

# PHenomenal Hope 2024

*Knowledge, Research & Advocacy in PH*

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## Predictive value of pulmonary artery pulsatility index in pulmonary arterial hypertension using the REVEAL Registry

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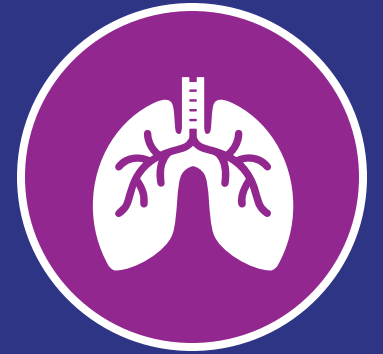
\*Was an employee at the time of study and presentation development.



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# Introduction

- Pulmonary arterial hypertension (PAH) is a progressive disorder associated with elevated pulmonary vascular resistance, leading to right ventricular (RV) failure and death<sup>1</sup>
- There is growing interest in risk assessment tools/metrics to improve treatment, management, and outcomes for patients with PAH
- The pulmonary artery pulsatility index (PAPi) is a novel hemodynamic index defined as pulmonary artery systolic pressure (PASP) minus pulmonary artery diastolic pressure (PADP) divided by right atrial pressure (RAP), or  $(PASP - PADP) / RAP$
- PAPi has been shown to predict right ventricular (RV) failure in patients with acute inferior myocardial infarction and post-left ventricular assist device (LVAD) implantation<sup>2-4</sup>
- Clinically, PAPi is now widely utilized in cardiac critical care and plays a key role in clinical decision-making in these cohorts
- PAPi has been evaluated in several small studies in PAH and has been shown to predict mortality in these patients<sup>5-7</sup>

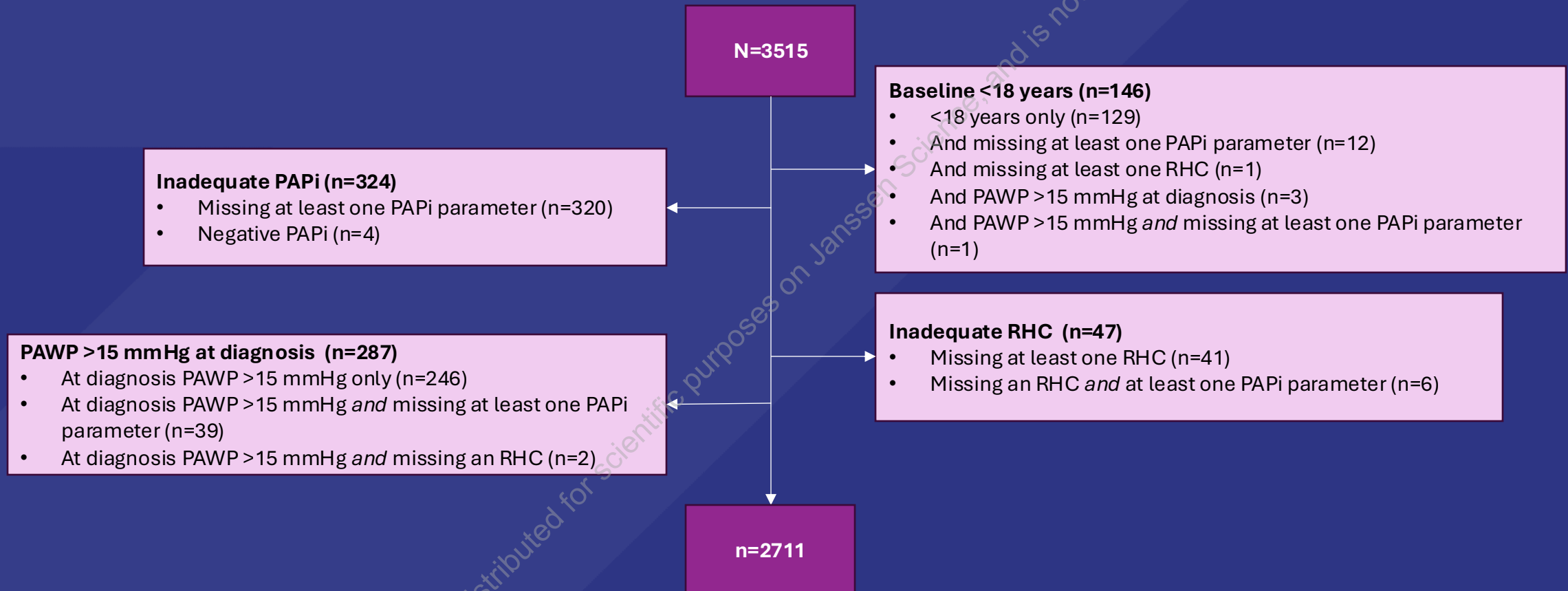


1. Benza RL, et al. *Chest*. 2012;142:448–56. 2. Korabathina R, et al. *Catheter Cardiovasc Interv*. 2012;80:593–600. 3. Kang G, et al. *J Heart Lung Transplant*. 2016;35:67–73. 4. Morine KJ, et al. *J Card Fail*. 2016;22:110–16. 5. Ostad S, et al. *CJC Open*. 2023;5:545–53. 6. Mazimba S, et al. *Heart Lung Circ*. 2019;28:752–60. 7. Lim Y, et al. *ESC Heart Fail*. 2021;8:3835–44.

# Methodology

- Patient characteristics data collected from the US-based Registry to Evaluate Early and Long-Term PAH Disease Management (REVEAL) study were stratified and analyzed according to baseline PAPI quartiles (<3.55,  $\geq 3.55$  to <5.5,  $\geq 5.5$  to <9.0,  $\geq 9.0$ ) during follow-up for 36 months
- An additional analysis of standardized log-rank statistics of all possible cut-off points were generated to determine the optimal cut-off point for PAPI in association with mortality (based on maximally selected rank statistic)

# Patient eligibility (inclusion/exclusion criteria)



PAPi, Pulmonary Artery Pulsatility Index; PAWP, pulmonary artery wedge pressure; RHC, right heart catheterization.

# Demographics and functional class

Characteristic	PAPi quartile				
	Overall (N=2711)	<3.55 (n=678)	≥3.55 to <5.5 (n=668)	≥5.50 to <9.0 (n=682)	≥9.0 (n=683)
Age, years					
Mean (SD)	52.4 (14.7)	51.4 (13.9)	53.5 (14.4)	53.1 (14.9)	51.8 (15.5)
Age at diagnosis, years					
Mean (SD)	49.7 (15.5)	49.1 (14.2)	51.0 (15.1)	50.2 (15.9)	48.6 (16.7)
Sex, %					
Female	79.3	75.8	79.3	80.6	81.4
Race, n (%)					
White	1969 (72.6)	480 (70.8)	489 (73.2)	518 (76.0)	482 (70.6)
Black	347 (12.8)	112 (16.5)	89 (13.3)	72 (10.6)	74 (10.8)
Hispanic	236 (8.7)	48 (7.1)	50 (7.5)	60 (8.8)	78 (11.4)
Asian	86 (3.2)	17 (2.5)	23 (3.4)	13 (1.9)	33 (4.8)
Other	73 (2.7)	21 (3.1)	17 (2.5)	19 (2.8)	16 (2.3)
NYHA/WHO FC, n (% <sup>a</sup> )					
I	172 (7.1)	26 (4.3)	39 (6.3)	54 (8.9)	53 (8.7)
II	843 (34.6)	181 (29.9)	200 (32.5)	229 (37.9)	233 (38.2)
III	1256 (51.6)	331 (54.6)	337 (54.8)	287 (47.5)	301 (49.3)
IV	164 (6.7)	68 (11.2)	39 (6.3)	34 (5.6)	23 (3.8)
Missing, n	276	72	53	78	73

<sup>a</sup>Percentages are adjusted to account for missing values.

FC, functional class; NYHA, New York Heart Association; PAPi, Pulmonary Artery Pulsatility Index; SD, standard deviation; WHO, World Health Organization.

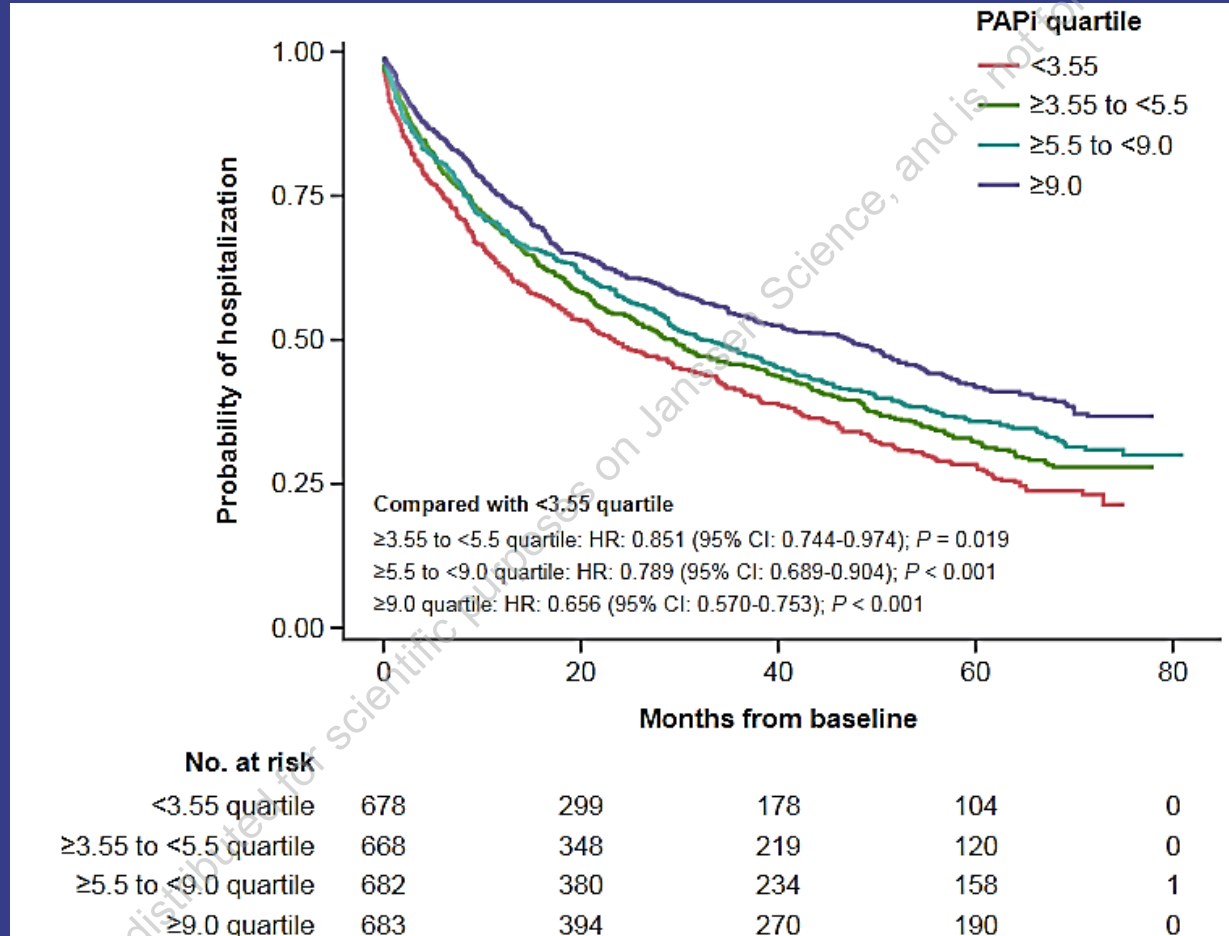
# Clinical characteristics and treatment history

Characteristic	PAPi quartile				
	Overall (N=2711)	<3.55 (n=678)	≥3.55 to <5.5 (n=668)	≥5.50 to <9.0 (n=682)	≥9.0 (n=683)
6-Minute Walk Distance, m					
Mean (SD)	361.6 (127.5)	340.1 (126.0)	355.0 (129.1)	369.4 (131.4)	380.1 (120.0)
Missing, n	572	169	141	129	133
PAH risk score (REVEAL 2.0 risk calculator)					
Mean (SD)	7.6 (2.3)	8.2 (2.4)	7.6 (2.3)	7.4 (2.4)	7.2 (2.1)
Baseline mPAP (at rest)					
Mean (SD)	49.6 (14.4)	48.6 (13.4)	49.4 (13.9)	50.5 (14.4)	49.7 (15.6)
Missing, n	57	13	19	12	13
Any prostacyclin, n (% <sup>a</sup> )					
Yes	1013 (38.1)	310 (46.5)	265 (40.8)	230 (34.3)	208 (31.0)
Missing, n	53	11	19	12	11
Any phosphodiesterase-5 inhibitor, n (% <sup>a</sup> )					
Yes	1239 (46.6)	300 (45.0)	294 (45.3)	328 (49.0)	317 (47.2)
Missing, n	53	11	19	12	11
Any endothelin receptor antagonist, n (% <sup>a</sup> )					
Yes	1118 (42.1)	259 (38.8)	241 (37.1)	307 (45.8)	311 (46.3)
Missing, n	53	11	19	12	11

<sup>a</sup>Percentages are adjusted to account for missing values.

mPAP, mean pulmonary artery pressure; PAH, pulmonary arterial hypertension; PAPi, Pulmonary Artery Pulsatility Index; REVEAL, Registry to Evaluate Early and Long-Term PAH Disease Management; SD, standard deviation.

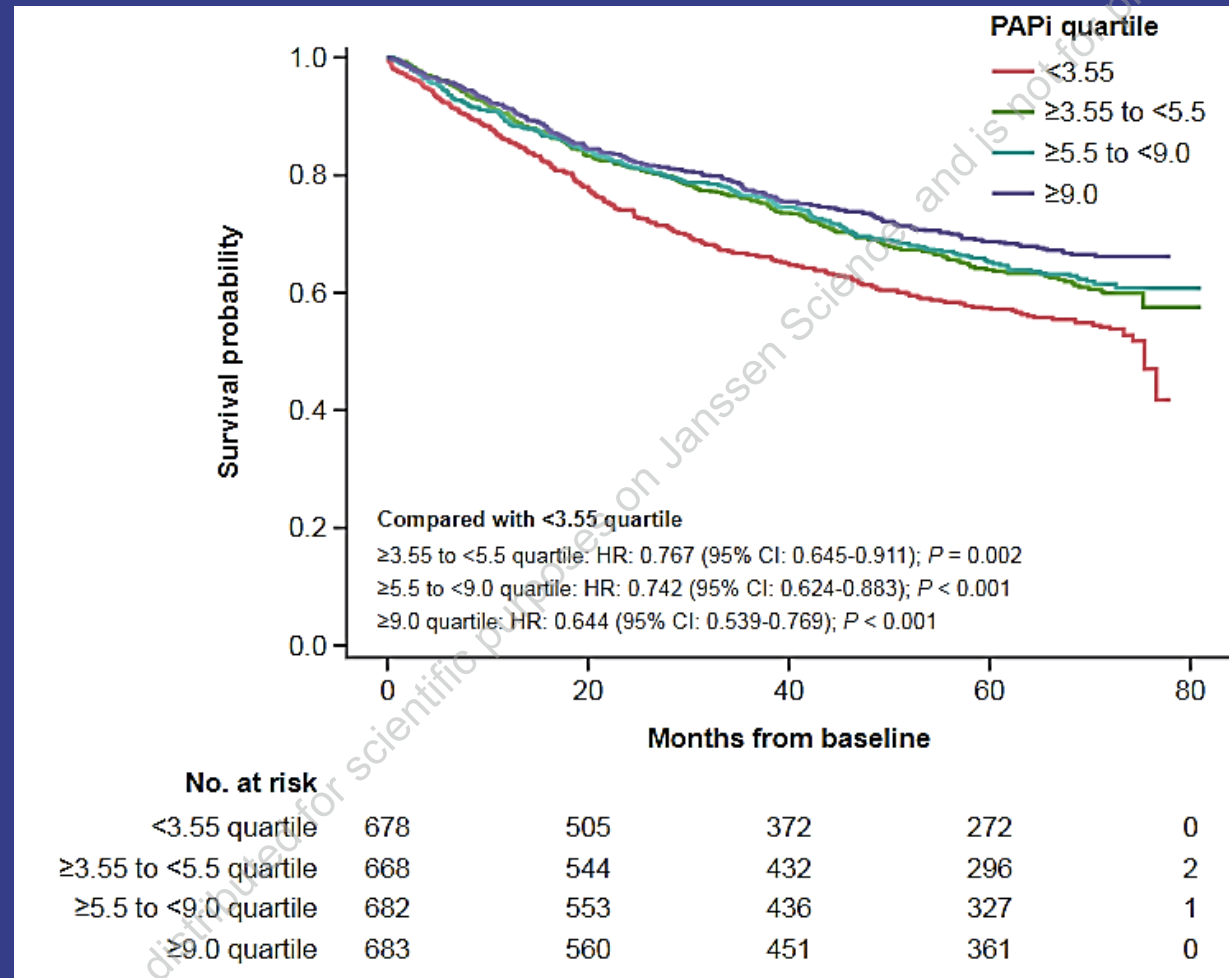
# Proportion of patients experiencing all-cause hospitalization according to PAPi quartile



CI, confidence interval; HR, hazard ratio; PAPI, Pulmonary Artery Pulsatility Index.

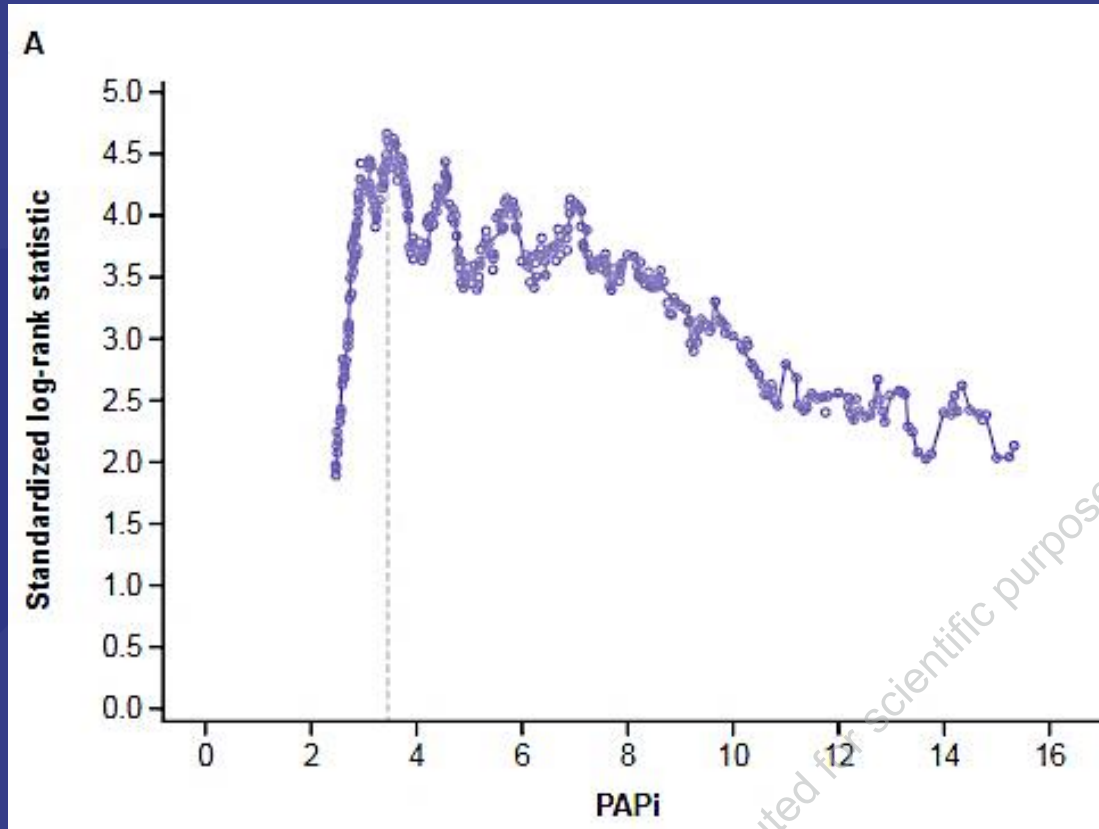


# Mortality rates according to PAPI quartile

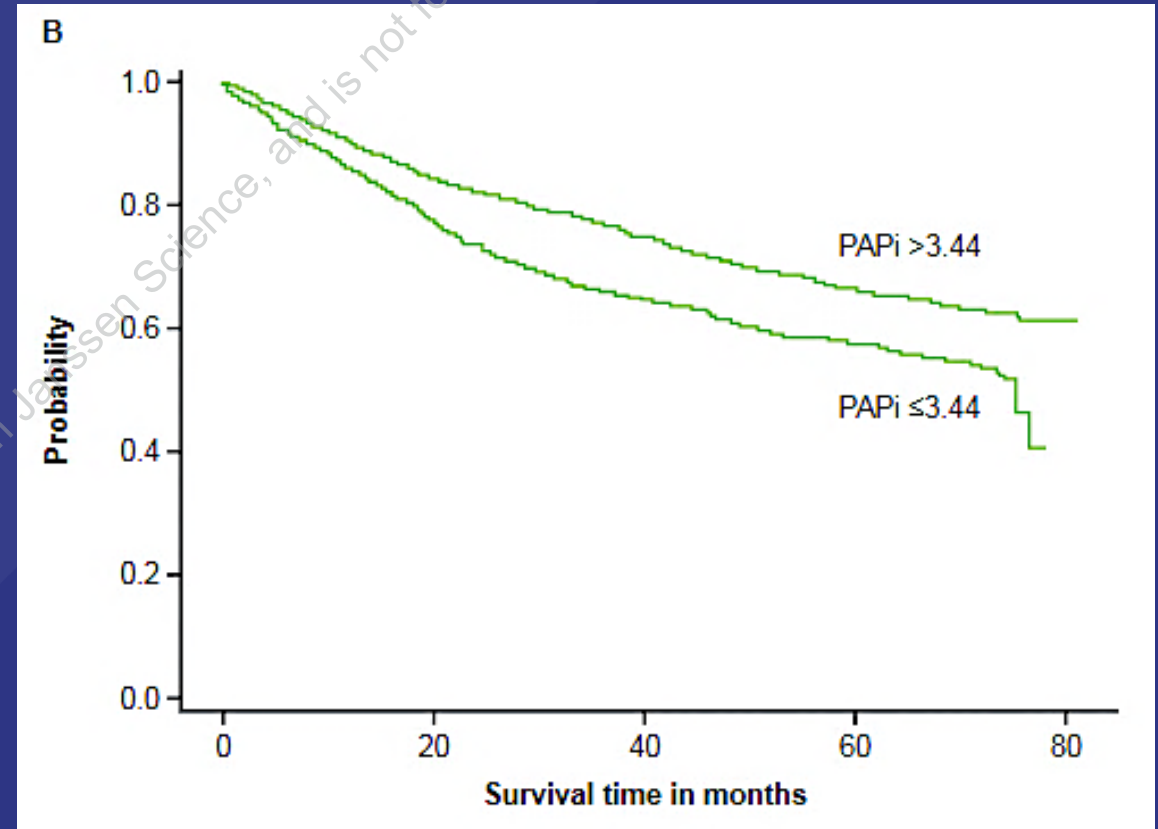


CI, confidence interval; HR, hazard ratio; PAPI, Pulmonary Artery Pulsatility Index.

# Cut-off point for mortality using log-rank statistics

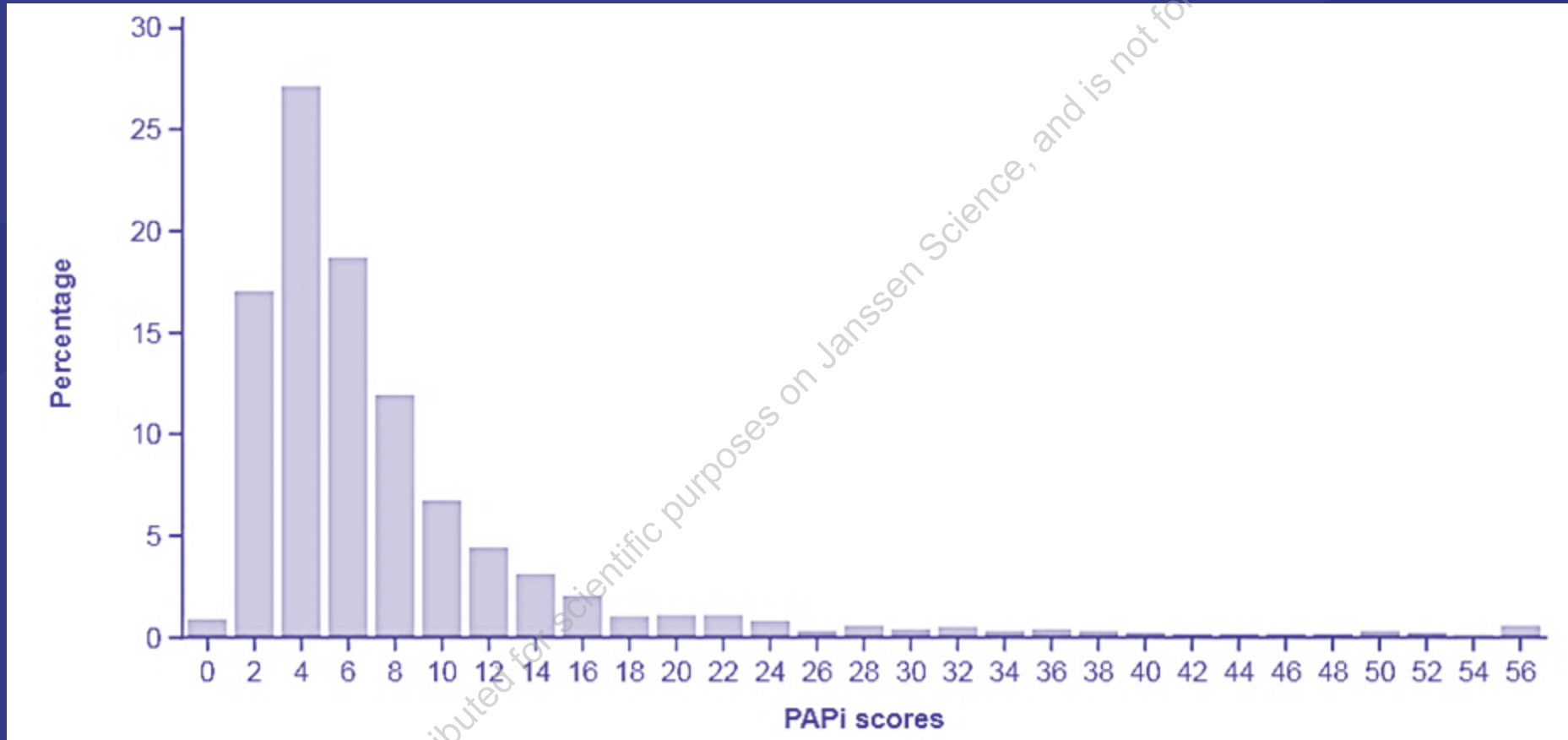


The optimal cut-off point was 3.44



The corresponding PAPi groups ( $\leq 3.44$  and  $> 3.44$ ) provided the best risk discrimination ( $P < 0.001$ )

# Histogram of PAPI scores/values

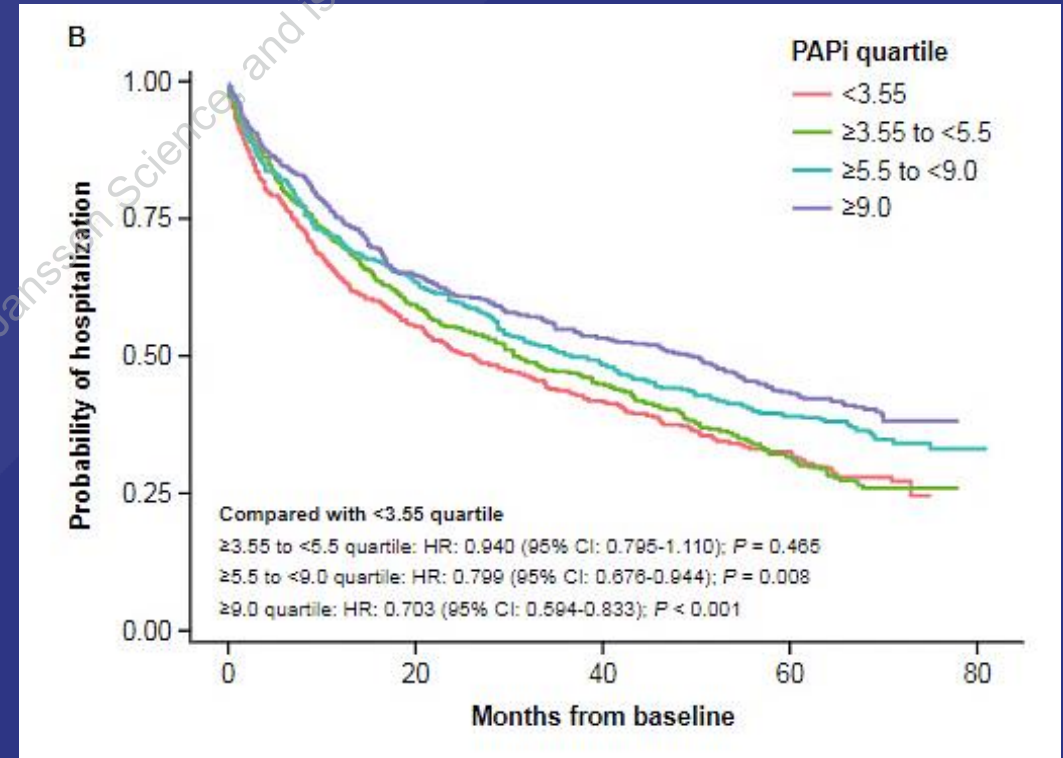
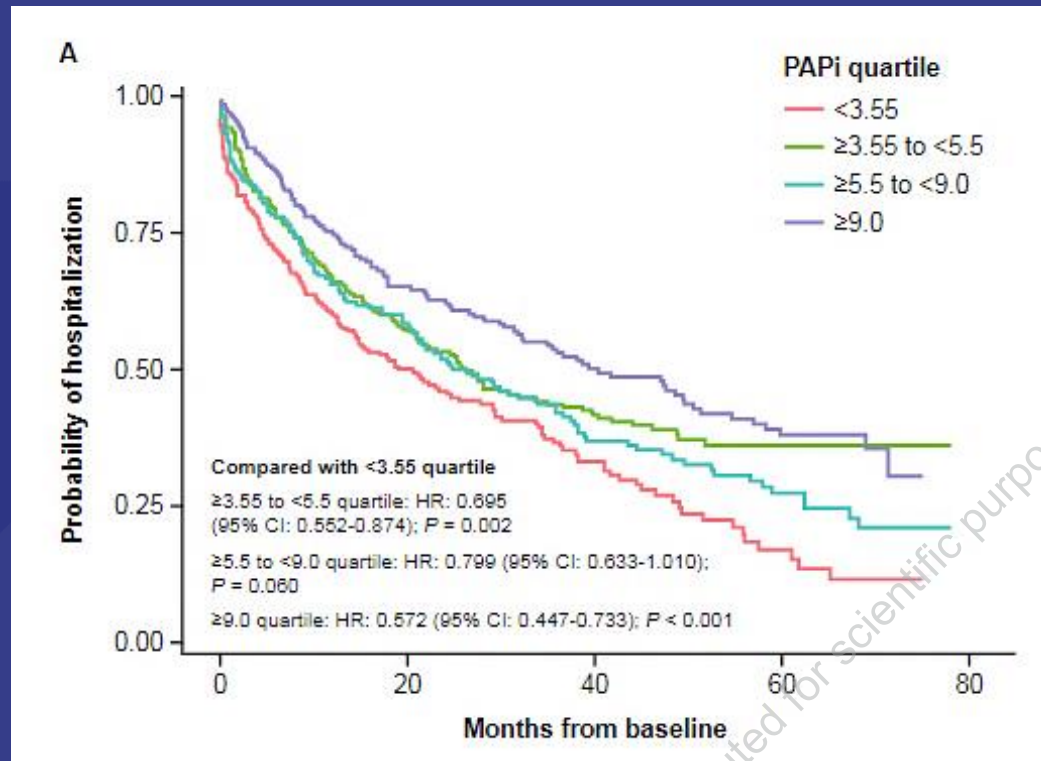


PAPi, Pulmonary Artery Pulsatility Index.

# Patient hospitalization by PAPI quartile: Incident and Prevalent groups

## Incident

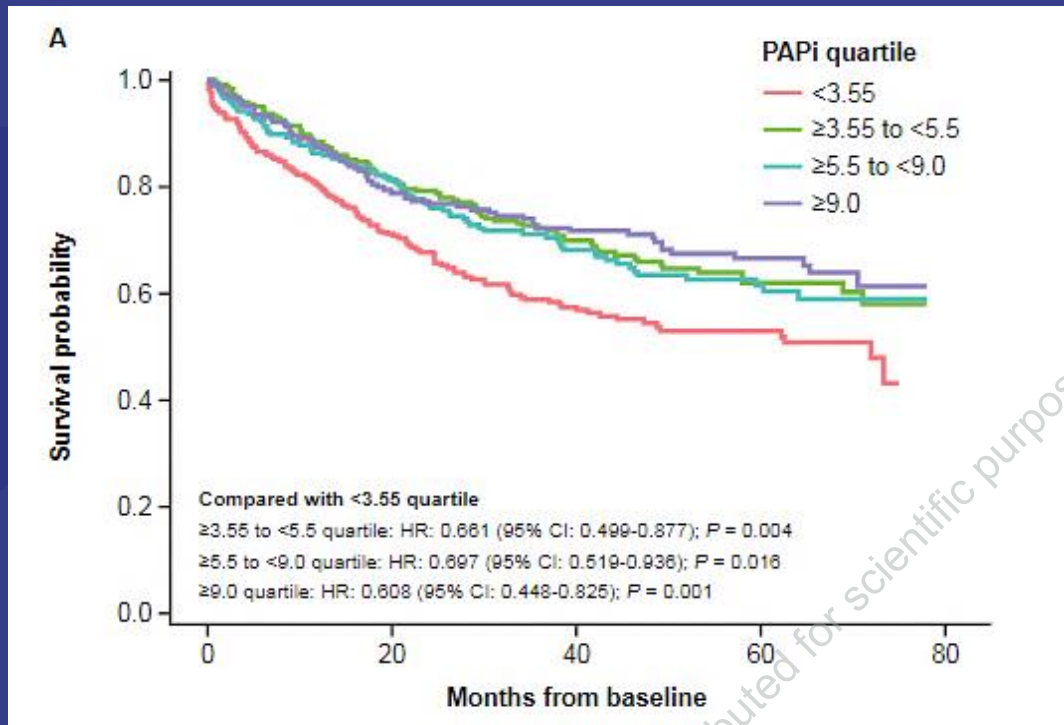
## Prevalent



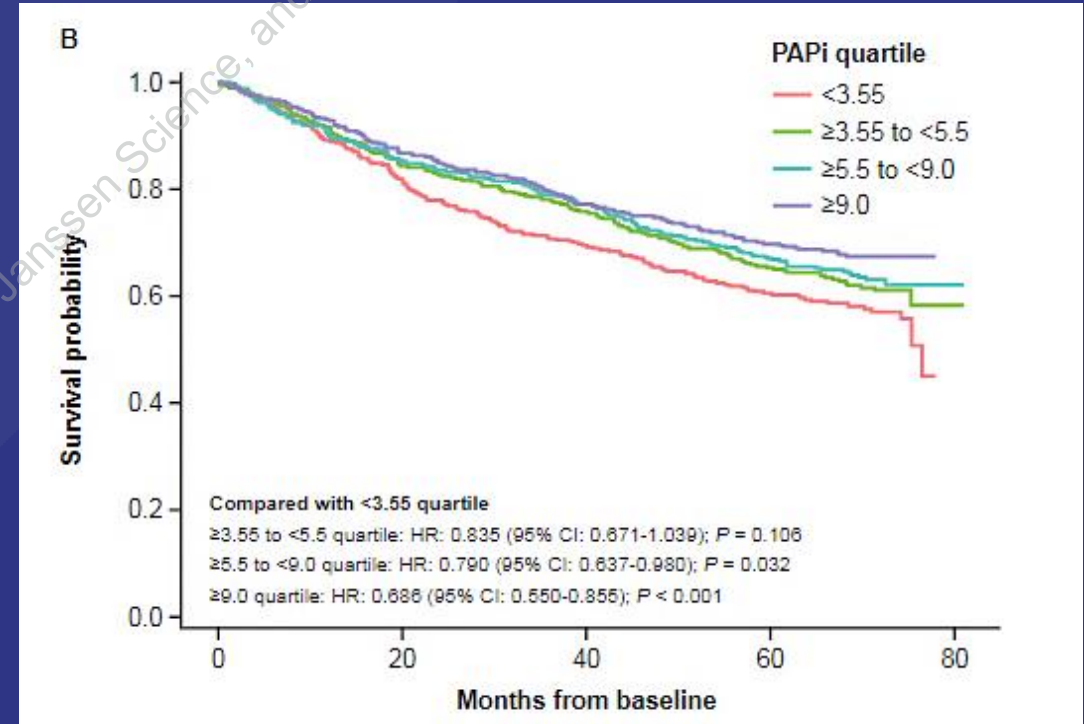
CI, confidence interval; HR, hazard ratio; PAPI, Pulmonary Artery Pulsatility Index.

# Patient mortality by PAPI quartile: Incident and Prevalent groups

## Incident



## Prevalent



CI, confidence interval; HR, hazard ratio; PAPI, Pulmonary Artery Pulsatility Index.

# Conclusions



- PAPI was a good prognostic tool and long-term predictor of clinical worsening events in PAH
  - Rates of hospitalization and mortality in the Incident and Prevalent groups were similar to those in the overall population
  - Patients in higher PAPI quartiles experienced lower rates of hospitalization and death



- PAPI may be an additional metric to improve prediction of outcomes in PAH alone or added to other risk assessment tools



- Future studies should longitudinally investigate whether PAPI demonstrates sustained prognostic utility of baseline hemodynamic measures in the current era of early and effective combination therapy

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# Disclosures

- ZS is a speaker, a scientific advisory board member and a consultant for United Therapeutics, Janssen Pharmaceutical Companies of Johnson & Johnson, and Boehringer Ingelheim; and a scientific advisory board member for Merck
- HWF is a speaker for Bayer (non-branded); a scientific advisory board member for Janssen Pharmaceutical Companies of Johnson & Johnson, Acceleron Pharma (Merck), Altavant, Roivant, Aerami, and United Therapeutics; and has received research support from Janssen Pharmaceutical Companies of Johnson & Johnson, Merck, and United Therapeutics
- TT is an employee of Johnson & Johnson
- MR and JY were employees of Johnson & Johnson during the study
- NFR and NK are employed by Tufts Medical Center



# Thank you!

<https://www.janssescience.com/media/attachment/congresses/pulmonary-hypertension/2024/team-phenomenal-hope/predictive-value-of-pulmonary-artery-pulsatility-index-in-pulmonary-arterial-hypertension-reveal-ana.pdf>

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