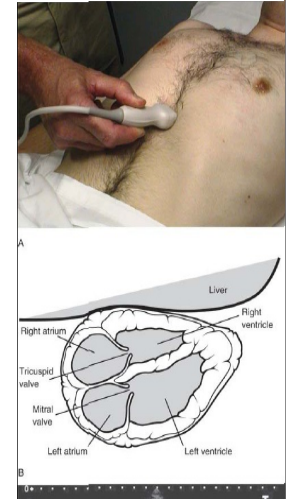


**1st INTERNATIONAL
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ROLE OF PERI-ARREST ULTRASOUND AND ECHOCARDIOGRAPHY

Cuma Yildirim
yildirimca@hotmail.com

- **Echocardiography is the gold standard for the diagnosis of many cardiac and pericardial abnormalities**
- In addition, echocardiography provides critical information about cardiac structure and function in real time
- Since it is impossible for expert echocardiographers to be present in a timely manner for most critical resuscitations, emergency physicians have begun to incorporate focused bedside echocardiography into their daily clinical practice

- Focused ultrasonography has emerged as a useful diagnostic tool for a variety of life threatening conditions in the emergency setting
- As an emergency doctor is faced with periarrest conditions, rapid and safe interpretation of the clinical picture may improve patient outcome

- No studies specifically examine the impact of echocardiography on patient outcomes in cardiac arrest
- However, a number of studies suggest that transthoracic and transesophageal echocardiography have potential utility in diagnosing treatable causes of cardiac arrest such as **cardiac tamponade, pulmonary embolism, ischemia, and aortic dissection**
- Transthoracic or transesophageal echocardiography may be considered to diagnose treatable causes of cardiac arrest and guide treatment decisions (Class IIb, LOE C)

- Primary indications for performing focused echocardiography include
 - Cardiac arrest
 - Pericardial effusion
 - Massive pulmonary embolism
 - Assessment of left ventricular function
 - Unexplained hypotension
 - Estimation of central venous pressure, and
 - External cardiac pacing
- Other indications that require more training and experience with focused echocardiography include
 - Severe valvular dysfunction
 - Proximal aortic dissection, and
 - Myocardial ischemia

1-CARDIAC ARREST

- Bedside echocardiography allows clinicians to directly visualize the heart and determine the presence and quality of mechanical cardiac function during a cardiac arrest
- If a carotid pulse is absent but echocardiography shows reasonable mechanical cardiac function, then clinicians should proceed with aggressive resuscitation

Pseudo Periarrest and True Periarrest

The complete absence of motion of the heart, visible only with echocardiography, allows us to identify true periarrest in a patient with no central arterial pulse

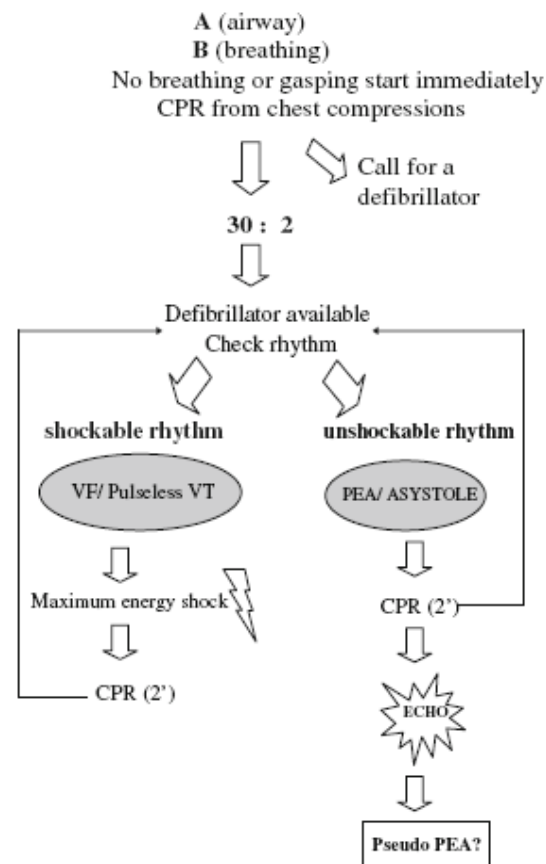


Fig. 42.1 Ultrasonographic assessment during advanced life support

- Pseudo periarrest is defined as the presence of residual wall motion with no central pulse. This is often due to severe cardiogenic shock and pump failure
- This echo pattern is more likely to be restored to that for spontaneous circulation compared with true periarrest
- Thus, aggressive searching for and removal of the causes is paramount

2-PULSELESS ELECTRICAL ACTIVITY (PEA)

- PEA are hypovolemia, hypoxia, acidosis, hypo/hyperkalemia, hypoglycemia, hypothermia, drug overdose, cardiac tamponade, tension pneumothorax, massive myocardial infarction, and massive pulmonary embolism (PE)
- Some of them such as, Hypovolemia, cardiac tamponade, massive PE, and massive myocardial infarction can be detected by bedside echocardiography so that early aggressive management of these abnormalities can then be instituted

- In current practice, many emergency physicians use echocardiography to confirm cardiac standstill before terminating resuscitation in all cardiac arrests
- Beyond predicting the outcome of resuscitation, echocardiography is essential in helping to rapidly identify the cause of the cardiac arrest since PEA is often associated with specific clinical states that may be readily reversed when identified and treated appropriately

- In cardiac arrest with PEA, it is critical to determine whether the patient has true electromechanical dissociation (EMD) with cardiac standstill or pseudo-EMD with mechanical cardiac contractions too weak to generate a palpable blood pressure
- Some patients thought to be in cardiac arrest have extreme hypotension
- Other patients with PEA have cardiac tamponade, massive PE, or severe left ventricular dysfunction
- All of these conditions can be detected with bedside transthoracic echocardiography. It can be performed serially during a critical resuscitation as long as the examination itself does not interfere with resuscitative efforts

3-PERICARDIAL EFFUSION AND PERICARDIOSENTESIS

Most patients with a pericardial effusion are stable and have nonspecific symptoms such as **dyspnea, chest pain, cough, or fatigue**

- When a pericardial effusion develops acutely, tamponade can occur with as little as 150 mL of fluid.
- Because the parietal pericardium can stretch over time, a chronic effusion can have a volume of more than 1000 mL without causing tamponade
- Echocardiography is now the standard means to evaluate for cardiac tamponade and can also be used to guide pericardiocentesis

Effusions can be categorized by the maximal width of the echogenic pericardial stripe

A stripe less than 10 mm is small, 10–15 mm is moderate, and greater than 15 mm is large



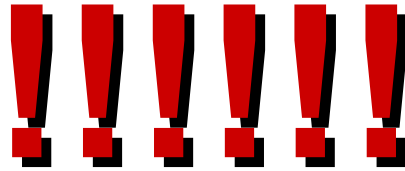
Source: Tintinalli JE, Stapczynski JS, Ma OJ, Cline DM, Cydulka RK, Meckler GD: *Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 7th Edition*; <http://www.accessmedicine.com>
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Classification of pericardial effusion by the European Society of Cardiology

Classification of pericardial effusion	Dimension in diastole (mm)	Location
Small	<10	Posterior atrioventricular groove
Moderate	10–20	
Large	>20	Usually extends behind the left atrium, may determine a compression of the heart
Very large	>20	Extends behind the left atrium and determines a compression of the heart

4- MASSIVE PULMONARY EMBOLISM

- Massive PE is responsible for about 10% of cardiac arrests in cases where a primary cardiac etiology is clinically suspected
- The routine use of bedside echocardiography in cardiac arrest may allow immediate detection of massive PE, even in cases where the diagnosis is not clinically suspected



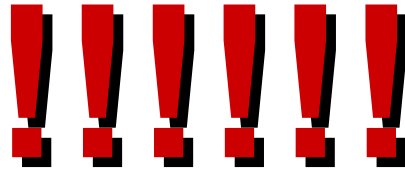
Echocardiography can also help exclude
diagnoses that **mimic PE** such as
pericardial tamponade, pneumothorax,
and myocardial infarction

5-ASSESSMENT OF LEFT VENTRICULAR FUNCTION

Echocardiography is the preferred **first-line test** for patients with symptoms or signs consistent with left ventricular dysfunction.

6-UNEXPLAINED HYPOTENSION

- Unexplained hypotension or shock is a common presentation in the emergency department or critical care setting.
- A simple assessment of global cardiac function and chamber size allows clinicians to assign hypotensive patients to one of four diagnoses:
 - Cardiogenic shock from severe left ventricular dysfunction,
 - Cardiac tamponade,
 - Massive PE, or
 - Severe hypovolemia.



When hypovolemic shock is suspected from echocardiographic findings, a search for hemorrhagic etiologies may include sonographic examinations for free intraperitoneal fluid and ruptured abdominal aortic aneurysm

7-ESTIMATION OF CENTRAL VENOUS PRESSURE

- Assessment of the size and respiratory variations of the proximal IVC can provide information about central venous pressure (CVP) and fluid status. The IVC can dilate or collapse depending on intraluminal pressure

- Bedside serial ultrasonographic measure of RV and IVC diameters, which is a noninvasive method for emergency physicians, may be a useful tool to detect and follow-up hypovolemia and evaluate the adequacy of volume replacement



8-EXTERNAL CARDIAC PACING

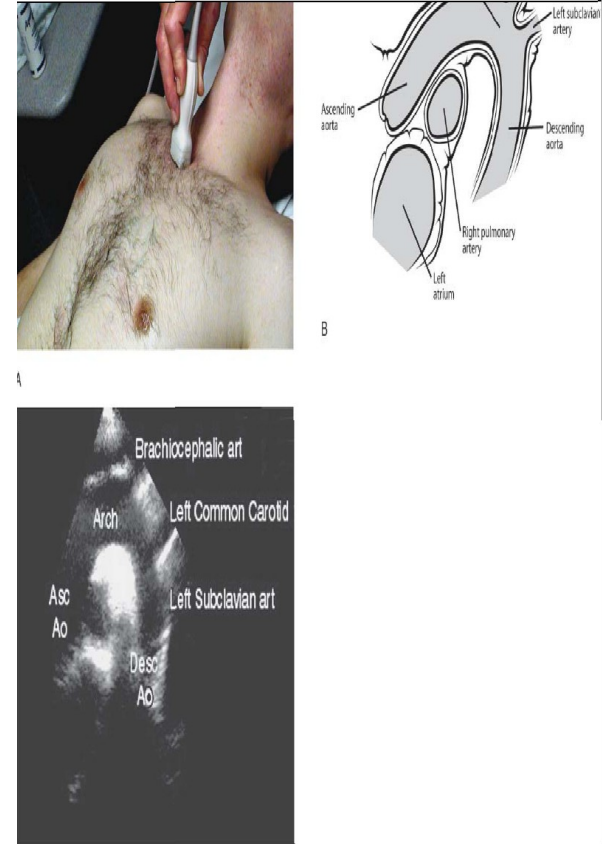
- Bedside echocardiography can also be used to help guide placement of a temporary transvenous pacemaker wire
- Emergency physicians have used echocardiography guidance to correctly place pacer wires into the apex of the right ventricle and confirm ventricular capture with excellent success

9-VALVULAR ABNORMALITIES

- Valvular dysfunction and structural abnormalities have not traditionally been a focal part of the emergent echocardiography examination
- In select cases of acute hemodynamic compromise, detection of significant valvular abnormalities by echocardiography may be life-saving

10-AORTIC DISSECTION

Aortic dissection and intramural hematoma may be detected by transthoracic echocardiography on parasternal long, parasternal short, and suprasternal views



11-MYOCARDIAL ISCHEMIA

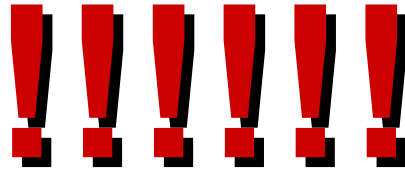
The diagnosis of acute myocardia ischemia can be made by echocardiographic findings of wall motion abnormalities. Myocardial function is immediately affected by ischemia and may precede ECG changes. New regional wall motion abnormalities, however, may be difficult to differentiate from old wall motion changes without reviewing prior echocardiograms

As a result..

During the last years, there is a growing
body of evidence that noncardiologists
can use focused echocardiography safely
and accurately in a variety of clinical
settings

As a result..

Focused transthoracic echocardiography is
an **ideal diagnostic tool** for detecting life-
threatening cardiac conditions in the
emergency department



Bedside focused echocardiography is now
the standard of care for patients with
potential penetrating cardiac injuries

As a result..

- A circular was published in 2009 in Turkey.
- With this circular, it was to the obligation of possession with the USG in level 3 emergency departments.
- Actually, this must be an opportunity for us
- All resuscitation process should be obliged to use bedside USG

As a result..

On the other hand..

- Bedside Ultrasound could not get its rightful place 2010 AHA guidelines
- The reason for this, there is not enough publication in this area, **especially in Turkey**
- We hope that, the more researches is published in this issue



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Thanks for attention