $55.4 \pm 19.8$ ,  $p = 0.04$ ). This difference was also demonstrated for shortening fraction measurements ( $37.5 \pm 7.8$  percent versus  $25.5 \pm 10.7$ ,  $p = 0.02$ ). **Discussion:** We report a correlation between troponin values and echocardiographic findings of ventricular dysfunction. This correlation is demonstrated in a pediatric population following global ischemic cardiac arrest. These patients were devoid of coronary artery disease or congenital heart disease.

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### Successfully Teaching of Early Defibrillation in Primary School Children Using a Self Instruction Video

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Traditionally the training course for early defibrillation lasts between four to eight hours. However the Automatic External Defibrillator (AED) is a friendly device which can be used by all first responders, independently by their age or education, and most people can complete a self-paced training program by using a video playback.

**Aim:** We investigated the efficacy of a video-tape as a mean to teach the AED application technique in a mock cardiac arrest scenario. The first end-point was to calculate the time from opening the AED box to the first shock in a simulated ventricular fibrillation case in potentially first responders from an Italian Primary School. Secondly we evaluated the correctness of electrodes placement.

**Method:** One hundred and four children between 8 to 10 years of age participated to the study. After a brief theoretical introduction, a two minute video with a mock cardiac arrest scenario showing the application protocol of the AED was shown and repeated twice for each group of children. Then the children were divided into subgroups of three participants. An instructor assigned to each child a specific role: one simulated the patient in cardiac arrest, one checked the reactions, responsive, breathing and sign of circulation and applied the AED, one carried the AED device and simulated the phone call to 1-1-8, the Italian EMS number. All the three children turned in each role. The "application time" was calculated for each of the three performance from opening the AED to first shock. **Results:** Electrode placement was correct in 95% of cases. All children remained clear off the patient during shock delivery. The mean application time was: 1° performance:  $100 + 20$  sec; 2° performance:  $69 + 12$  sec, 3° performance  $52 + 8$  sec. mean total time of application:  $82.4 + 26$  sec (ranging from 58 sec to 134 sec).

**Conclusion:** A self instruction video is simple and low expensive method of learning and may represents an easy strategy to favor the widespread use of AED. It offers a valuable learning tool to teach AED also in children with no experience in first aid. Future work should assess the quality of the acquired skill in other populations of non conventional responders from the community.

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### The Impact of Limited Bedside Echocardiography in an Acute Clinical Setting by Noncardiology Personnel With Compact Systems

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**Background:** Echocardiography (echo) can provide important information in a variety of acute clinical situations. Unfortunately, bedside physical exam skills have declined as medical technology has advanced resulting in an inadequate clinical assessment of the acute patient (pt). Limited echo's can be performed on compact, echo systems as an adjunct to the bedside exam. However, skepticism abounds whether these limited echo studies have value and if non-cardiology personnel can be trained in a reasonable time-frame to perform them. **Objectives:** To determine (1) if non-cardiologists can perform and interpret a limited echo on a compact system, and (2) whether limited echo can impact clinical management in an acute medical setting.

**Methods:** 4 intensivists and 4 medical students were trained to perform and interpret limited bedside echo's (parasternal long and short and apical 2 and 4 chamber; no Doppler) in a 2 1/2 day course. Pts were studied in the emergency department (120 pts) with the Cypress® laptop sized system (Acuson/Siemens) and the surgical ICU (74 pts) with the Sonoheart® hand-held system (Sonosite). Studies were immediately reviewed and repeated with full Doppler by an echo-cardiologist to determine if the limited echo's performed by the intensivists and students were technically diagnostic, interpreted accurately and had a clinical impact in the acute setting.

**Results:** Echo's were primarily performed for LV function and relative volume status. Non-cardiologists were able perform a limited echo in 190/194 pts (98%) whose mean weight was 87 kg (range 50-154 kg). Forty-six percent of echo's were abnormal and 54% were normal studies; 96% of their limited echo's were of diagnostic quality and 78% were interpreted accurately. Limited echo led to a change in pt diagnosis in 23% and altered therapy in 26% of pts. The mean echo acquisition time was 8.58 min. **Conclusion:** Physicians (non-cardiologists) and medical students can quickly perform and interpret limited bedside echo's in acute clinical situations on small echo systems. These limited echo's can significantly impact pt care in acute settings.

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### Defibrillator Clocks Are Unable to Maintain Accurate Time Over a Three-Month Period

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**Background:** Collapse-to-first-shock time interval is the single most important determinant of survival in patients with cardiac arrest. American Heart Association guidelines recommend a collapse-to-first-shock interval of less than 3 minutes for in-hospital cardiopulmonary resuscitation (CPR) and assessment of this interval is a crucial first step to improve in-hospital CPR performance. At our hospital, time of first shock is determined with the defibrillator clock. Our Bioengineering Department routinely checks the defibrillators and adjusts the clocks every 6 months in a non-standardized fashion.

The objective of this study was to determine the accuracy of defibrillator clocks over a 3-month period.

**Methods:** Sixty-one defibrillators in patient care areas (7 different models from 3 different manufacturers) were evaluated. Defibrillator clocks were synchronized with the atomic clock in Boulder, CO and the time difference between each defibrillator and the atomic clock was recorded 3 months later. Mean time differences between defibrillator models were compared with the Kruskal-Wallis test.