

Maternal heart imaging

A guide to understanding normal cardiac anatomy and basic cardiac assessment

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The basics

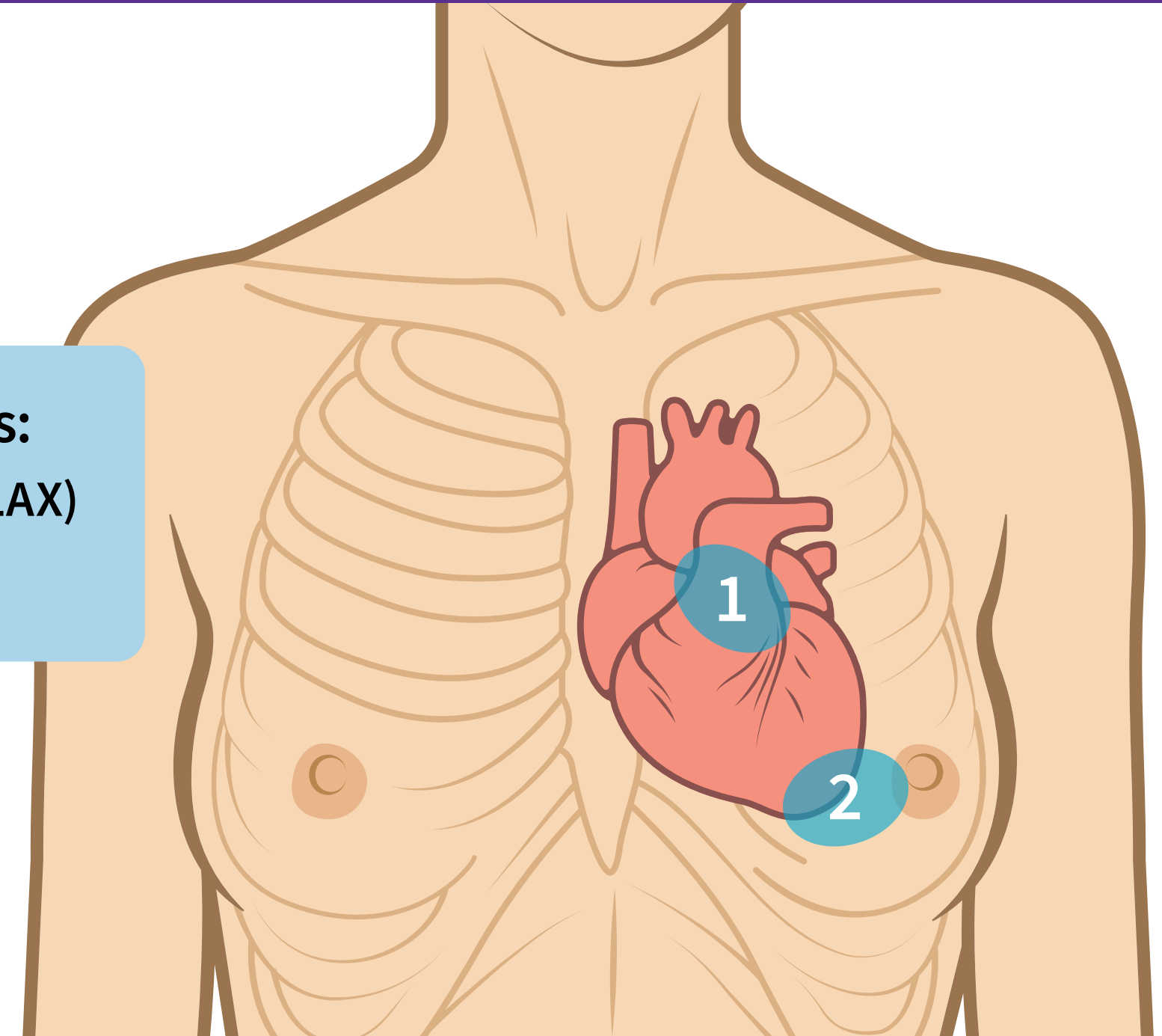
Ergonomics and set-up

- Stand at the level of the patient's shoulders, facing the ultrasound system.
- Adjust the height of the patient's bed and ultrasound system so you are in a comfortable position while scanning.
- It is recommended to scan with your left hand.

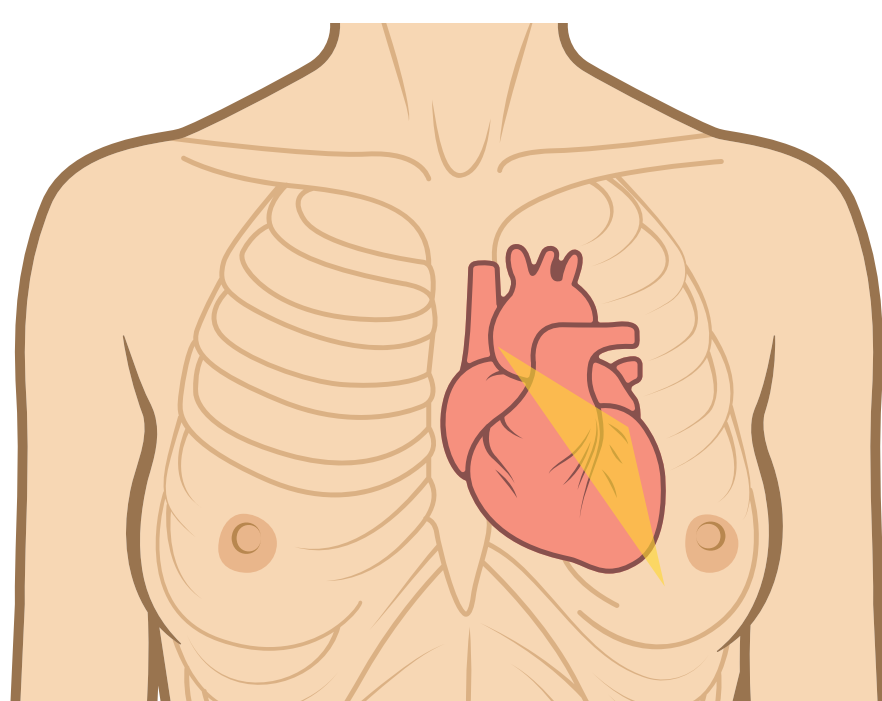
The patient

- The patient should be lying on her left side – this will bring the heart closer to the chest wall.
- Abduct the patient's left arm – this will open the intercostal spaces.

Main transthoracic windows:
1. Parasternal long-axis view (PLAX)
2. Apical 4-chamber view (A4C)



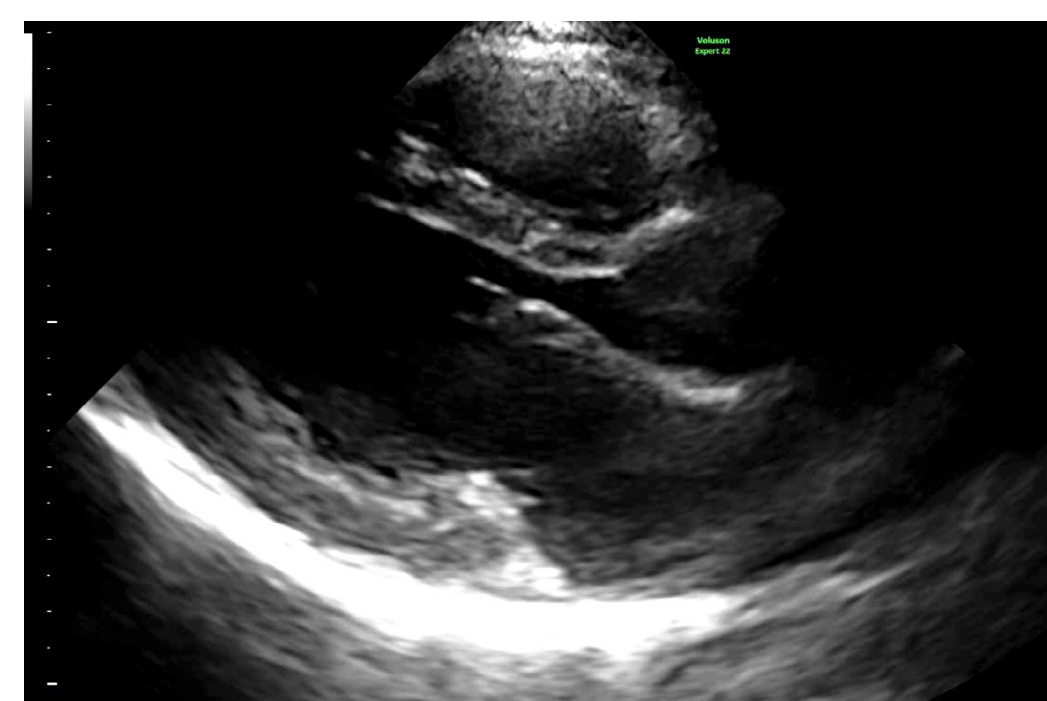
Parasternal Long-Axis View (PLAX)



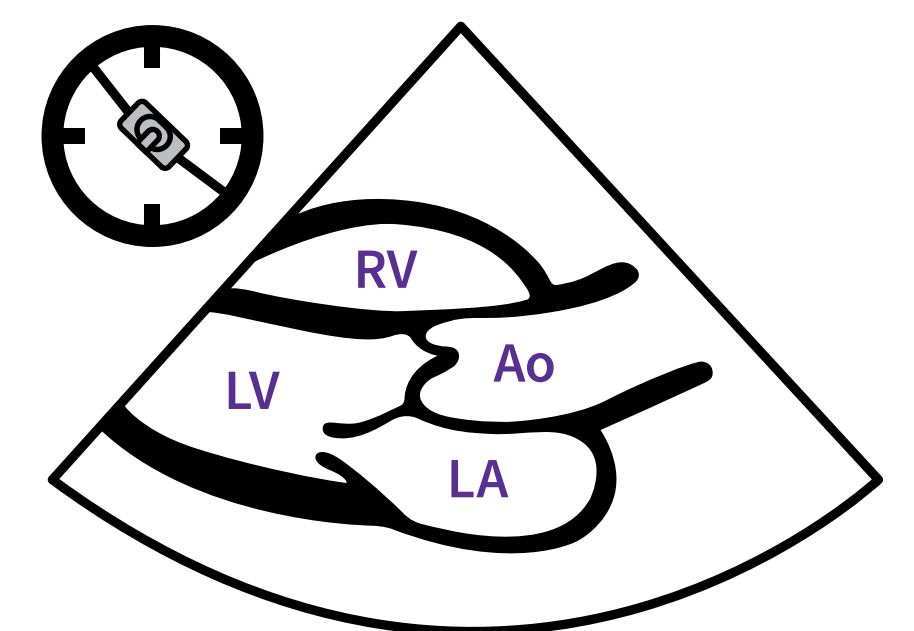
Transducer orientation marker is pointing toward the patient's right shoulder (~10 o'clock).



Transducer is placed in 3rd-4th intercostal space.



The image should demonstrate the chamber along its centre axis to maximize dimension. Papillary muscles should not be visible.

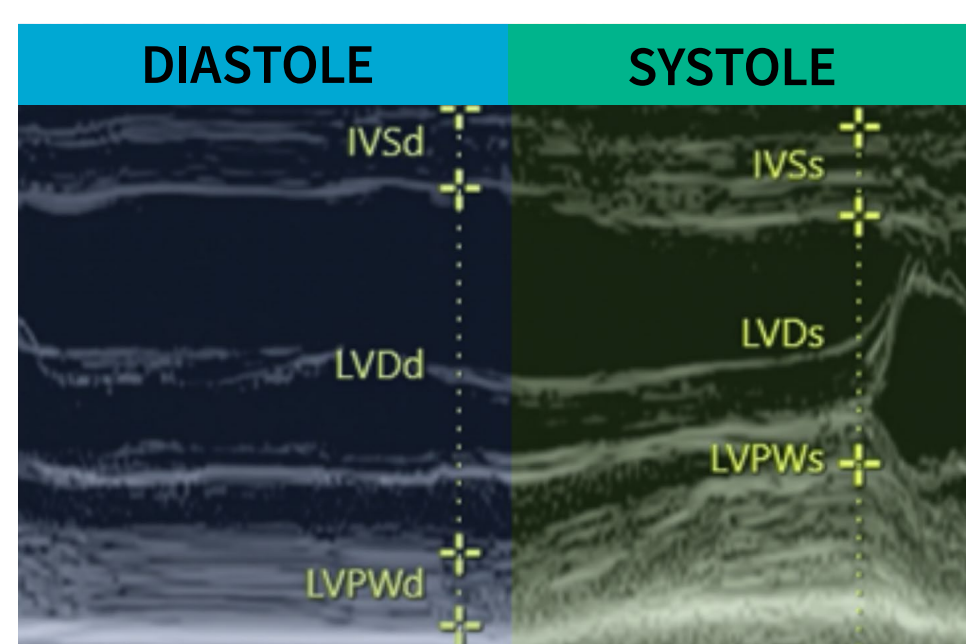
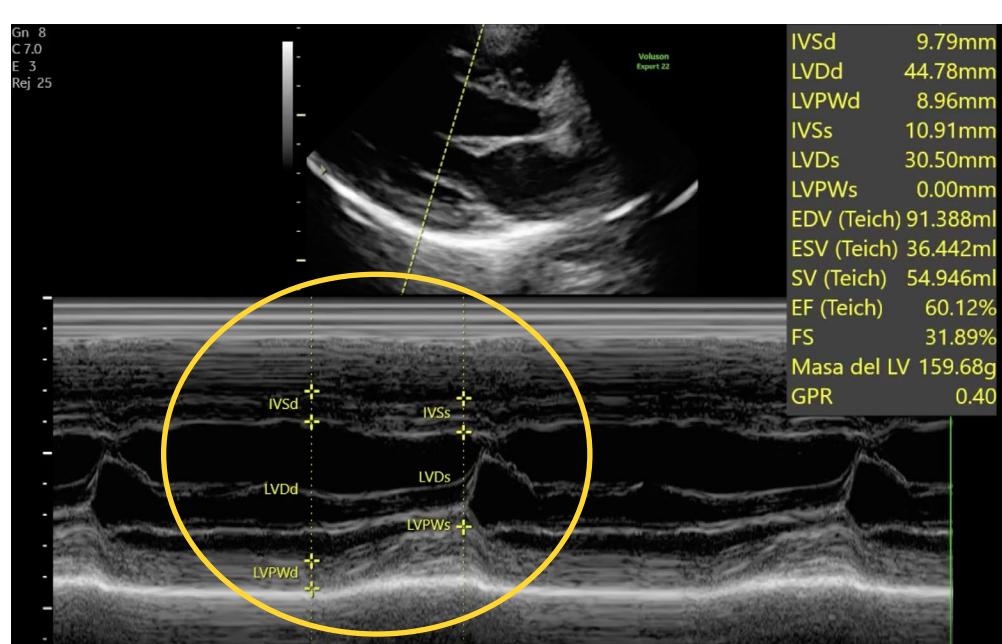


LV wall thicknesses and chamber dimension are measured at end-diastole, defined as the first video frame immediately after mitral leaflet closure.

Basic measurements

1. Left ventricle (LV):

Use **M-mode** perpendicular to the long axis of the LV to assess wall thicknesses and dimensions, just below the MV leaflet tips

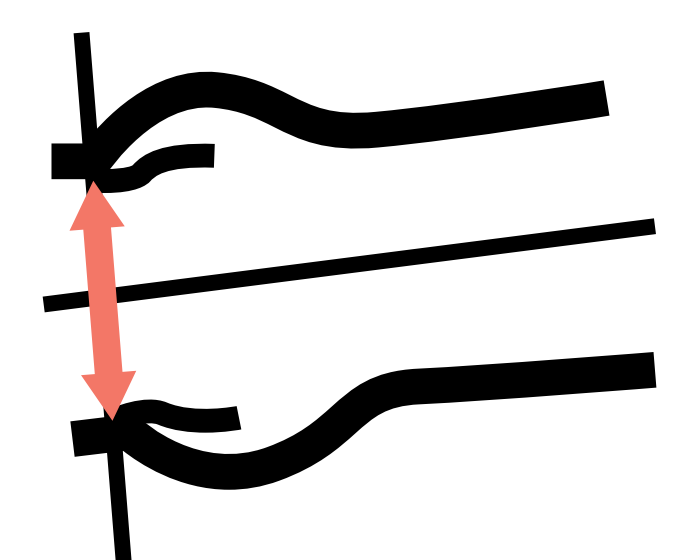
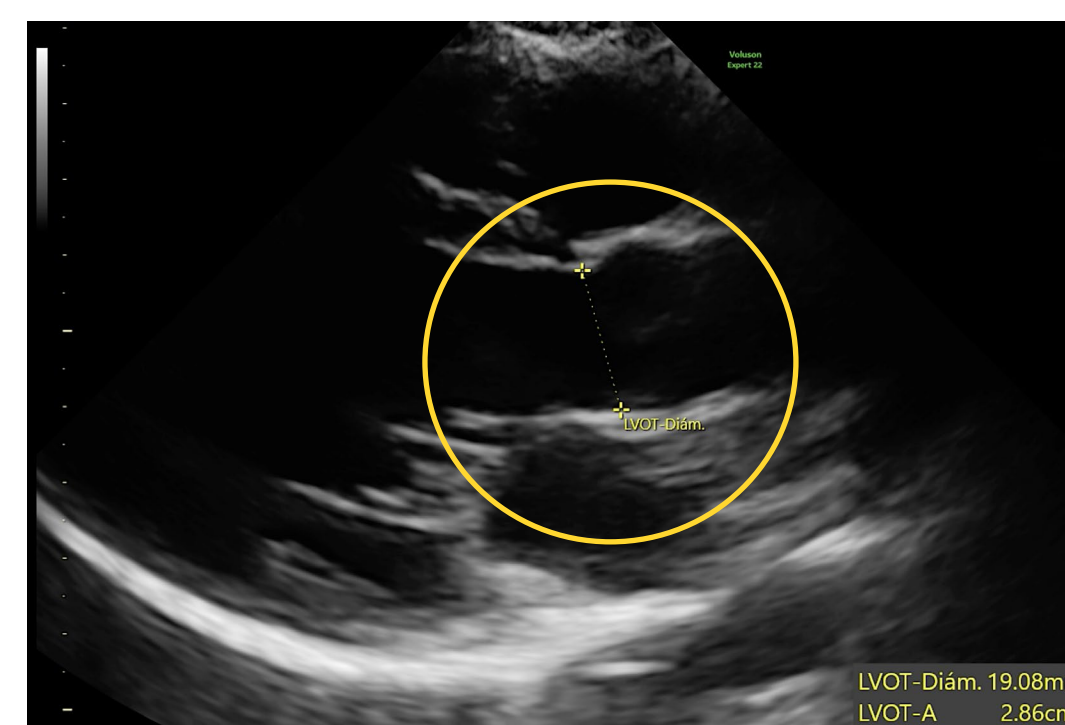


Structure	How to measure
IVSd (interventricular septum in diastole)	Place the caliper from the RV-IVS to the IVS-LV interface
LVDd (left ventricular diameter in diastole)	Place the caliper from the IVS-LV to the LV-PW interface
LVPWd (left ventricular posterior wall in diastole)	Place the caliper from the LV-PW to the PW-pericardial interface
LVDd (left ventricular diameter in systole)	Place the caliper from the IVS-LV to the LV-PW at the smallest cavity dimension (systole)

2. Left ventricular outflow tract (LVOT):

The **LVOT diameter** is measured from zoomed PLAX with visualization of AV cusp insertion points (annulus):

- inner-to-inner edge of the leaflet Insertion points
- at the maximal opening of the valve in **systole**



Calculated parameters:

- LV Mass = $0.8 \times [1.04 \times ((LVDd + IVSd + LVPWd)^3 - LVDd^3)] + 0.6$
- Relative wall thickness (RWT) = $(2 \times LVPWd) / LVDd$
- Ejection fraction (EF) = $((EDV - ESV) / EDV) \times 100$

Relative Wall Thickness	LV Mass index (g/m ²)	
	≤ 95	> 95
> 0.42	Concentric remodelling	Concentric hypertrophy
≤ 0.42	Normal geometry	Eccentric remodelling

Recommended literature

- Mitchell C, Rahko PS, Blauwet LA, Canaday B, Finstuen JA, Foster MC, Horton K, Ogunyankin KO, Palma RA, Velazquez EJ. Guidelines for Performing a Comprehensive Transthoracic Echocardiographic Examination in Adults: Recommendations from the American Society of Echocardiography. *J Am Soc Echocardiogr.* 2019 Jan;32(1):1-64. doi: 10.1016/j.echo.2018.06.004.
- Lang RM, Badano LP, Mor-Avi V, Afilalo J, Armstrong A, Ernande L, Flachskampf FA, Foster E, Goldstein SA, Kuznetsova T, Lancellotti P, Muraru D, Picard MH, Rietzschel ER, Rudski L, Spencer KT, Tsang W, Voigt JU. Recommendations for cardiac chamber quantification by echocardiography in adults: an update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. *J Am Soc Echocardiogr.* 2015 Jan;28(1):1-39.e14. doi: 10.1016/j.echo.2014.10.003.
- Nagueh SF, Smiseth OA, Appleton CP, Byrd BF 3rd, Dokainish H, Edvardsen T, Flachskampf FA, Gillebert TC, Klein AL, Lancellotti P, Marino P, Oh JK, Popescu BA, Waggoner AD. Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. *J Am Soc Echocardiogr.* 2016 Apr;29(4):277-314. doi: 10.1016/j.echo.2016.01.011.