Towards evidence based emergency medicine: PRIVATE Best BETs from the Manchester Royal Infirmary

Edited by Craig Ferguson

**BEST 1: BEDSIDE ECHOCARDIOGRAPHY FOR PROGNOSIS OF EMERGENCY DEPARTMENT CARDIAC ARREST**

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**ABSTRACT**

A short cut review was performed to assess the utility of emergency physician echocardiography in patients with cardiac arrest. Six studies with a total of 434 patients were found. The authors, date and country of publication, patient group studied, study type, relevant outcomes, results and study weaknesses are tabulated. The clinical bottom line is that cardiac standstill witnessed in emergency physician echocardiography is predictive of a poor outcome in cardiac arrest.

**CLINICAL SCENARIO**

A 62-year-old male emergency patient arrives in cardiac arrest. During resuscitation he is found to have pulseless electrical activity. Several rounds of ACLS are performed with no improvement in the patient's condition. You wonder if a rapid bedside cardiac ultrasound (echocardiography) would be of any prognostic or diagnostic utility.

**Table 1**: Diagnostic value of echocardiogram in cardiac arrest

<table>
<thead>
<tr>
<th>Author, country, date</th>
<th>Patient group</th>
<th>Study type</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niendorff et al, 2005, USA</td>
<td>17 Consecutive patients with 18 PEA arrests over a 6-month period at a major academic hospital. Bedside echocardiography attempted in seven patients and completed in five</td>
<td>Prospective feasibility study</td>
<td>Evaluate performance and reliability of US assessment as an integrated part of the ACLS PEA arrest protocol</td>
<td>In 4/5 cases, the non-expert interpretation was confirmed</td>
<td>Extremely small sample size. Low compliance with study protocol. No follow-up on cause of PEA. Non-emergency physicians with limited ultrasound training</td>
</tr>
<tr>
<td>Blalivas and Fox, 2001, USA</td>
<td>Convenience sample of 169 adult non-traumatic patients arriving to a single ED over a 20-month period receiving ongoing CPR. Rapid bedside echocardiogram was performed during pulse check pauses. No patients with cardiac standstill on arrival (136) survived to leave the ED. 100% of patients presenting with asystole (65) had cardiac standstill on initial ECHO</td>
<td>Prospective observational study</td>
<td>Survival of patients with cardiac motion on arrival at the ED</td>
<td>20 Patients (12, 67% with PEA, 8, 53% with VF) survived to leave the ED. 13 Patients (6, 33% with PEA, 7, 47% with VF) died despite cardiac activity on arrival</td>
<td>Small convenience sample (800 eligible patients during study). No follow-up of survivors. 'Survival' included only to hospital admission</td>
</tr>
<tr>
<td>Salen et al, 2001, USA</td>
<td>102 Non-consecutive patients presenting to two community EDs over a 12-month period. All received a subxiphoid cardiac ultrasound during CPR pause. 53 Patients also had capnography levels recorded</td>
<td>Prospective clinical observational study</td>
<td>Survival to hospital admission</td>
<td>27% (11/41) Patients with cardiac motion survived to admission vs 3% (2/61) patients with cardiac standstill 96% of EPs felt US was helpful</td>
<td>Convenience sample. No quantification of cardiac contractility. Only measured survival to admission. Small sample size. Resuscitation team not blinded to US results</td>
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</tbody>
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**Best Evidence Topic reports (BETs)** summarise the evidence pertaining to particular clinical questions. They are not systematic reviews, but rather contain the best (highest level) evidence that can be practically obtained by busy practicing clinicians. The search strategies used to find the best evidence are reported in detail in order to allow clinicians to update searches whenever necessary. Each BET is based on a clinical scenario and ends with a clinical bottom line which indicates, in the light of the evidence found, what the reporting clinician would do if faced with the same scenario again.

The BETs published below were first reported at the Critical Appraisal Journal Club at the Manchester Royal Infirmary1 or placed on the BestBETs website. Each BET has been constructed in the four stages that have been described elsewhere.2 The BETs shown here together with those published previously and those currently under construction can be seen at http://www.bestbets.org.3 Four BETs are included in this issue of the journal.


**THREE-PART QUESTION**

In (adults in cardiac arrest) does (emergency physician performed bedside trans-thoracic echocardiography) have (accurate prognostic accuracy)?
SEARCH STRATEGY
The following databases were searched:
Ovid Medline(R) 1950 to August 2011 using ((exp ultrasonography OR exp echocardiography) AND (exp cardiopulmonary resuscitation OR exp heart arrest OR cardiac arrest)). Limited to English and human. 457 papers were found of which six were considered relevant to the three-part question.

COMMENTS
Cardiac standstill on bedside echocardiography performed during cardiac arrest is an extremely poor prognostic indicator. Only 0.9% of patients with cardiac standstill across all six studies (3/320) survived to hospital admission. One study, Niendorff DF et al, demonstrated that non-emergency physicians with minimal ultrasound experience might carry out inadequate examinations and/or misinterpret the results. However, in the other four studies where this was examined, for all studying emergency physicians in EDs with formal ultrasound training programmes, there was excellent correlation between EP and radiologist interpretations and quick and reliable assessments of cardiac activity were obtained. Several cases of tamponade were identified at the bedside and emergent drainage permitted survival to hospital admission. Few physicians felt that the sonography interfered with, or delayed, resuscitation. All the studies had small sample sizes and the resuscitation teams were not blinded to the ultrasound results. However, the results were highly consistent between studies and cardiac standstill was almost universally associated with failed resuscitations.

Cardiac standstill seen on physician-performed bedside echocardiography during cardiac arrest virtually predicts unsuccessful resuscitation. Even physicians with minimal training can reliably differentiate cardiac standstill from contractile myoccardium. Experienced EP sonographers can also use bedside echocardiography to accurately diagnose reversible causes of cardiac arrest (ie, pericardial effusion, hypovolaemia, right heart strain, etc) and therefore potentially improve their patient’s prognosis by treating the underlying process.

Clinical bottom line

Cardiac standstill seen on physician-performed bedside echocardiography during cardiac arrest virtually predicts unsuccessful resuscitation. Even physicians with minimal training can reliably differentiate cardiac standstill from contractile myoccardium. Experienced EP sonographers can also use bedside echocardiography to accurately diagnose reversible causes of cardiac arrest (ie, pericardial effusion, hypovolaemia, right heart strain, etc) and therefore potentially improve their patient’s prognosis by treating the underlying process.

ACLS, advanced cardiac life support; CPR, cardiopulmonary resuscitation; ED, emergency department; EP, emergency physician; PEA, pulseless electrical activity; ROSC, return of spontaneous circulation; US, ultrasound; VWM, ventricular wall movement.

Table 1 Continued

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<td>Salen et al, 2005, USA</td>
<td>Convenience sample of 70 adult non-traumatic patients arriving to four EDs over a 12-month period in either PEA or asystole. Rapid bedside echocardiography was performed during pulse check pauses by emergency physicians</td>
<td>Prospective observational study</td>
<td>Survival of patients arriving with cardiac standstill</td>
<td>No patients with cardiac standstill on arrival (n=59) survived to leave the hospital</td>
<td>Convenience sample. Small sample size. Resuscitation teams were not blinded to US results. Most patients arrived with cardiac standstill. 17/70 Subjects did not get sequential US examinations.</td>
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<td>Tayal and Kline, 2003, USA</td>
<td>20 Adult patients arriving at the ED in non-traumatic haemodynamic collapse over an 18-month period at a level 1 trauma centre</td>
<td>Prospective observational study</td>
<td>Cardiac standstill</td>
<td>8/20 (40%) Patients were in cardiac standstill</td>
<td>Not randomised. Selection bias, (higher pre-test probability of pericardial effusion). Resuscitation team not blinded to US results. Patients not necessarily in cardiac arrest, inclusion criteria included patients with hypotension</td>
</tr>
<tr>
<td>Hayhurst et al, 2011, UK</td>
<td>Convenience sample of 56 patients in cardiac arrest recruited over a 29-month period from two hospitals. Six patients excluded because scans were performed outside the cardiac arrest period</td>
<td>Prospective feasibility study</td>
<td>Return of spontaneous circulation</td>
<td>Ventricular wall movement present in 20 cases, 11 had ROSC. 1 Patients without VWM had ROSC</td>
<td>Small study</td>
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</tbody>
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BET 2: INTRALIPID/ LIPID EMULSION IN BETA-BLOCKER OVERDOSE

Report by: Dianne Tabone, ST6 Emergency Medicine
Search checked by: Craig Ferguson, Consultant Emergency Medicine
Institution: Royal Preston Hospital, Preston, UK

ABSTRACT
A short cut review was performed to seek the evidence for use of intravenous lipid emulsion in the treatment of overdose with β-receptor antagonists. Eight case reports and one case series with a total of 10 patients were found.
Bet 1: Bedside Echocardiography for Prognosis of Emergency Department Cardiac Arrest

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