POCKET vs. FoCUS vs. FULL Echo in Emergency CV Care

Aleksandar N. Nešković

Clinical Hospital Center Zemun
Belgrade University School of Medicine
Ultrasound Imaging of the Heart

- Comprehensive (standard) echocardiography
- Emergency echo
- Goal-oriented echo
- FoCUS
- Limited echocardiography
- Hand-held US exam …
Chest pain, Successful CPR in ambulance, Shock
Shock after CPR
Shock after CPR
Shock after CPR

Referred for emergent surgery!
Is it really important how we name this examination and/or which imaging device is used, if it may save a life?
Why it may be important how we name this examination and/or which imaging device is used, in order to save a life?
POCKET vs. FoCUS vs. FULL echo in Emergency CV Care

1. Perspective and goals
2. Terminology
3. Arguments and philosophy
4. Reaching competence
5. Take Home Message
POCKET vs. FoCUS vs. FULL echo in Emergency CV Care

1. Perspective and goals
2. Terminology
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Cardiac/Cardiac-Like Emergencies in ED

Causes

- ACS
- Acute Aortic Syndrome
- Acute Pulmonary Embolism
- ADHF
- Pneumothorax
- Acute pericarditis
- Tamponade
- Acute valve regurgitations
- Prosthetic valve dysfunction

Chest pain
Dyspnea
Shock
New murmur
Chest trauma
Cardiac arrest/CPR
Cardiac Emergencies

Examination (diagnostic work-up)

**Accurate information**

Decision making

Treatment
Ideally...

• Experienced practitioner (always)

• Fully trained both in echo and acute/intensive cardiovascular care

• Fully equipped echo system
Reality...

• Fully trained practitioners **NOT available** everywhere

• It is **impossible** (and **NOT necessary**) to be always comprehensive

• **Variety of US machines** in use

• What really matters is: **INFORMATION**!

• **Team work** is crucial
POCKET vs. FoCUS vs. FULL echo in Emergency CV Care

1. Perspective and goals
2. Terminology
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Emergency echocardiography: the European Association of Cardiovascular Imaging recommendations

Aleksandar N. Neskovic1, André Milliez2, Fabio Guarracino3, Albert Vargha2, Bogdan A. Popescu8, Luna Gargasli6, Sirpa Helle8, and on behalf of the European Association of Cardiovascular Imaging

1University Clinical Hospital Center Zemun, Faculty of Medicine, University of Belgrade, Dermatologije, Abteilung für Kardiologie und Angiologie, Universitätsklinikum Hamburg-Eppendorf, Department of Cardiology, CHU Sart Tilman, University of Liège, Cardiology Center, University of Liège, Belgium; 2Department of Medicine and Cardiology Center, University of Liège, Belgium; 3Academic Hospital, Uppsala University, Uppsala, Sweden; 4Cardiovascular Department, National University Hospital, Singapore; 5Karolinska Institutet, Stockholm, Sweden; and 6Cardiology Department, University Hospital of Trieste, Trieste, Italy.

Received 24 July 2012; accepted after revision 30 October 2012

Focus cardiac ultrasound: the European Association of Cardiovascular Imaging viewpoint

ESC European Society of Cardiology

Focus cardiac ultrasound core curriculum and

Emergency echocardiography

“Goal-oriented” (targeted) echocardiography

FoCUS
FoCUSB ≠ Emerg Echo

- Point-of-care
- Standardized, but **restricted** scanning protocol
- **Operator responsible** for decision making/Th
- Training in FoCUSB (not necessarily in ECHO!)
- Often HUD

- Comprehensive, standard echo
- **FULL study** of heart morphology and function
- **Independent** operator
- **Full training** in ECHO
- Fully equipped ECHO machines

EACVI Viewpoint on FoCUSB, EHJ-CI 2014
FoCUS – 5 standard views
**E/B Targets of FoCUS**

- Global LV systolic function and size
- Global RV systolic function and size
- Pericardial effusion
- Intravascular volume assessment

**Scenarios**
- Shock
- Cardiac arrest
- Chest pain
- Chest/Cardiac trauma
- Respiratory compromise

**Conditions**
- LV/RV ischem dysfunc
- Cardiomyopathies
- Myocarditis
- Tamponade
- Pulmonary embolism
- Hypovolemia
1st Point

• The **SCOPE** of the FoCUS is **NOT to completely** evaluate cardiac morphology and function.…

• …**BUT** to rapidly detect **LIMITED** number of critical cardiac conditions, requiring urgent medical attention.
• Both cardiologists & non-cardiologists can perform either ECHO or FoCUS
  - Clinical circumstances
  - Equipment
  - Expertise/Competence

• Crucial difference: the amount of information
FoCUS ≠ “Goal-Oriented” Echo

- Targeted examination
- To solve specific, often critical and/or complex clinical dilemmas
- Fully trained echocardiographer!
HUD: result of advanced technology
Currently available US machines according to their size and function

Terminology

- Hand held ultrasound devices (HUD)
- Hand held imaging devices (HID)
- Pocket size imaging devices (PSID)
- Pocket size ultrasound devices (PSUD)
- Hand held echo devices (HED)
- Pocket size echo devices (PSED)
- HED/PSED
- HID/PSID
- HUD/PSUD

**Table 1** Classification of currently available echo machines according to their size and functions

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**HUD**

Hand held ultrasound device

*Sicari R et al, EJE 2011*
HUD: Technical Limitations

- **2D + Color Doppler** only
- **NO** spectral Doppler
- **NO** M-mode
- **NO** ECG
- **NO** other techniques (strain. 3D)
- **Limited quantification**: linear measurements only
3rd Point

- **HUD can** be used for **FoCUSE/POCUS** examinations!

- **HUD cannot** perform comprehensive/**FULL** emergency echocardiography due to technical limitations

_EACVI Viewpoint on FoCUS, EHJ-CI 2014_
Why it may be important how we name the examination and/or which imaging device is used, in order to save a life?
Why Terminology is Important?

- To understand and respect differences
- To maintain the quality of information obtained by both FULL Echo and FoCUS, using various US devices
- To define specific education & training for all
POCKET vs. FoCUSB vs. FULL echo in Emergency CV Care

1. Perspective and goals
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Cardiac Emergencies

Examination (diagnostic work-up)

Accurate information

Decision making

Treatment
Cardiac Emergencies

Focus Cardiac Ultrasound (FoCUS)

Echocardiography

after FoCUS, whenever it is insufficient
### Table 8  ‘ABCD approach’ in performing emergency echocardiography

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<th>Column</th>
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<td>Comprehensiveness</td>
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<td>D</td>
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- Fight against routine  
- Think beyond apparent explanations  
- Referral diagnosis may be misleading  
- Never trust, confirm  
- Do as complete examination as suitable  
- Careful interpretation  
- The study should be recorded and reviewed  
- Team work is crucial  

---

*Rewind and Review.

with advanced level of expertise in echocardiography according to EAE recommendations. The consultation via network connections enables a nearly immediate discussion with the most competent colleagues in the hospital, with direct visualization of the echocardiographic images, which may improve interpretation of the findings and adjust decision making.

### Emergency echocardiographic study report

The emergency echocardiographic study report should be in line with the basic format recently recommended by the EAE. However, since the time for producing report is often extremely limited, an initial, preliminary report focused on critical findings and integrated into decision-making process may be issued. Whenever the result of the study indicates the need for urgent treatment, the physician who is in charge for the patient must be directly informed. Detailed, more complete, final report must follow soon after the patient is transferred/referred for further diagnostic or therapeutic procedure.

### Focused peri-resuscitation and critical care echocardiography

Ideally, the echocardiography laboratory which serves as a core of emergency echocardiography service should be accredited in TTE and TEE. Comprehensive programme with teaching courses of basic and advanced TTE, TEE, and contrast echocardiography should be organized through the laboratory, as well as additional training (Tables 3–5) for cardiologists and non-cardiologists involved in emergency cardiac care.
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<sup>a</sup>Record and Review.
Emergency echocardiography: the European Association of Cardiovascular Imaging recommendations

Aleksandar N. Neskovic¹*, Andreas Hagendorff², Patrizio Lancellotti³, Fabio Guarracino⁴, Albert Varga⁵, Bernard Cosyns⁶, Frank A. Flachskampf⁷, Luigi P. Badano¹¹, on behalf of the EACVI Fellows Programme Committee.

From the ethical point of view, emergency echocardiography should be performed by anyone who knows how to get valuable information from it and use it in the decision-making process. Know how includes: ability to obtain adequate images (imaging technique) and ability to interpret them in the specific clinical context (reading/interpretation). Improperly acquired and/or poor-quality images may result in inaccurate reading, with misleading and potentially dangerous conclusions.
Focus cardiac ultrasound: the European Association of Cardiovascular Imaging viewpoint

Aleksandar N. Neskovic1*, Thor Edvardsen2, Maurizio Galderisi3, Madalina Garbi4, Giuseppe Gullace5, Ruxandra Jurcut6, Havard Dalen7,8, Andreas Hagendorff9, and Patrizio Lancellotti10, for the European Association of Cardiovascular Imaging Document Reviewers: Bogdan A. Popescu, Rosa Sicari and Alexander Stefanidis

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where medical emergencies occur. Therefore, we believe that the EACVI should encourage any medical professional, sufficiently trained to obtain valuable information from FoCUS, to use it in emergency settings. Thus, all attempts at individual or professional organ-
“Truth is one, paths are many”

M. Gandhi
FoCUS with HUD in ICU; shock

7:34:01

7:34:18
FoCUS with HUD in ICU; shock

7:35:58

< 2 min!
In this situation, who needs...

- TAPSE
- RV, LV, LA, LP….measurements
- RVOT flow acceleration time
- LV inflow profile
- Color Doppler M-mode
- DTI
- Strain
- …
M. Gandhi

“Truth is one, paths are many”

O. Wild

“The pure and simple truth is rarely pure and never simple”
• Male, 46 yrs
• Severe dyspnea, tachypnea (7 days)
• No chest pain
• Op Colon Cancer – 1 year ago
• TA 110/70 mmHg
• D-dimer 18,000 (230)
• CRP 160 (4)
• Le 14,500
ECG in the ER…

S1 Q3 T3

RV strain
TR jet
Pulmonary artery flow profile
Acute pulmonary embolism?
MSCT Pulmoangiography

This is **NOT** a pulmonary embolism!
Back to Basics

Acute Respiratory Distress Syndrome
FoCUS + ECHO + LUS

Acute Cor Pulmonale in 25-50% of ARDS

### Table 8  ‘ABCD approach’ in performing emergency echocardiography

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| D | Double R<sup>a</sup> | • The study should be recorded and reviewed  
|   |   | • Team work is crucial  |

<sup>a</sup>Record and Review.
Right Heart Dilation in the ED

Acute PE

RV infarct

COPD

ARDS

ARVC
US examination of the heart in emergency cardiac care!

“Truth is one, paths are many”

“The pure and simple truth is rarely pure and never simple”

M. Gandhi

O. Wilde
POCKET vs. FoCUS vs. FULL echo in Emergency CV Care

1. Perspective and goals
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FoCUS-related Risks

1. Failure to detect important abnormalities

2. Misinterpretation of limited data set or complex cases
Chest pain, w/o WMA, Tn negative
Chest pain, w/o WMA, Tn negative

Next morning, FULL echo
FoCUS, Fellow

Expert, Full echo

Supervision & Quality Control
Severe Dyspnea, Fever

FoCUS, HUD
Severe Dyspnea, Fever

Full Echo

- Descending thoracic aortic aneurysm
- Left atrial obliteration – lung congestion (?)
- A mass attached to the aortic valve
FoCUS/HUD vs. FULL Echo

Tip: Daylight (ICU, CCU, ED…) ➔ Increase GAIN!
Emergency echocardiography: the European Association of Cardiovascular Imaging recommendations

Aleksandar N. Neskovic¹, Andreas Hagendorff², Patrizio Lancellotti³, Fabio Guarracino⁴, Albert Varga⁵, Bernard Cosyns⁶, Frank A. Flachskampf⁷, Bogdan A. Popescu⁸, Luna Gargani⁹, Jose Luis Zamorano¹⁰, and Luigi P. Badano¹¹, on behalf of the European Association of Cardiovascular Imaging²

¹University Clinical Hospital Center Zaborn, Faculty of Medicine, University of Belgrade, Vukova 9, 11080 Belgrade, Serbia; ²Department für Innere Medizin, Neurologie und Dermatologie, Abteilung für Kardiologie und Angiologie, Universitätshilfiklinikum Leipzig AöR, Leipzig, Germany; ³CIGA Cardiovascular Sciences, Heart Valve Clinic, University of Liège, Department of Cardiology, CH U Ste. Sint-Titus, Liège, Belgium; ⁴Department of Anesthesia and Intensive Care Medicine, University Hospital of Pisa, Pisa, Italy; ⁵2nd Department of Medicine and Cardiology Center, University of Szeged, Szeged, Hungary; ⁶Universiteit Ziekenhuis Brussel, CHIREC Braine (Braine l’Alleud), Belgium; ⁷Uppsala University, Akademiska sjukhuset, Uppsala, Sweden; ⁸Carol Davila University of Medicine and Pharmacy, Bucharest, Romania; ⁹Institute of Clinical Physiology, National Research Council, Pisa, Italy; ¹⁰Cardiology Department, University Hospital Ramón y Cajal, Madrid, Spain; and ¹¹Department of Cardiac, Thoracic and Vascular Sciences, University of Padua, Padua, Italy

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Received 24 July 2012; accepted after revision 30 August 2012
To act as an **Independent Operator** in Emergency Echocardiography:

### Requirements for Training & Expertise

- Competence **at least the same** as for elective cases
- For Non-cardiologists - **the same** level of expertise as for cardiologists

*The EACVI Recommendations, EHJ-CI 2013*
**The EACVI Recommendations, EHJ-CI 2013**

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### Table 3: Minimal requirements for training and expertise for cardiologists and non-cardiologists for unaided performing/interpretation of adult echocardiography in emergency settings (modified from Popescu et al.1)

<table>
<thead>
<tr>
<th>Level of competence in emergency echocardiography</th>
<th>Profile of individual performing emergency echocardiography</th>
<th>Minimal number of examinations performed to become competent</th>
<th>Achieved level of expertise according to EAE recommendations</th>
<th>Level of competence to be achieved according to ESC Core Curriculum</th>
<th>Additional education/training requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent operator</td>
<td>Cardiologists (completed training according to ESC Core Curriculum requirements for general training for cardiologists)</td>
<td>350 (TTE)</td>
<td>Basic echocardiography</td>
<td>Mandatory</td>
<td>- Theoretical: specific knowledge on emergency cardiovascular diseases/conditions (see list, Table 4),</td>
</tr>
<tr>
<td></td>
<td>Non-cardiologists (completed training in their own specialties, but not in cardiology)</td>
<td>350 (TTE)</td>
<td></td>
<td></td>
<td>- Practical skills: 150 emergency cases interpreted/reported; 50 of which personally performed and documented</td>
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<tr>
<td>Expert operator</td>
<td>Cardiologists (completed training appropriate for cardiologists with subspecialty interest in echocardiography)</td>
<td>750 (TTE), 75 (TEE), 100 (stress echo)</td>
<td>Advanced echocardiography</td>
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Focus cardiac ultrasound core curriculum and core syllabus of the European Association of Cardiovascular Imaging†

Aleksandar N. Neskovíc1*, Henry Skinner2‡, Susanna Price3¶, Gabriele Via4§, Stefan De Hert5¶, Ivan Stankovic1, Maurizio Galderisi6, Erwan Donal7, Denisa Muraru8, Erik Sloth9, Luna Gargani10, Nuno Cardim11, Alexandros Stefanidis12, Matteo Cameli13, Gilbert Habib14,15, Bernard Cosyns16, Patrizio Lancellotti17, Thor Edvardsen18, and Bogdan A. Popescu19
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In collaboration with: ACCA, EACTA, ESA, WINFOCUS

EHJ-CI 2018
Aim

• To provide key principles and unifying framework for teaching and training of FoCUS…

• …that should result in competence in FoCUS for various medical professionals dealing with diagnostics and treatment of CV emergencies.
EACVI FoCUS Core Curriculum & Syllabus

Components of Training

**FoCUS technique**

**Basic Lung US**

**ACLS Compliance**
The use of pocket-size imaging devices: a position statement of the European Association of Echocardiography

Rosa Sicari*, Maurizio Galderisi, Jens-Uwe Voigt, Gilbert Habib, Jose L. Zamorano, Patrizio Lancellotti, and Luigi P. Badano

• Info for pts: NOT a substitute for FULL echocardiography
• Reported always as part of physical examination

Work in progress, almost completed

Cardim (document chair), Dalen, Delgado, Donal, Edvardsen, Galderisi, Ionescu, Neskovic, Popescu, Price, Sicari, Stefanidis, Voigt, Zamorano
Education, Training & Competence in HUD

- Competence in Imaging Acquisition & Interpretation
- Specific Education & Training in HUD

EACVI requirements for training and competence in Echocardiography or FoCUS

Basic Training & Certification + Practical training on HUD
EACVI Handheld Ultrasound Devices on-line Teaching Course

Included in the ESC electronic Learning platform (ESCeL)
Available to all EACVI members since December 2012

http://learn.escardio.org

EACVI Education Programme for Pocket Size Ultrasound Devices

Home  About the Programme  Help

Educational Programme

- The European Association of Cardiovascular Imaging (EACVI) recommends specific training and certification for all users of pocket size ultrasound devices, with the exception of cardiologists, according to national legislation. This programme was specifically designed to prepare for this EACVI certification. The programme is composed of several courses which introduce the principles of echocardiography and relevant cardiology topics from the daily routine of a non-cardiologist.

- Courses include an instructional lecture with illustrative figures and movies, references for further reading, multiple choice questions for self-assessment and teaching cases.

- EACVI Certification can be obtained online with multiple choice questions as well as a final exam.

Introduction & course presentation
POCKET vs. FoCUS vs. FULL echo in Emergency CV Care

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• Team work is crucial |

<sup>a</sup>Record and Review.
Emergency Echocardiography Service

- To improve institutional logistics
- 24-hour availability of doctors with independent operator level of competence in emerg echo
- Efficient consultative or on-call service for special echo techniques
- Team work
- Continuous supervision and quality control

Emergency Echo: the EACVI Recommendations. EHJCI 2013
Patient should be referred for comprehensive ECHO whenever FoCUS findings are insufficient for the immediate patient management!
“For critically ill patients, it is NOT important whether the life-saving information is acquired by non-cardiologist performing FoCUS, or by the expert cardiologist performing echocardiography. When such information is available, it has to be used. However, for the benefit of the patients, the involved medical professionals should have the necessary knowledge to understand the obtained information entirely, and to use it correctly, thoughtfully and with care.”

EACVI Viewpoint on FoCUS, EHJ-CI 2014