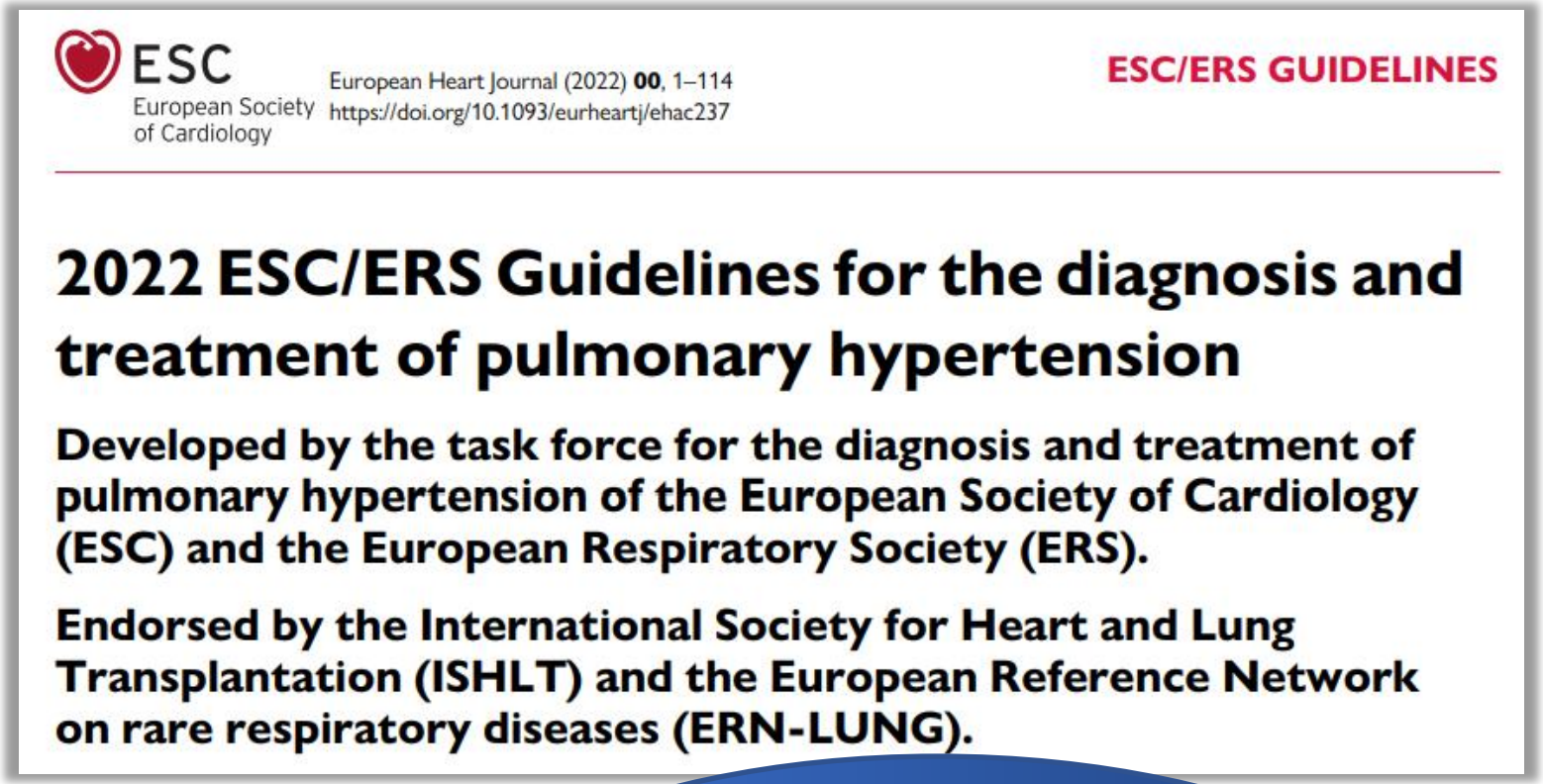
Assessment of Pulmonary Hypertension

Dr Julie Humphries

ECHO AUSTRALIA

17-19 March 2025

PHT Definition



ESC European Society of Cardiology

European Heart Journal (2022) **00**, 1–114
https://doi.org/10.1093/eurheartj/ehac237

ESC/ERS GUIDELINES

2022 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension

Developed by the task force for the diagnosis and treatment of pulmonary hypertension of the European Society of Cardiology (ESC) and the European Respiratory Society (ERS).

Endorsed by the International Society for Heart and Lung Transplantation (ISHLT) and the European Reference Network on rare respiratory diseases (ERN-LUNG).

Normal pulmonary artery pressures

PAPsys <30mmHg

PAPdiast <15mmHg

PAPmean <20mmHg

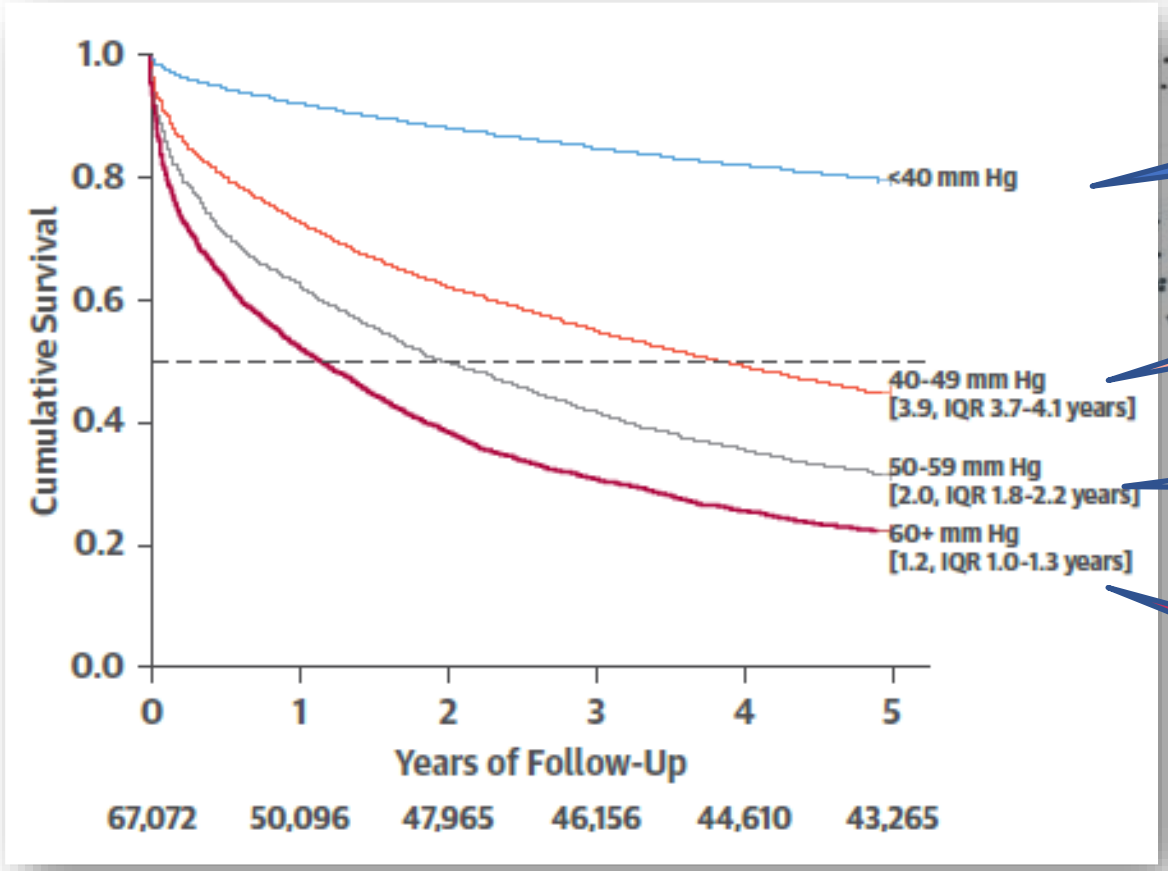
PHT

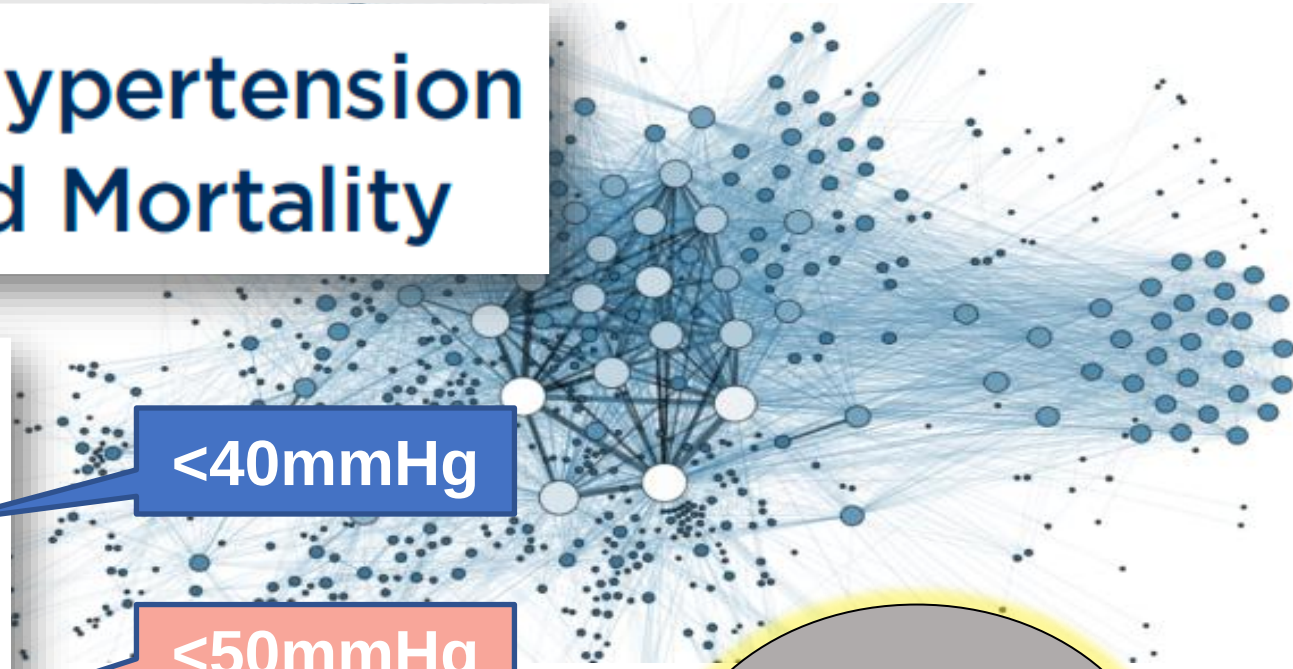
PAP_{sys} >30mmHg

PAP_{mean}>20mmHg

ECHO AUSTRALIA

Threshold of Pulmonary Hypertension Associated With Increased Mortality





<40mmHg

<50mmHg

<60mmHg

>60mmHg

J Am Coll Cardiol 2019;73:2660–72

ECHO AUSTRALIA

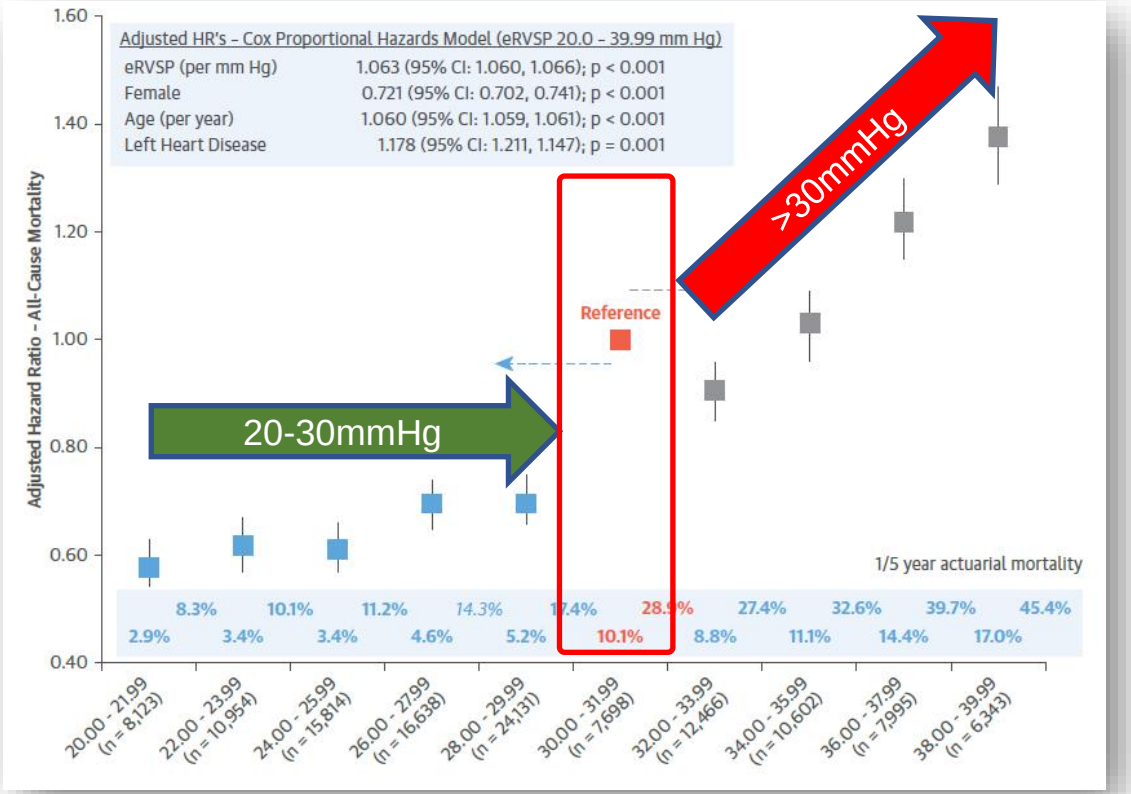
Principal Investigator
Professor David Playford

1.8 million echos

Principal Investigator
Professor Geoff Strange

Professor David Celermajer
Professor Greg Scalia
Professor Tom Marwick
A/Professor David Prior
Dr Majo Joseph
Dr Marcus Ilton
Professor Simon Stewart
Professor Jim Codde

Threshold of Pulmonary Hypertension Associated With Increased Mortality

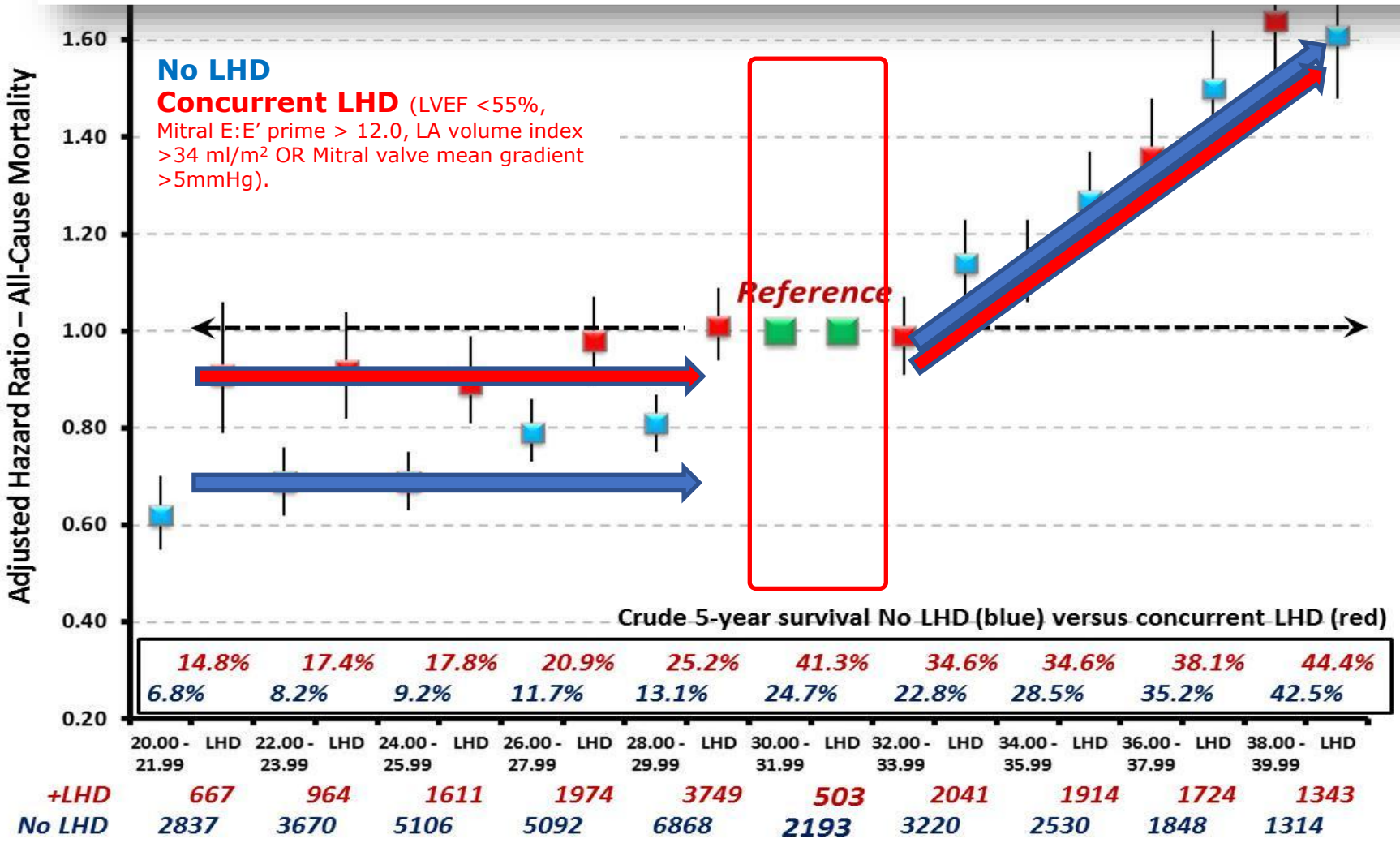


Risk inflection point
RVSP >30mmHg

J Am Coll Cardiol 2019;73:2660–72

ECHO AUSTRALIA

Threshold of Pulmonary Hypertension Associated With Increased Mortality



Risk inflection point
RVSP >30mmHg
Pre- and post-capillary

ECHO AUSTRALIA

Incident pulmonary hypertension in 13,448 cases investigated with repeat echocardiography:

Insights from the National Echo Database of Australia

Simon Stewart PhD FESC, on behalf of **Chan YK, Playford D, Strange G & the NEDA Investigators**

simon.stewart@nd.edu.au

29th August 2022

ESC CONGRESS 2022
Barcelona & Online

Incident pulmonary hypertension in 13,448 cases investigated with repeat echocardiography:

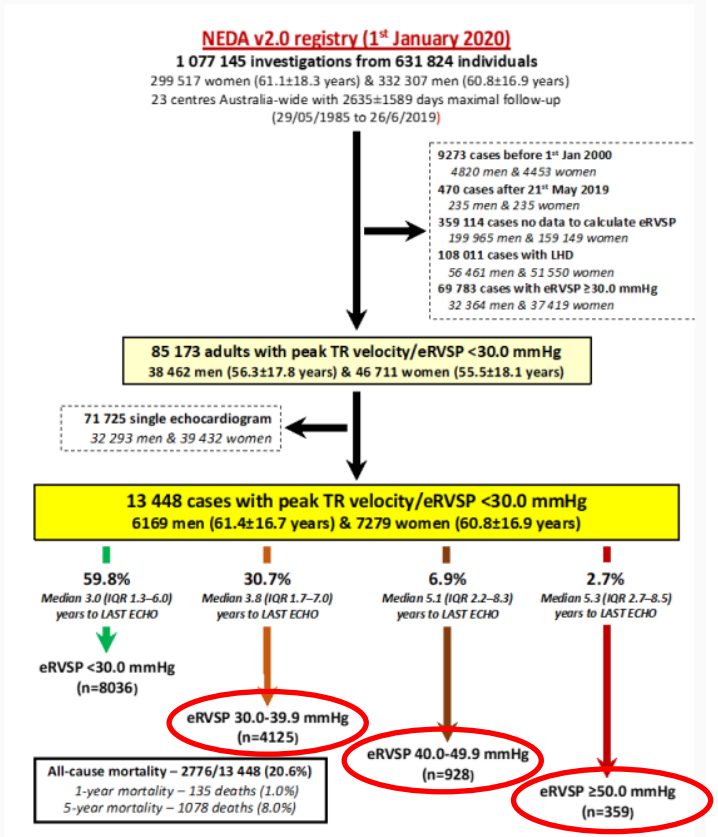
Insights from the National Echo Database of Australia

ESC European Society of Cardiology

METHODS

- NEDA captured routine echo data on 631,824 people
- 85,173 – eRVSP <30.0 mmHg & no LHD on initial echo
- 13,448 (15.5%) repeat echo
- Repeat echo categorised as –
  - No PHT (59.8%) 8,036
  - Mild PHT (30.7%)
  - Moderate PHT (6.9%)
  - Severe PHT (2.7%)

5,412 ~40%



ESC CONGRESS 2022
Barcelona & Online

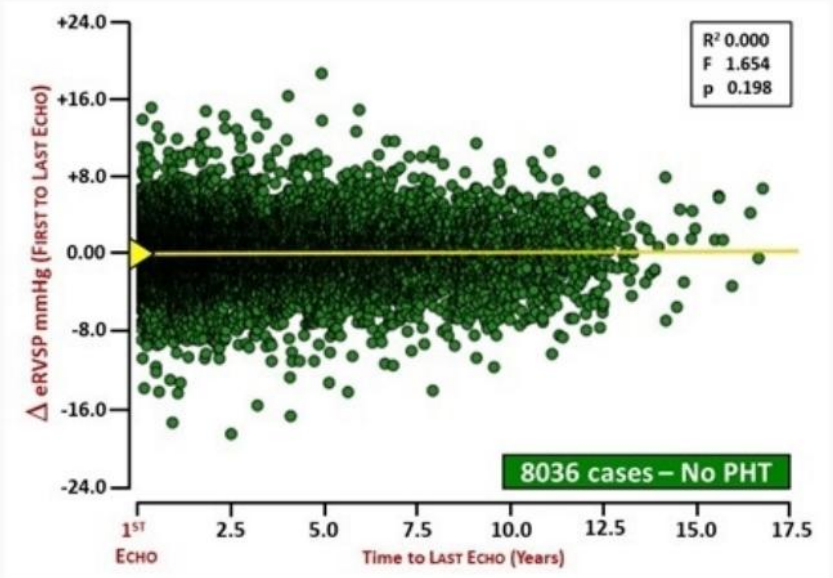
ECHO AUSTRALIA

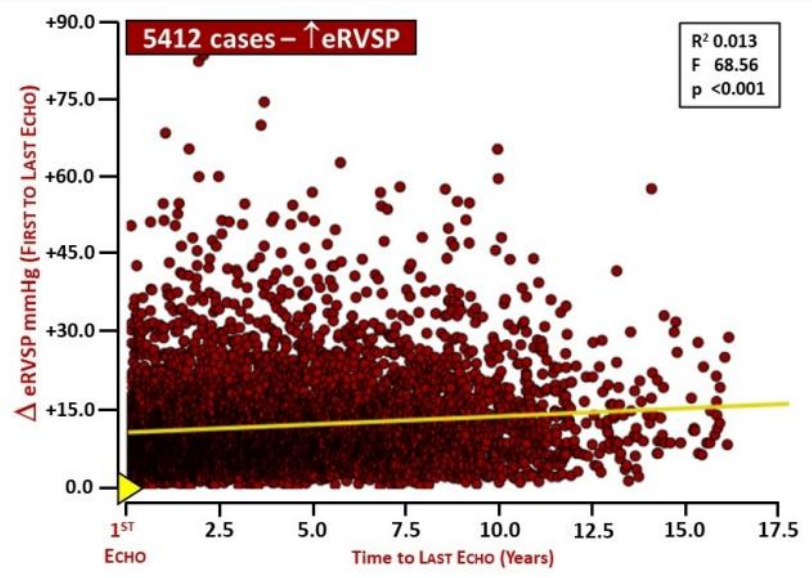
Incident pulmonary hypertension in 13,448 cases investigated with repeat echocardiography:

Insights from the National Echo Database of Australia

ESC European Society of Cardiology

Pattern/Rate of Change in eRVSP





Median eRVSP +30.68 (IQR +26.03 to +37.31) mmHg in severe PHT

ESC CONGRESS 2022
Barcelona & Online

ECHO AUSTRALIA

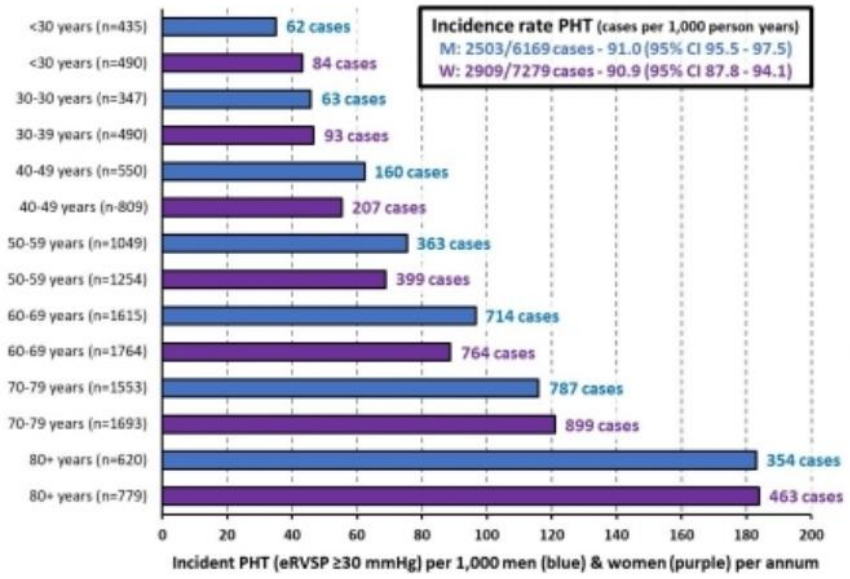
Incident pulmonary hypertension in 13,448 cases investigated with repeat echocardiography:

Insights from the National Echo Database of Australia

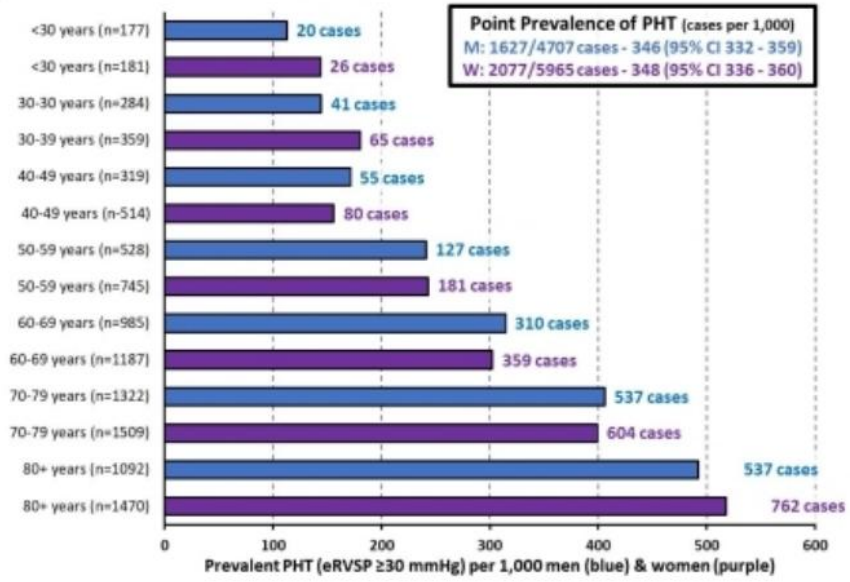
ESC European Society of Cardiology

INCIDENCE & PREVALENCE OF PHT

Incidence rate calculated from 1st to Last Echo



Point prevalence derived from censored alive cohort



ESC CONGRESS 2022
Barcelona & Online

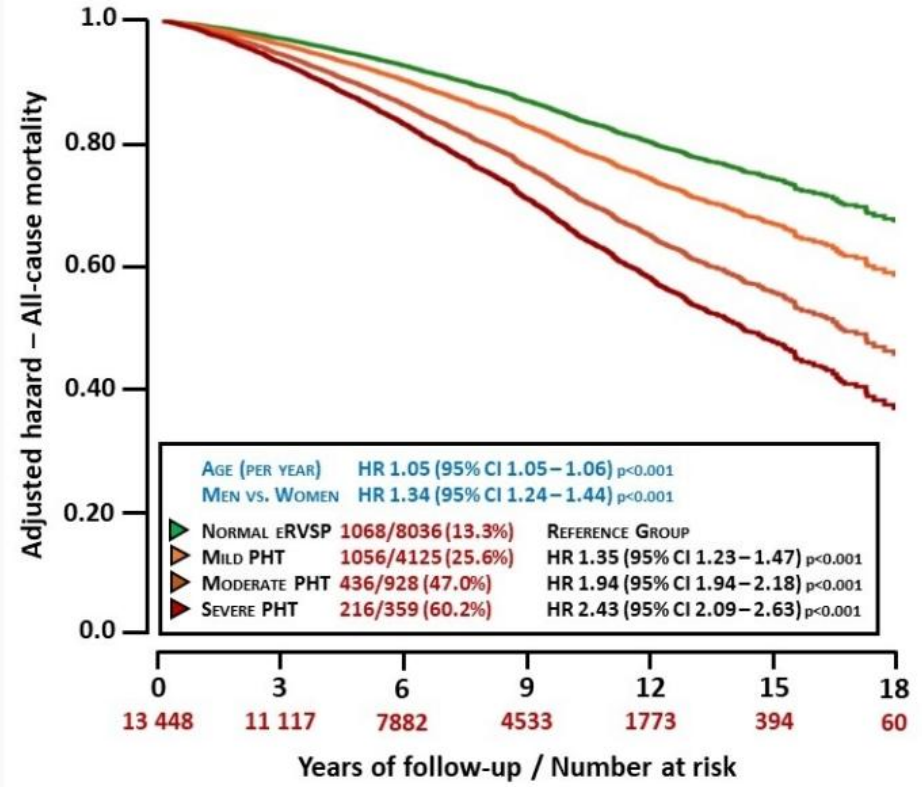
ECHO AUSTRALIA

Incident pulmonary hypertension in 13,448 cases investigated with repeat echocardiography:

Insights from the National Echo Database of Australia

ESC European Society of Cardiology

All Cause Mortality



ESC CONGRESS 2022
Barcelona & Online

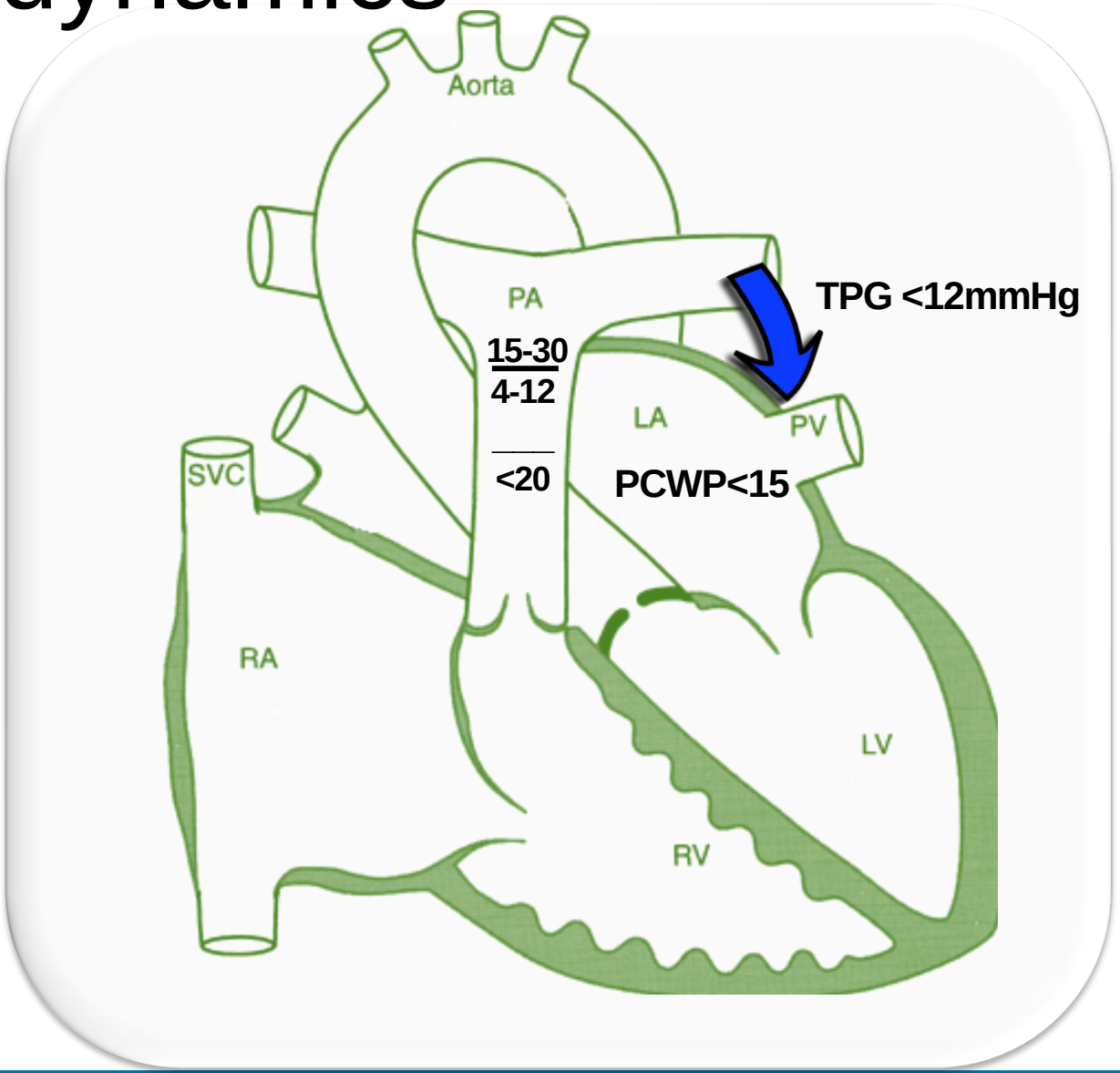
- 13,448 (15.5%) repeat echo
- Repeat echo categorised as
  - No PHT (59.8%)
  - Mild PHT (30.7%)
  - Moderate PHT (6.9%)
  - Severe PHT (2.7%)

ECHO AUSTRALIA

Pulmonary Hemodynamics

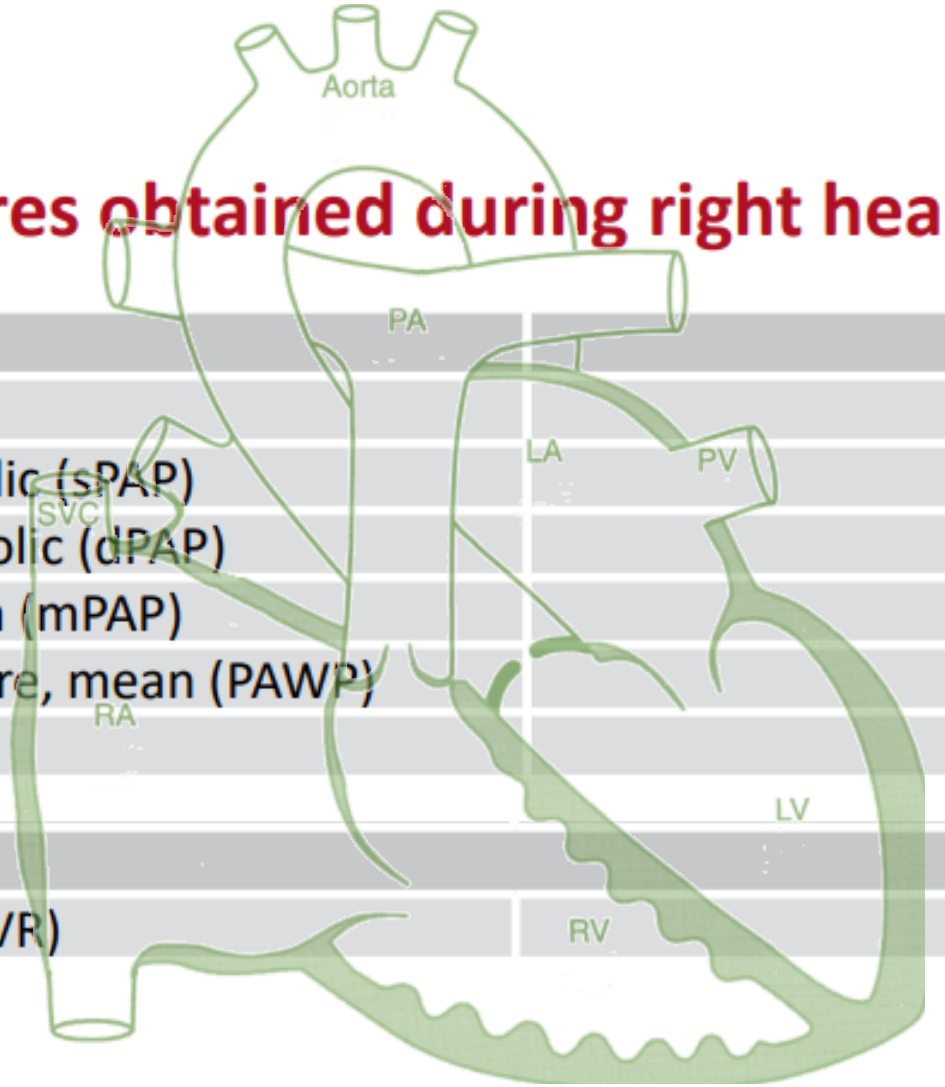
Right heart catheterisation "gold-standard"

- Pulmonary artery pressure (PAP)
- Pulmonary capillary wedge pressure (PCWP) = LAP
- Trans-pulmonary gradient
- TPG = PAP_{mean}-PCWP
- Pulmonary vascular resistance
  PVR = TPG/Cardiac Output
  Normal <2.0 Wood Units



Haemodynamic measures obtained during right heart catheterization

Measured variables	Normal value
Right atrial pressure, mean (RAP)	2–6 mmHg
Pulmonary artery pressure, systolic (sPAP)	15–30 mmHg
Pulmonary artery pressure, diastolic (dPAP)	4–12 mmHg
Pulmonary artery pressure, mean (mPAP)	8–20 mmHg
Pulmonary arterial wedge pressure, mean (PAWP)	≤15 mmHg
Cardiac output (CO)	4–8 L/min
Calculated parameters	
Pulmonary vascular resistance (PVR)	0.3–2.0 WU



Echocardiography

PA Catheter in a Box

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association®
Learn and Live℠

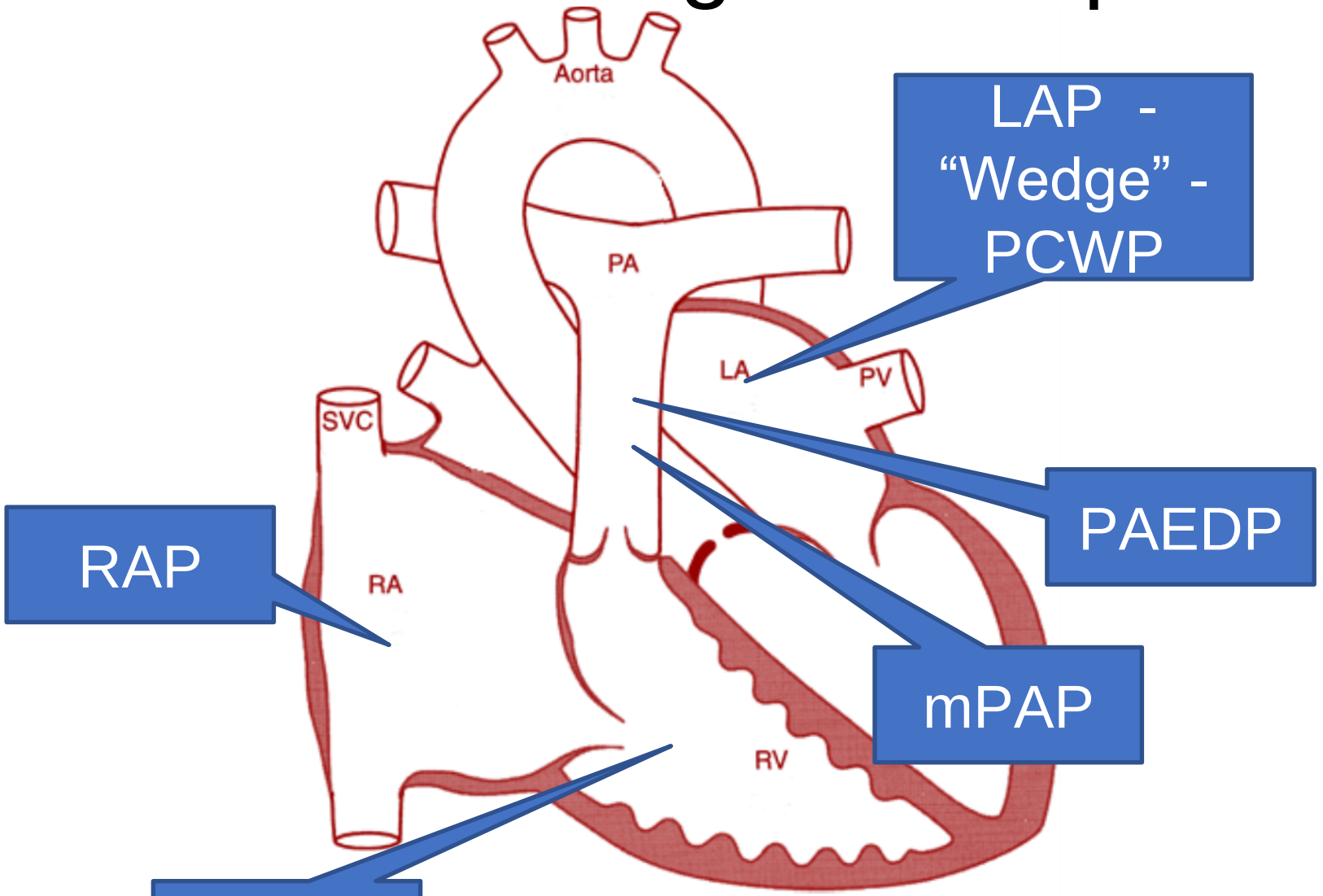
Echocardiography as a Noninvasive Swan-Ganz Catheter

Jae K. Oh, MD

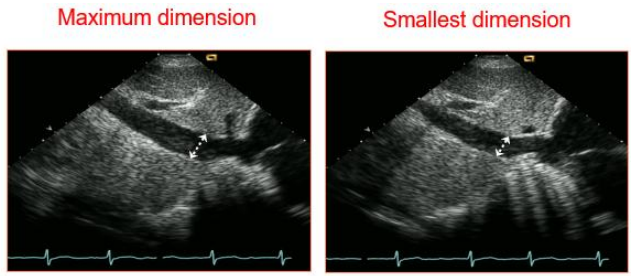
Circulation 2005;111;3192-3194

ECHO AUSTRALIA

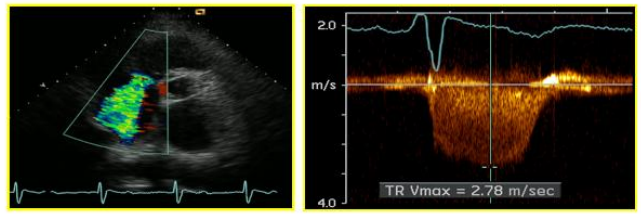
Echo assessment of Right heart pressures



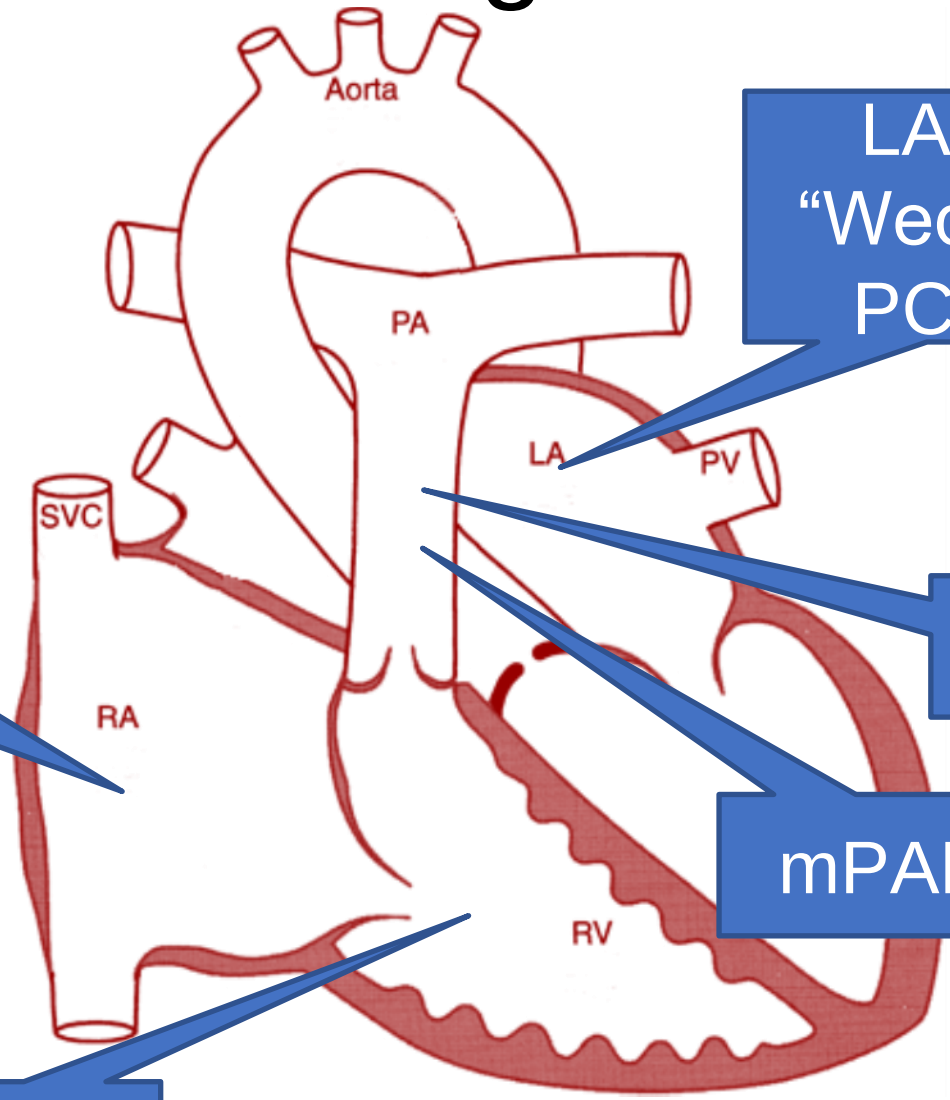
Echo assessment of Right heart pressures



CI (%) = [($IVCD_{max}$ - $IVCD_{min}$) / $IVCD_{max}$] x 100



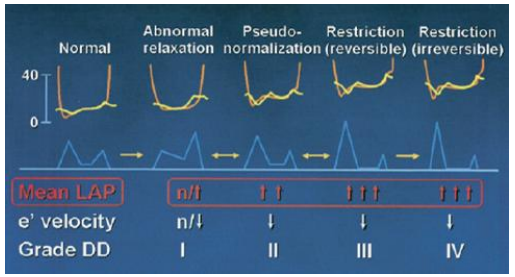
RVSP = $4(V_{TR})^2$ + RAP



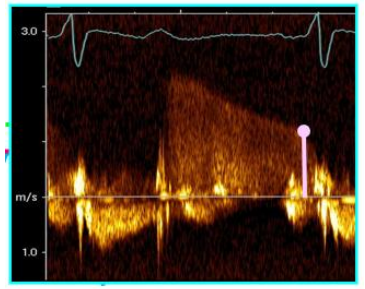
RAP

RVSP

LAP - "Wedge" - PCWP

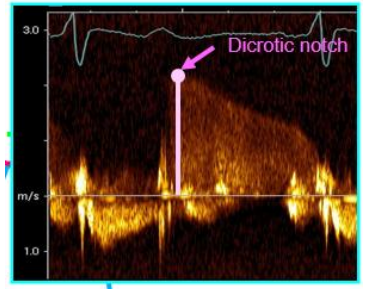


PAEDP



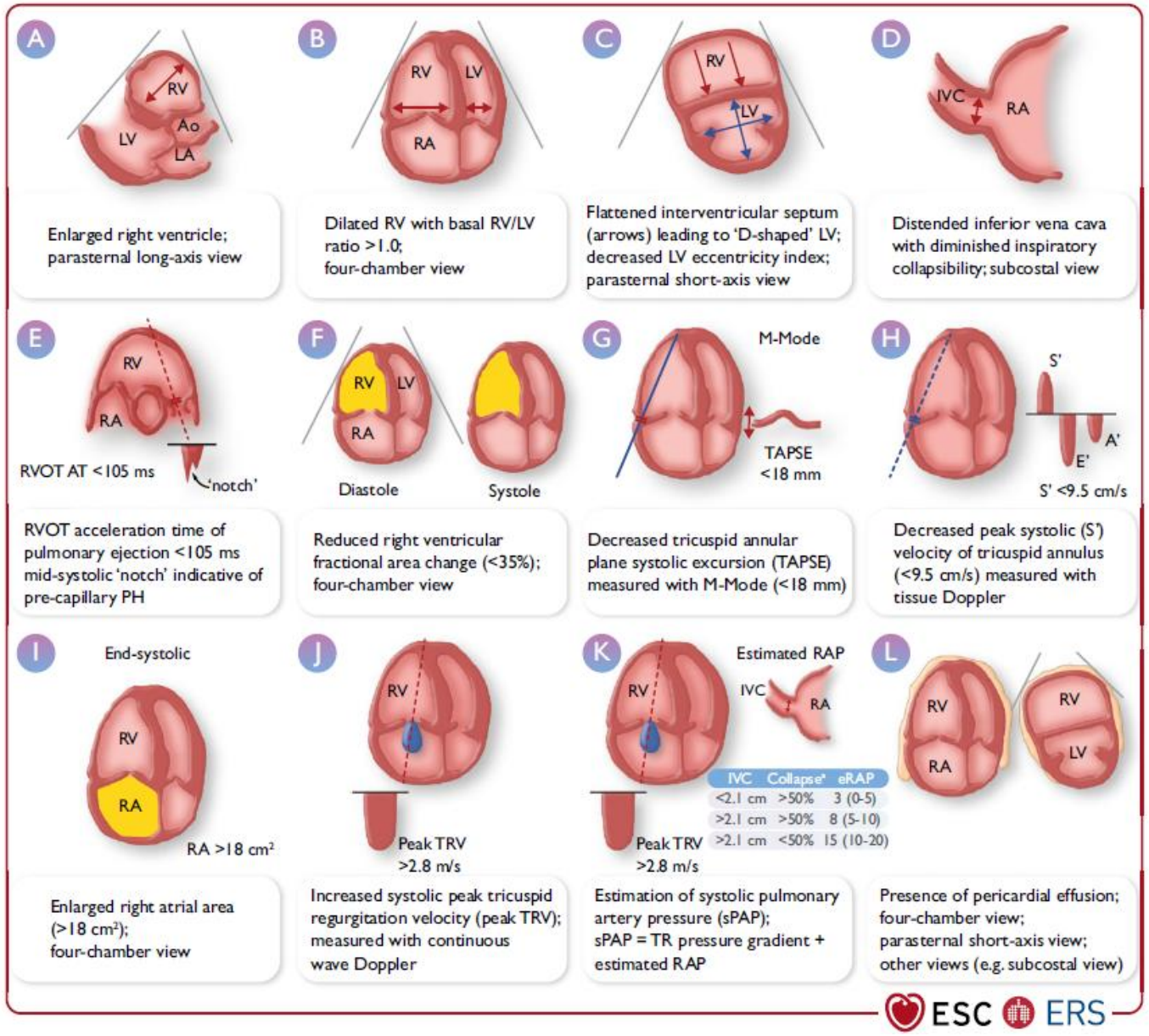
PAEDP = $4(V_{end\text{-}PR})^2$

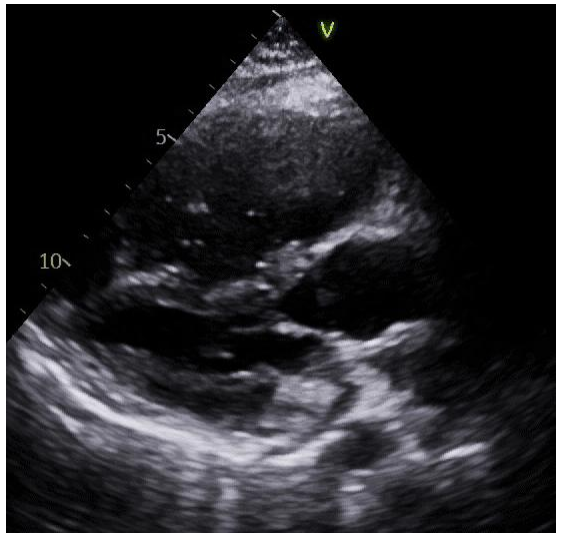
mPAP

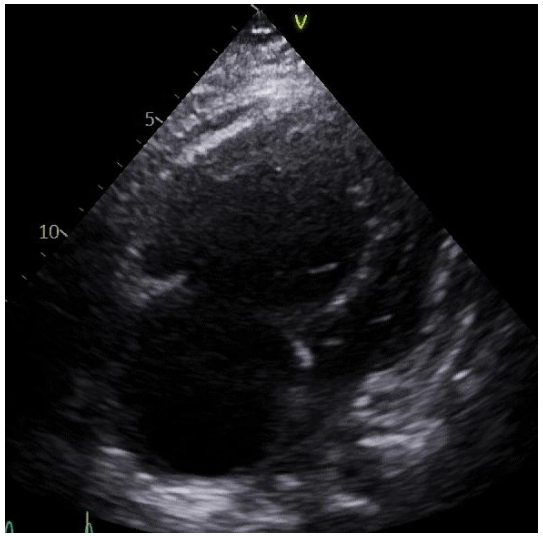


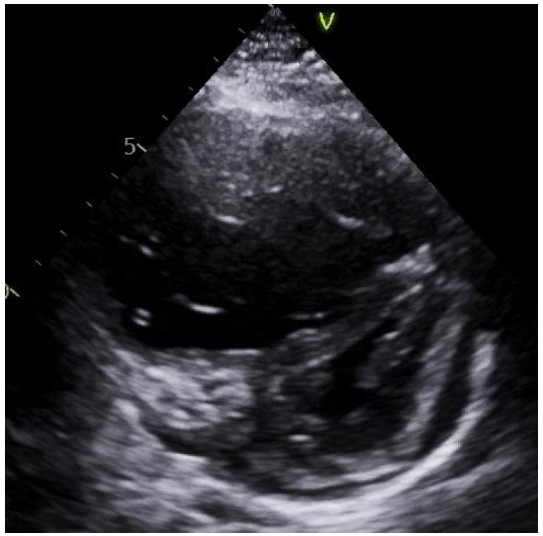
mPAP = $4(V_{early\text{-}PR})^2$

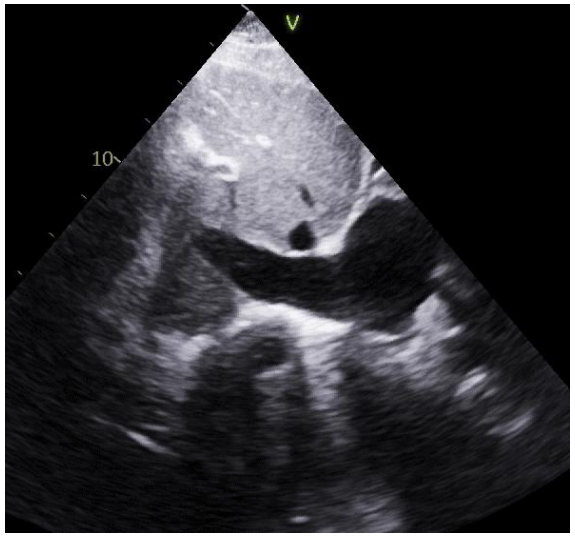
Echo PHT menu

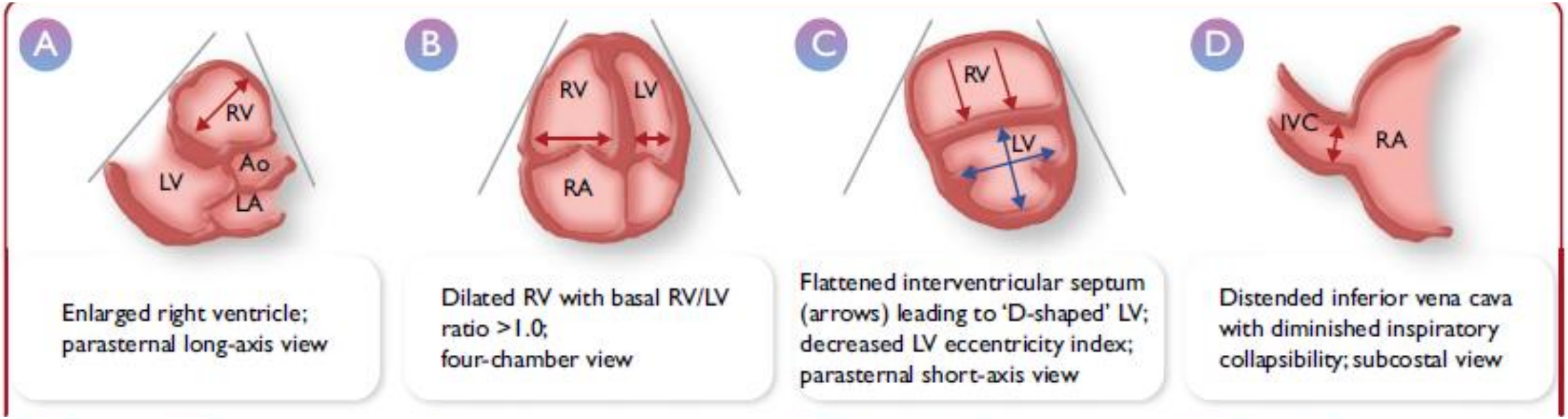










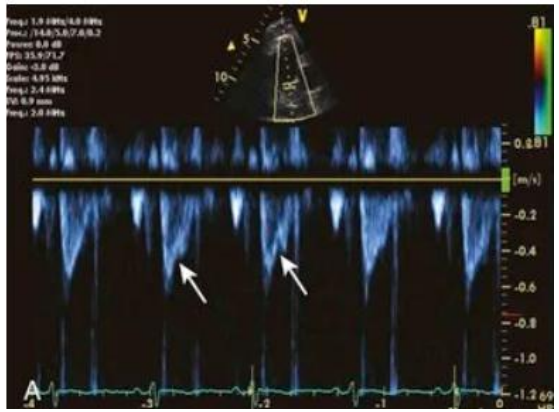


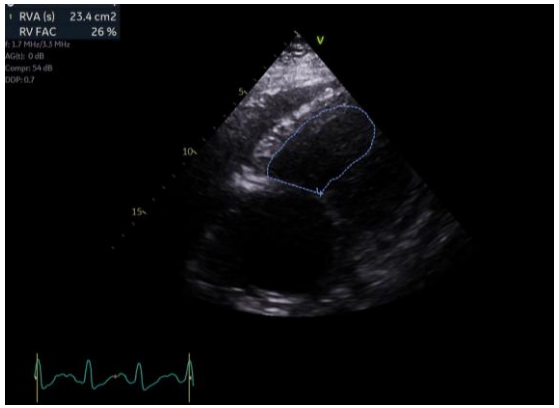
Enlarged right ventricle; parasternal long-axis view

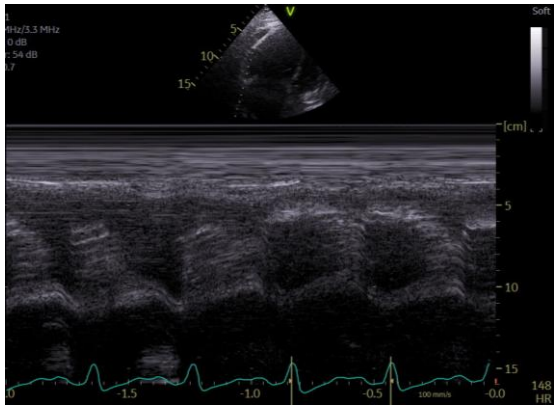
Dilated RV with basal RV/LV ratio >1.0; four-chamber view

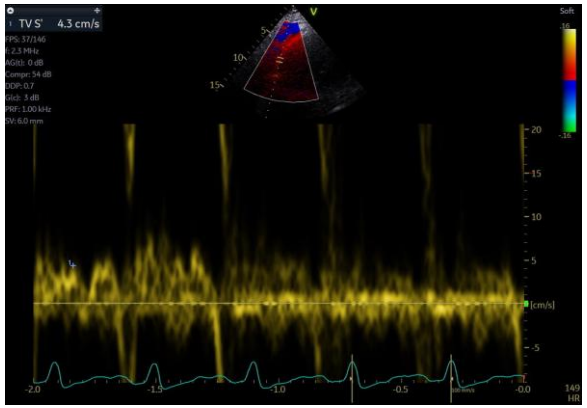
Flattened interventricular septum (arrows) leading to 'D-shaped' LV; decreased LV eccentricity index; parasternal short-axis view

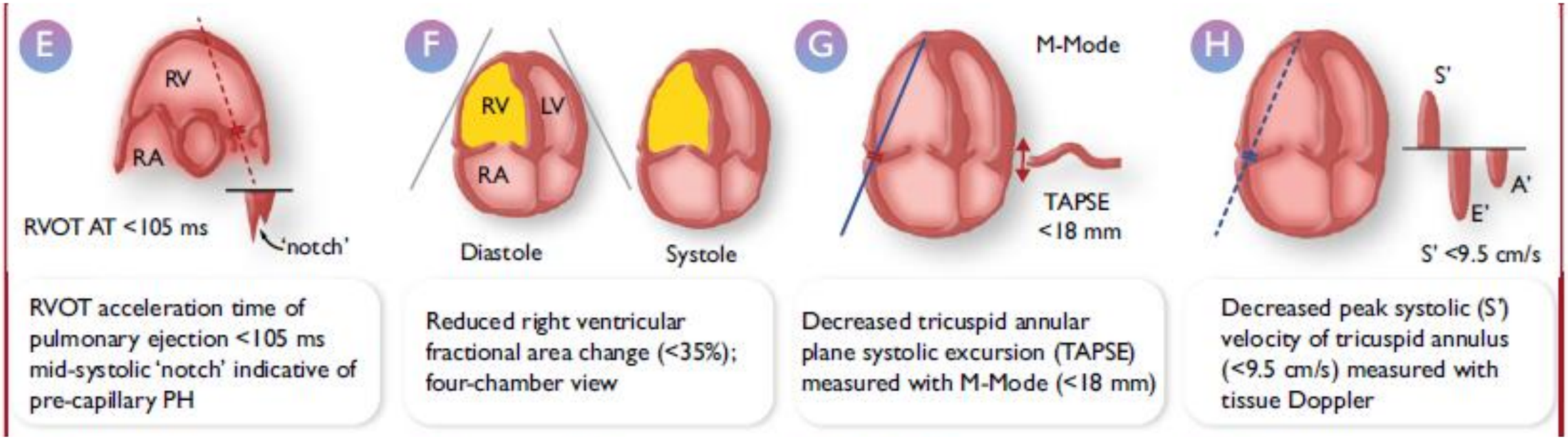
Distended inferior vena cava with diminished inspiratory collapsibility; subcostal view









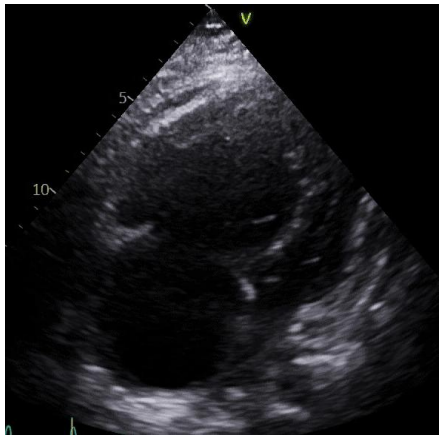


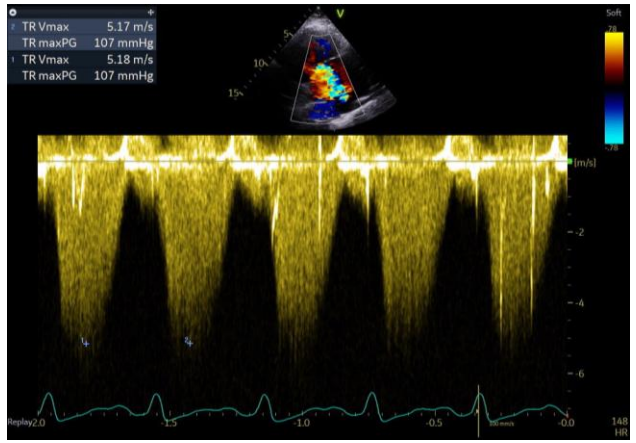
RVOT acceleration time of pulmonary ejection <105 ms mid-systolic 'notch' indicative of pre-capillary PH

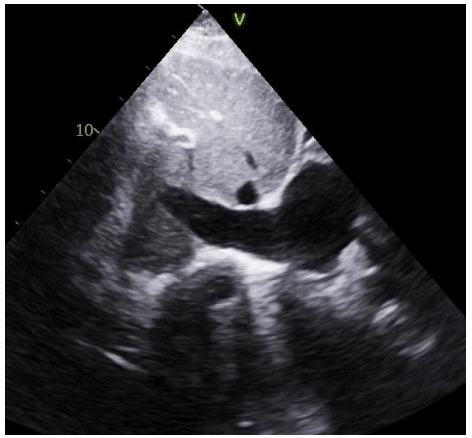
Reduced right ventricular fractional area change (<35%); four-chamber view

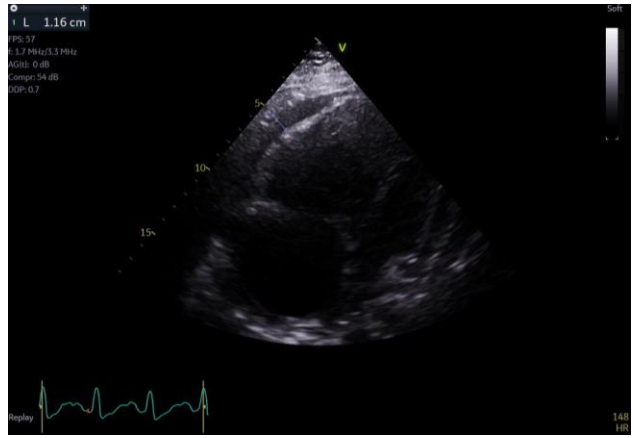
Decreased tricuspid annular plane systolic excursion (TAPSE) measured with M-Mode (<18 mm)

Decreased peak systolic (S') velocity of tricuspid annulus (<9.5 cm/s) measured with tissue Doppler



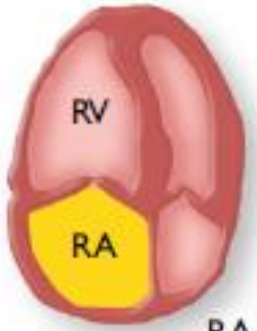






I

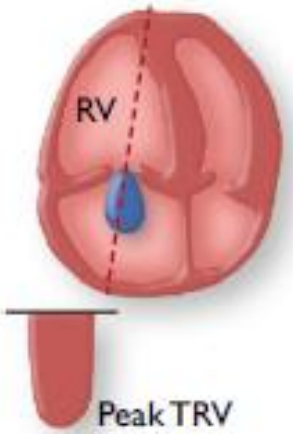
End-systolic



RA >18 cm²

Enlarged right atrial area (>18 cm²); four-chamber view

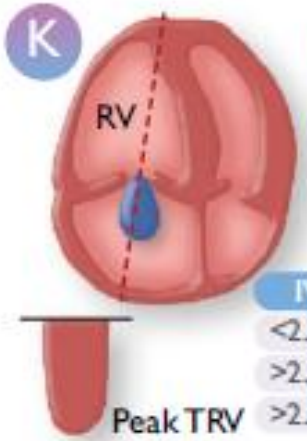
J



Peak TRV >2.8 m/s

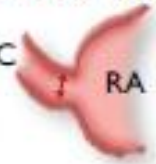
Increased systolic peak tricuspid regurgitation velocity (peak TRV); measured with continuous wave Doppler

K



Peak TRV >2.8 m/s

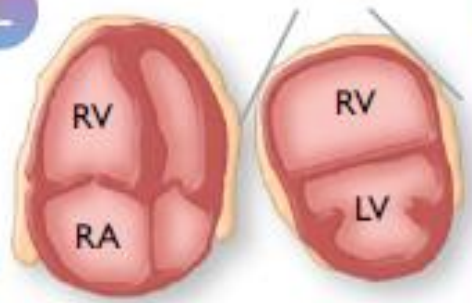
Estimated RAP



IVC	Collapse*	eRAP
<2.1 cm	>50%	3 (0-5)
>2.1 cm	>50%	8 (5-10)
>2.1 cm	<50%	15 (10-20)

Estimation of systolic pulmonary artery pressure (sPAP); sPAP = TR pressure gradient + estimated RAP

L



Presence of pericardial effusion; four-chamber view; parasternal short-axis view; other views (e.g. subcostal view)

How do I interpret a high RVSP?

Need to determine nature & likely underlying cause to determine appropriate treatment

How can the Echo derived data help me decide?

Hemodynamic definitions ESC/ERS

Definition	Haemodynamic characteristics
PH	**mPAP >20 mmHg**
Pre-capillary PH	mPAP >20 mmHg PAWP ≤15 mmHg **PVR >2 WU**
Isolated post-capillary PH	mPAP >20 mmHg PAWP >15 mmHg **PVR ≤2 WU**
Combined post- and pre-capillary PH	mPAP >20 mmHg PAWP >15 mmHg **PVR >2 WU**
Exercise PH	**mPAP/CO slope between rest and exercise >3 mmHg/L/min**

2022 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension
(*European Heart Journal*; 2022 – doi: 10.1093/eurheartj/ehac237 and *European Respiratory Journal*; 2022 – doi: 10.1183/13993003.00879-2022)

Recommendations for diagnostic strategy

Recommendations	Class	Level
Echocardiography		
Echocardiography is recommended as the first-line, non-invasive, diagnostic investigation in suspected PH	I	B
It is recommended to assign an echocardiographic probability of PH, based on an abnormal TRV and the presence of other echocardiographic signs suggestive of PH	I	B
It is recommended to maintain the current threshold for TRV (>2.8 m/s) for echocardiographic probability of PH according to the updated haemodynamic definition	I	C
Based on the probability of PH by echocardiography, further testing should be considered in the clinical context (i.e. symptoms and risk factors or associated conditions for PAH/CTEPH)	IIa	B
In symptomatic patients with intermediate echocardiographic probability of PH, CPET may be considered to further determine the likelihood of PH	IIb	C

www.escardio.org/guidelines

2022 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension
(*European Heart Journal*; 2022 – doi: 10.1093/eurheartj/ehac237 and *European Respiratory Journal*; 2022 – doi: 10.1183/13993003.00879-2022)

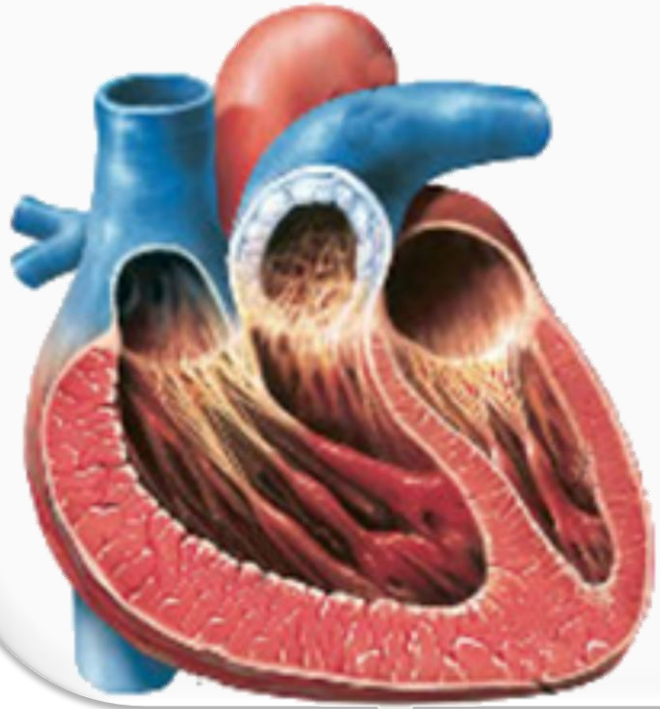
Pre-capillary Pulmonary Hypertension

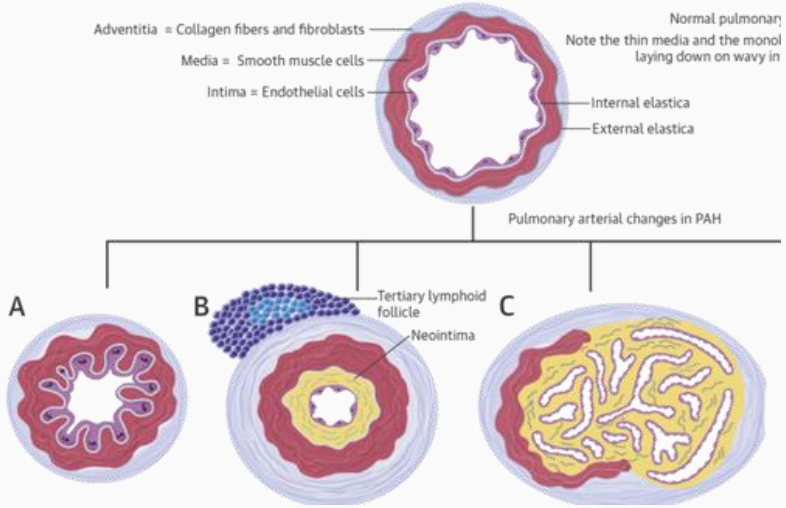
Obstructed arterial tree

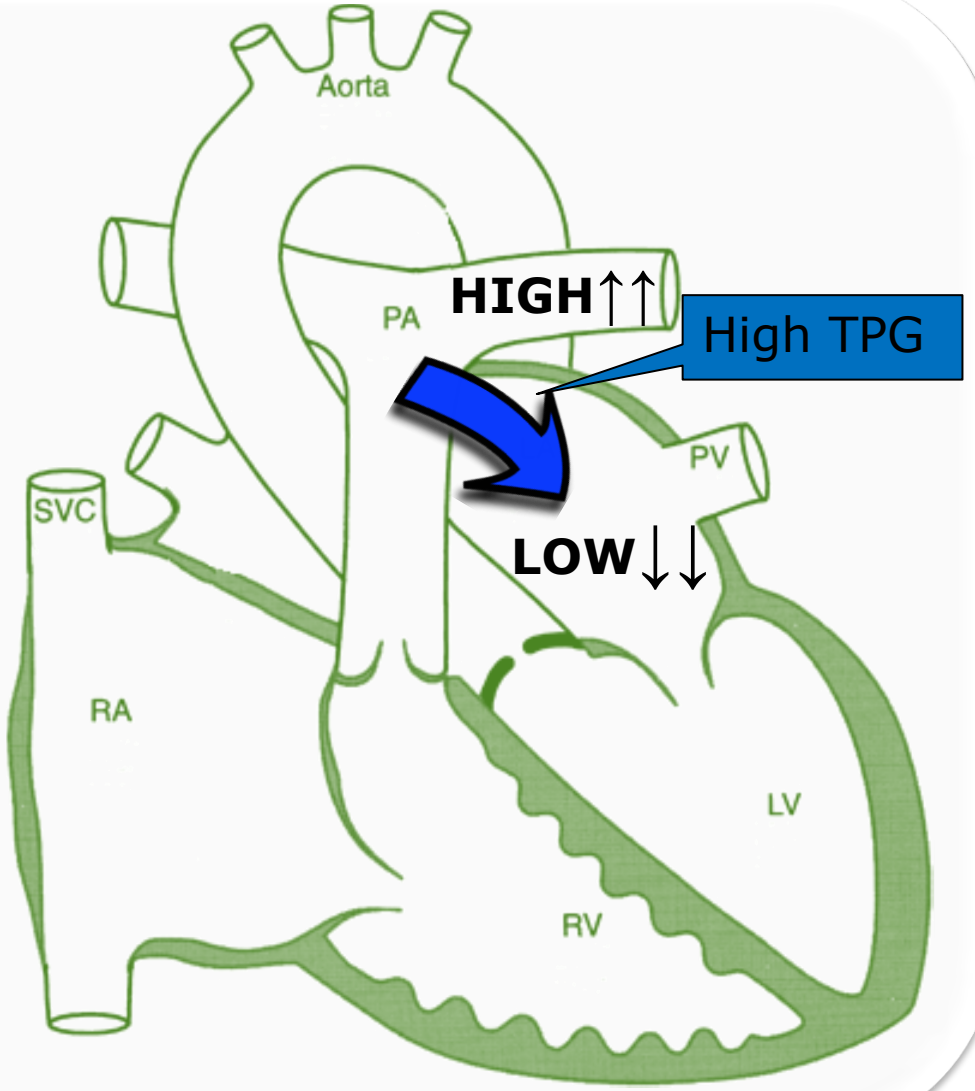
Very high PAP

Low LAP

High PVR/TPG



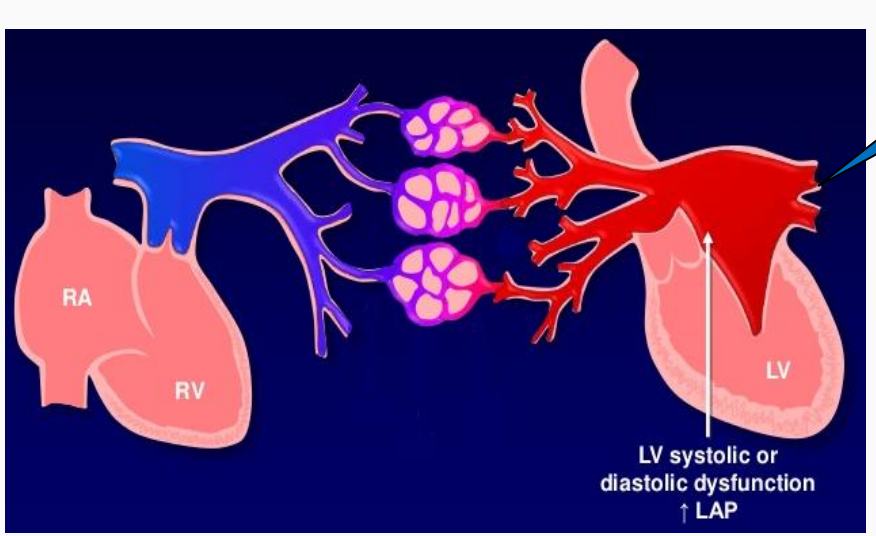


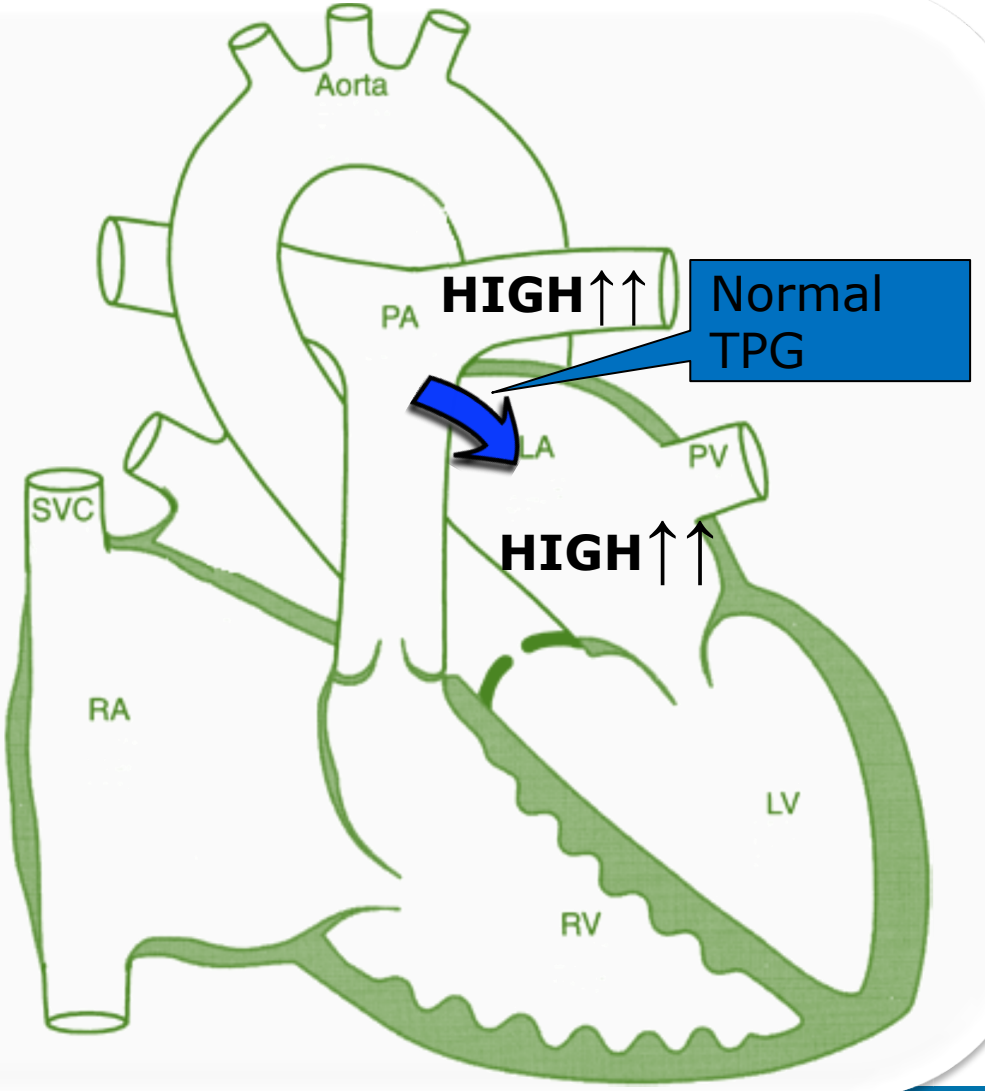


Post-capillary Pulmonary Hypertension

Obstructed venous efflux from lungs to LA

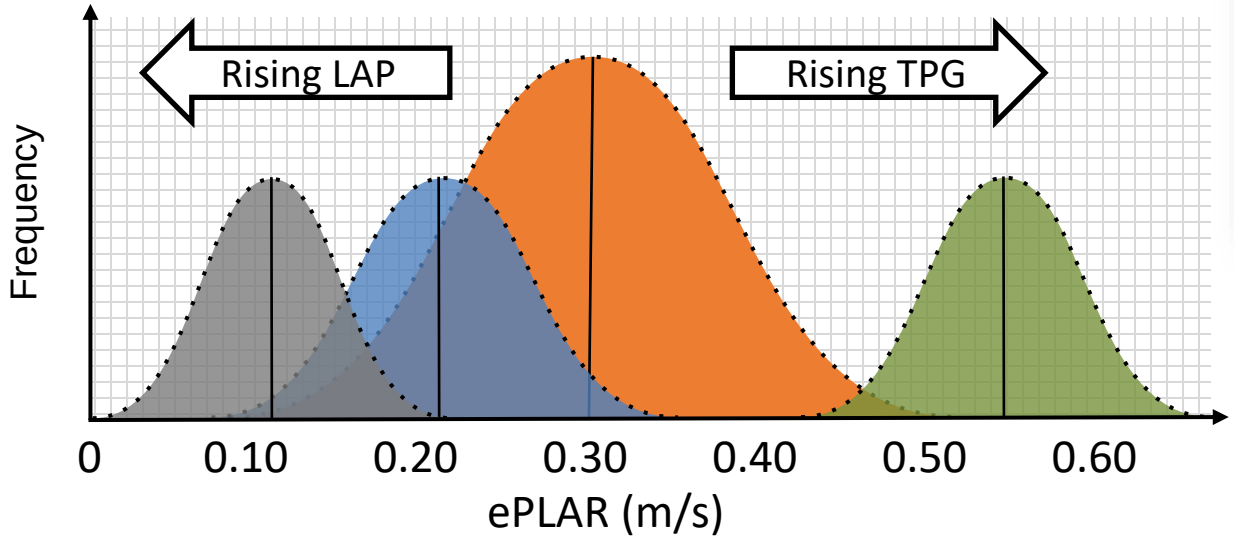
- High LAP
- High PAP
- Normal TPG
  - (+/- "Out-of-proportion" or "Mixed Pre/Post")





ePLAR – The echocardiographic Pulmonary to LA Ratio

$$ePLAR = \frac{TRV_{max}}{Mitral\ E/e'}$$



International Journal of Cardiology 212 (2016) 379–386

Contents lists available at ScienceDirect

International Journal of Cardiology

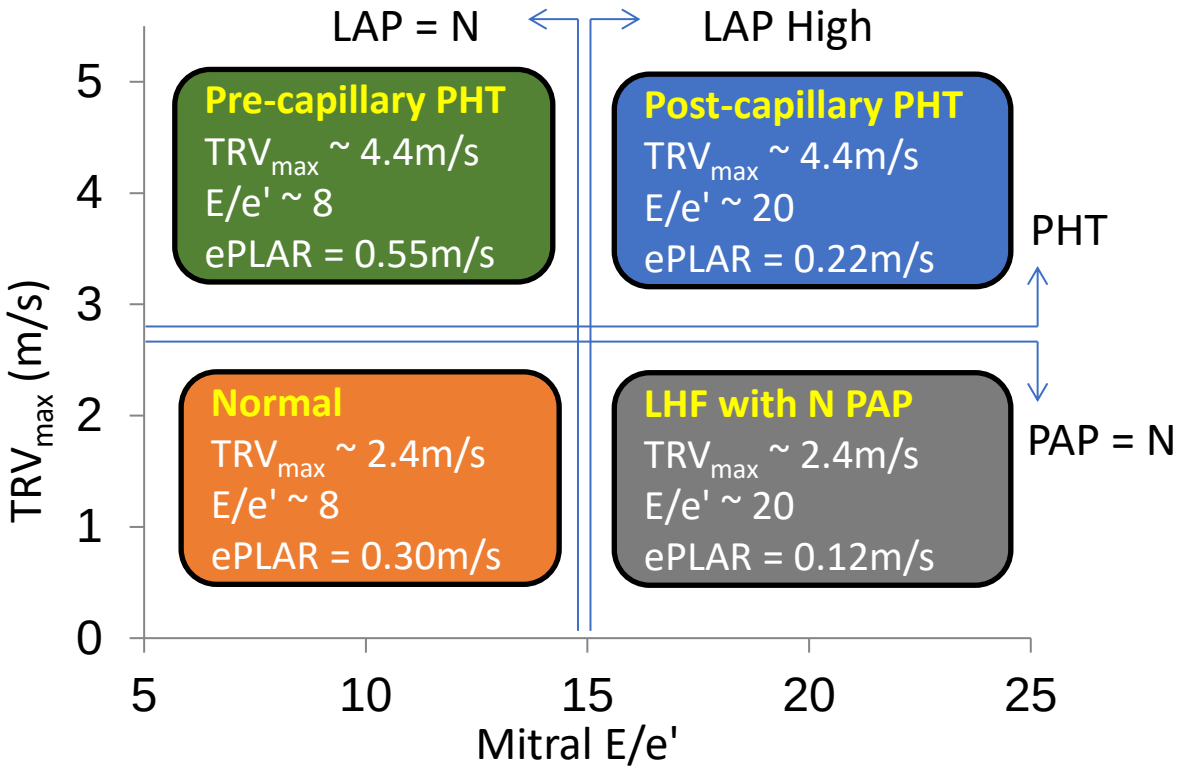
journal homepage: www.elsevier.com/locate/ijcard

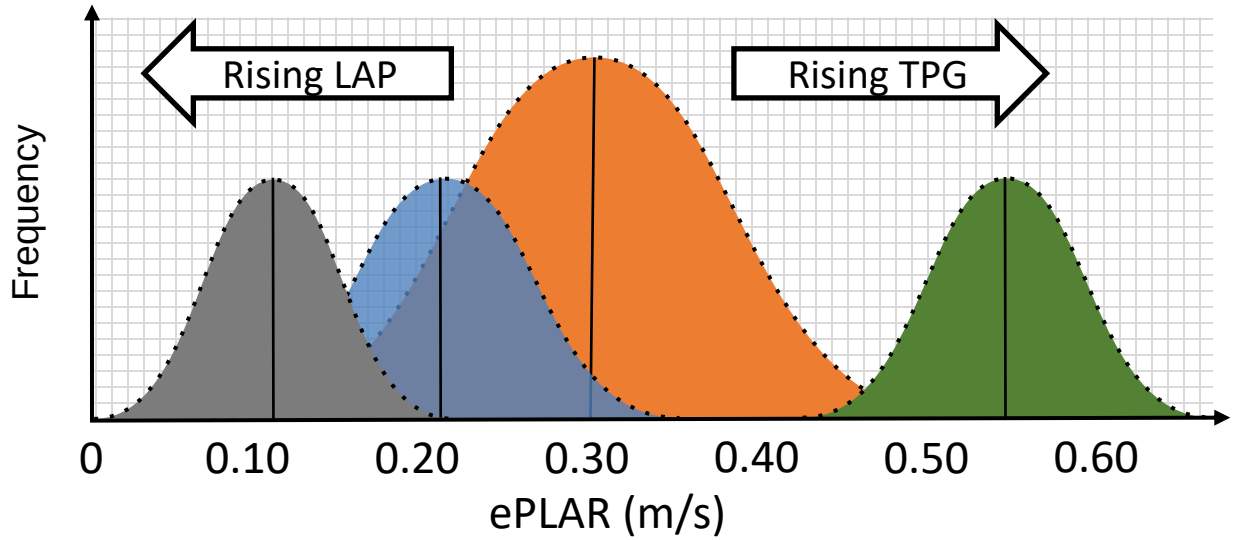
ePLAR – The echocardiographic Pulmonary to Left Atrial Ratio – A novel non-invasive parameter to differentiate pre-capillary and post-capillary pulmonary hypertension

Gregory M. Scalia [a,b,c,d,*], Isabel G. Scalia [d], Rebecca Kierle [b], Rebekka Beaumont [c], David B. Cross [b,c], John Feenstra [c], Darryl J. Burstow [a,d], Benjamin T. Fitzgerald [a,b,c], David G. Platts [a]

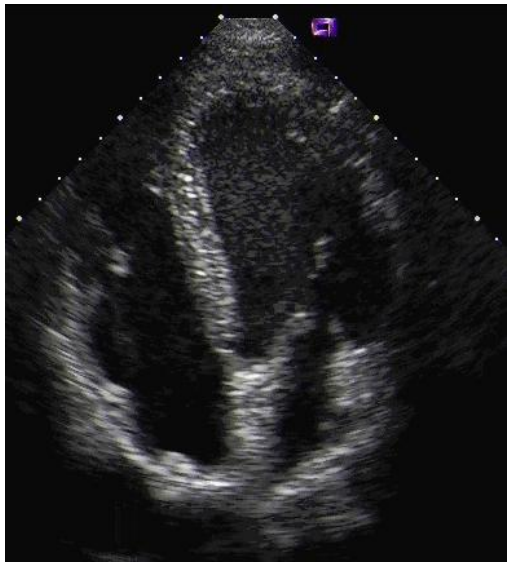
[a] The Prince Charles Hospital, Brisbane 4032, Australia
[b] Heart Care Partners, Brisbane 4066, Australia
[c] The Wesley Hospital, Brisbane 4066, Australia
[d] University of Queensland, Brisbane 4068, Australia

ePLAR – conceptual framework

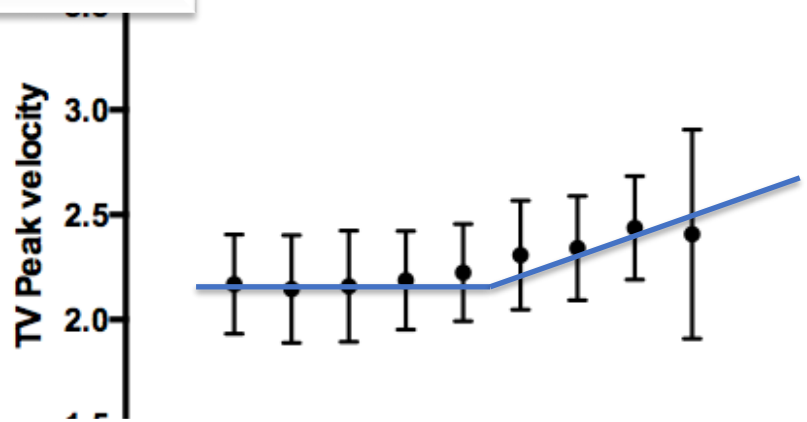




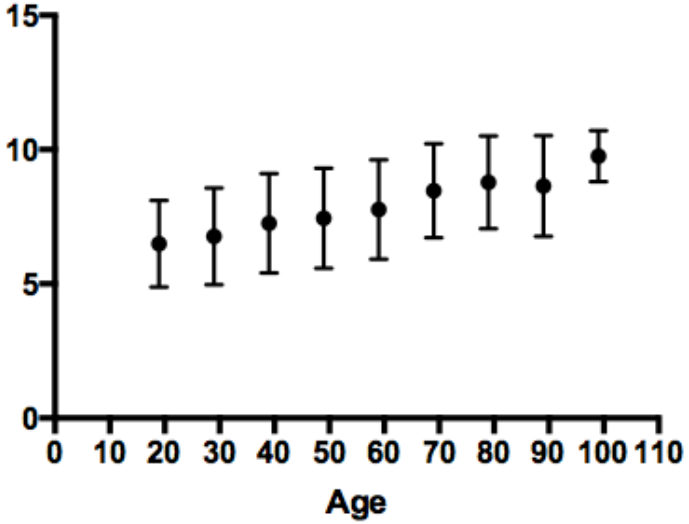
ePLAR - 16356 Normals



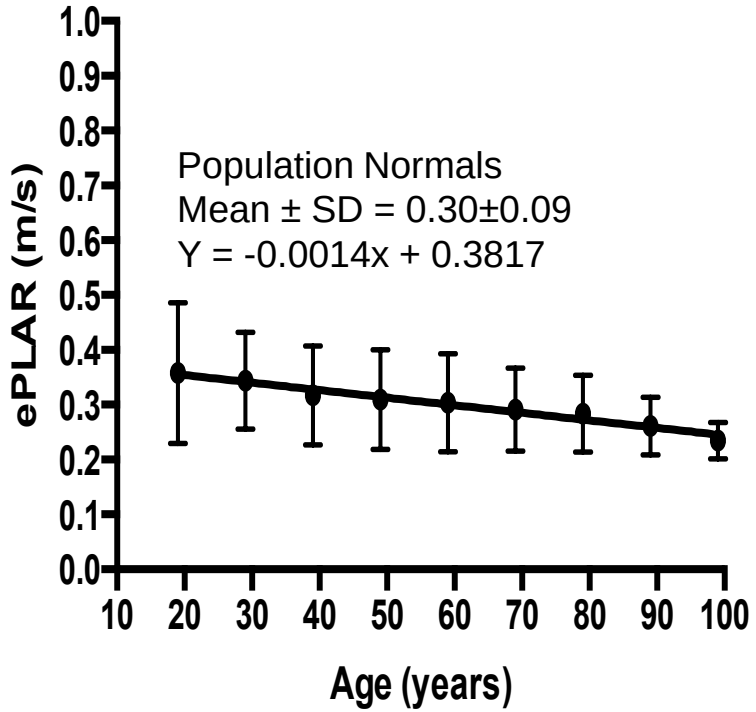
EF >= 50%
TR < 2.9m/s
LAA <= 22 cm2
E/e' <= 12
Mean mitral grad <=5mmHg
Peak AoV <= 2m/s
IVS thickness <=11mm
AR PHT <> 200-400ms



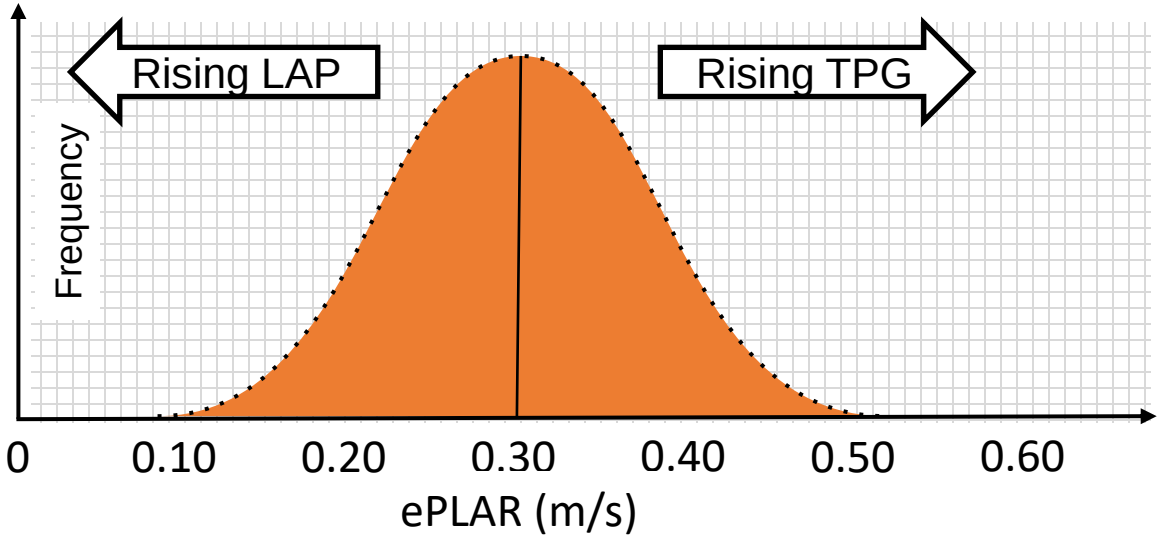
÷



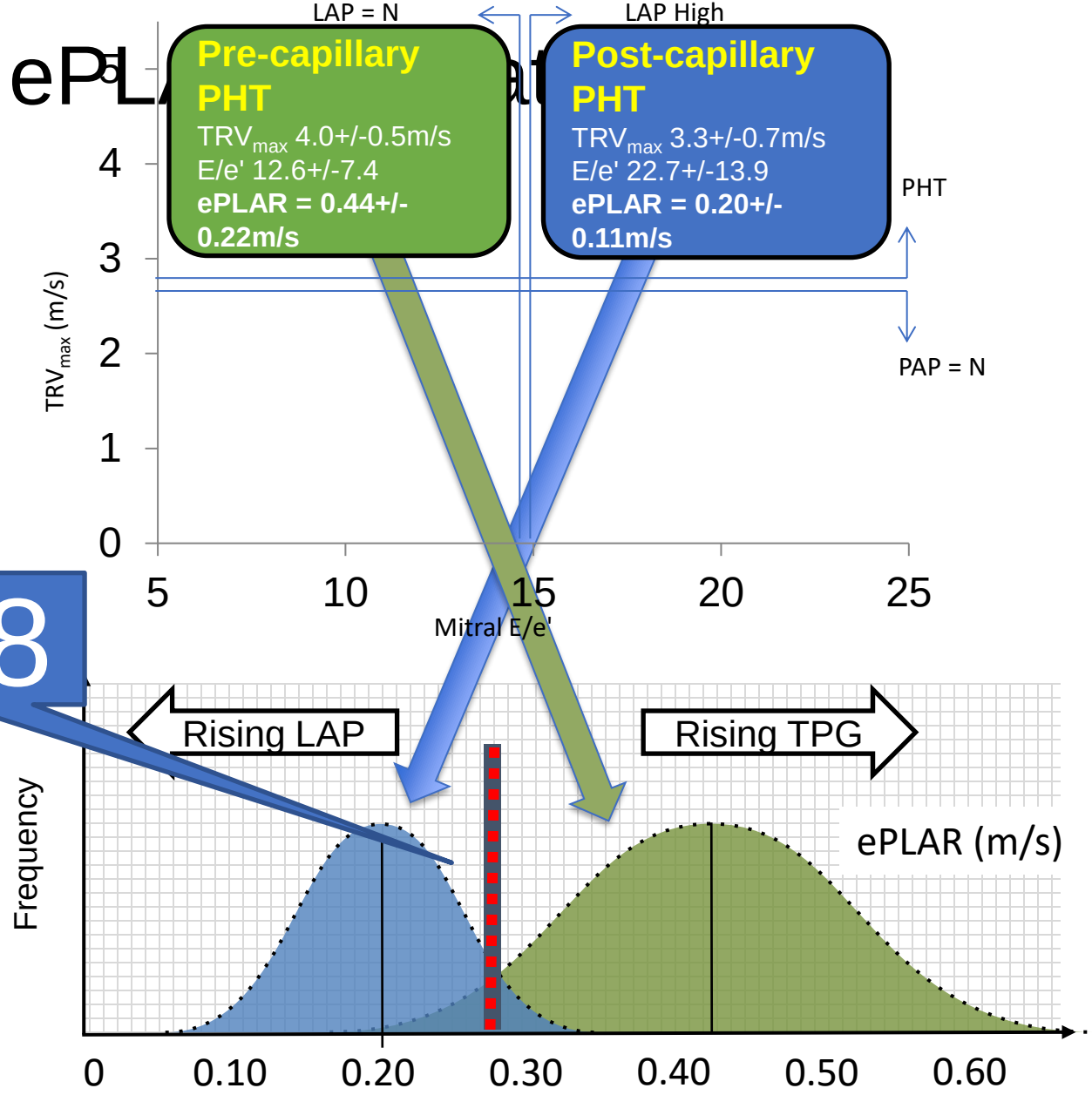
=



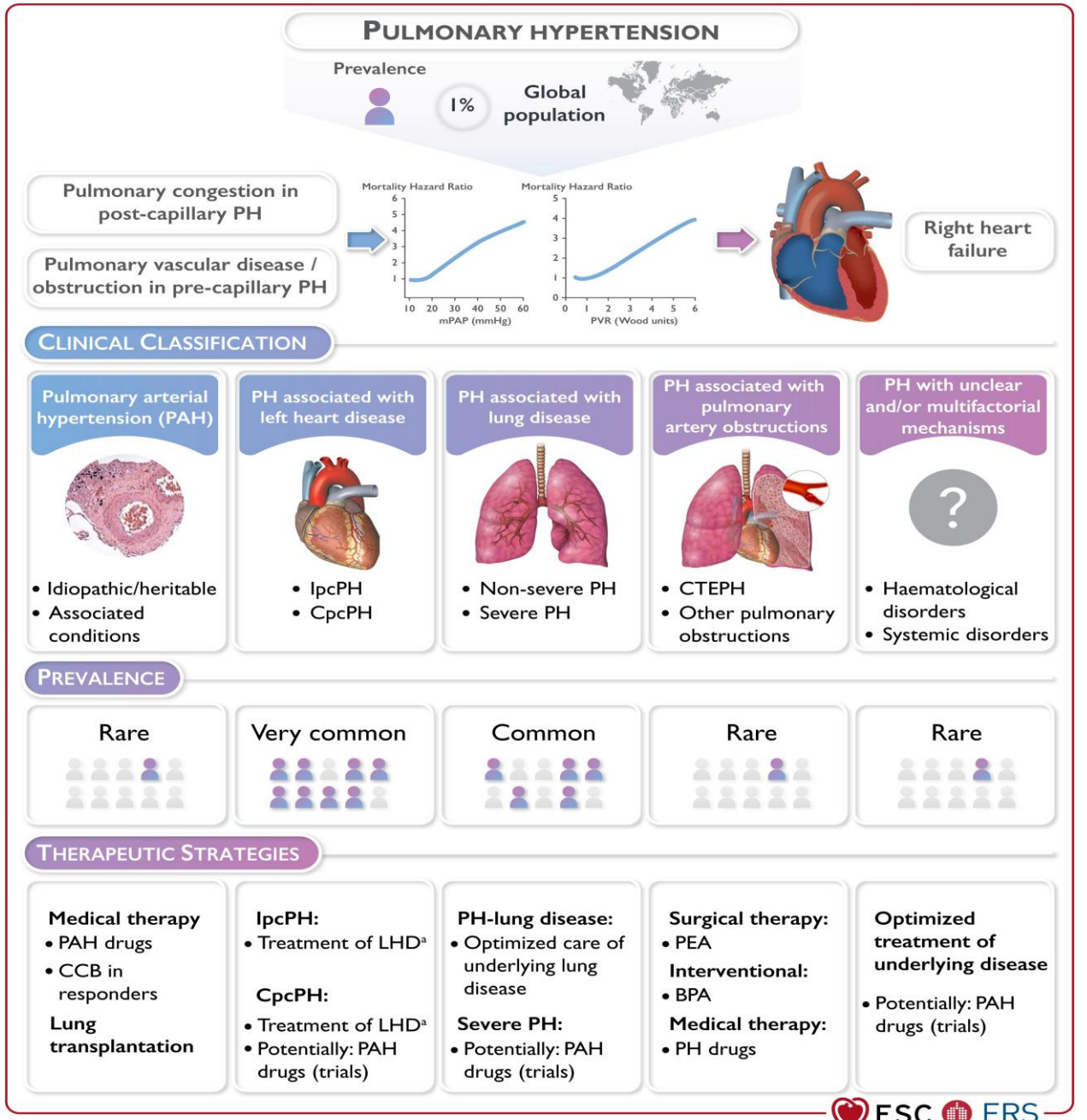
Population Normals
Mean ± SD = 0.30±0.09
Y = -0.0014x + 0.3817



ePLAR



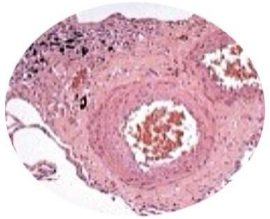
Post-cap vs Popn normal p<0.005
Pre-cap vs Popn normal p<0.005
Pre-cap vs post-cap p<0.001
Post-cap vs LHF p=ns



Eur Heart J, ehac237, https://doi.org/10.1093/eurheartj/ehac237

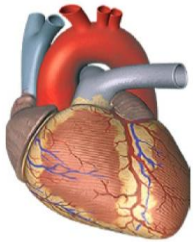
Clinical Classification

Pulmonary arterial hypertension (PAH)



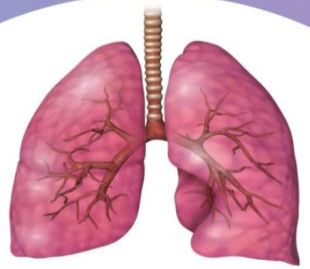
- Idiopathic/heritable
- Associated conditions

PH associated with left heart disease



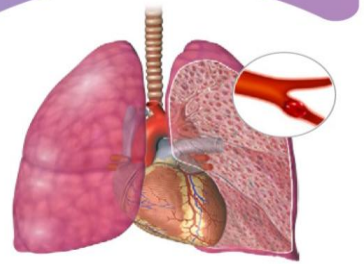
- IpcPH
- CpcPH

PH associated with lung disease



- Non-severe PH
- Severe PH

PH associated with pulmonary artery obstructions

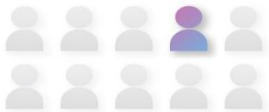
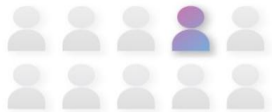
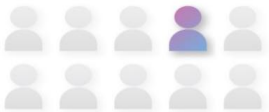


- CTEPH
- Other pulmonary obstructions

PH with unclear and/or multifactorial mechanisms

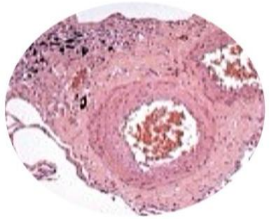
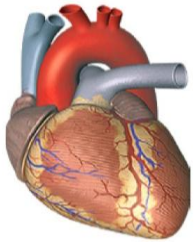
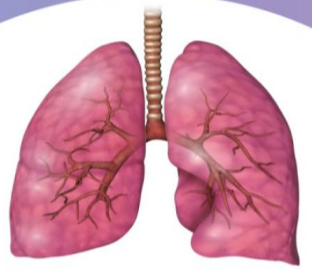
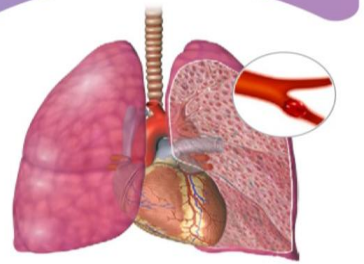
- Haematological disorders
- Systemic disorders

Prevalence

Rare	Very common	Common	Rare	Rare
				

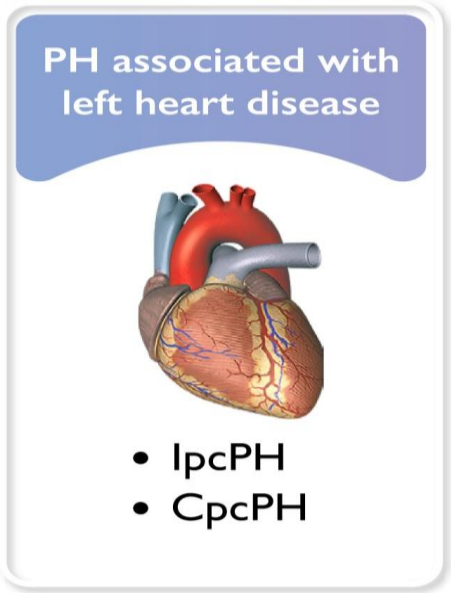
Eur Heart J, ehac237, https://doi.org/10.1093/eurheartj/ehac237

Clinical Classification

Group 1	Group 2	Group 3	Group 4	Group 5
Pulmonary arterial hypertension (PAH)	PH associated with left heart disease	PH associated with lung disease	PH associated with pulmonary artery obstructions	PH with unclear and/or multifactorial mechanisms
				?
• Idiopathic/heritable • Associated conditions	• IpcPH • CpcPH	• Non-severe PH • Severe PH	• CTEPH • Other pulmonary obstructions	• Haematological disorders • Systemic disorders

Eur Heart J, ehac237, https://doi.org/10.1093/eurheartj/ehac237

Post-capillary (left heart) PHT



Group 2

GROUP 2 PH associated with left heart disease

- **2.1 Heart failure:**
  - **2.1.1 with preserved ejection fraction**
  - **2.1.2 with reduced or mildly reduced ejection fraction**
- 2.2 Valvular heart disease
- **2.3 Congenital/acquired cardiovascular conditions leading to post-capillary PH**

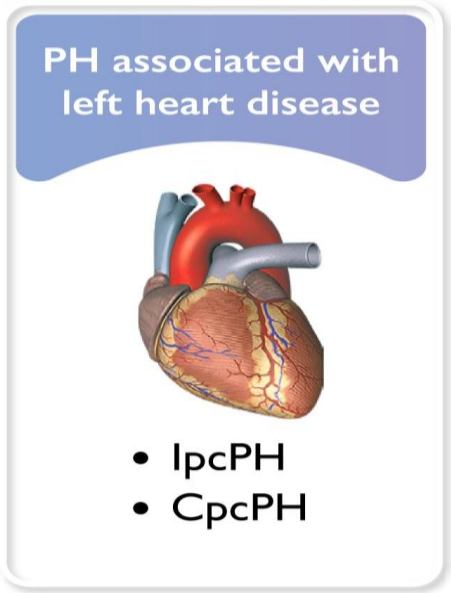
Heart, Lung and Circulation (2018) 27, 301–309
1443-9506/04/$36.00
https://doi.org/10.1016/j.hlc.2017.09.015

REVIEW

Left Heart Disease and Pulmonary Hypertension: Are We Seeing the Full Picture?

Kevin Chung, MBBS [a*], Geoff Strange, PhD [a,b], Jim Codde, PhD [f], David Celermajer, MBBS, PhD [b,c,d,e], Gregory M. Scalia, MBBS, MMedSc [g,h], David Playford, MBBS, PhD [a,b]

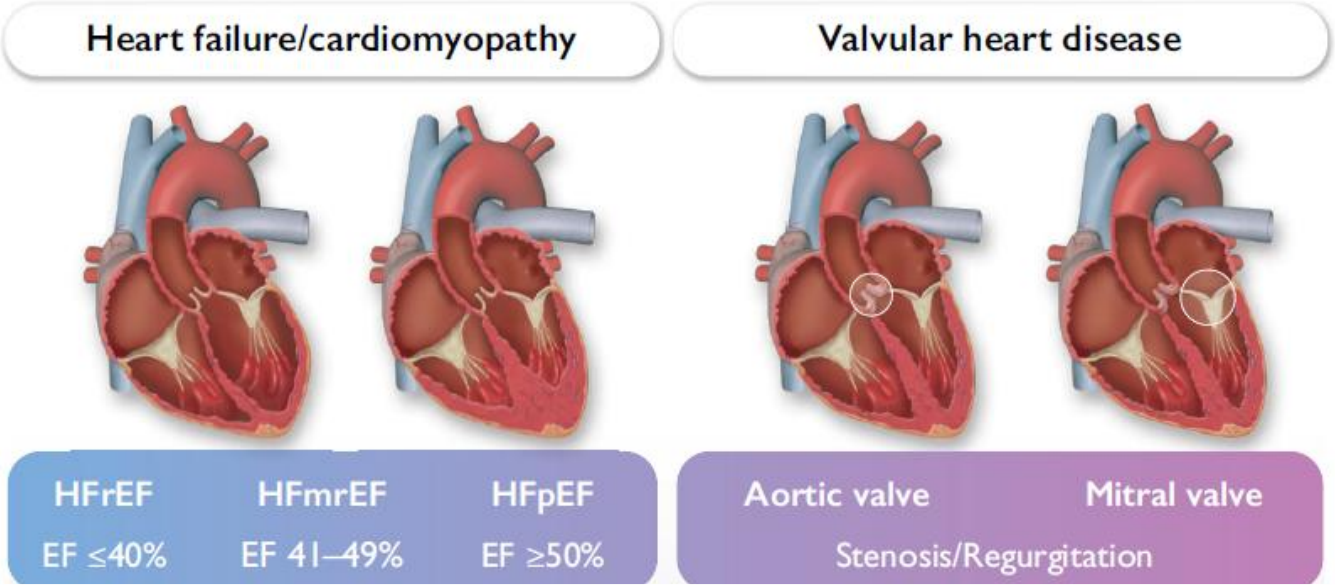
Post-capillary (left heart) PHT



Group 2

GROUP 2 PH associated with left heart disease

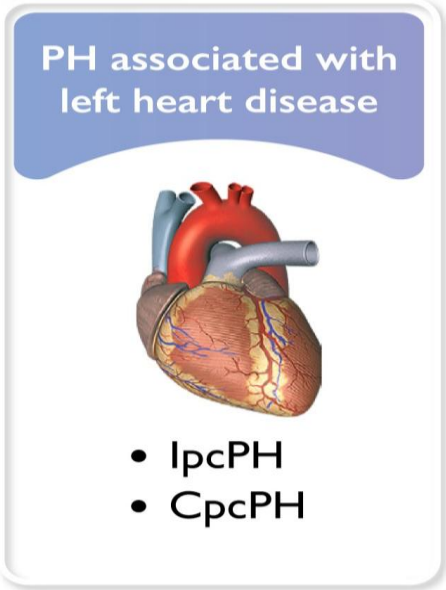
- **2.1 Heart failure:**
  - **2.1.1 with preserved ejection fraction**
  - **2.1.2 with reduced or mildly reduced ejection fraction**
- 2.2 Valvular heart disease
- **2.3 Congenital/acquired cardiovascular conditions leading to post-capillary PH**



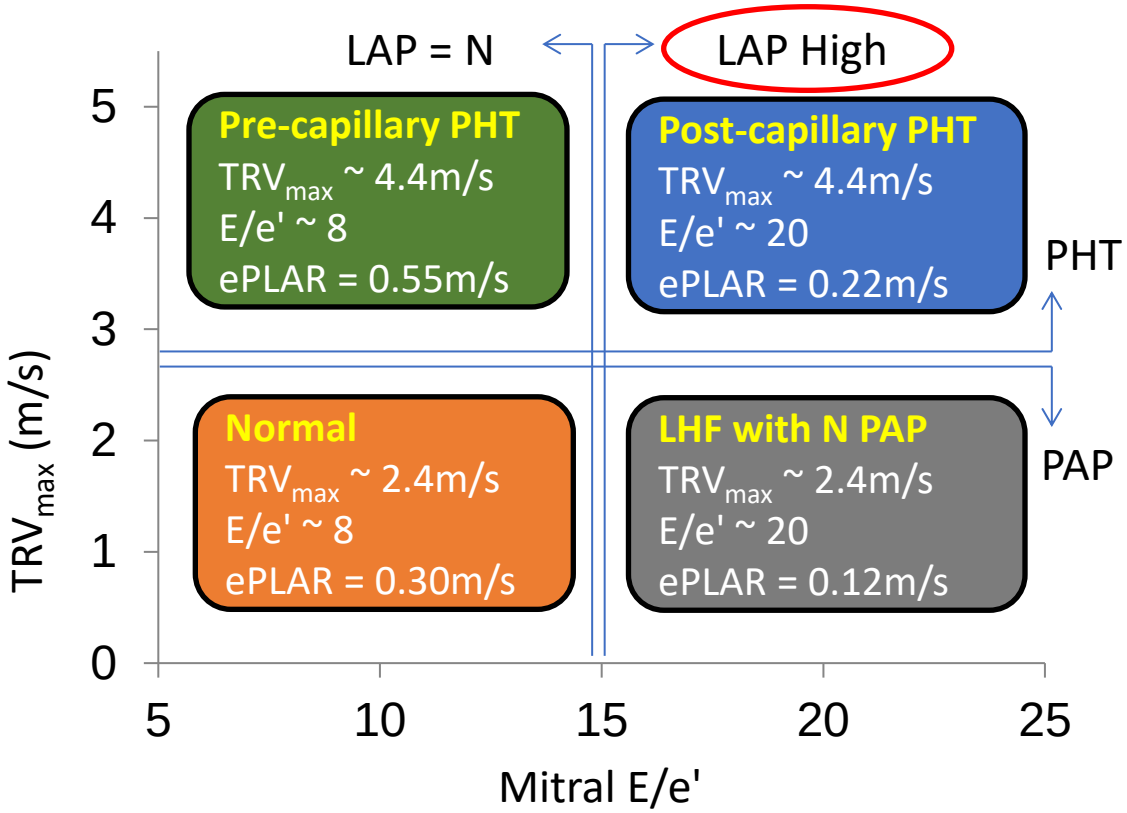
Eur Heart J, ehac237, https://doi.org/10.1093/eurheartj/ehac237

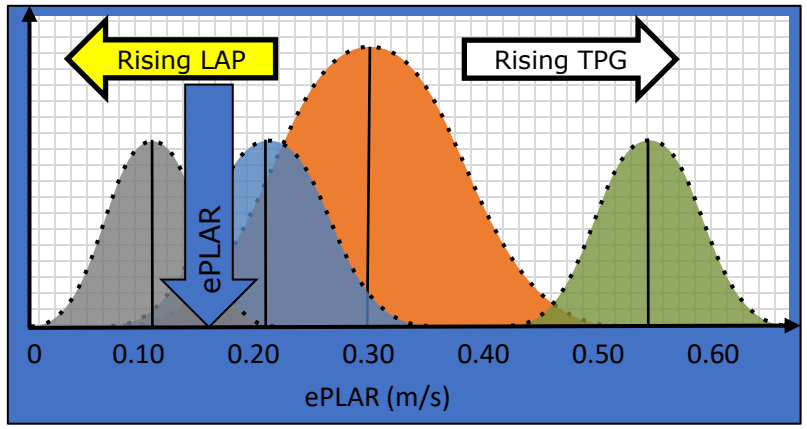
ECHO AUSTRALIA

Post-capillary (left heart) PHT

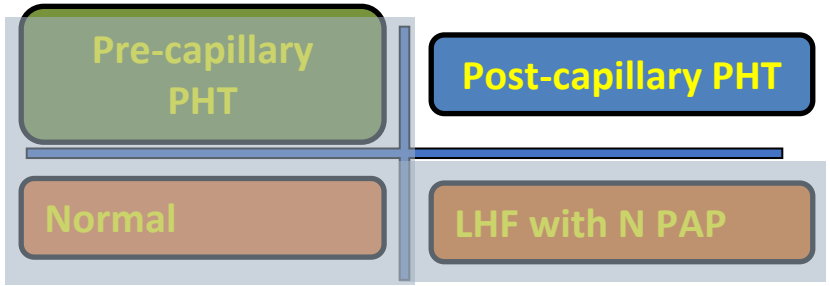


Group 2



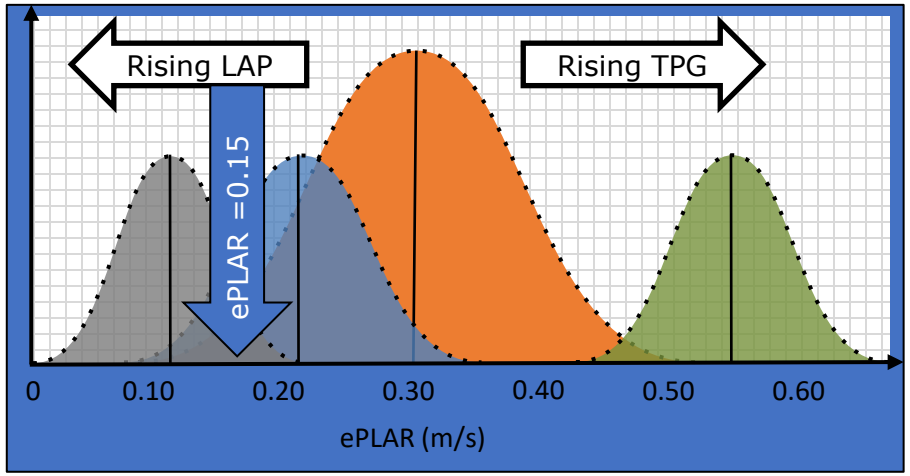


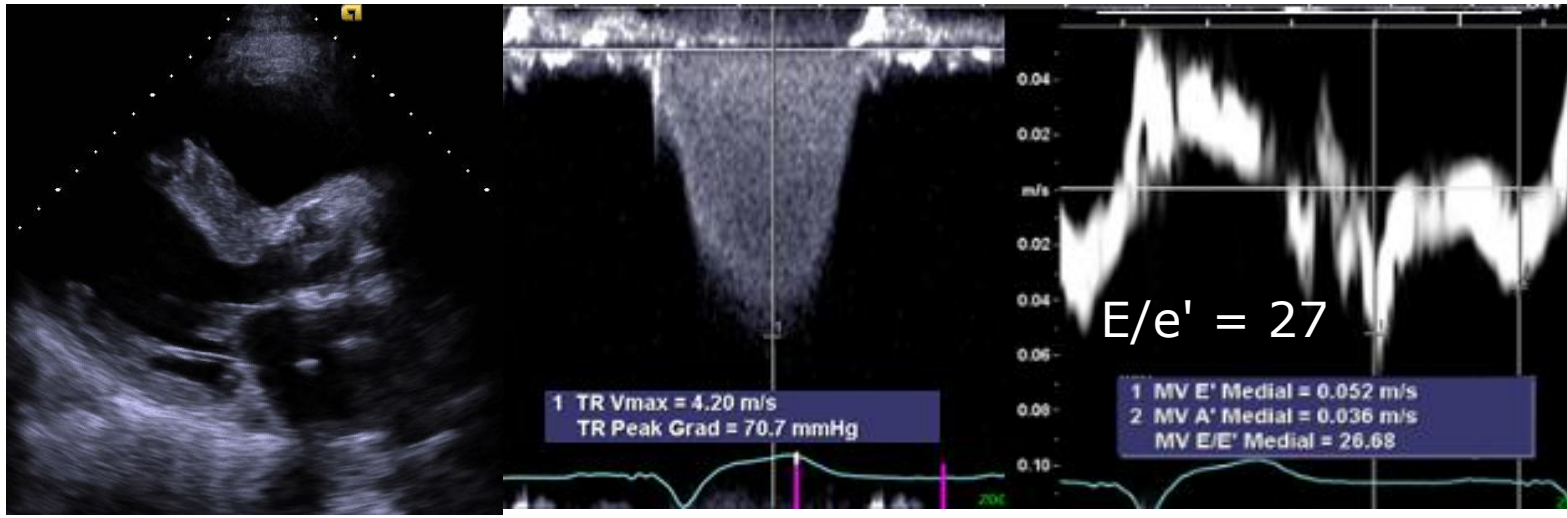
PHT secondary to LHD



$$ePLAR = \frac{TRVmax}{Mitral\ E/e'}$$

$= 4.2 \div 27 = 0.15$ m/s



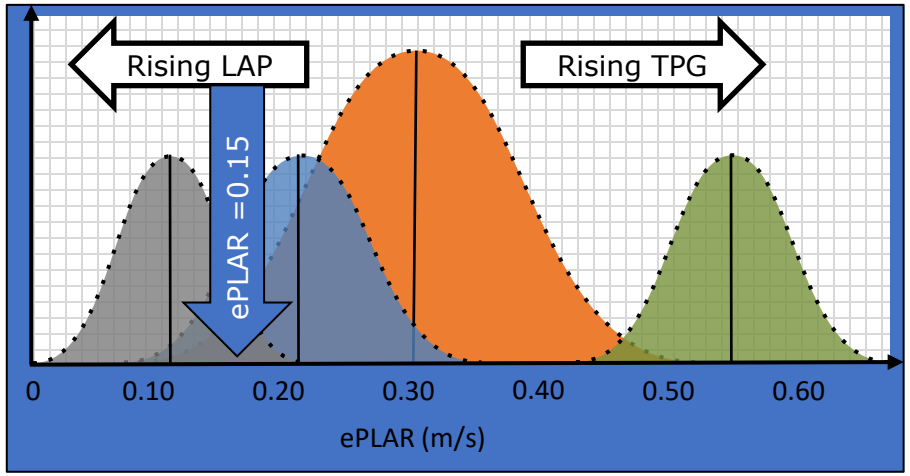


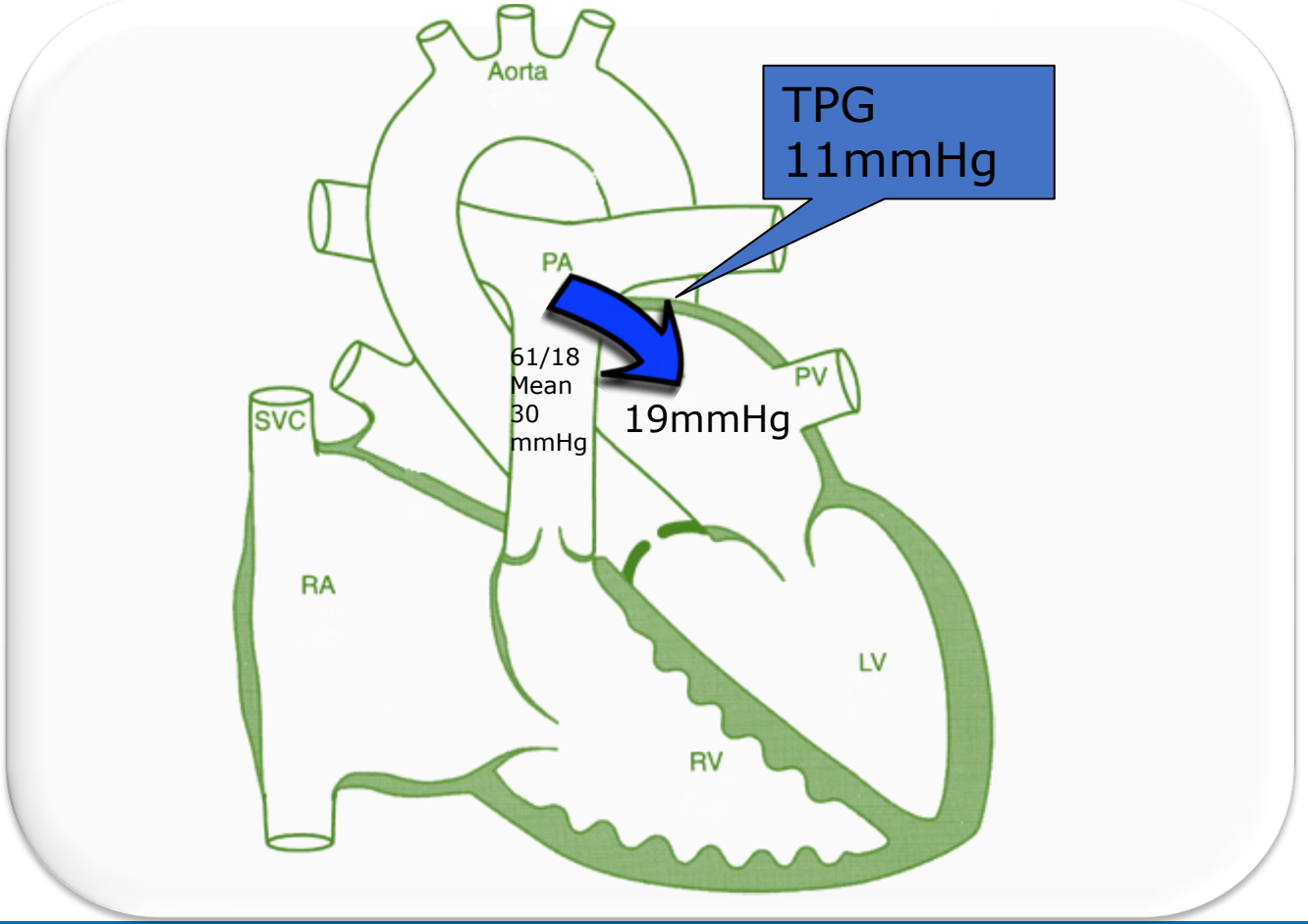
PHT secondary to LHD

Pre-capillary PHT	Post-capillary PHT
Normal	LHF with N PAP

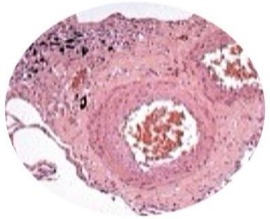
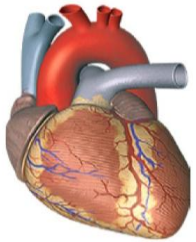
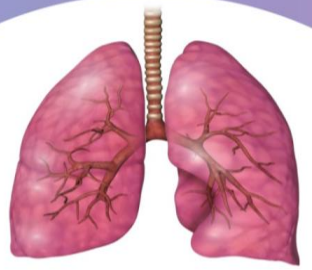
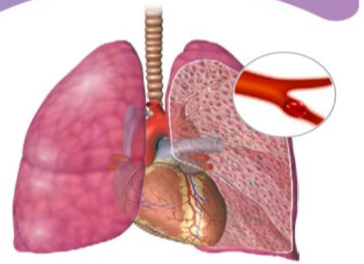
$$ePLAR = \frac{TRVmax}{Mitral\ E/e'}$$

$$= 4.2 \div 27 = 0.15\ m/s$$



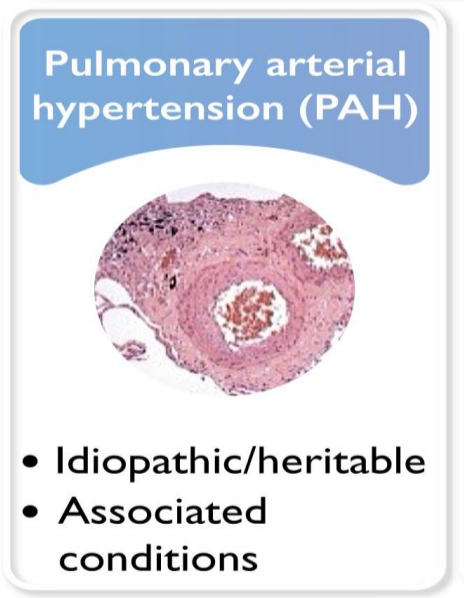


Clinical Classification

Group 1	Group 2	Group 3	Group 4	Group 5
Pulmonary arterial hypertension (PAH)	PH associated with left heart disease	PH associated with lung disease	PH associated with pulmonary artery obstructions	PH with unclear and/or multifactorial mechanisms
				?
• Idiopathic/heritable • Associated conditions	• IpcPH • CpcPH	• Non-severe PH • Severe PH	• CTEPH • Other pulmonary obstructions	• Haematological disorders • Systemic disorders

Eur Heart J, ehac237, https://doi.org/10.1093/eurheartj/ehac237

Precapillary PHT

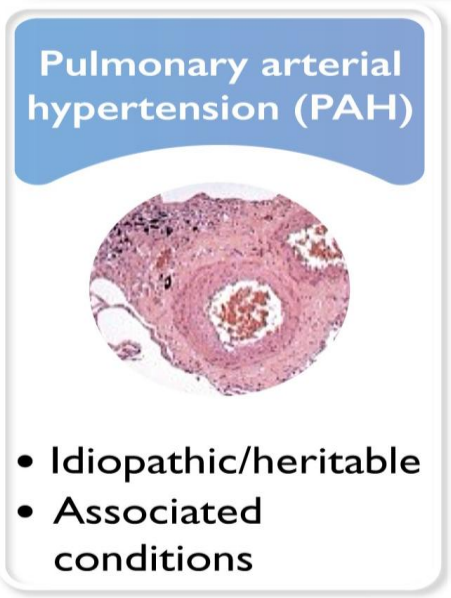


Group 1

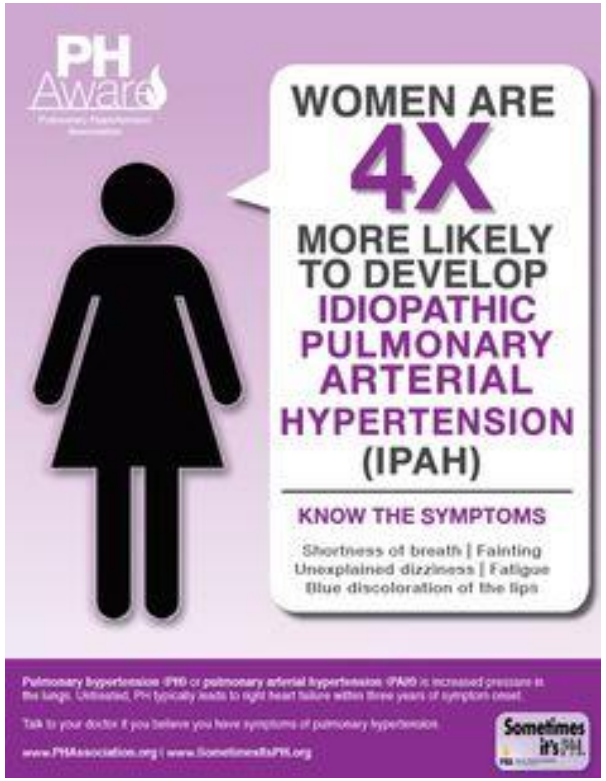
GROUP 1 Pulmonary arterial hypertension (PAH)
1.1 Idiopathic
1.1.1 Non-responders at vasoreactivity testing
1.1.2 Acute responders at vasoreactivity testing
1.2 Heritable
1.3 Associated with drugs and toxins
1.4 Associated with:
1.4.1 Connective tissue disease
1.4.2 HIV infection
1.4.3 Portal hypertension
1.4.4 Congenital heart disease
1.4.5 Schistosomiasis
1.5 PAH with features of venous/capillary (PVOD/PCH) involvement
1.6 Persistent PH of the newborn

Eur Heart J, ehac237, https://doi.org/10.1093/eurheartj/ehac237

Precapillary PHT



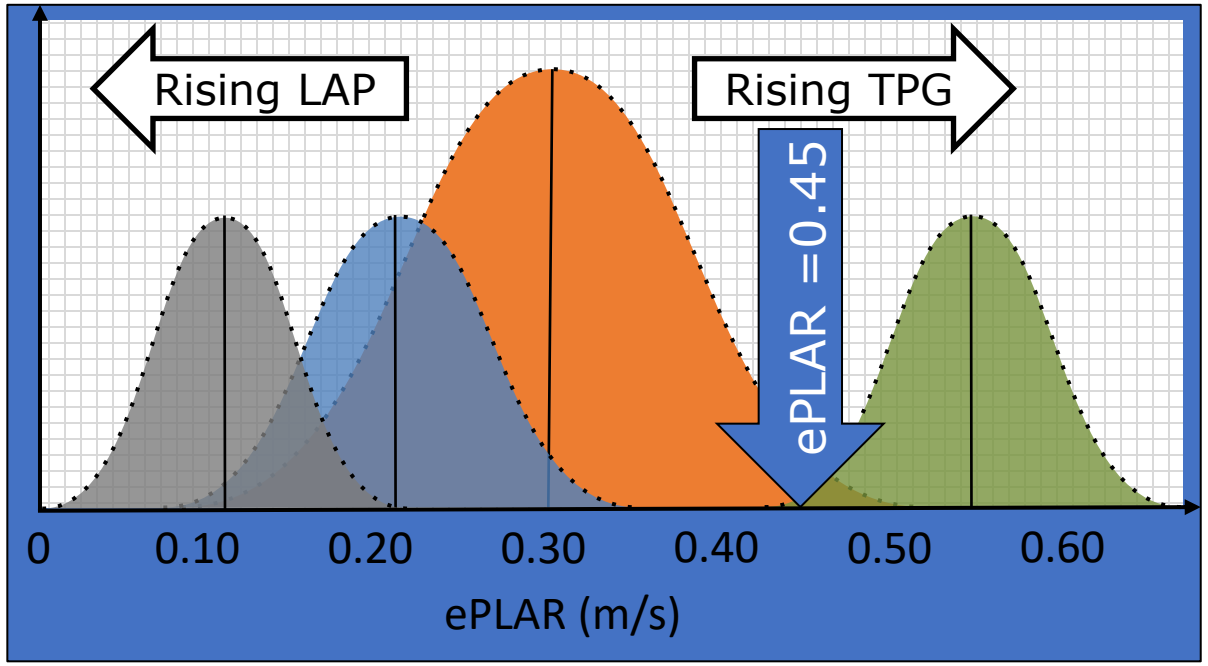
Group 1

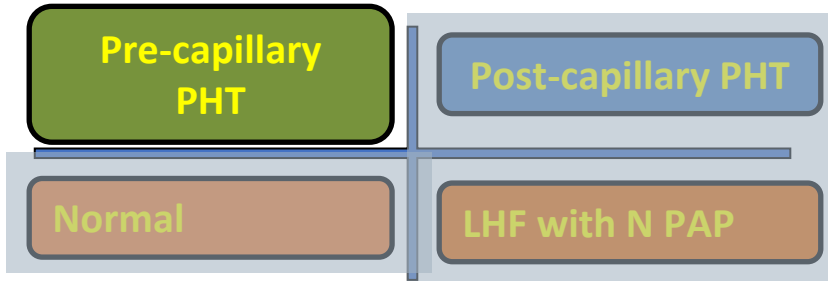


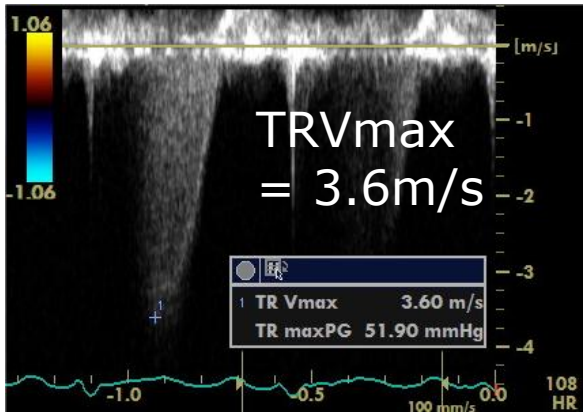
Pre Capillary PAH

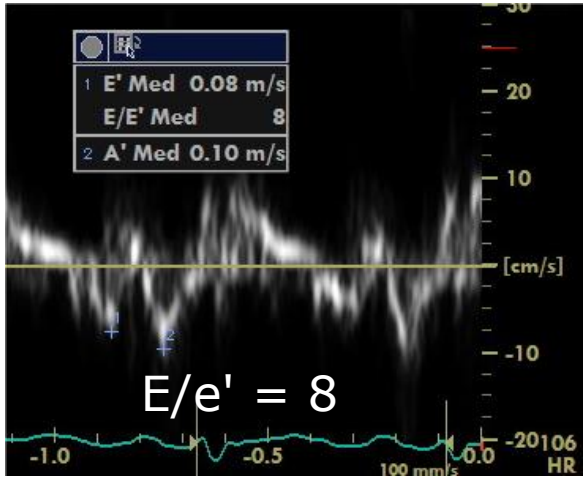
$$ePLAR = \frac{TRVmax}{Mitral\ E/e'}$$

$$= 3.6 \div 8 = 0.45\ m/s$$





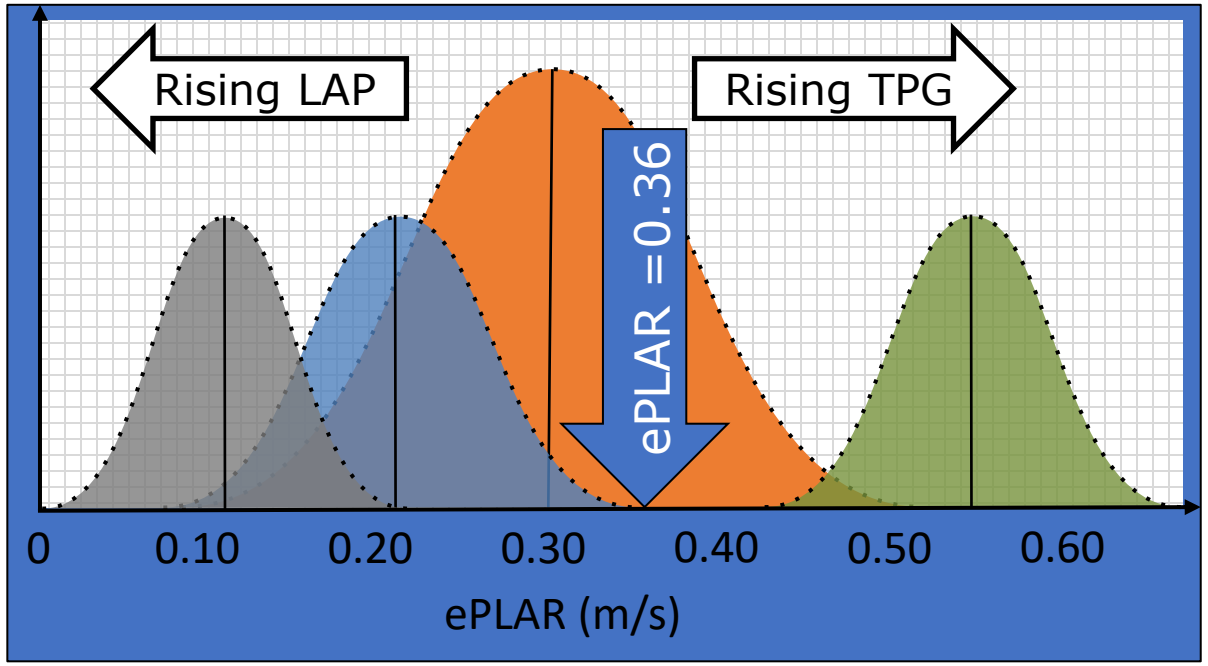


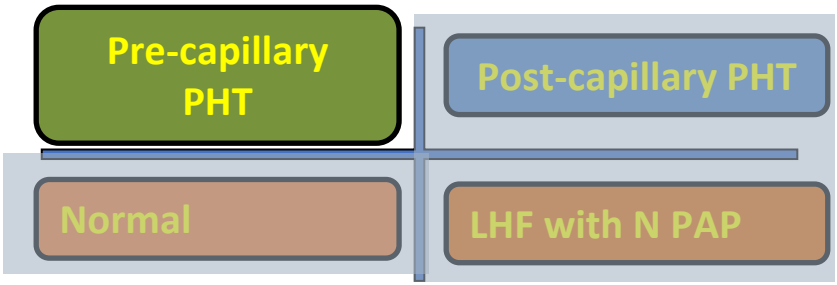


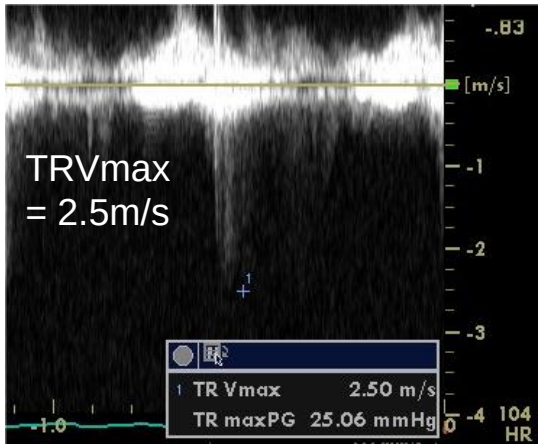
Pre Capillary PAH Rx 1 month

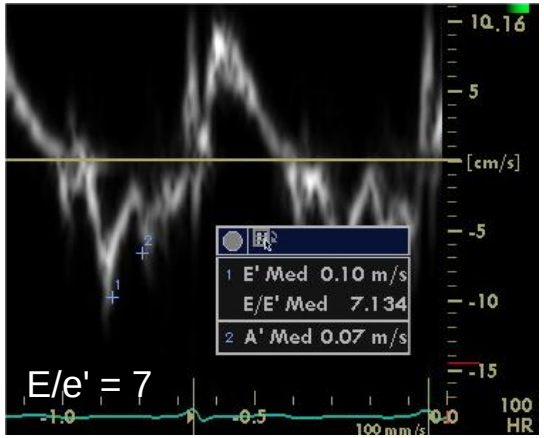
$$ePLAR = \frac{TRVmax}{Mitral\ E/e'}$$

$$= 2.5 \div 7 = 0.36\ m/s$$







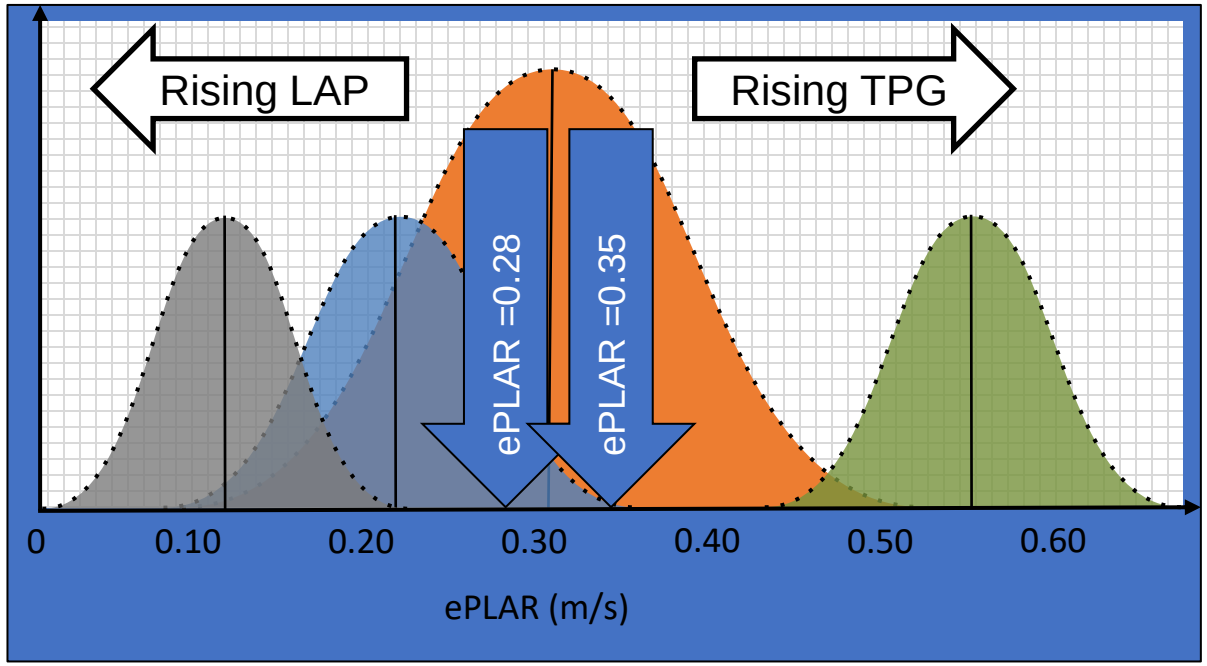


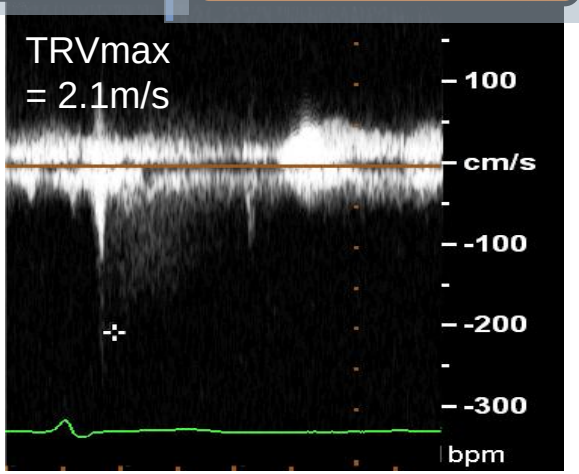
Pre Capillary PAH Rx 1 year

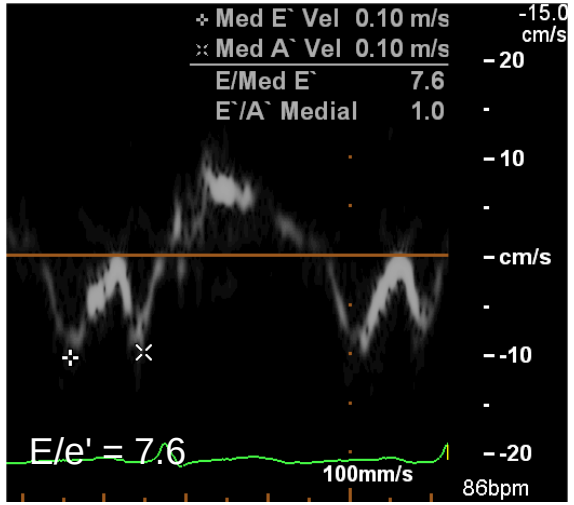
Pre-capillary PHT	Post-capillary PHT
Normal	LHF with N PAP

$$ePLAR = \frac{TRVmax}{Mitral\ E/e'}$$

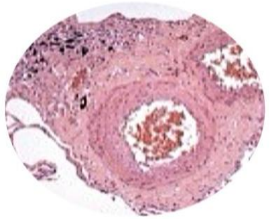
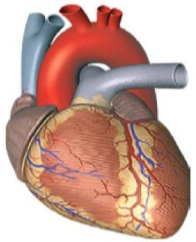
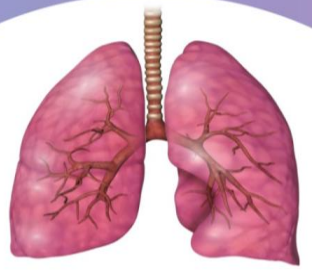
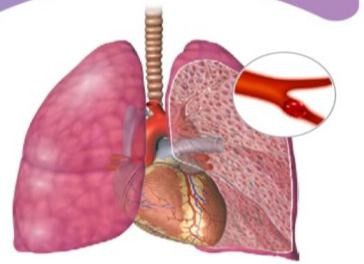
$$= 2.1 \div 7.6 = 0.28\ m/s$$







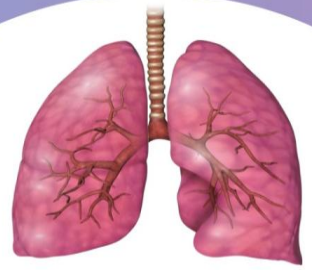
Clinical Classification

Group 1	Group 2	Group 3	Group 4	Group 5
Pulmonary arterial hypertension (PAH)	PH associated with left heart disease	PH associated with lung disease	PH associated with pulmonary artery obstructions	PH with unclear and/or multifactorial mechanisms
				?
• Idiopathic/heritable • Associated conditions	• IpcPH • CpcPH	• Non-severe PH • Severe PH	• CTEPH • Other pulmonary obstructions	• Haematological disorders • Systemic disorders

Eur Heart J, ehac237, https://doi.org/10.1093/eurheartj/ehac237

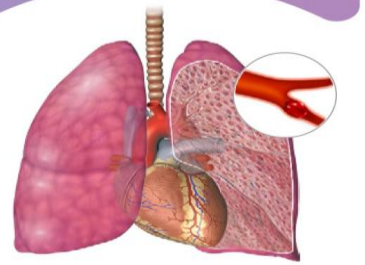
Other Pre-capillary conditions

PH associated with lung disease



- Non-severe PH
- Severe PH

PH associated with pulmonary artery obstructions



- CTEPH
- Other pulmonary obstructions

PH with unclear and/or multifactorial mechanisms

- Haematological disorders
- Systemic disorders

Group 3 Group 4 Group 5

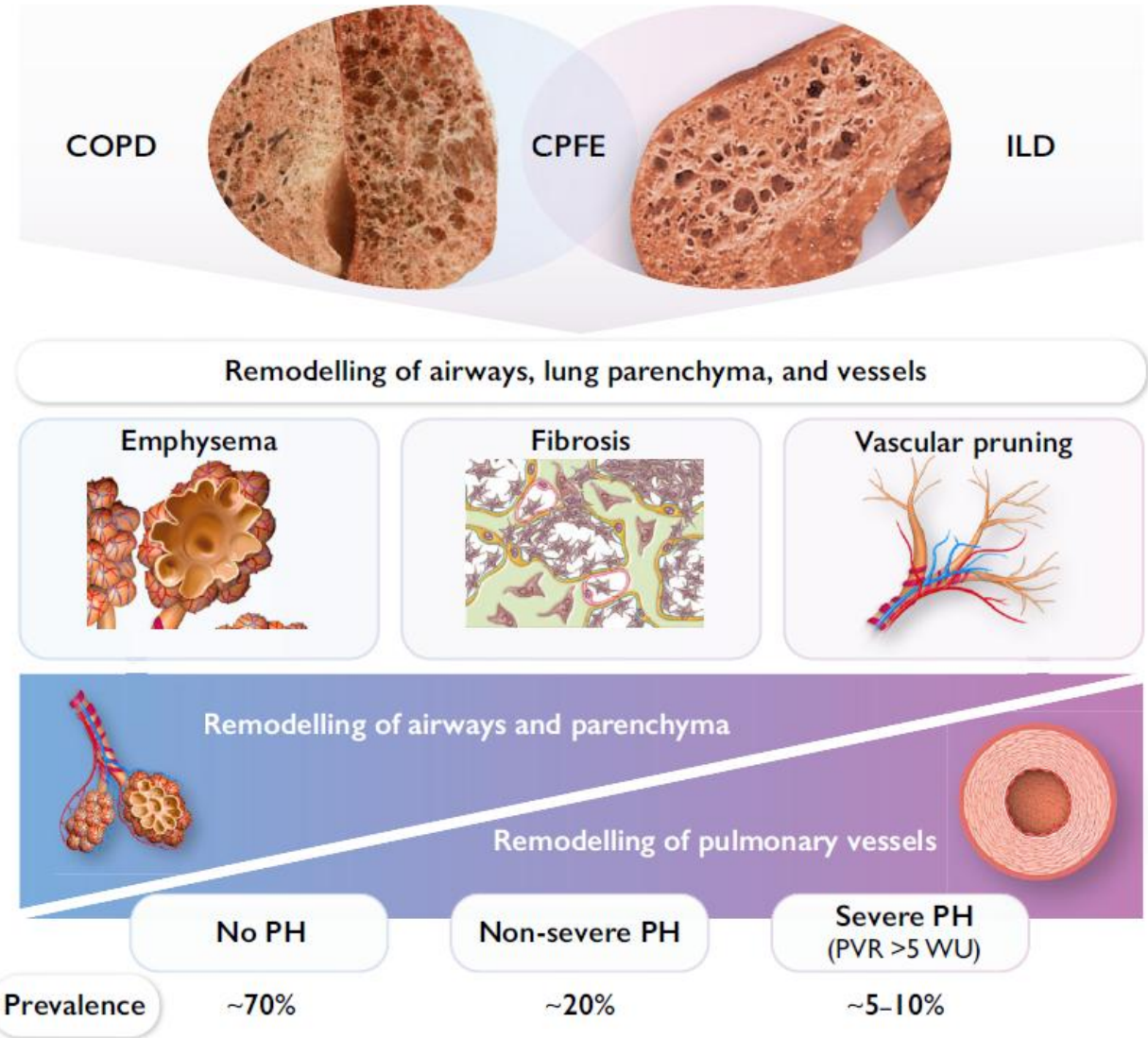
GROUP 3 PH associated with lung diseases and/or hypoxia
3.1 Obstructive lung disease or emphysema
3.2 Restrictive lung disease
3.3 Lung disease with mixed restrictive/obstructive pattern
3.4 Hypoventilation syndromes
3.5 Hypoxia without lung disease (e.g. high altitude)
3.6 Developmental lung disorders

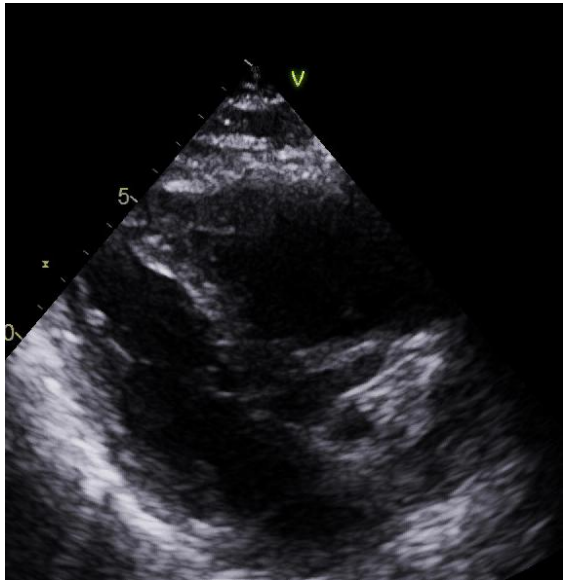
Sleep-disordered breathing is removed from the classification

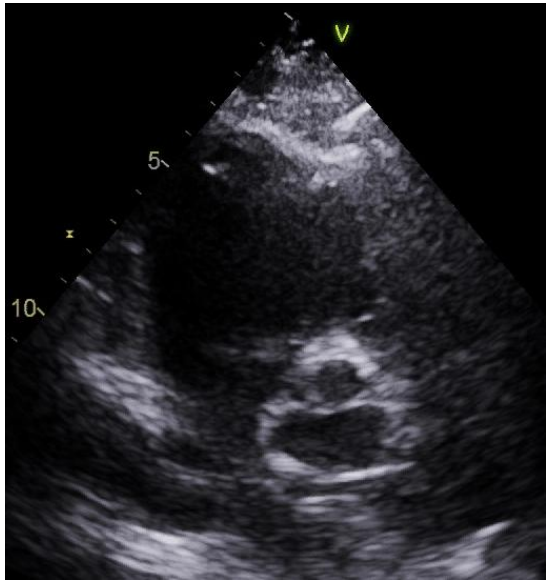
GROUP 4 PH associated with pulmonary artery obstructions
4.1 Chronic thrombo-embolic PH
4.2 Other pulmonary artery obstructions
GROUP 5 PH with unclear and/or multi-factorial mechanisms
5.1 Haematological disorders
5.2 Systemic disorders
5.3 Metabolic disorders
5.4 Chronic renal failure with or without haemodialysis
5.5 Pulmonary tumour thrombotic microangiopathy
5.6 Fibrosing mediastinitis

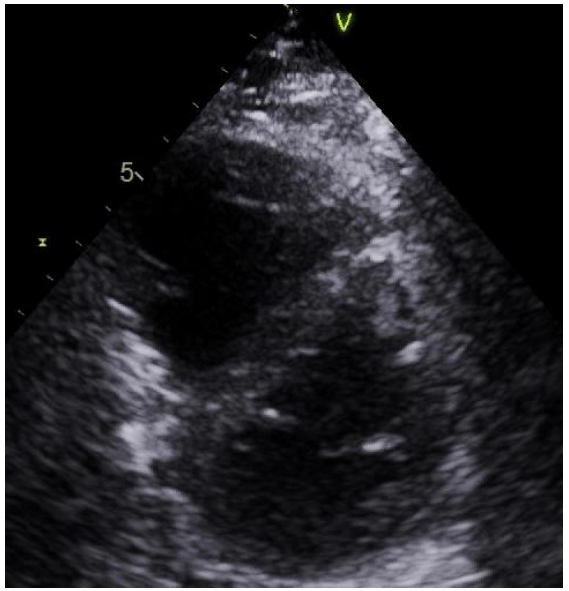
Eur Heart J, ehac237, https://doi.org/10.1093/eurheartj/ehac237

Group 3 Lung disease

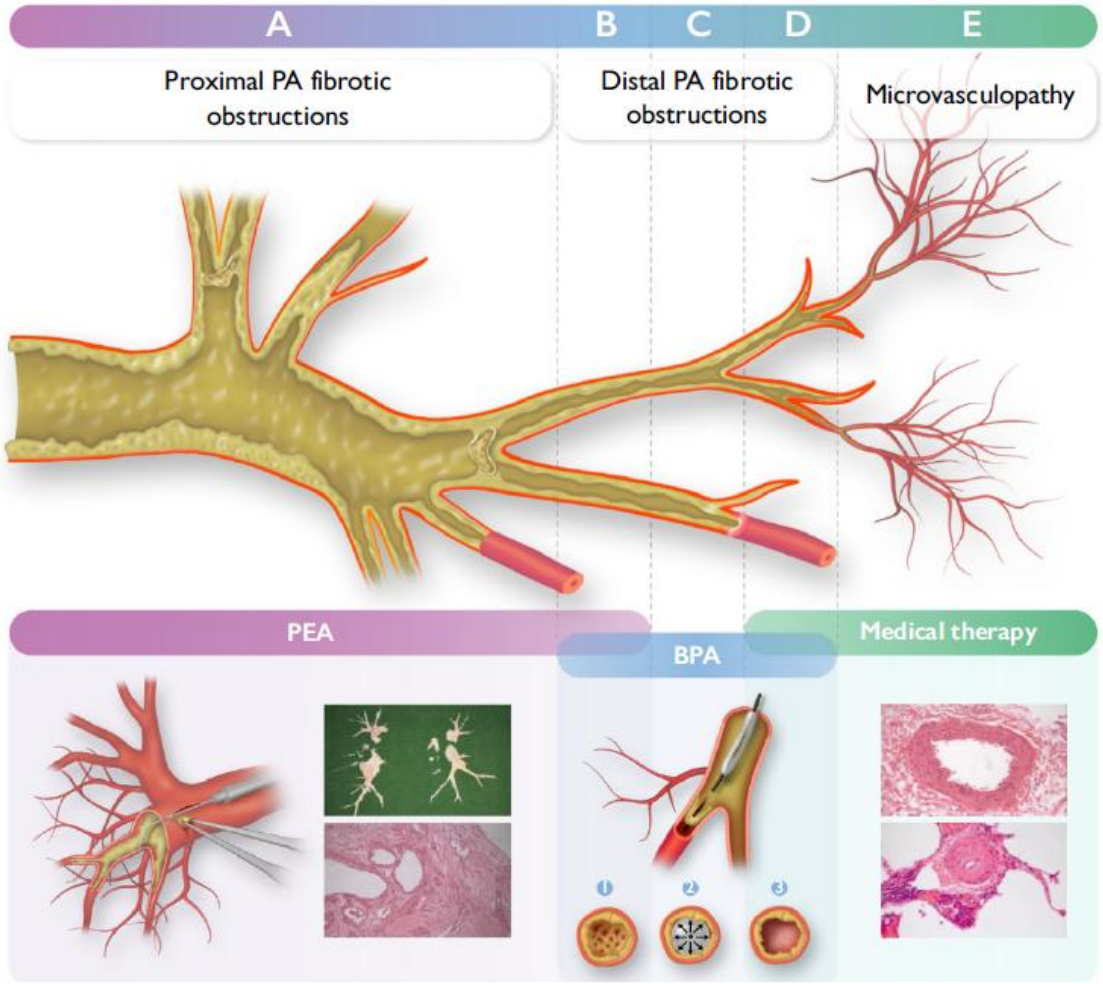


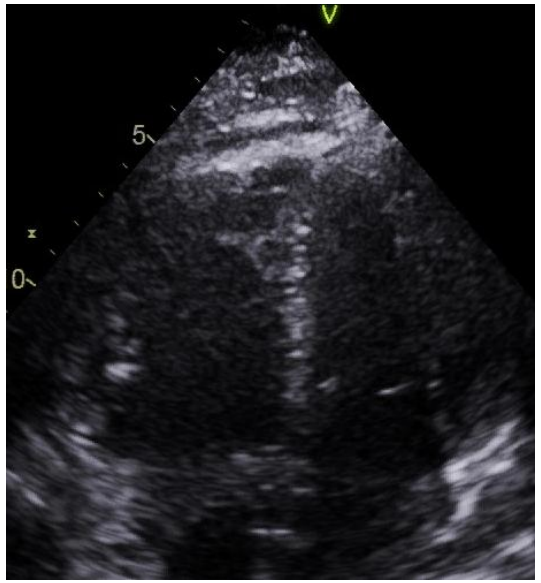


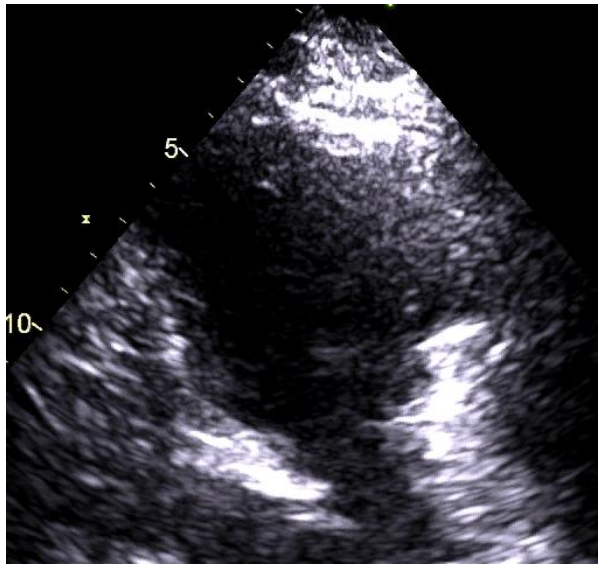


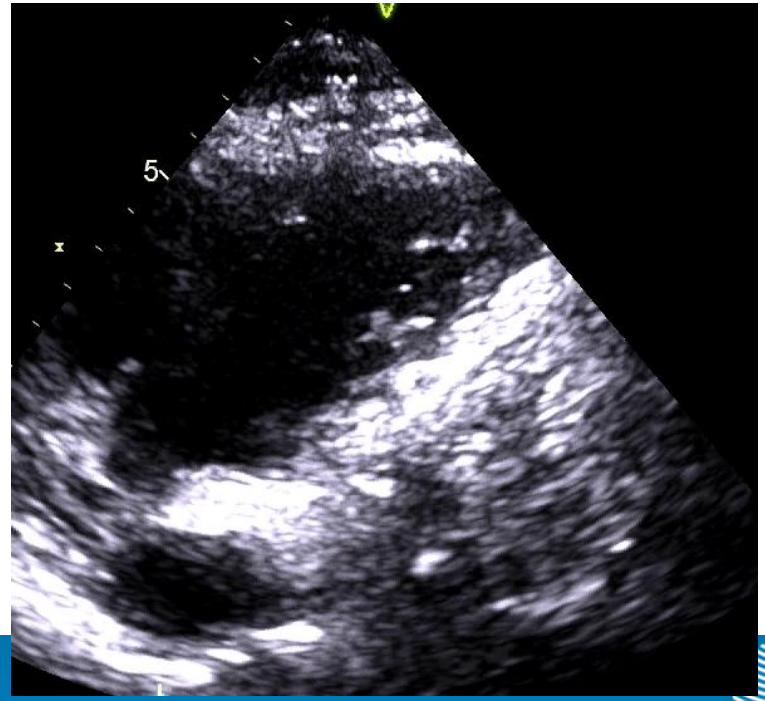


Group 4 CTEPH

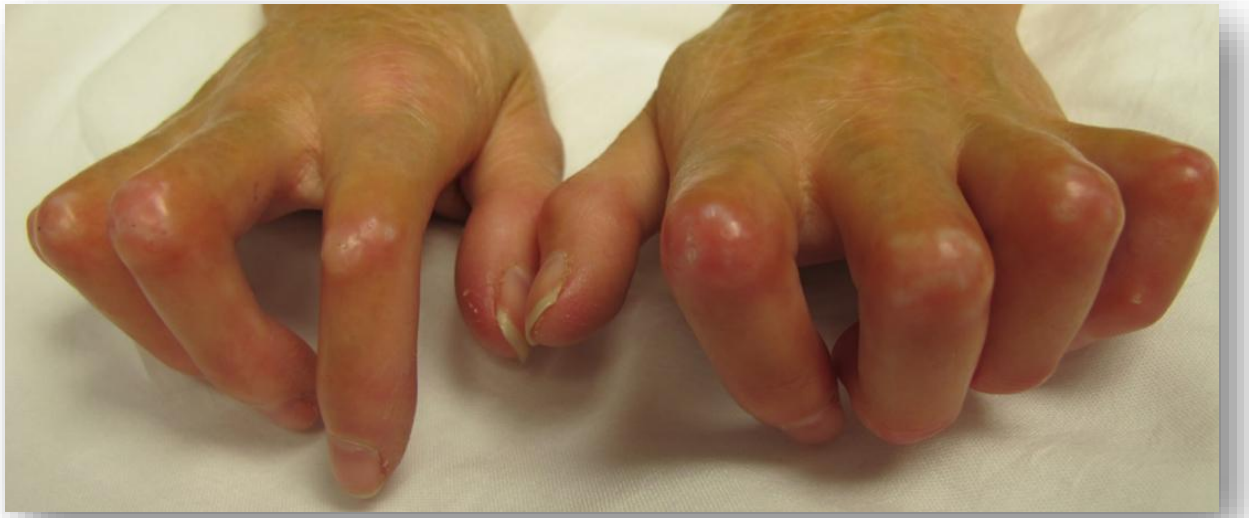






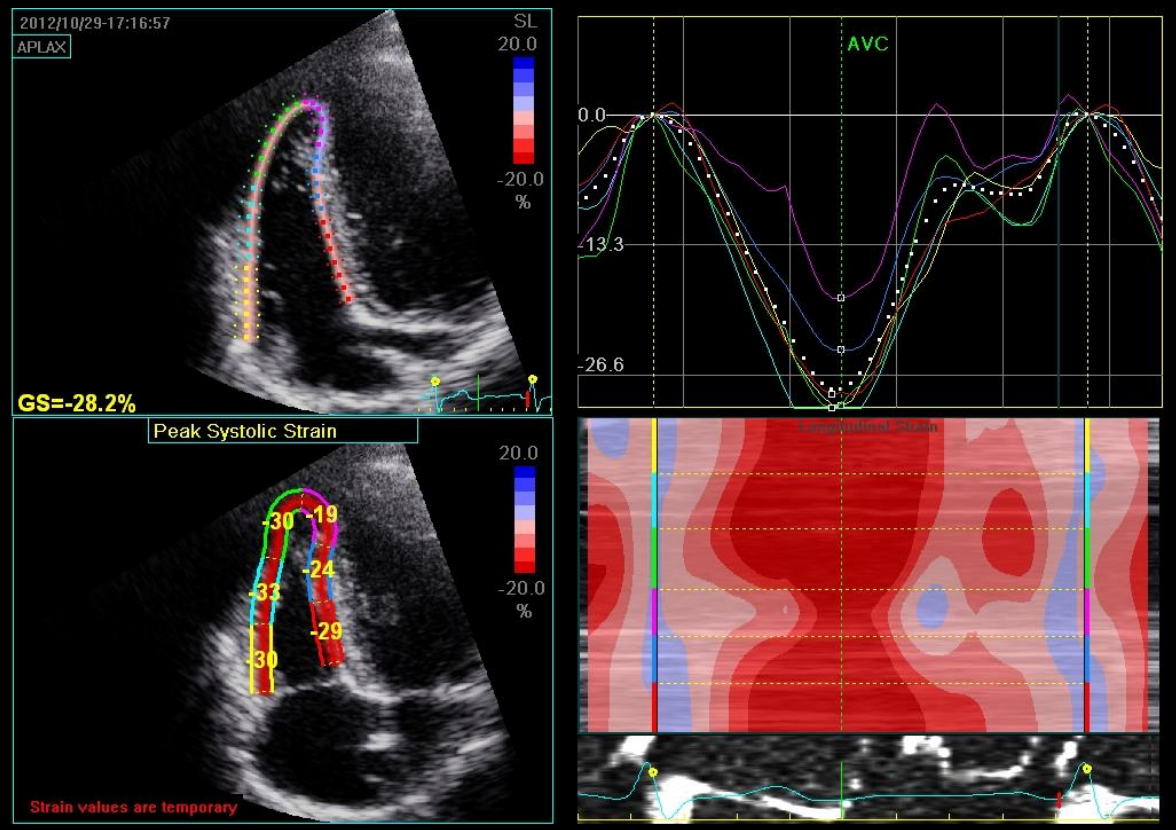


Systemic Sclerosis (Scleroderma)

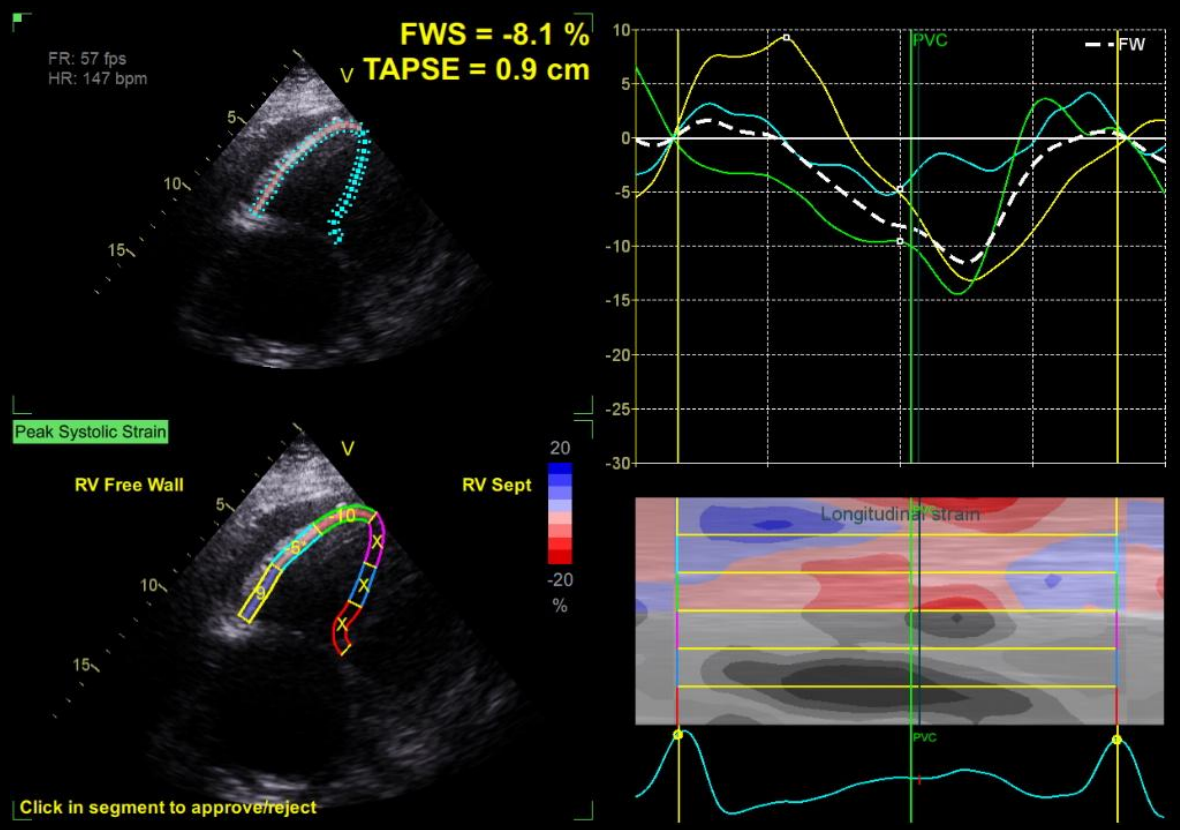


Recommendations	Class	Level
Systemic sclerosis		
In patients with SSc, an annual evaluation of the risk of having PAH is recommended	I	B
In adult patients with SSc with >3 years' disease duration, an FVC ≥40%, and a DLCO <60%, the DETECT algorithm is recommended to identify asymptomatic patients with PAH	I	B
In patients with SSc, where breathlessness remains unexplained following non-invasive assessment, RHC is recommended to exclude PAH	I	C

What about RV Strain?

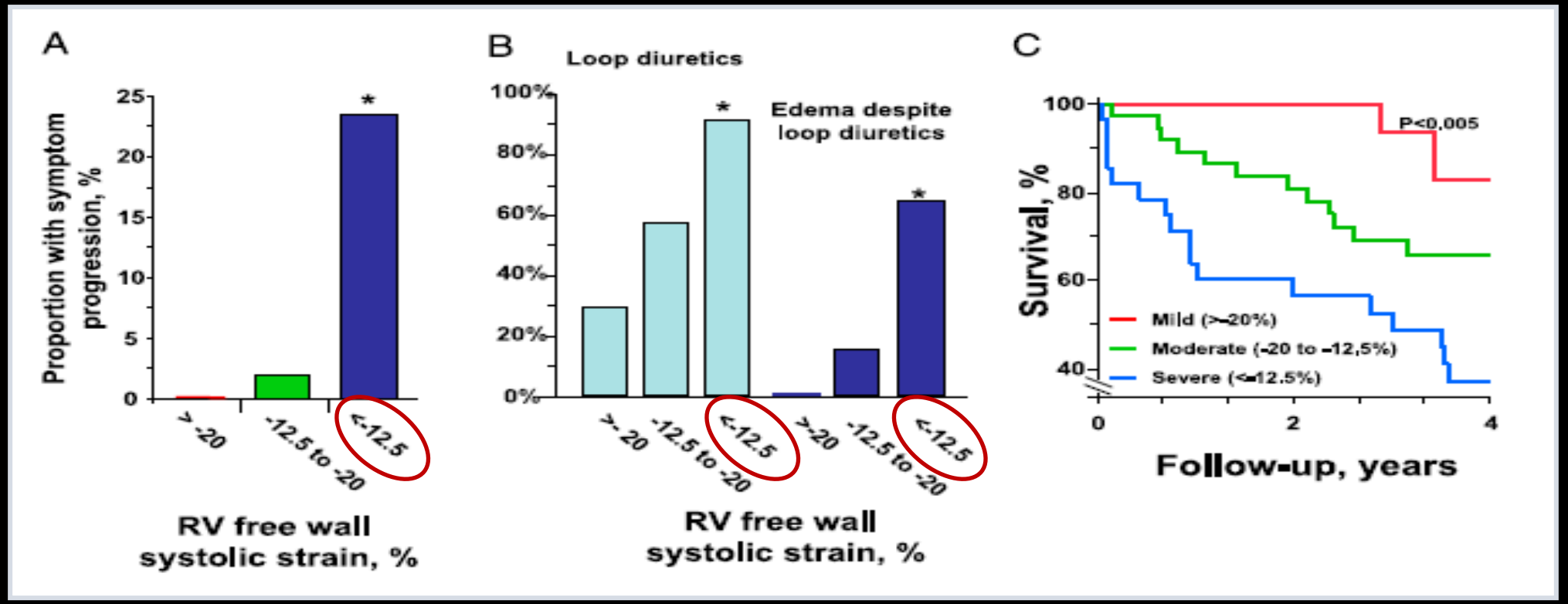


RV GLS
6 segment



RV FWS
3 segment

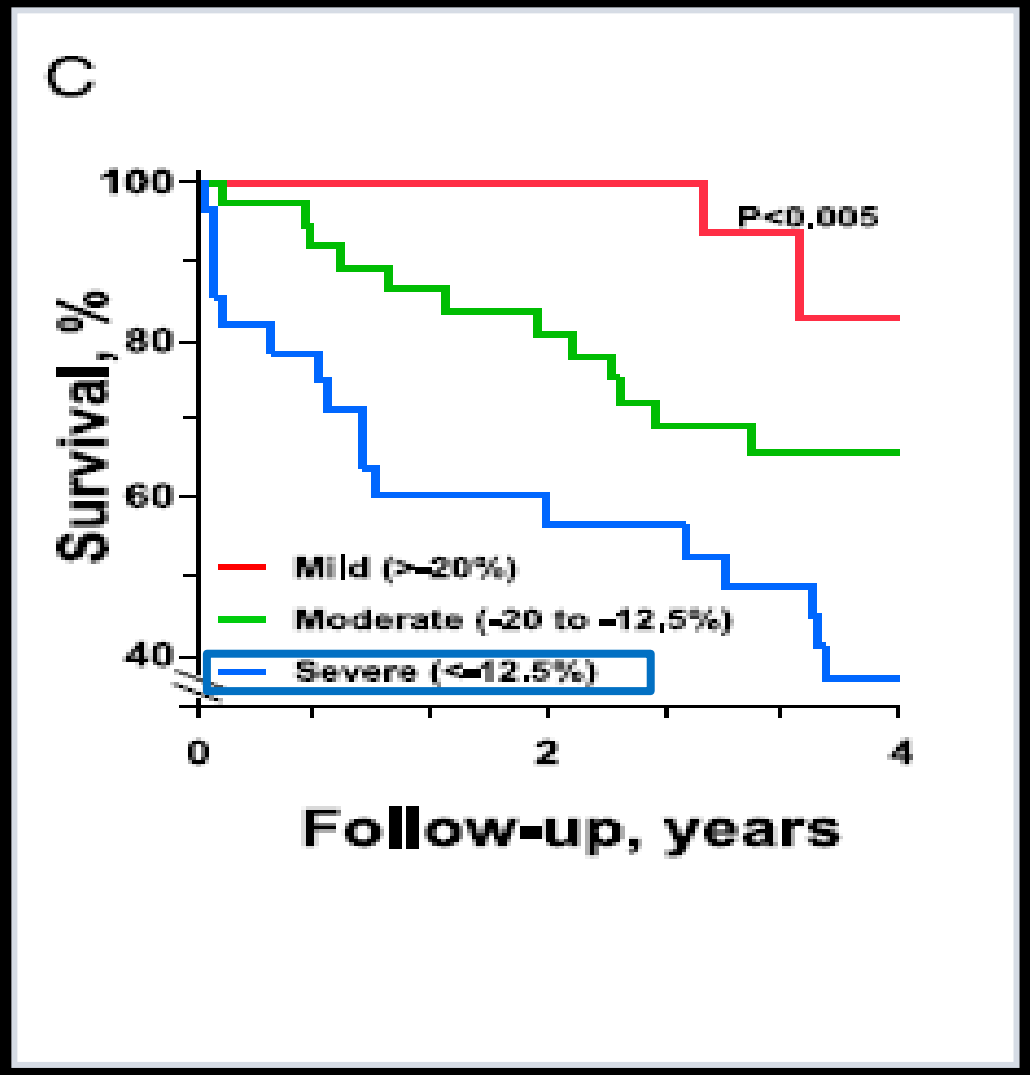
RV FW Strain - Prediction of Survival in PH



- N=80 PH patients, retrospective VVI strain

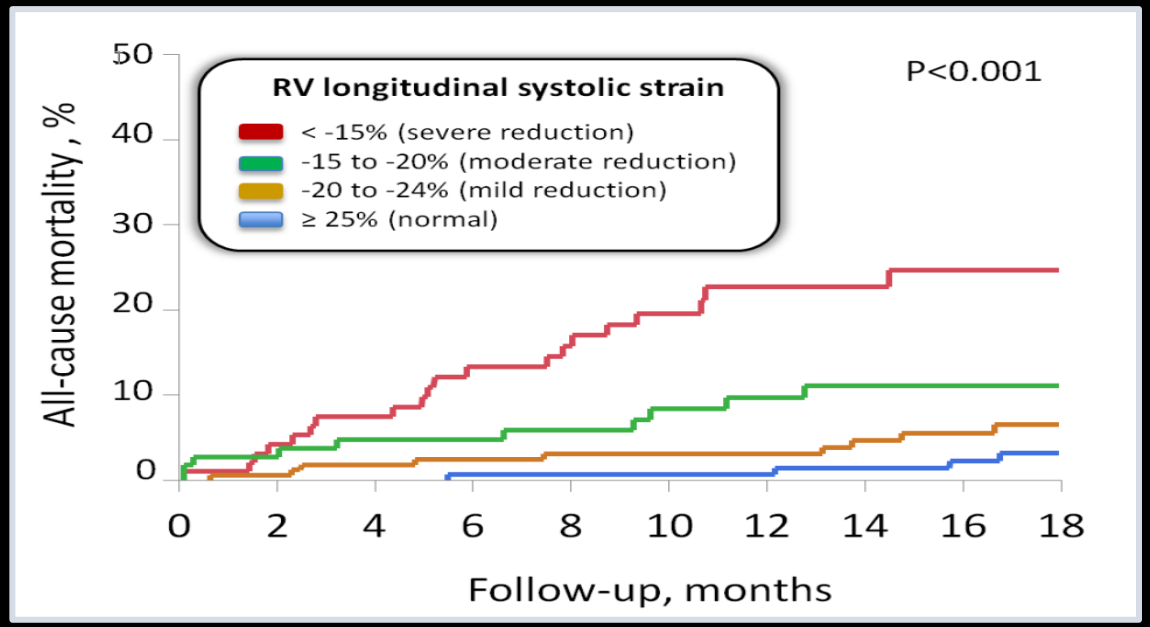
Sachdev, et al. Chest 2011:139;1299-1309

RV FW Strain - Prediction of Survival in PH

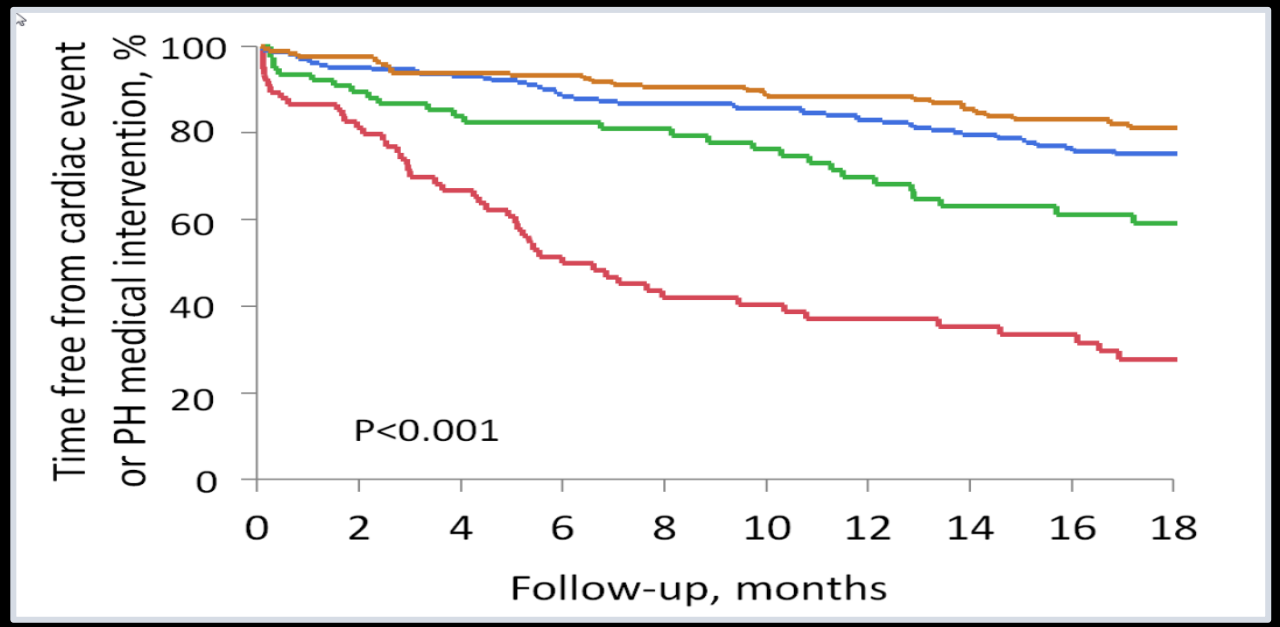


Sachdev, et al. Chest 2011:139;1299-1309

RV FW Strain - Prediction of Survival in PH



All-cause mortality



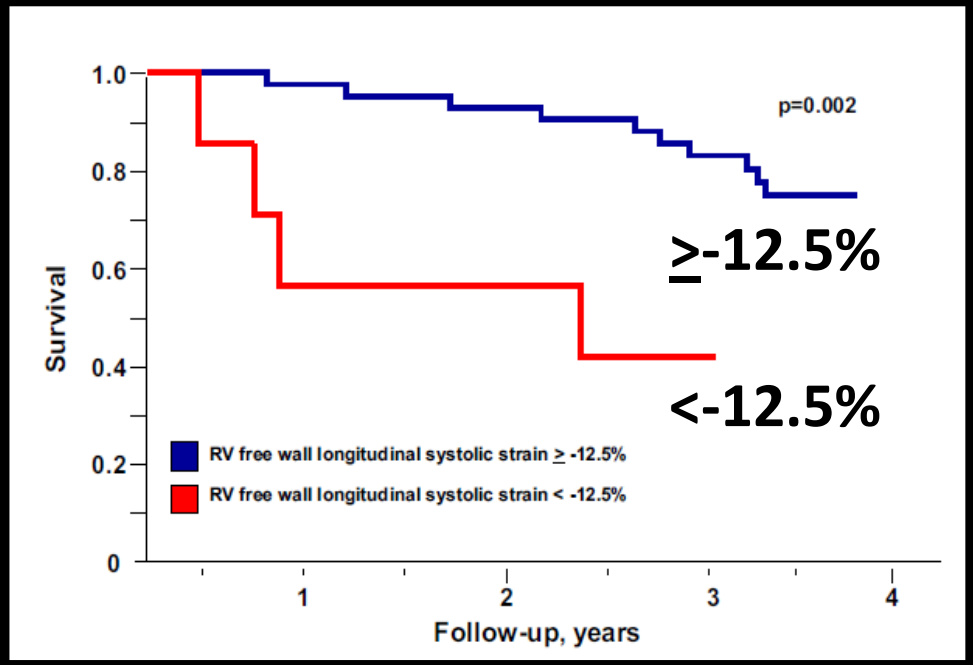
Time free of cardiac events or PH medical intervention

Fine NM et al Circ Cardiovasc Imaging 2013; 6: 711-21

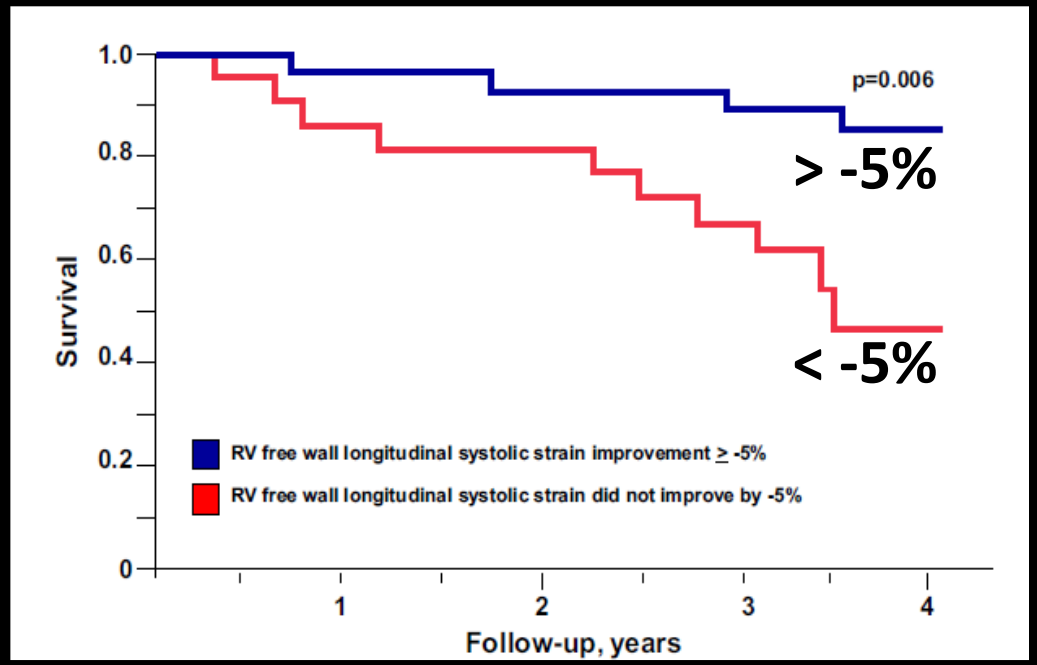
ECHO AUSTRALIA

RV FW strain in treated patients with PPH

50 patients – pre and 6/12 post PPH Rx



Free wall strain at follow up and prognosis



Improved free wall strain at follow up and prognosis
Correlated with symptom improvement and BNP

Hardegree EL, Kane GC et al Am J Cardiol 2013; 111: 143-148

ECHO AUSTRALIA

Pulmonary hypertension “iceberg”

RV dysfunction & failure

RV enlargement, increased HR
Mismached contractility and afterload

Increased RV contractility and RV hypertrophy

Increased PVR with anatomical remodelling and narrowing of pulmonary vessels

RV failure

RV PA uncoupling

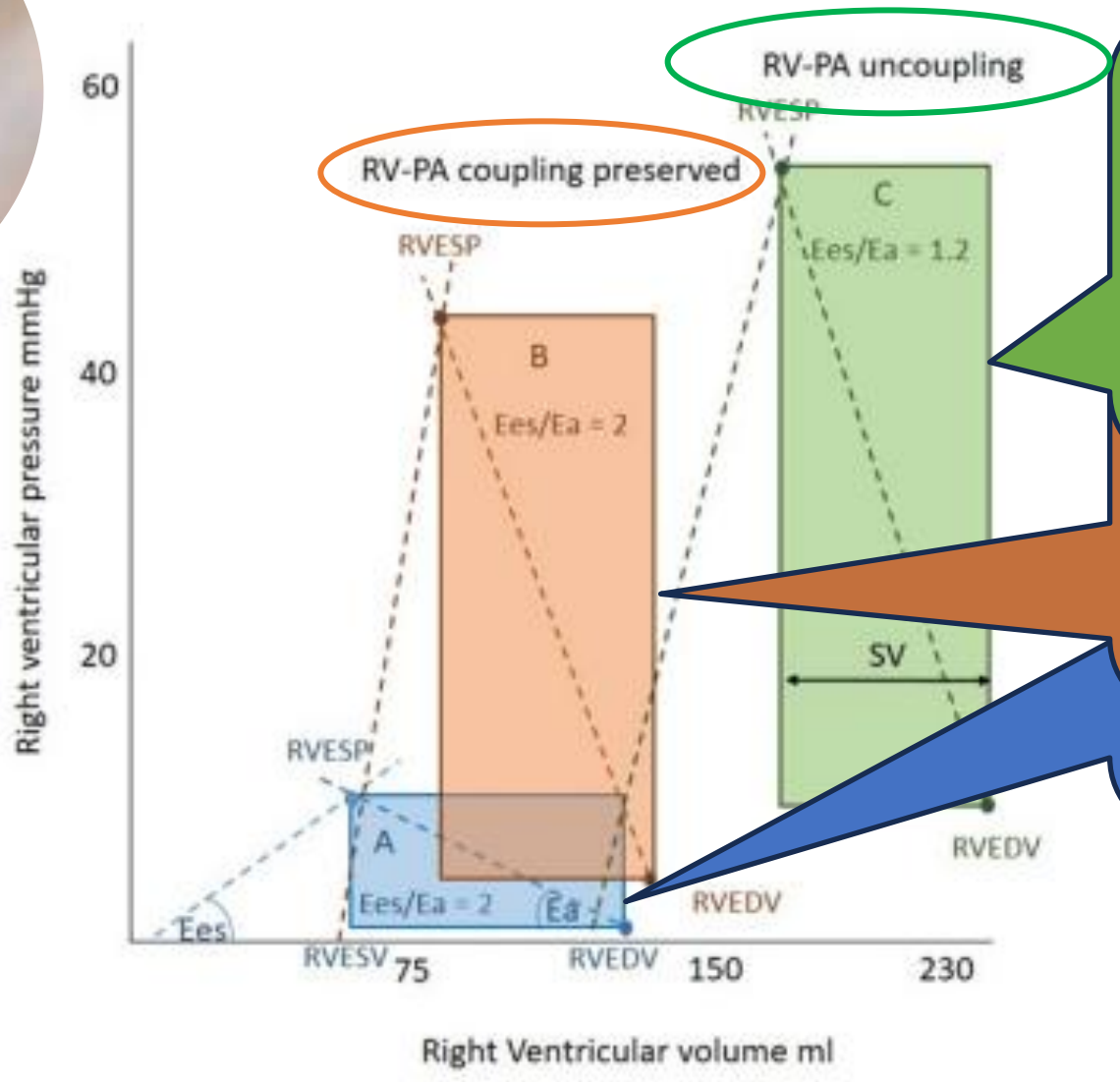
RV PA coupling preserved

Chronic RV afterload increase

Todaro et al, Am J Cardiovasc Dis 2020;10(4):272-283

ECHO AUSTRALIA

Concept of RV-PA coupling



Advanced PH
Increasing RV volume + HR
Increasing Arterial Load
Decreasing RV contractility/elastance
Ees/Ea = 1.2

Increased Arterial Load
Increased RV contractility
Ees/Ea = 2

Ees/Ea = 2

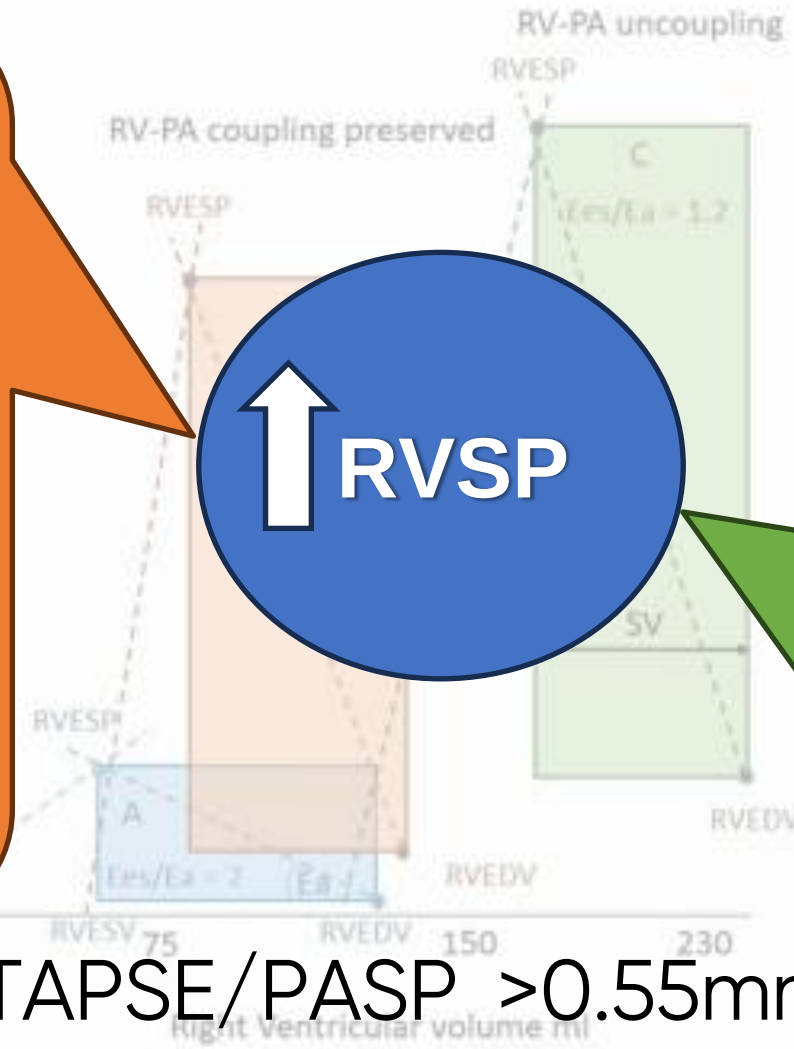
Ees – slope of end-systolic pressure as measure of RV contractility(elastance)

Ea – measure of arterial load

RV-PA Coupling : Ratio of TAPSE/PASP

RV-PA coupling

TAPSE/PASP >0.31 mm/mmHg (Ees/Ea >0.8) Sens 87.5% Spec 76%



RVSP

RV-PA un-coupling

TAPSE/PASP <0.31 mm/mmHg (Ees/Ea <0.8) Sens 87.5% Spec 76%

Normal TAPSE/PASP >0.55mm/mmHg

Tello et al, Circ Cardiovasc Imaging, 2019;12.

ECHO AUSTRALIA

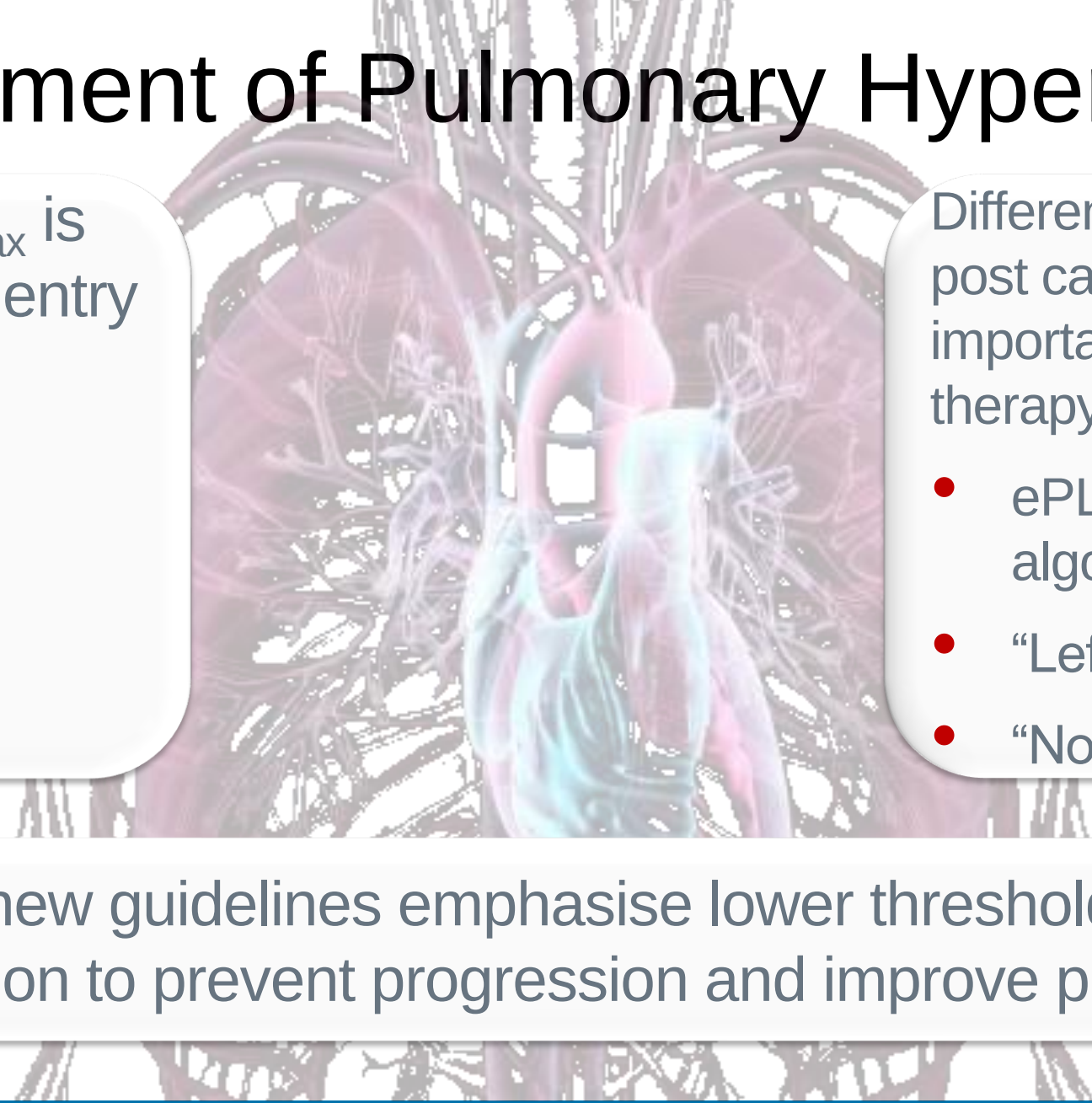
Invasive vs Non-Invasive RV-PA Coupling assessment

	RV Afterload	RV function	RV-PA Coupling
Invasive (RHC)	mPAP 50mmHg PVR 7WU	CO 5.7L/min RAP 5mmHg	**Preserved**
Non-Invasive	PASP 60mmHg RVOT notching RVOT AccTime <100ms pPTT 130msec	TAPSE 24mm TAPSE/PASP 0.4 S` 14cm/s FAC 55% RVFWS 28%	**Preserved**

Todaro et al, Am J Cardiovasc Dis 2020;10(4):272-283

Assessment of Pulmonary Hypertension

- RVSP/TRV_{max} is the universal entry level test
- IVC for RAP
- E/e' for LAP
- RV FWS
- TAPSE/PASP



Differentiating pre and post capillary HTN important for guiding therapy

- ePLAR and other algorithms
- "Left heart" PHT
- "Non-left heart" PHT

Big data and new guidelines emphasise lower thresholds and earlier intervention to prevent progression and improve prognosis

Assessment of Pulmonary Hypertension

Dr Julie Humphries

ECHO AUSTRALIA

17-19 March 2025