# Critical Ultrasound for pre-H trauma management

Is it about time?



# Critical Ultrasound for pre-H trauma management

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ITLS Italian Chapter Medical Director

No significant conflicts of interest or financial relationships to disclose



## What if there was something:

That Helps to quickly identify lifetreatening conditions as occult bleeding, pnx

Portable on ambulance, HEMS, combact field, pts house....

No side effects

Easy to use

## Would You Use It?

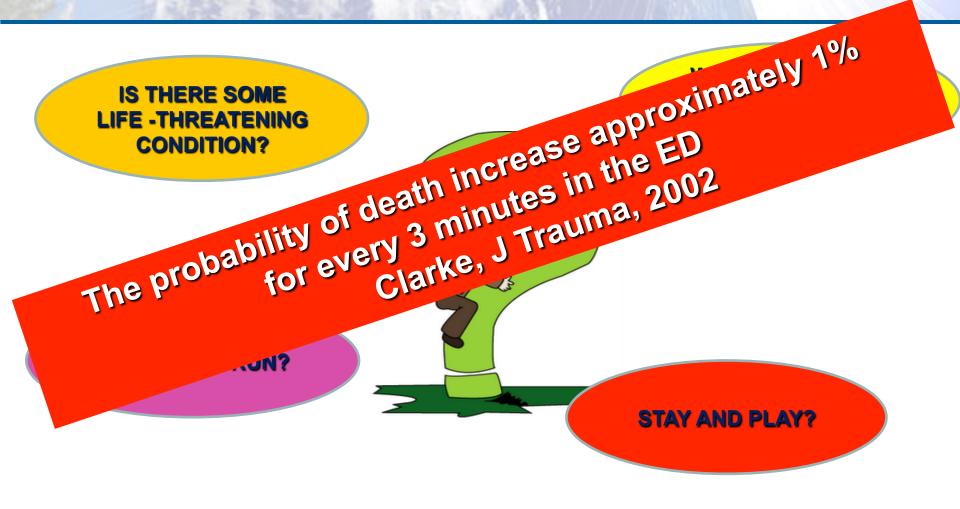


# The Big Questions





# The Big Questions





### Critical Ultrasound for trauma

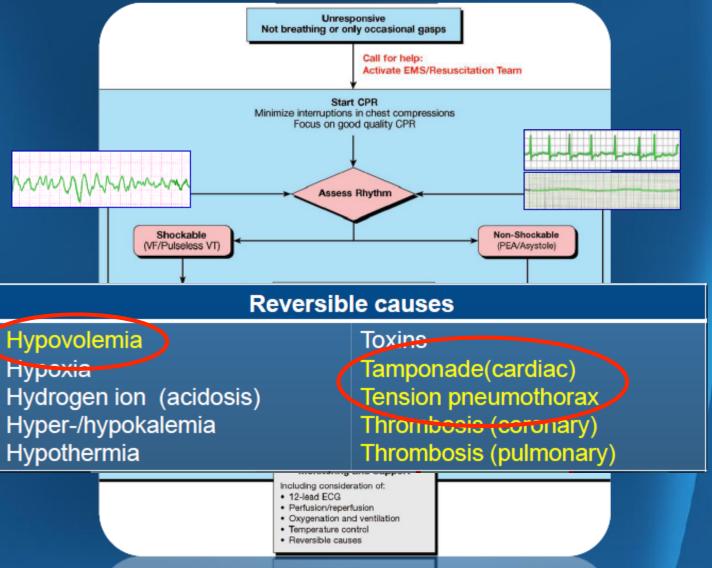
Hemorrhagic Shock remains the major cause of preventable death in trauma patients

Stopping hemorrhage remains a mainstay of trauma care

Abdominal bleeding is the "big boss"



### Cardiac Arrest & Periarrest Management



2010 International Consensus on CPR and ECC Science With Treatment Recommendations



# IDENTIFYING AND TREATING REVERSIBLE CAUSES OF CARDIOPULMONARY ARREST







## ACEP POLICY STATEMENT

Emergency ultrasound can be classified into the following functional clinical

categories:

1. Resuscitative: ultrasound use as directly relate

aluman institute of Ultrasound in Medicine

ATLS® 2004, 7<sup>a</sup> ed.



FAST included in trauma algorithms

asound used in a or sign (eg, shoi

zed in an emergent

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: ultrasound use

e of Emergency Physician

9911 • Dallas, TX 752

AlUM Practice Guideline for the Performance of the Focused Assessment With Sonography for Trauma (FAST) Examination



aium

Resuscitation 59 (2003) 315-318



www.elsevier.com/locate/resuscitation

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

American Journal of Emergency Medicine (2005) 23, 459-462

Abstract

Objectives: electric activity effusion in par patients with: period. Outcom operation or a were without

Americ Lineage

The Journal of

Injury, Infection and Critical Care

Resuscitation (2008) 76, 198-206



available at www.sciencedirect.com journal homepage: www.elsevier.com/locate/resuscitation



CLINICAL PAPER

C.A.U.S.E.: Cardiac arrest ultra-sound exam— A better approach to managing patients in primary non-arrhythmogenic cardiac arrest\*

Caleb Hernandeza, Klaus Shulera, Hashibul Hannana, Chionesu Sonyikaa, Antonios Likourezos a, \*, John Marshalla, b

> of Emergency Medicine, Malmonides Medical Center, 4802 Tenth Avenue, Brooklyn, NY 11219, United States School of Medicine, One Gustave L. Levy Place, New York, NY 10029, United States

ebruary 2007; received in revised form 21 June 2007; accepted 25 June 2007

RESUSCITATION



A Prospective Study of Surgeon-Performed Ultrasound as the Primary Adjuvant Modality for Injured Patient Assessment.

Rozycki GS, Ochsner M, Gage M, et al, Journal of Trauma, 39(3):492-500,1995.

c evaluation in resuscitation

management: Concept of an advanced life support-conformed algorithm

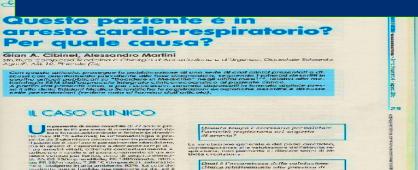
Raoul Breitkreutz, MD; Felix Walcher, MD, PhD; Florian H. Seeger, MD

Emergency ultrasound is suggested to be an important tool in minimal interruptions to reduce the no-flow intervals. However,

critical care medicine. Time-dependent scenarios occur during preresuscitation care, during cardiopulmonary resuscitation, and In postresuscitation care. Suspected myocardial insufficiency due to acute global, left, or right heart failure, pericardial tamponade, and hypovolemia should be identified. These diagnoses cannot be made with standard physical examination or the electrocardiogram. Furthermore, the differential diagnosis of pulseless electrical activity is best elucidated with echocardiography. Therefore, we developed an algorithm of focused echocardiographic evaluation in resuscitation management, a structured process of an advanced life support-conformed transthoracic echocardiography protocol to be applied to point-of-care diagnosis. The new 2005 American Heart Association/European Resuscitation Councii/international Liaison Committee on Resuscitation guidelines recommended high-quality cardiopulmonary resuscitation with

they also recommended identification and treatment of reversible causes or complicating factors. Therefore, clinicians must be trained to use echocardiography within the brief interruptions of advanced life support, taking into account practical and theoretical considerations. Focused echocardiographic evaluation in resuscitation management was evaluated by emergency physicians with respect to incorporation into the cardiopulmonary resuscitation process, performance, and physicians' ability to recognize characteristic pathology. The aim of the focused echocardiographic evaluation in resuscitation management examination is to improve the outcomes of cardiopulmonary resuscitation. (Crit Care Med 2007; 35[Suppl.]:S150-S161)

Key Words: emergency echocardiography; focused echocardiographic evaluation in resuscitation; resuscitation; cardiopulmonary resuscitation; algorithm; critical care ultrasound



ography system was cre ember 1, 2003 and Apri ound examination desig arrest alert to sonograp cy ultrasound examination 3 min). Three of these apher and echocardiogra nography can be success when sufficiently trains All rights reserved. ivity (PEA); Cardiopulmo

ardiac ultrasound assess

lal Trauma Vancouv

# Cardiac Arrest and Hypotension US protocols

	UHP	AE JONES (UHP+)	TRINITY	FATE	FEER	BLUE	CAUSE	ACES	RUSH (SW)	RUSH (DM)	FEEL	CORE
YEAR	2001	2004	2002	2004	2007	2008	2008	2009	2009	2010	2010	unpub (2010)
WHO	Rose	Jones	Bahner	Jensen	Breitkreutz	Lichtenstein	Hernandez	Atkinson	Weingart	Mandavia	Breitkreutz	Wu
Cardiac	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
SX		Yes	AND	AND	AND		OR		AND	AND	AND	
PSLA		Yes	AND	AND	AND (or PSSA)		OR		AND	AND	AND	
A4C		Yes		AND	AND		OR		AND	AND	AND	
Lung				Yes		Yes	Yes		Yes	Yes		Yes
FAST	Yes	RUQ, PELVIS	Yes					Yes	Yes	Yes		
Aorta	Yes	Yes	Yes					Yes	Yes	Yes (and suprasternal)		Yes
IVC		Yes						Yes	Yes	Yes		Yes
DVT										Yes		Yes
ETT												Yes



### Usefulness, feasibility, added value...

"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."

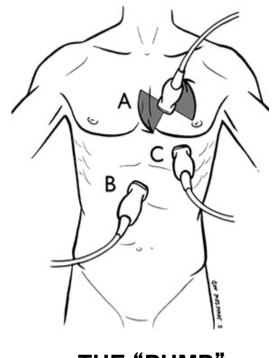
Massen H, Mercat C. Intérêt des explorations par les ultrasons dans les véhicules de transport primaires d'urgence des malades ou blessés. Rev SAMU. 1983;7:321-4.

36

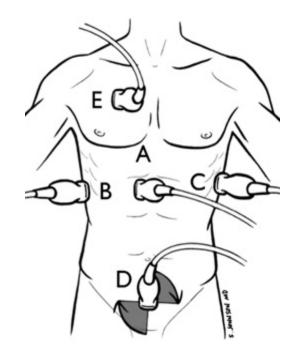
#### The RUSH Exam:

Rapid Ultrasound in SHock in the Evaluation of the Critically III

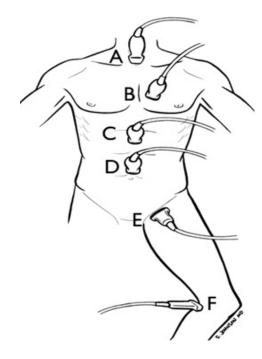
Phillips Perera, T.Mailhot, D. Riley, D. Mandavia



THE "PUMP"



THE "TANK"



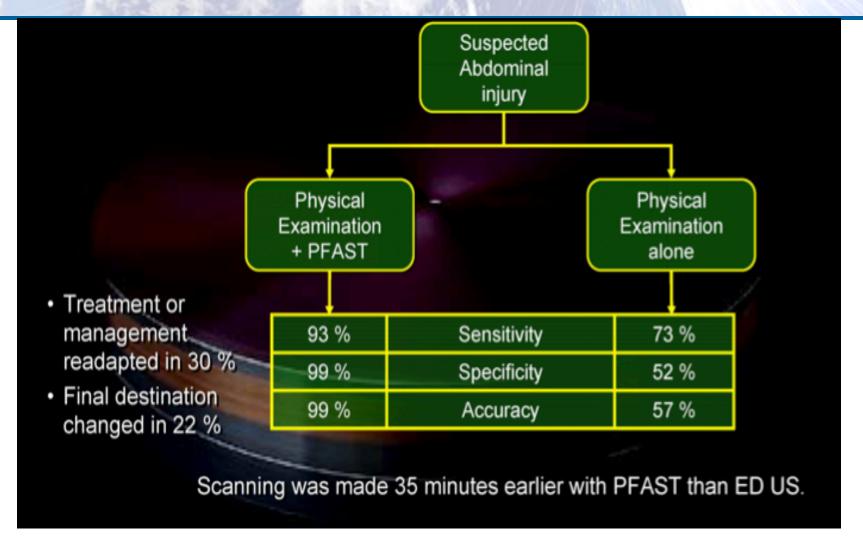
THE "PIPES"



#### "LEVEL 1" ULTRASOUND GOALS in TRAUMA CRITICAL CARE "ABCDE" PRIMARY ASSESSMENT (Vital signs, anomalies, detectable causes, responses, complications) AIRWAY: Airway patency & obstructive causes **ULTRASOUND ENHANCED** BREATHING: Respiratory performance & dyspnea/hypoxiemia causes CRITICAL MANAGEMENT CYCLE: B CIRCULATION: Haemodinamics & shock 1) Primary "ABCDE" Assessment CERVICAL US /hypothension causes 2) Resuscitation C 3) Secondary "Head-to-toe" Assessment 4) Intensive / Definitive Care **LUNG US** 5) Continuing Follow Up **ECHOCARDIO** Airway patency (ventilation) **VASCULAR US** Tracheal lesions /emphysema Ventilation 26 Tracheal Emphysema **DISABILITY**: Neurologic status ABDOMINAL US displacement Pneumothorax & coma/focal signs causes Heart performance Compressive Pleural fluid 26 D (rythm, contractility, haematoma Atelectasia **EXPOSURE**: Exclude SOFT TISSUE US Prandial status volume, ratio) Dyaphr, lesions missed findings Miocard, failure Multiple fractures Caval vein asset E Pericardial fluid/ (volume, responsiv.) Deep venous tamponade CRANIAL US Acute dilation thrombosis Peritoneal fluid Valvular lesions (limbs, iliac, (FAST, abdominal) Pulm. embolysm subclavian) Miscellanea Haematomas ++ Large haematomas (parenchymal, (chest and sub-capsular, abdominal wall, pre- & retrolimbs, pelvis, Optic nerve enlarg. periton, spaces, perineum) Pupilla reflexes\* retro-placentar) Peripheral pulse Midline shift\* Preventing missed Neonatal/Infant assessment life-threatning lesions



Walcher F, Weinlich M, Conrad G, Schweigkofler U, Breitkreutz R, Kirschning T, Marzi I. Prehospital ultrasound imaging improves management of abdominal trauma. Br J Surg. 2006 Feb;93(2):238-42.



## **Additional Studies**

Optimized management of polytraumatized patients by prehospital ultrasound Walcher F, Kortum S, Kirschning T, Weihgold N, Marzi I. *Unfallchirurg*.2002;105:986-94

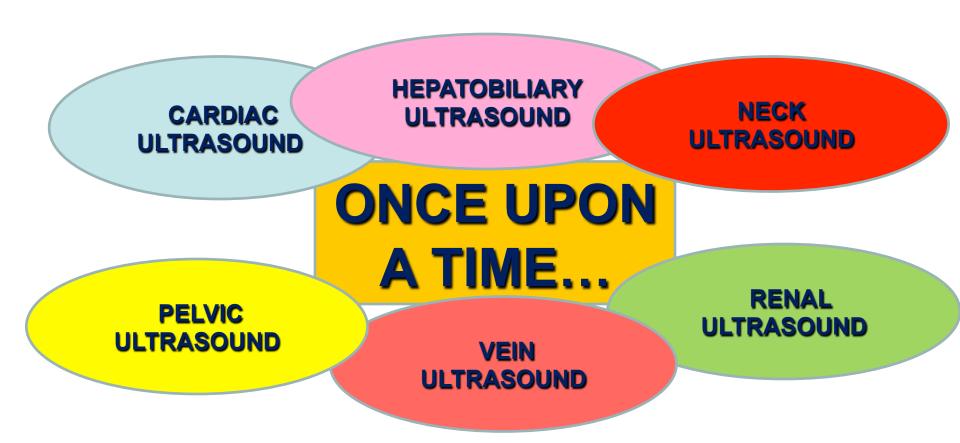
## Accuracy of prehospital focused abdominal sonography for trauma after a 1-day hands-on training course

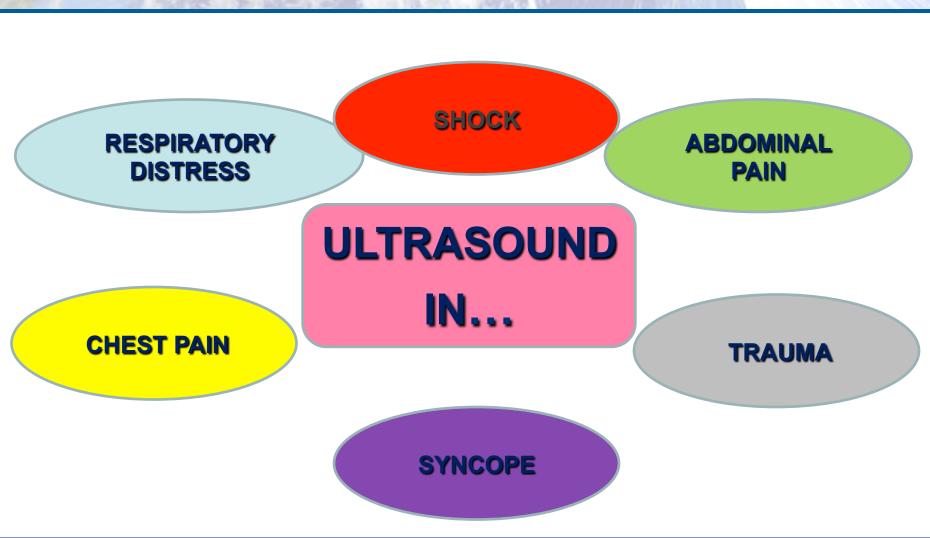
F. Walcher, T. Kirschning, R. Breitkreutz et al, Emerg Med J 2010;27:345-349

#### Ultrasound in pre-hospital care

Knudsen L, Sandberg M, Acta Anaesthesiol Scand 2011;55:377-378









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

D. Bassier, et all. J. Emerg Med, 24:4, 2003

#### CLINICAL EVALUATION (200 Paz.)

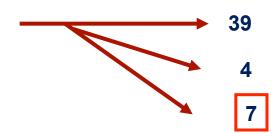
LOW CERTAINTY OF DISEASE

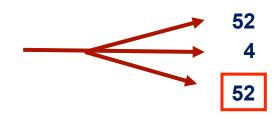
**50** 

**MODERATE CERTAINTY OF DISEASE** 

HIGH CERTAINTY OF DISEASE

CLINICAL EVALUATION +"EU"





LOW CERTAINTY OF DISEASE

MODERATE CERTAINTY OF DISEASE 108

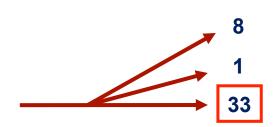
HIGH CERTAINTY OF DISEASE

LOW CERTAINTY OF DISEASE

MODERATE CERTAINTY OF DISEASE

HIGH CERTAINTY OF DISEASE

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"That it will ever come into general practice, I am extremely doubtful;

be requir of tr ation good bit nd the

J. For Preface

eatise"

London Times, 1034

# "ABCDE"

VISUAL MANAGEMENT

VS

BLIND MANAGEMENT