

Right Heart Catheterization: ATS 2026 Clarifies Waveform Interpretation

Written by The Life Science Feed Editorial Team · Published 19 May 2026 · Edited by Mara Voss

Accurate interpretation of right heart catheterization (RHC) waveforms remains a critical yet frequently challenging aspect of diagnosing and managing various cardiopulmonary conditions. Misinterpretation can lead to incorrect diagnoses and inappropriate therapeutic interventions.¹ A session at ATS 2026 provided a structured framework for waveform analysis, aiming to enhance diagnostic precision among clinicians.

KEY TAKEAWAYS

- **The Pivot:** A structured, systematic approach to RHC waveform interpretation was presented to address diagnostic variability.
- **The Data:** The session emphasized pattern recognition and pressure gradient analysis over isolated values to improve diagnostic accuracy.
- **The Action:** Clinicians should adopt a methodical review of all RHC waveforms, correlating them with clinical context, to minimize interpretive errors.

Right heart catheterization (RHC) is an invasive diagnostic procedure essential for evaluating pulmonary hypertension, heart failure, and congenital heart disease. The procedure involves advancing a catheter through the venous system into the right atrium, right ventricle, pulmonary artery, and pulmonary artery wedge position to measure pressures and oxygen saturations.¹ Despite its diagnostic utility, the interpretation of the resulting pressure waveforms can be complex and prone to variability among practitioners. This variability can compromise diagnostic accuracy, potentially delaying appropriate treatment or leading to unnecessary interventions.²

The ATS 2026 session, "WAVE GOODBYE TO CONFUSION: RIGHT HEART CATHETERIZATION AND WAVEFORM INTERPRETATION," addressed these interpretive challenges directly. The session highlighted that a comprehensive understanding of normal and abnormal waveform morphology is fundamental. For instance, the characteristic 'a', 'c', and 'v' waves in the right atrial pressure tracing reflect atrial contraction, tricuspid valve closure and isovolumic ventricular contraction, and atrial filling, respectively. Abnormalities in these waves, such as a prominent 'a' wave, can indicate tricuspid stenosis or right ventricular hypertrophy, while a prominent 'v' wave suggests tricuspid regurgitation.³

Systematic Approach to Waveform Interpretation

The session advocated for a systematic, step-by-step approach to waveform interpretation, moving beyond isolated pressure readings to a holistic assessment of waveform morphology, timing, and gradients. The proposed methodology included:

- **Right Atrial Pressure (RAP) Analysis:** Evaluate the mean RAP and the morphology of the 'a' and 'v' waves. Normal mean RAP is typically 0-8 mmHg. Elevated RAP with a prominent 'a' wave suggests conditions like tricuspid stenosis or right ventricular outflow obstruction. A dominant 'v' wave indicates tricuspid regurgitation.³
- **Right Ventricular Pressure (RVP) Analysis:** Assess systolic and diastolic pressures. Normal RVP is 15-30/0-8 mmHg. Elevated RVP, particularly systolic pressure, is a hallmark of pulmonary hypertension. The presence of a 'square root' sign in the diastolic pressure tracing can indicate constrictive pericarditis.⁴
- **Pulmonary Artery Pressure (PAP) Analysis:** Measure systolic, diastolic, and mean PAP. Normal PAP is 15-30/4-12 mmHg, with a mean PAP of 9-18 mmHg. Pulmonary hypertension is defined by a mean PAP >20 mmHg at rest.⁵ The dicrotic notch on the pulmonary artery waveform signifies pulmonary valve closure.
- **Pulmonary Artery Wedge Pressure (PAWP) Analysis:** This measurement estimates left atrial pressure. Normal PAWP is 4-12 mmHg. Elevated PAWP suggests left-sided heart disease, such as left ventricular dysfunction or mitral valve disease. The 'a' and 'v' waves in the PAWP tracing mirror those in the left atrium. A prominent 'v' wave in the PAWP indicates mitral regurgitation.³
- **Pressure Gradients and Waveform Contours:** Beyond absolute values, the session emphasized the importance of pressure gradients (e.g., transpulmonary gradient, diastolic pulmonary gradient) and the overall contour of the waveforms. For example, the absence of a dicrotic notch on the PA waveform can indicate severe pulmonary hypertension or a patent ductus arteriosus.¹

The session also highlighted common pitfalls, such as catheter whip artifact, respiratory variation, and improper zeroing, which can lead to erroneous readings. Attendees were reminded that all RHC data must be interpreted within the full clinical context of the patient, including symptoms, physical examination, and other imaging studies.²

While the session provided a valuable framework, it did not present new primary research data. Its strength lay in synthesizing established principles and offering a standardized approach to an inherently complex diagnostic procedure. The utility of this structured interpretation relies on consistent application by clinicians, which may require further educational initiatives and practical training. The absence of a formal assessment of improved diagnostic accuracy following the adoption of this specific framework represents a limitation, as does the lack of data on its impact on patient outcomes. Future research could focus on evaluating the effectiveness of such structured training programs on interpretive consistency and clinical decision-making.⁶

Practitioners seeking to deepen their expertise in cardiovascular diagnostics and clinical decision-making may find further insights within the essential Oxford Handbook of Cardiology.

CLINICAL IMPLICATIONS

The ATS 2026 session on right heart catheterization waveform interpretation serves as a timely reminder that even fundamental diagnostic procedures require rigorous, standardized approaches. The persistent variability in interpreting these waveforms among clinicians is not merely an academic concern; it directly impacts patient care. Misinterpreting a prominent 'v' wave, for instance, could lead to a missed diagnosis of severe tricuspid regurgitation, delaying surgical intervention and potentially worsening right ventricular function. This session underscores the need for continuous medical education that moves beyond theoretical knowledge to practical, pattern-recognition skills, especially for procedures where subtle visual cues are paramount.

For medical device manufacturers, the emphasis on precise waveform analysis highlights an opportunity. While the session focused on interpretation, the quality of the acquired waveforms is equally critical. Innovations in catheter technology that reduce artifact, improve signal fidelity, and offer real-time interpretive assistance could significantly enhance diagnostic accuracy. Imagine a system that flags atypical waveform patterns or suggests differential diagnoses based on established algorithms. Such advancements could reduce the cognitive load on clinicians and standardize data acquisition, thereby mitigating some of the interpretive variability that the ATS session sought to address.

Ultimately, the goal is to ensure that every patient undergoing RHC receives the most accurate diagnosis possible. This session, while not presenting novel data, reinforces the importance of foundational skills and systematic thinking. It suggests that guideline bodies, such as the ACC/AHA, might consider incorporating more explicit, step-by-step interpretive algorithms into their recommendations for RHC. Without such standardization, the risk of diagnostic drift remains, potentially leading to suboptimal management strategies and, consequently, poorer patient outcomes. The dry precision of waveform analysis is not just a technical exercise; it is a direct determinant of clinical efficacy.

EDITORIAL & AI STANDARDS

AI tools are used solely to structure and summarise evidence from peer-reviewed primary sources. No AI-generated conclusions appear in The Life Science Feed without editor verification against the primary source.

REFERENCES

1. Naeije R, Vachiéry JL, Yerly P, et al. Hemodynamic measurements in pulmonary hypertension. *Eur Respir Rev.* 2017;26(143):160088. doi:10.1183/16000617.0088-2016
2. Badesch DB, Champion HC, Sanchez MA, et al. Diagnosis and assessment of pulmonary hypertension. *J Am Coll Cardiol.* 2009;54(1 Suppl):S55-66. doi:10.1016/j.jacc.2009.04.011
3. Otto CM. Valvular Heart Disease. In: Zipes DP, Libby P, Bonow RO, Mann DL, Tomaselli GF, Braunwald E, eds. *Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine*. 11th ed. Elsevier; 2019:1210-1269. doi:10.1016/b978-0-323-42973-3.06001-7
4. Oh JK, Hatle L, Seward JB, et al. Diagnostic role of Doppler echocardiography in constrictive pericarditis. *J Am Coll Cardiol.* 1994;23(1):154-162. doi:10.1016/0735-1097(94)90518-X
5. Galiè N, Humbert M, Vachiéry JL, et al. 2015 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension. *Eur Heart J.* 2016;37(1):67-119. doi:10.1093/eurheartj/ehv317
6. Kovacs G, Olschewski H, Berghold A, et al. Pulmonary vascular resistance and pulmonary arterial compliance in pulmonary hypertension: a systematic review and meta-analysis. *Eur Respir J.* 2012;40(4):873-882. doi:10.1183/09031936.00163311

LICENCE & RIGHTS

© 2026 The Life Science Feed. All rights reserved. This content is produced for medical education purposes. It may not be reproduced, distributed, or transmitted without prior written permission from The Life Science Feed.

MEDICAL DISCLAIMER

This content is intended for healthcare professionals only and does not constitute medical advice. Clinical decisions must be made by qualified practitioners based on individual patient circumstances.

FOLLOW THE LIFE SCIENCE FEED

Instagram @lifesciencefeed **LinkedIn** linkedin.com/company/thelifesciencefeed

thelifesciencefeed.com