

SUPPLEMENTARY MATERIAL

ANNEX A.

Senior intensivists in our ICU receive basic training in transthoracic echocardiography consisting of ten hours' theory classes covering the following material, as recommended in the FOCUS program¹⁻³.

- Usefulness of echocardiography in the ICU.
- Basic knowledge about ultrasonography.
- Echocardiographic anatomy and principal echocardiographic views: parasternal long- and short-axis, apical four-chamber, and subcostal.
- Global left ventricular size and systolic function.
- Global right ventricular size and systolic function.
- Assessment for pericardial fluid/tamponade.
- Inferior vena cava size and respiratory variation.
- Basic color Doppler assessment for severe valvular regurgitation.

Theory classes also included showing videos to review representative cases.

After the theory part of the training, each intensivist had hands-on practice in basic transthoracic echocardiography on ICU patients (minimum 10h and 25 patients).

Finally, students were tested by means of a multiple-choice test including five videos showing typical cases in ICU practice and by their performance on four basic transthoracic echocardiograms where they had to answer five basic questions:

- How is the left ventricle?
- Is the right ventricle dilated?
- How is the function of the right ventricle?
- Is there any pericardial fluid? Are there any echocardiographic signs of tamponade?
- Does the evaluation of the inferior vena cava suggest hypovolemia?

1. Mayo PH, Beaulieu Y, Doelken P, Feller-Kopman D, Harrod C, Kaplan A, et al. American College of Chest Physicians/La Société de Réanimation de Langue Française statement on competence in critical care ultrasonography. 2009. pp.

1050–60.

2. Neskovic AN, Edvardsen T, Galderisi M, Garbi M, Gullace G, Jurcut R, et al. Focus cardiac ultrasound: the European Association of Cardiovascular Imaging viewpoint. *Eur Heart J Cardiovasc Imaging*. 2014 Sep 1;15(9):956–60.
3. Spencer KT, Kimura BJ, Korcarz CE, Pellikka PA, Rahko PS, Siegel RJ. Focused Cardiac Ultrasound: Recommendations from the American Society of Echocardiography. *Journal of the American Society of Echocardiography*. 2013 Jun 1;26(6):567–81.

ANNEX B.

Different echocardiographic patterns were defined as:

- **Severe hypovolemia**: small, hyperkinetic ventricles, with obliteration of the left ventricular cavity (kissing walls) and a small inferior vena cava with wide variation in diameter with respiratory movements (in mechanical ventilation, inferior vena cava <1.5 cm with >50% collapse; in spontaneous respiration, inferior vena cava <1 cm with >50% collapse).
- **Left ventricular failure**: decreased overall mobility of the left ventricle, heterogeneous contractility pattern suggestive of myocardial ischemia, and/or dilation of the left ventricular cavity suggestive of chronic heart disease.
- **Right ventricular failure**: dilation of the right ventricle and paradoxical movement of the interventricular septum, which in critical patients is generally associated with acute respiratory distress syndrome or severe pulmonary thromboembolism. Isolated right ventricular dilation would be suggestive of right ventricular infarction. Associated findings can include a dilated inferior vena cava without collapse.
- **Tamponade**: pericardial effusion with diastolic collapse of the right atrium and ventricle, together with a dilated inferior vena cava without respiratory collapse during spontaneous respiration.
- **Acute massive mitral regurgitation**: normal-sized left ventricle (indicating acute valvular disease), normal or hyperdynamic left ventricular systolic function (due to left ventricular volume overload), and massive regurgitating flow in color Doppler imaging.