

# Comparison of echocardiographic and invasive measurement of pulmonary artery pressure in a tertiary cardiology center

 **Danijela Grizelj<sup>1</sup>**,  
 **Tomo Svaguša<sup>1</sup>**,  
 **Vanja Ivanović Mihajlović<sup>1</sup>**,  
 **Hrvoje Falak<sup>1</sup>**,  
 **Petra Vitlov<sup>1</sup>**,  
 **Marija Radić<sup>1</sup>**,  
 **Jana Tarnik<sup>2</sup>**,  
 **Maja Špoljarić<sup>2</sup>**,  
 **Mario Udovičić<sup>1,2\*</sup>**

<sup>1</sup>Dubrava University Hospital, Zagreb, Croatia

<sup>2</sup>University of Zagreb, School of Medicine, Zagreb, Croatia

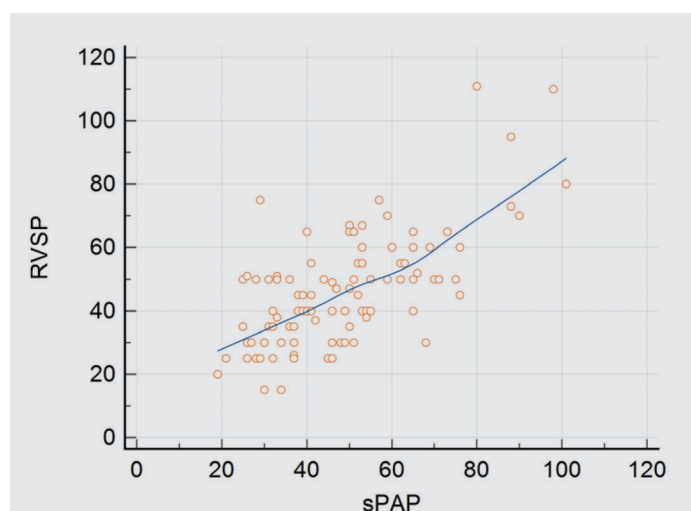
**KEYWORDS:** cardiac catheterization, echocardiography, pulmonary hypertension.

**CITATION:** *Cardiol Croat.* 2025;20(5-6):121. | <https://doi.org/10.15836/ccar2025.121>

**\*ADDRESS FOR CORRESPONDENCE:** Mario Udovičić, Klinička bolnica Dubrava, Avenija Gojka Šuška 6, HR-10000 Zagreb, Croatia. / Phone: +385 98 477 248 / E-mail: [mario.udovicic@gmail.com](mailto:mario.udovicic@gmail.com)

**ORCID:** Danijela Grizelj, <https://orcid.org/0000-0002-8298-7974> • Tomo Svaguša, <https://orcid.org/0000-0002-2036-1239> • Vanja Ivanović Mihajlović, <https://orcid.org/0000-0001-6931-5404> • Hrvoje Falak, <https://orcid.org/0000-0002-6502-683X> • Petra Vitlov, <https://orcid.org/0000-0001-6983-1409> • Marija Radić, <https://orcid.org/0000-0003-2317-6300> • Jana Tarnik, <https://orcid.org/0009-0007-0025-4181> • Maja Špoljarić, <https://orcid.org/0009-0005-5714-5176> • Mario Udovičić, <https://orcid.org/0000-0001-9912-2179>

**Introduction:** The accuracy of transthoracic echocardiography (TTE) in estimating systolic pulmonary artery pressure (sPAP) by determining right ventricular systolic pressure (RVSP) compared to direct measurement with right heart catheterization (RHC) remains a clinical concern<sup>1</sup>. This study aimed to assess the correlation, agreement, and diagnostic accuracy of echocardiographic RVSP in detecting pulmonary hypertension (PH) in a cohort of clinically stable patients undergoing both echocardiography and invasive pressure measurement.



**FIGURE 1.** Relation of right ventricular systolic pressure (RVSP) measured by transthoracic echocardiography to systolic pulmonary artery pressure (sPAP) measured by right heart catheterization.

**Methods and Results:** This retrospective study was conducted at the Cardiology Department of Dubrava University Hospital, including 104 clinically stable patients who underwent TTE and RHC measurements within a 5-day period (**Figure 1**). Pearson's correlation analysis demonstrated a strong positive correlation between echocardiographic and invasively measured sPAP ( $r = 0.709$ ,  $P < 0.0001$ ). However, Bland-Altman analysis revealed a mean bias of  $-1.78$  mmHg (95% limits of agreement:  $-29.63$  to  $+26.07$  mmHg) for RVSP, indicating substantial individual variability. Lin's concordance correlation coefficient ( $CCC = 0.7057$ ) further confirmed moderate agreement between methods. To assess the diagnostic accuracy of echocardiographic RVSP in identifying PH (defined as mean pulmonary artery pressure [mPAP]  $> 20$  mmHg), we performed a receiver operating characteristic (ROC) analysis. The optimal cut-off value for sPAP was 38 mmHg, yielding a sensitivity of 77.6% and a specificity of 66.7%. The area under the curve (AUC) was 0.746, indicating moderate discriminatory power. Despite a good correlation, the relatively wide limits of agreement and moderate specificity suggest that TTE alone may not be sufficient for definitive PH diagnosis.

**Conclusions:** Echocardiography-derived sPAP correlates well with invasive measurements but demonstrates considerable variability on an individual level. Although the ROC analysis supports its use as a screening tool, TTE alone lacks the precision required for definitive PH diagnosis.

The identified cut-off of 38 mmHg provides a reasonable balance of sensitivity and specificity, but RHC remains necessary for confirmation and clinical decision-making. Future studies with larger cohorts are warranted to refine echocardiographic criteria for PH detection.

**RECEIVED:**  
**February 19, 2025**

**ACCEPTED:**  
**April 2, 2025**



## LITERATURE

- Greiner S, Jud A, Aurich M, Hess A, Hilbel T, Hardt S, et al. Reliability of noninvasive assessment of systolic pulmonary artery pressure by Doppler echocardiography compared to right heart catheterization: analysis in a large patient population. *J Am Heart Assoc.* 2014 Aug 21;3(4):e001103. <https://doi.org/10.1161/JAHA.114.001103>