Critical Ultrasound for pre-H trauma management

Is it about time?
Critical Ultrasound for pre-H trauma management

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No significant conflicts of interest or financial relationships to disclose
What if there was something:

That Helps to quickly identify life-threatening conditions as occult bleeding, pnx

Portable on ambulance, HEMS, compact field, pts house…. 

No side effects

Easy to use

Would You Use It?
The Big Questions
The Big Questions

**IS THERE SOME LIFE-THREATENING CONDITION?**

**THE PROBABILITY OF DEATH INCREASE APPROXIMATELY 1% FOR EVERY 3 MINUTES IN THE ED**

Clarke, J Trauma, 2002

**STAY AND PLAY?**
Critical Ultrasound for trauma

Hemorrhagic Shock remains the major cause of preventable death in trauma patients

Stopping hemorrhage remains a mainstay of trauma care

Abdominal bleeding is the “big boss”
IDENTIFYING AND TREATING REVERSIBLE CAUSES OF CARDIOPULMONARY ARREST
Emergency ultrasound can be classified into the following functional clinical categories:

1. **Resuscitative**: ultrasound use as directly related to resuscitation or stabilization of the patient.

Ultrasound used in a trauma context is often categorized by its role or sign (e.g., short-axis view of the heart, FAST scan). These ultrasound techniques are used as an alternative to more invasive procedures.

**ATLS® 2004, 7th ed.**

**FAST included in trauma algorithms**
A Prospective Study of Surgeon-Performed Ultrasound as the Primary Adjuvant Modality for Injured Patient Assessment.


Emergency echocardiography to detect pericardial effusion in patients in PEA and near-PEA states.

# Cardiac Arrest and Hypotension

US protocols

<table>
<thead>
<tr>
<th>YEAR</th>
<th>UHP</th>
<th>AE JONES (UHP*)</th>
<th>TRINITY</th>
<th>FATE</th>
<th>FEER</th>
<th>BLUE</th>
<th>CAUSE</th>
<th>ACES</th>
<th>RUSH (SW)</th>
<th>RUSH (DM)</th>
<th>FEEL</th>
<th>CORE</th>
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<tbody>
<tr>
<td>WHO</td>
<td>Rose</td>
<td>Jones</td>
<td>Bahner</td>
<td>Jensen</td>
<td>Breitkreutz</td>
<td>Lichtenstein</td>
<td>Hernandez</td>
<td>Atkinson</td>
<td>Weingart</td>
<td>Mandavia</td>
<td>Breitkreutz</td>
<td>Wu</td>
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</table>

Cardiac

- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes

.LX

- Yes
- AND
- AND
- AND
- AND
- AND
- AND
- AND
- AND
- AND

.PSLA

- Yes
- AND
- AND
- AND (or PSSA)
- OR
- AND
- AND
- AND
- AND
- AND

.A4G

- Yes
- AND
- AND
- OR
- AND
- AND
- AND
- AND
- AND
- AND

Lung

- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes

FAST

- Yes
- RUQ, PELVIS
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes

Aorta

- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes

IVC

- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes

DVT

- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes

ETT

- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes

2013 International Trauma Life Support Conference
Vancouver, BC
"Explorations with ultrasounds are possible and desirable when a medicalized transport is needed, allowing an early diagnosis of certain severe thoraco-abdominal lesions or of the limbs for the implementation of treatments or of intensive care gestures on field, to orient directly the patient to the best adapted center in its state, to inform the hospital team of the precise lesions, in order not to waste an invaluable time from the accident to the treatment and to ensure transport with a better safety."

The RUSH Exam:
Rapid Ultrasound in Shock in the Evaluation of the Critically Ill

Phillips Perera, T. Mailhot, D. Riley, D. Mandavia

THE "PUMP"

THE "TANK"

THE "PIPES"
“LEVEL 1” ULTRASOUND GOALS in TRAUMA CRITICAL CARE

1. “ABCDE” PRIMARY ASSESSMENT  (Vital signs, anomalies, detectable causes, responses, complications)

   A. AIRWAY: Airway patency & obstructive causes
      CERVICAL US
      LUNG US
      ECHOCARDIO
      VASCULAR US
      ABDOMINAL US
      SOFT TISSUE US
      CRANIAL US
      Miscellanea
      DISABILITY: Neurologic status & coma/focal signs causes
      EXPOSURE: Exclude missed findings

   B. BREATHING: Respiratory performance & dyspnea/hypoxemia causes

   C. CIRCULATION: Haemodynamics & shock /hypotension causes

ULTRASOUND ENHANCED CRITICAL MANAGEMENT CYCLE:
1) Primary “ABCDE” Assessment
2) Resuscitation
3) Secondary “Head-to-toe” Assessment
4) Intensive / Definitive Care
5) Continuing Follow Up

- Treatment or management readapted in 30%
- Final destination changed in 22%

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<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Accuracy</th>
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<tbody>
<tr>
<td>Physical Examination + PFAST</td>
<td>93%</td>
<td>99%</td>
<td>99%</td>
</tr>
<tr>
<td>Physical Examination alone</td>
<td>73%</td>
<td>52%</td>
<td>57%</td>
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Scanning was made 35 minutes earlier with PFAST than ED US.
Additional Studies

Optimized management of polytraumatized patients by prehospital ultrasound

Accuracy of prehospital focused abdominal sonography for trauma after a 1-day hands-on training course

Ultrasound in pre-hospital care
ONCE UPON A TIME...

CARDIAC ULTRASOUND

HEPATOBILIARY ULTRASOUND

NECK ULTRASOUND

PELVIC ULTRASOUND

RENAL ULTRASOUND

VEIN ULTRASOUND
RESPIRATORY DISTRESS

SHOCK

ABDOMINAL PAIN

CHEST PAIN

ULTRASOUND IN...

TRAUMA

SYNCOPE
GOAL-DIRECTED ABDOMINAL ULTRASONOGRAPHY: IMPACT ON REAL-TIME DECISION MAKING IN THE EMERGENCY DEPARTMENT


CLINICAL EVALUATION (200 Paz.)

LOW CERTAINTY OF DISEASE 50
MODERATE CERTAINTY OF DISEASE
HIGH CERTAINTY OF DISEASE

LOW CERTAINTY OF DISEASE
MODERATE CERTAINTY OF DISEASE 108
HIGH CERTAINTY OF DISEASE

LOW CERTAINTY OF DISEASE
MODERATE CERTAINTY OF DISEASE
HIGH CERTAINTY OF DISEASE 42

CLINICAL EVALUATION + “EU”

39
4
7

52
4
52

8
1
33
92
“That it will ever come into general practice, I am extremely doubtful; but it is the only way of providing a constant and adequate education required by the business of modern life. A good bit of this business is done behind the back, and the

J. For.

Preface

London Times, 1834
“ABCDE”

VISUAL MANAGEMENT vs BLIND MANAGEMENT