

Pulmonary Hypertension and Pulmonary Embolism: Role of Echo

ECHO HAWAII

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Japan

My home



Economy class syndrome

Economy class syndrome



New seats

Kumamoto Castle in 2016
Earthquake



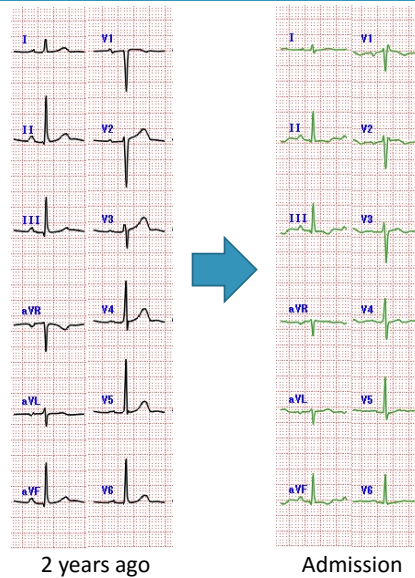
Hospital in Kumamoto

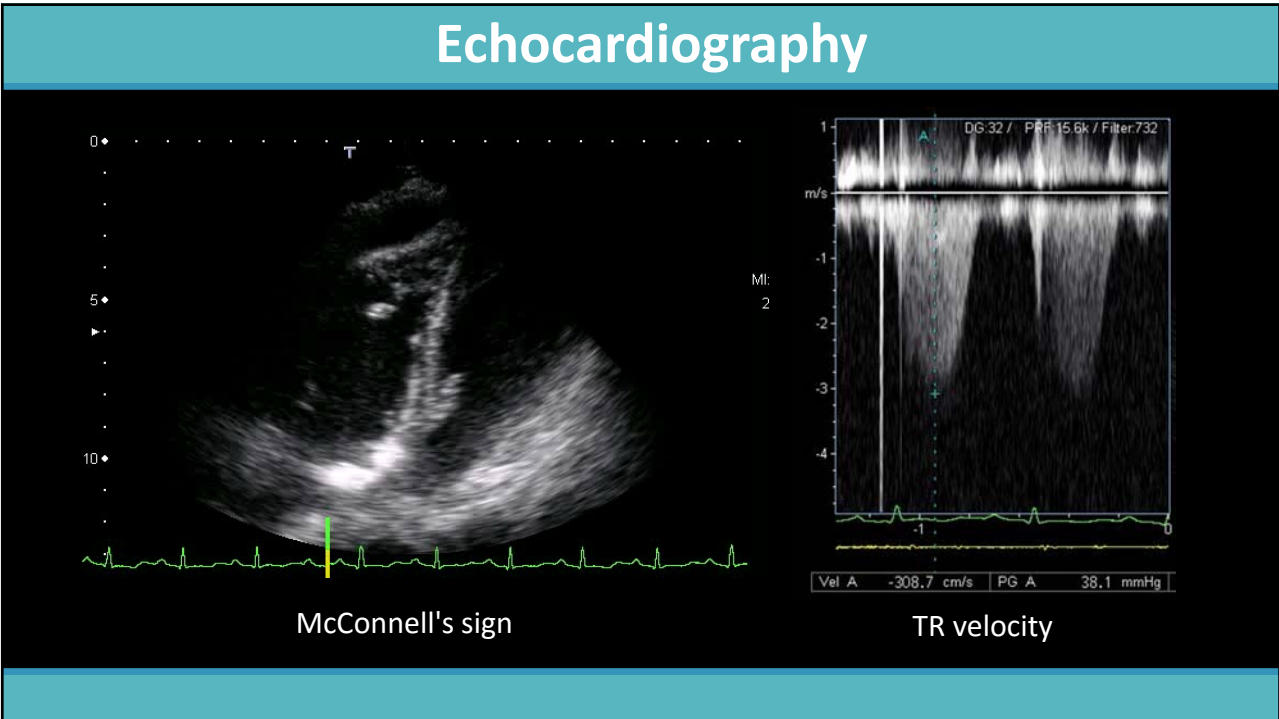
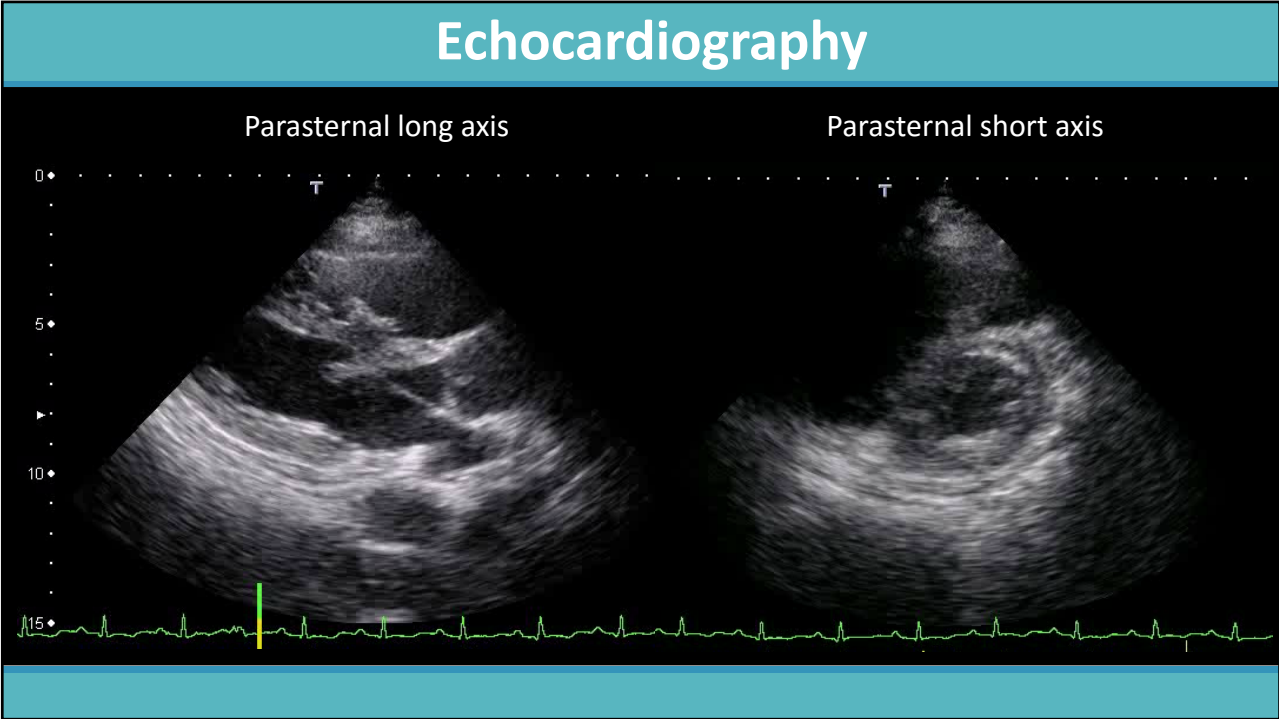




Case 1

- 66 Female presents with acute onset of chest pain.
- She had no medical history.
- Shortness of breath and chest pain.





Question 1

- 66 y.o. female with acute onset of chest pain and pulmonary hypertension

Your recommendation is...

1. Follow up
2. Coronary angiography
3. Delayed enhancement MRI
4. Contrast CT

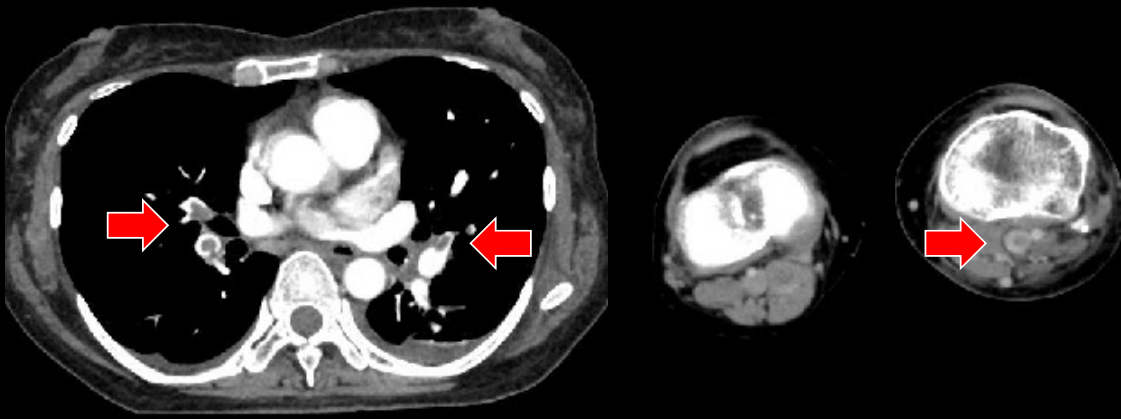
Question 1

- 66 y.o. female with acute onset of chest pain and pulmonary hypertension

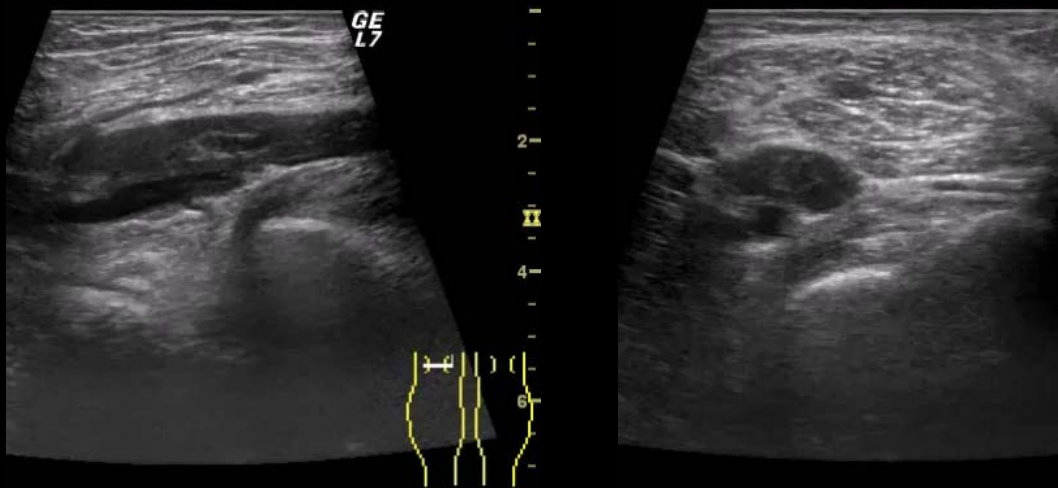
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Contrast-enhanced CT



Ultrasonography



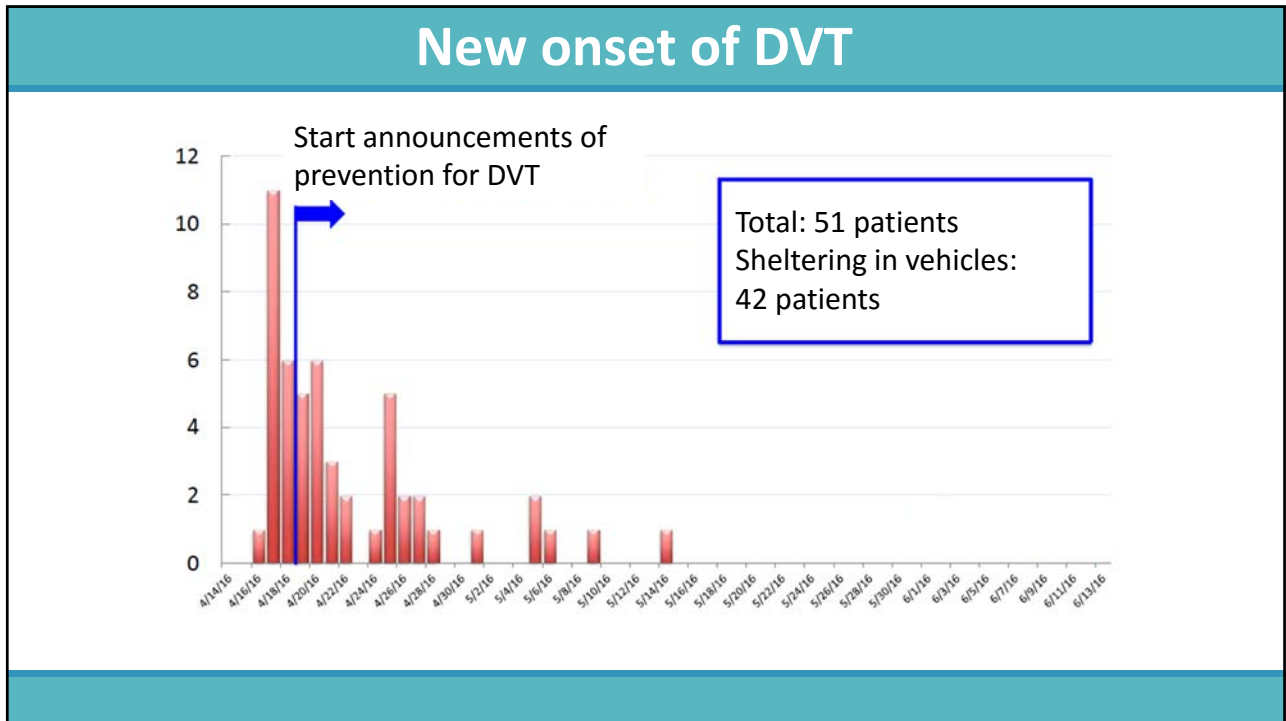
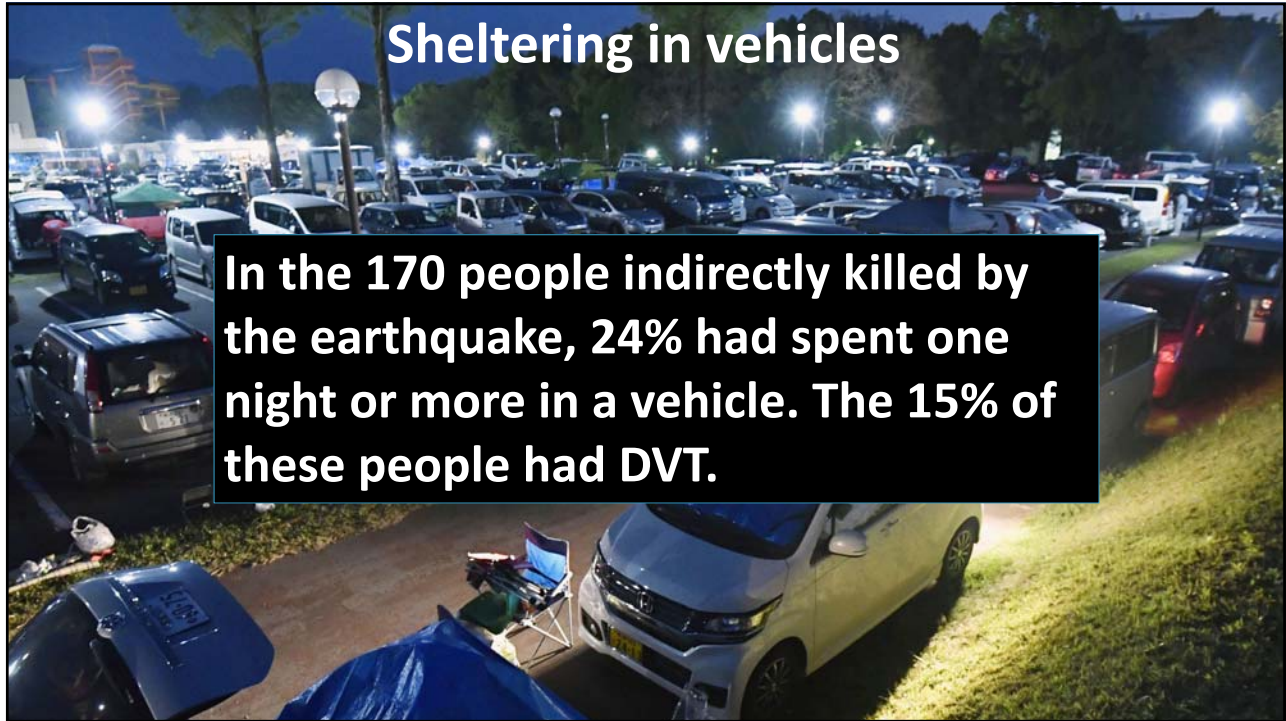
Case 1 summary

- **Paradoxical septal motion**
- **McConnell's sign**
- **Estimated PA pressure: elevated**
- **Deep vein thrombus**
- **Pulmonary emboli**

Diagnosis: Acute pulmonary embolism with deep vein thrombus

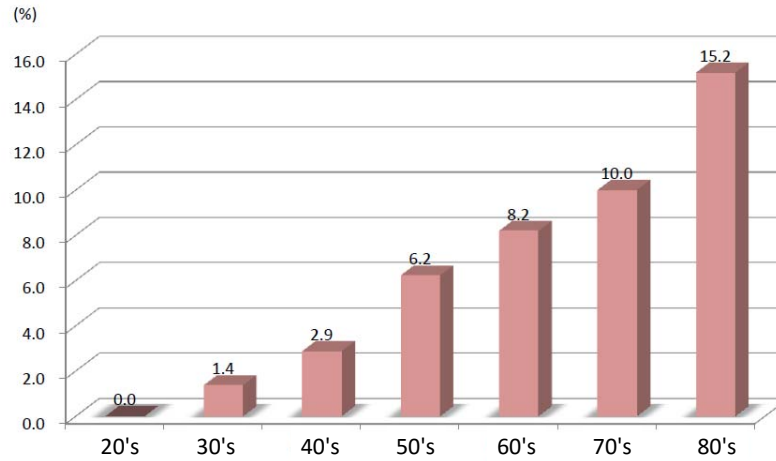
Decision

- **This Patient started an anticoagulant therapy.**



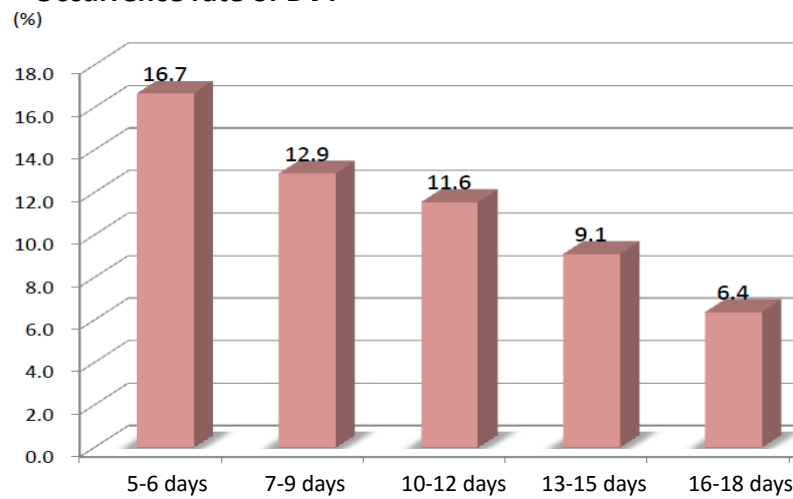
Elder is high risk

Occurrence rate of DVT



Days after the earthquake

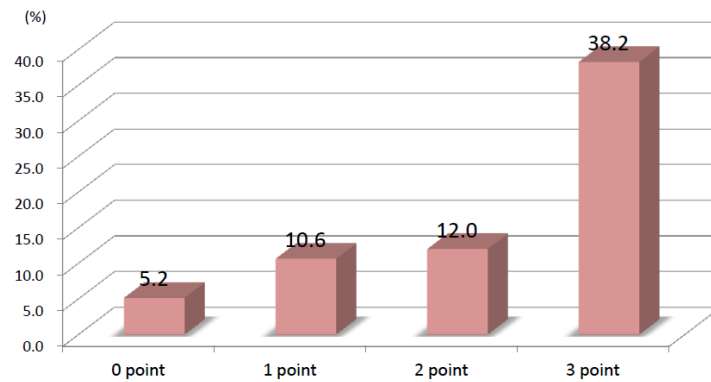
Occurrence rate of DVT



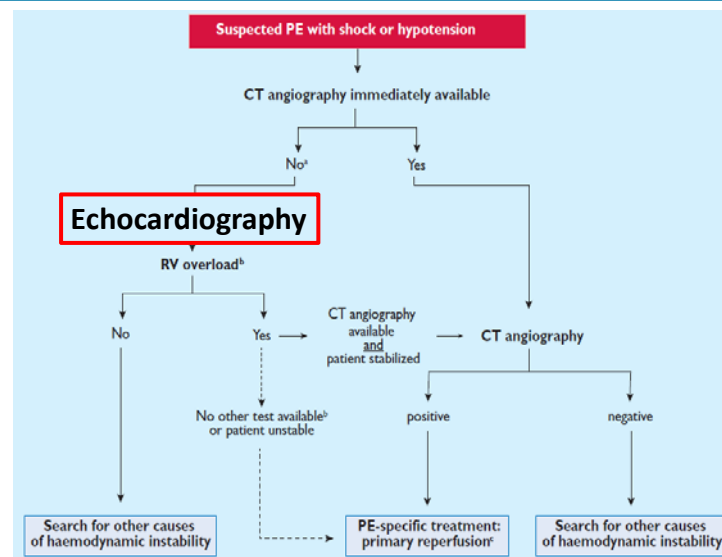
Risk factors of DVT in Kumamoto

- Age (>70 years old)
- Use of sleeping pill
- Leg swelling

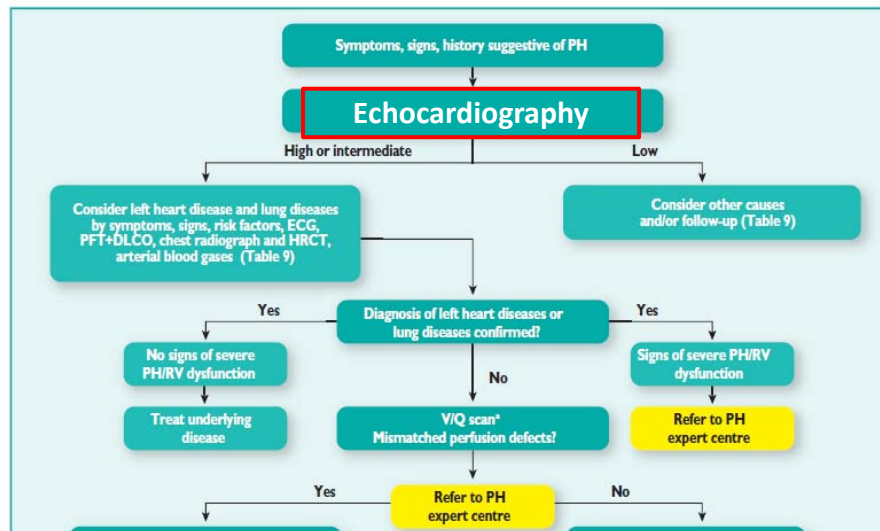
Occurrence rate of DVT



Echo – Early in the management of PE and PH



Echo – Early in the management of PE and PH



2015 ESC guideline for PH

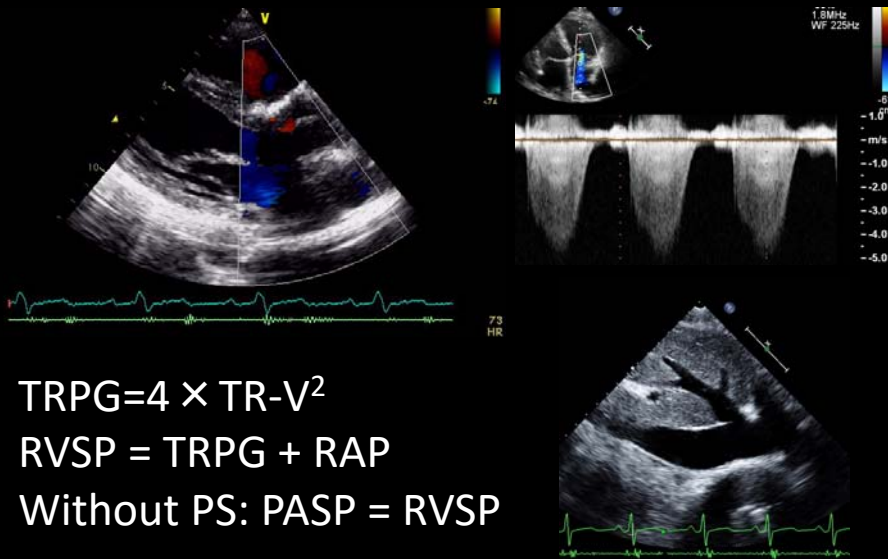
Summary (1)

- Sheltering a vehicle is a risk of DVT, we always check the history of patients.
- Age (>70 years old), use of sleeping pill and leg swelling were risk factors of DVT in the earthquake situation.
- We need a screening test using echocardiography in patients with any high risk.

Echocardiographic assessment in PH

- Pulmonary arterial pressure (PAP)
- RV size
- RV function

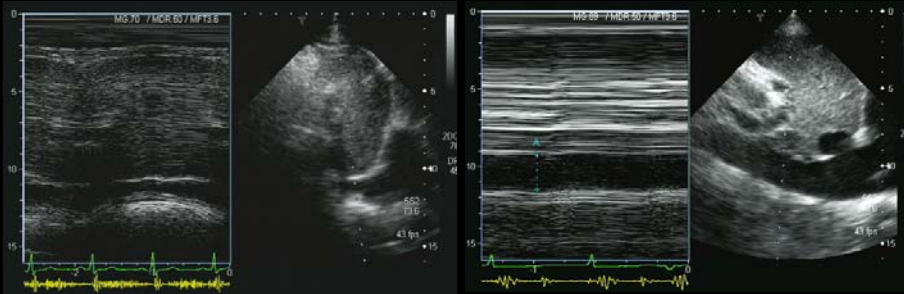
Estimation of systolic PAP



Sniff test

“Take several quick, short sniff,
as if you have a stuffy nose.”

Klein and Garcia, Diastology



Estimation of systolic PAP

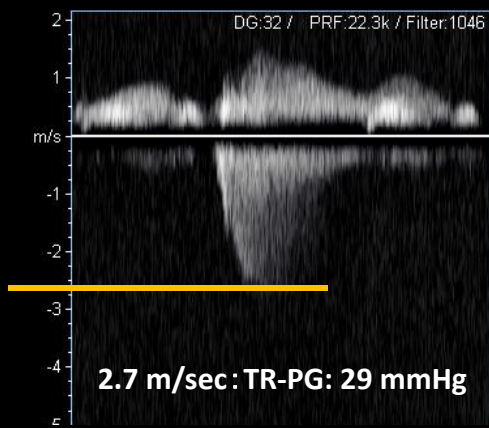
IVC size (mm)	Sniffing % collapse	RA pressure (mm Hg)
≤ 21	> 50%	3
	< 50%	8
> 21	> 50%	8
	< 50%	15

J Am Soc Echocardiogr. 2015 Jan;28(1):1-39.e14.

Five Pitfall of TR-PG



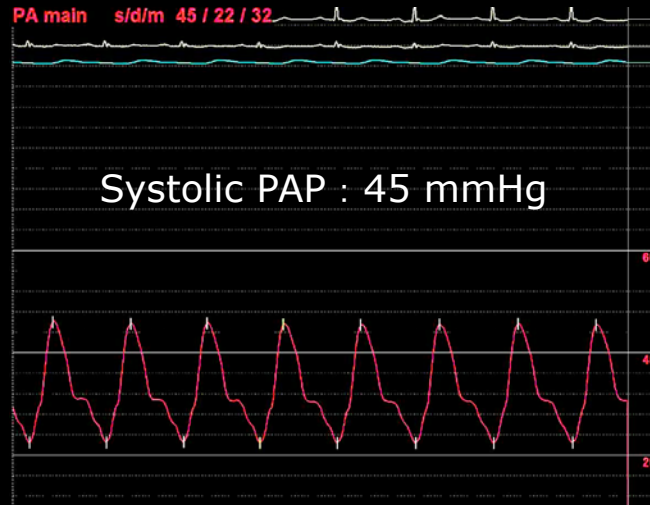
Small TR



IVC collapse

Estimated PAP: 32 mmHg

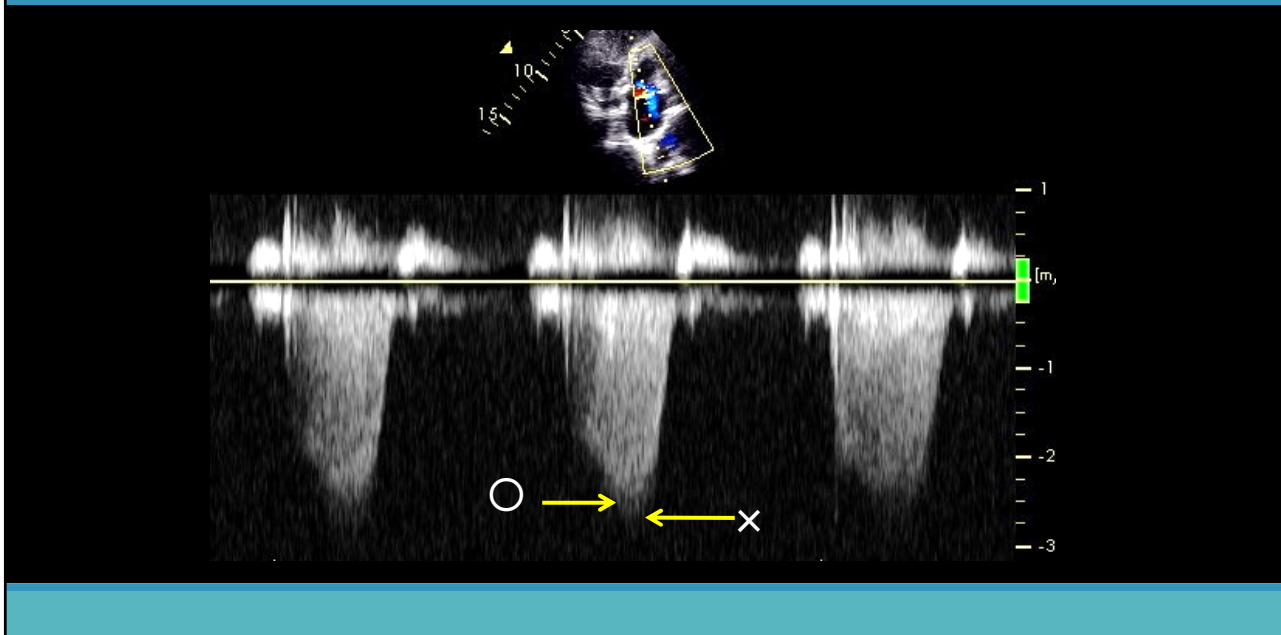
Small TR



Pitfall

1) Small tricuspid valve regurgitation

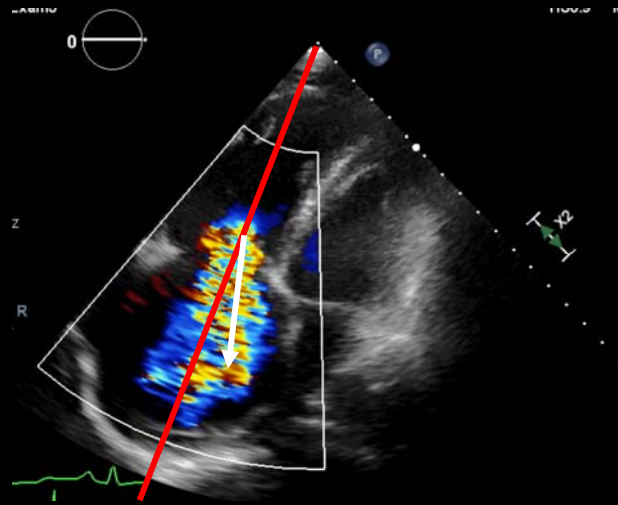
Gain, take a haircut



Pitfall

2) Over or under gain

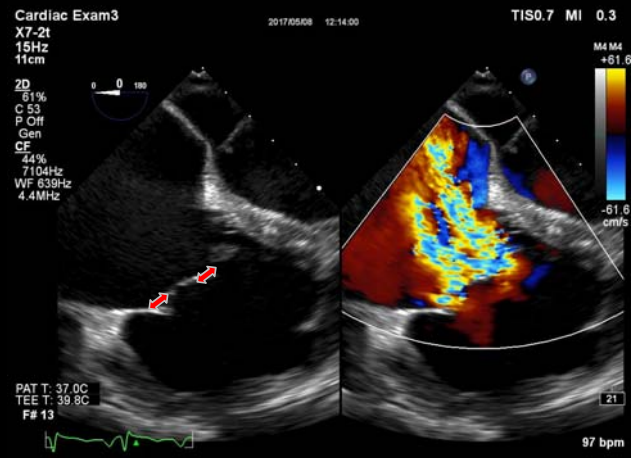
Angle: alignment



Pitfall

3) Inadequate angle

Laminar



Echo underestimates

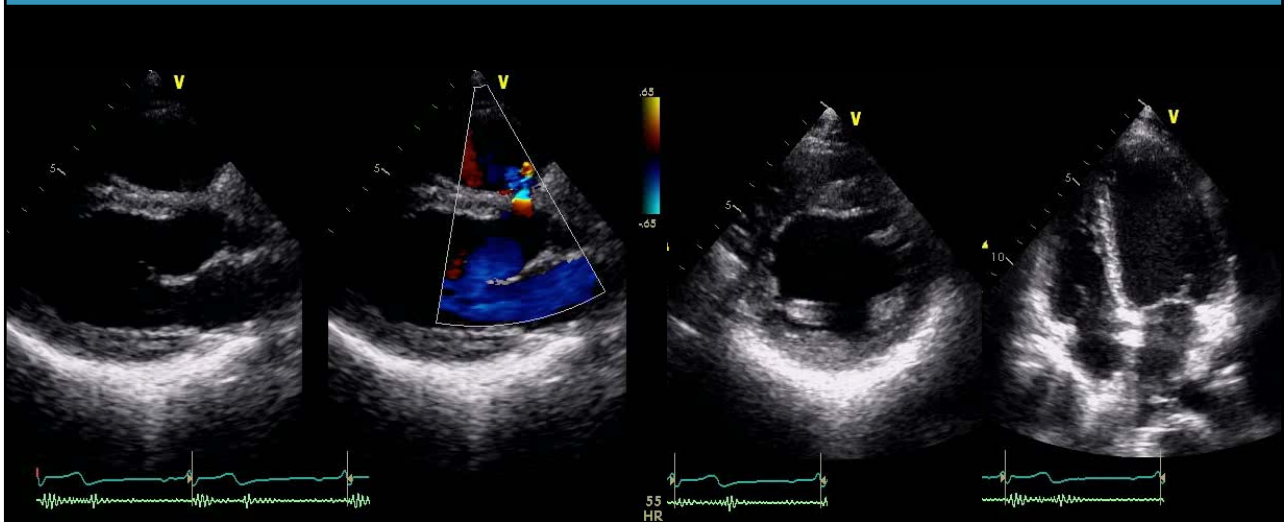
Pitfall

4) Laminar flow

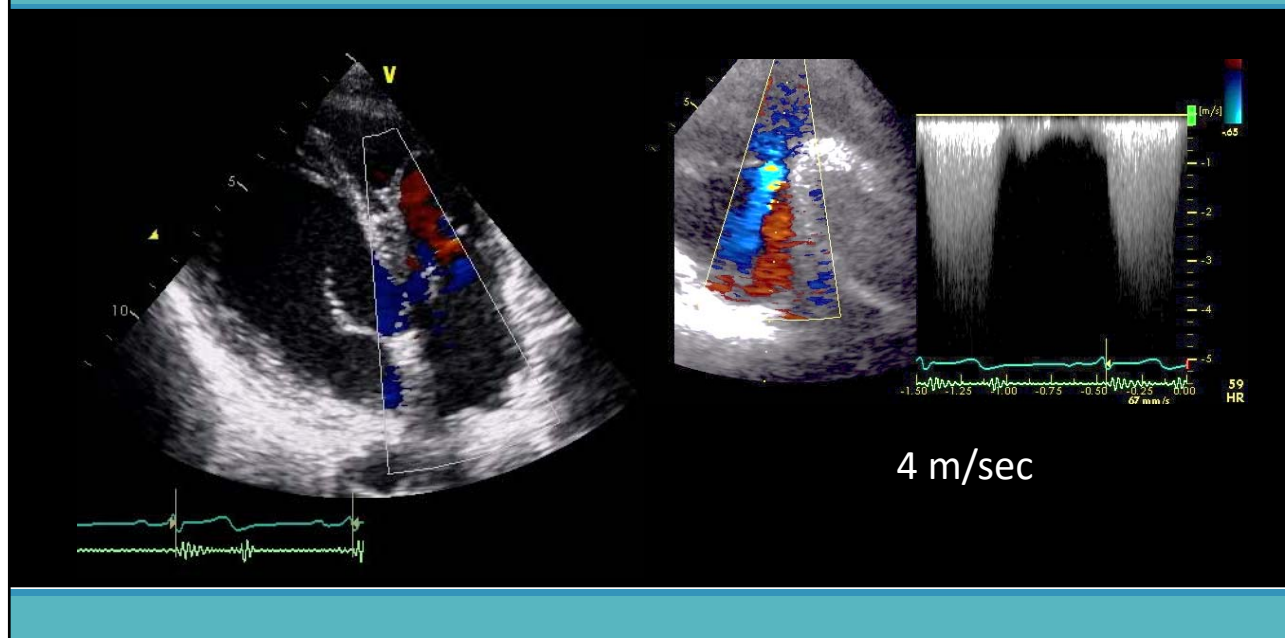
Case 2

- 48 y.o. female
- With a history of ventricular septal defect.
- She had no symptom.
- She presented for a second opinion regarding diagnosis of pulmonary hypertension (family doctor diagnosed).

Echocardiography



Doppler



Question 2

A 48 year old female with small VSD.

Your diagnosis is...

1. Pulmonary hypertension
2. Dilated cardiomyopathy
3. Heart failure with preserved EF
4. Additional test required

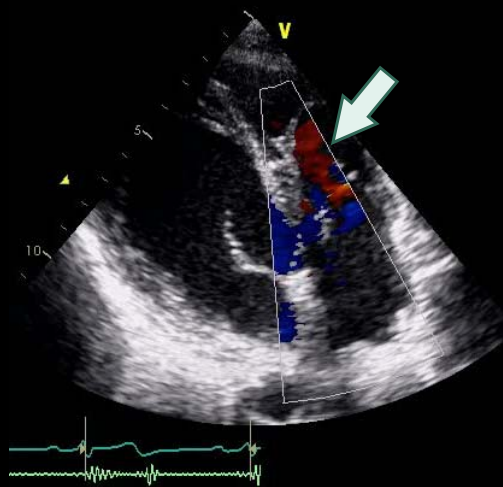
Question 2

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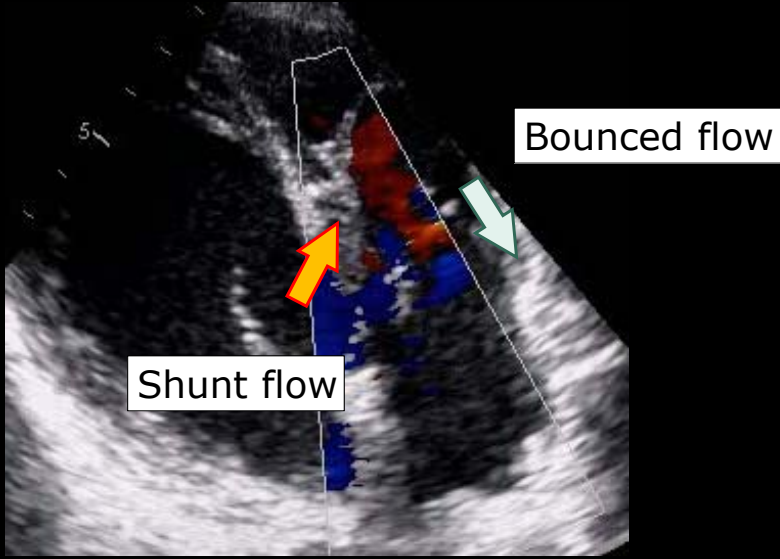
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Tricuspid Pouch

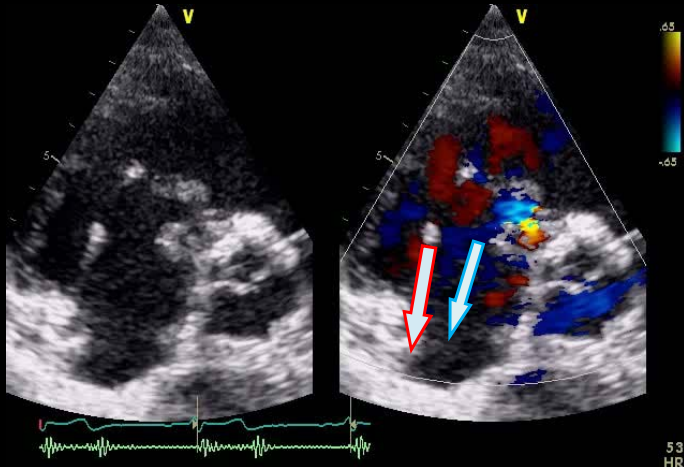


Tricuspid Pouch

Echocardiography

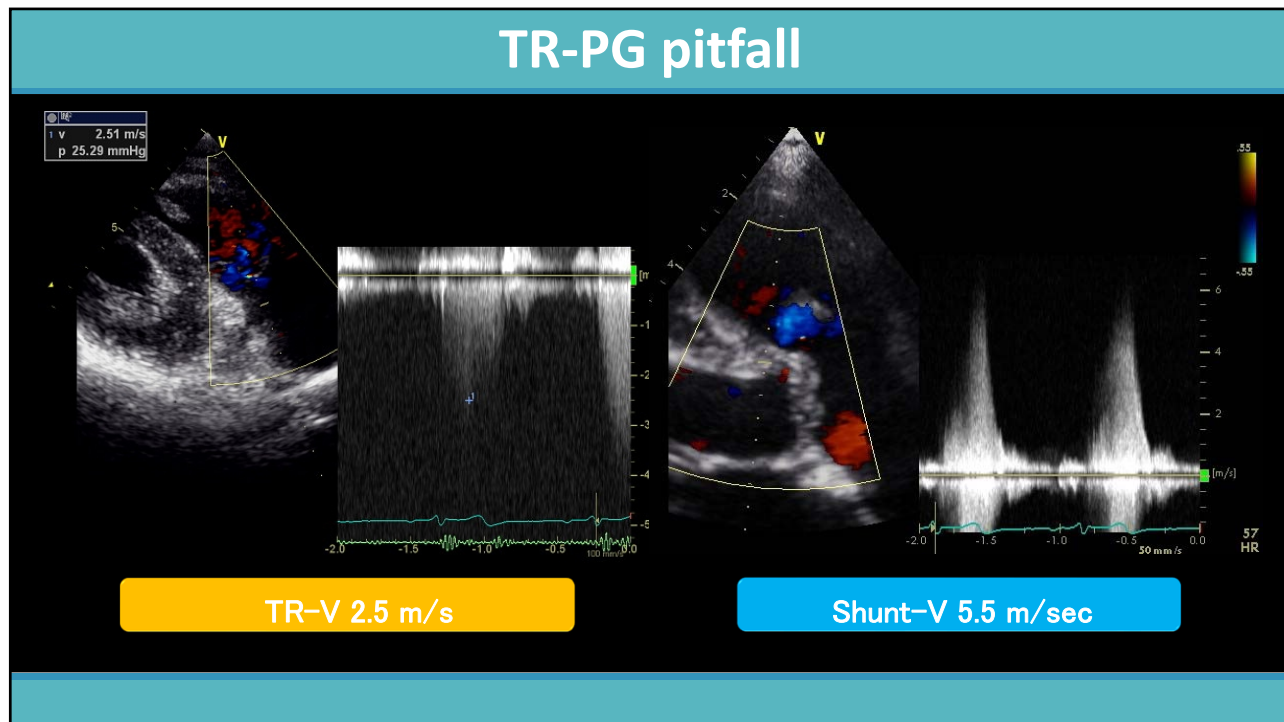


Echocardiography



TR velocity (↓)

Shunt flow (↓)



Case summary

- VSD with shunt V: 5.5 m/sec
- Tricuspid pouch
- TR-V: 2.5 m/sec

The recommendation is observation.

Pitfall

5) Misunderstand TR

Summary (2)

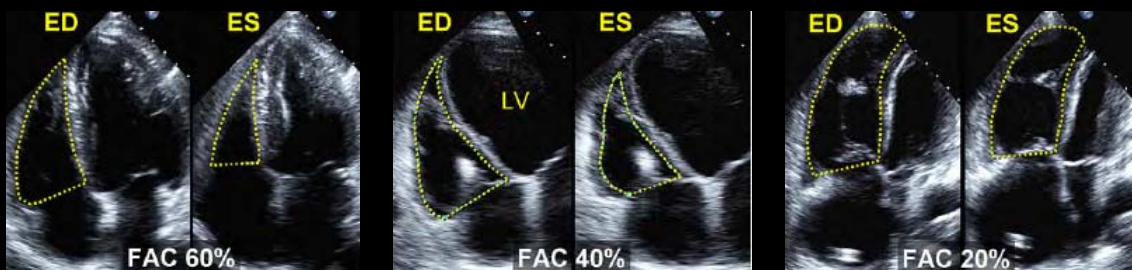
Pitfalls for TR are...

- 1) Small tricuspid valve regurgitation**
- 2) Over or under gain**
- 3) Inadequate angle**
- 4) Laminar flow**
- 5) Misunderstand TR**

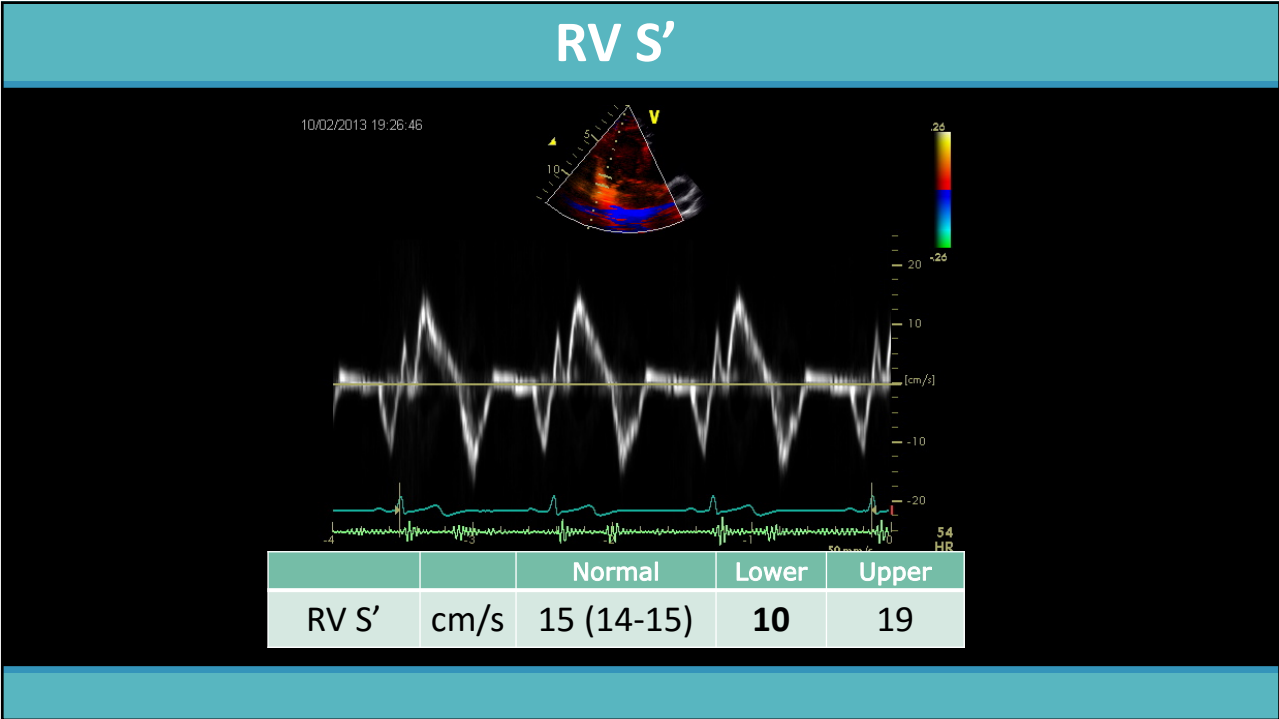
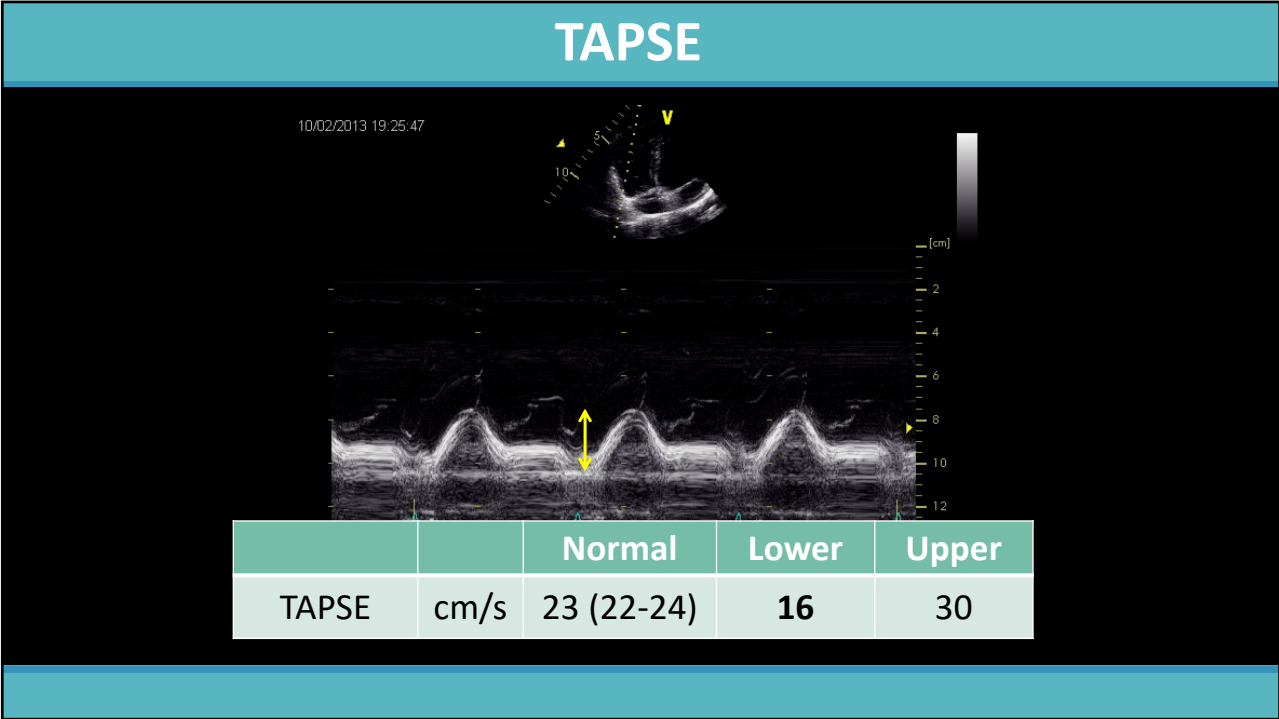
RV systolic function

- Fractional area change (FAC)
- TAPSE
- RV S'
- RV strain

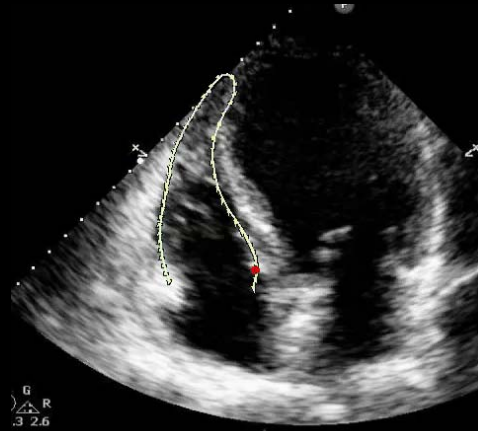
FAC



		Normal value	Lower	upper
RVEDA	cm ²	18 (16-19)	10	25
RVESA	cm ²	9 (8-10)	4	14
RVFAC	%	49 (47-51)	35	63



RV strain



		Mean	Abnormality cut off
RV strain	%	-29	-20%

Prognosis

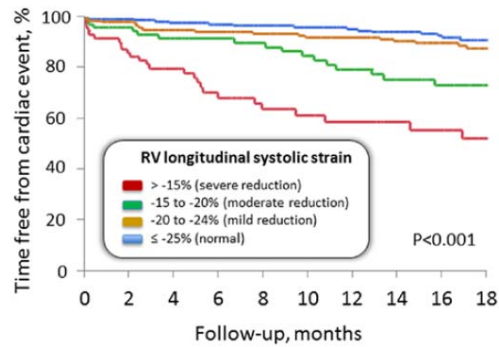
211 patients with acute PE who underwent echocardiography in intensive care unit.

Echocardiographic parameter	Unadjusted		Adjusted	
	OR	95% CI	OR	95% CI
RA systolic dimension (per 1-cm change)	1.50	1.05–2.20		
LV EDD (per 1-cm change)	0.41	0.22–0.77	0.44	0.23–0.84
LVEF (per 10% change)			0.64	0.43–0.98
RV/LV EDD ratio (per 0.1 change)	1.16	1.02–1.32		
Estimated RVSP (per 10 mm Hg change)	1.40	1.1–1.80	1.35	1.05–1.74
Maximum TR jet velocity (per 1 m/sec change)	1.46	1.08–1.99		
IVC collapsibility \geq 50% (presence)	0.25	0.1–0.67	0.20	0.07–0.58

Simple parameters (ratio of RV to LVEDD, RVSP, TAPSE, IVC collapsibility) were associated with mortality.

Prognosis

575 patients with PH or suspected PH who underwent strain imaging echocardiography.



RV free-wall strain is a powerful predictor of the clinical outcome of patients with known or suspected PH.

Fine NM, et al. Circ Cardiovasc Imaging. 2013 Sep;6(5):711-21.

Summary (3)

PE Echo Findings

- Increased RV size
- New/worsened TR
- RV Thrombus
- Regional wall motion: McConnell's sign
- Increased PAP
- RV dysfunction

Take Home Message

- Screening for the high risk population.
- Consideration for the pitfall for TR.
- Utility of several RV parameters.



Thank you for your attention!!

