CARDIAC ARREST ULTRASOUND

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Point of Care Ultrasound provides important **diagnostic**, **procedural** and **prognostic** guidance in the management of patients in cardiac arrest. To use ultrasound effectively to guide resuscitation, it is important to have a predefined strategy to incorporate insonation into the flow of ACLS care.

Diagnostic point of care ultrasound in Cardiac Arrest

VF/VT – ultrasound plays a limited role. May be useful in differentiation fine ventricular fibrillation from asystole.

PEA/Asystole – ultrasound has greater utility. PEA/Asystole arrests have a much broader differential than VF/VT. Many causes of PEA/Asystole can be uncovered by ultrasound.

Hypovolemia	**Tension Pneumothorax**
Hypoxia	**Tamponade (Cardiac)**
H+ Ion (Acidosis)	Toxins
Hypo/Hyperkalemia	**Thrombosis (PE)**
Hypothermia	Thrombosis (ACS)

Table 1. Differential Diagnosis of PEA/Asystole. The "H"s and "T"s. US definable etiologies are bolded.

A number of protocols have been designed for both cardiac arrest and the intimately related problem of unexplained hypotension.

	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

Table 2. Cardiac Arrest and Hypotension US protocols

Of these protocols, the one which includes only those elements we find essential and performable during a cardiac arrest is the RUSH exam. With the current paradigm of minimally interrupted CPR, the views obtained need to be split between those that can be performed during chest compressions and those that must be done with a still chest – i.e. during the rhythm or pulse check. The RUSH exam can be tweaked to allow this separation as noted below in Figure 1.

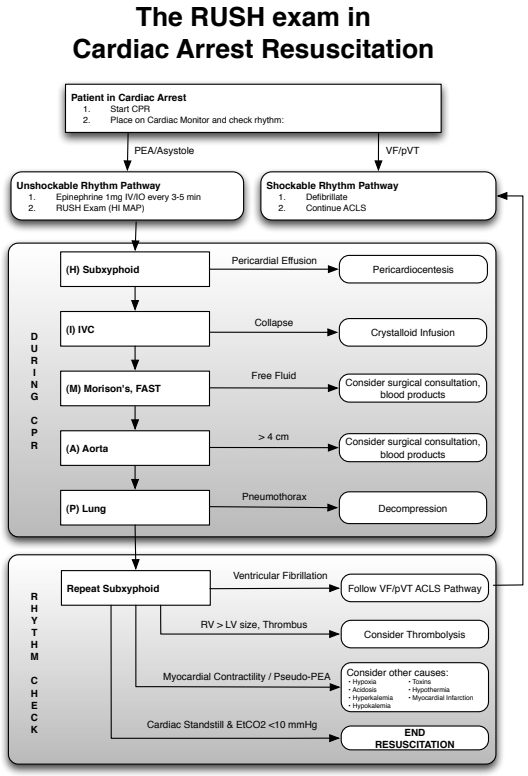

Figure 1. The RUSH Exam in Cardiac Arrest Resuscitation. (see last page)

In addition to a formal, algorithmic approach to the integration of ultrasound into ACLS, the ultrasound machine itself needs to be integrated into the team roles and positioning. As in trauma codes, when cardiac arrest team members have designated places and roles, resuscitation is run most efficiently. Figure 2. demonstrates the optimal placement of the team member assigned to sonography.

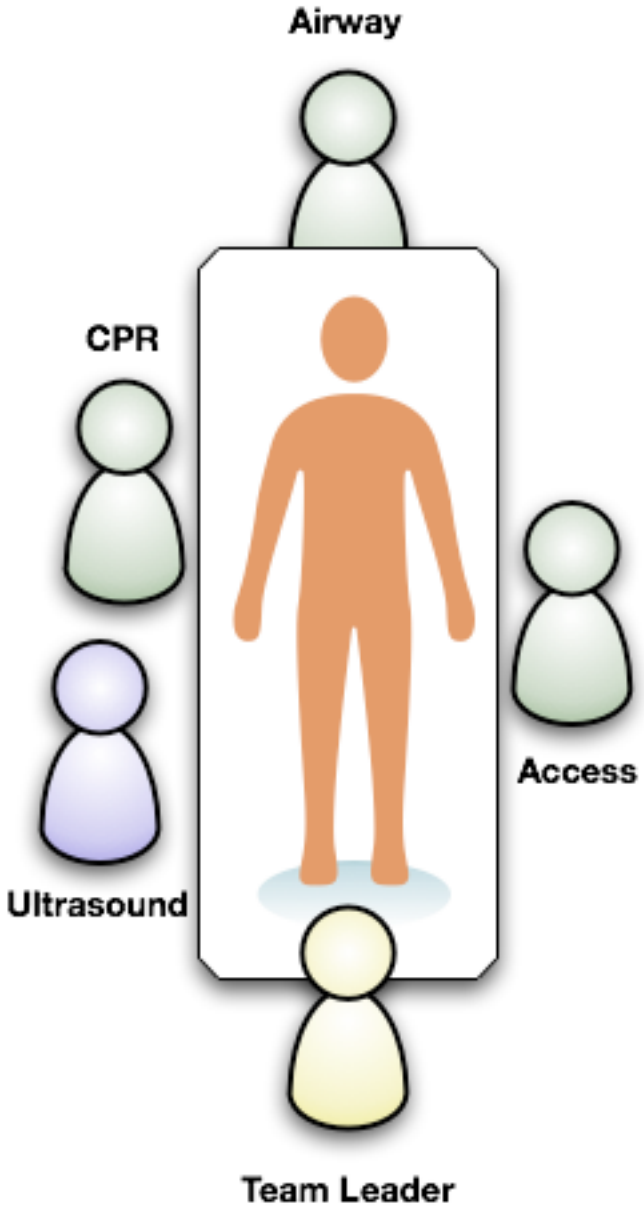

Figure 2. Cardiac arrest team positions and roles.

For efficiency, limit yourself to scanning with one multifunctional probe if for your cardiac arrest patients. This can be either a large curvilinear or a phased array transducer.

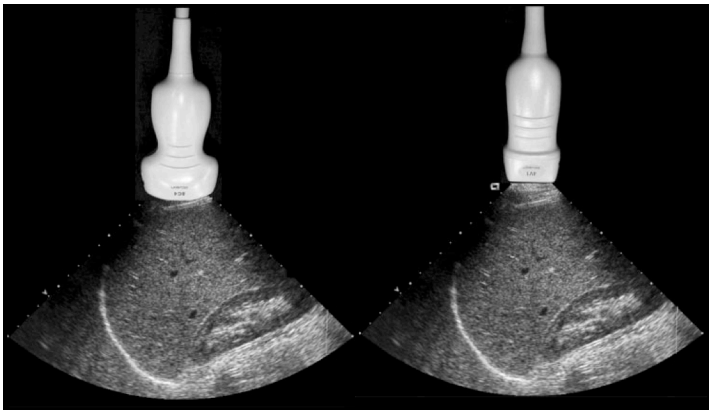

Figure 3. Curvilinear and Phased array transducers

Prognostic utility of ultrasound in cardiac arrest

Cardiac standstill carries exceedingly poor prognostic value. Most studies have shown no survival when standstill is seen on intraarrest echo (Blaivas, Salen). Of those few cases where patients survived to admission, no cases of survival with good neurologic outcome have been published.

Standstill can be documented as a video clip. Or with m-mode through the still heart.

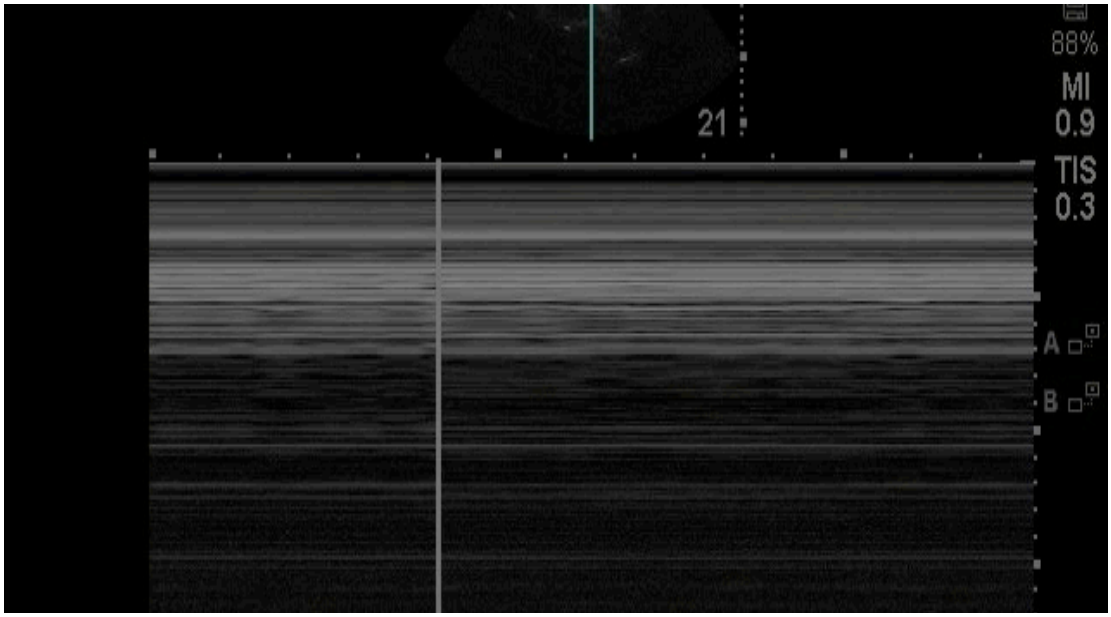

Figure 3. Cardiac Standstill on M-Mode

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The RUSH exam in Cardiac Arrest Resuscitation