MAYO CLINIC

Unforgettable Patients and Echoes
Echo Hawaii 2020

Abatross Wisdom

Jae K. Oh, MD

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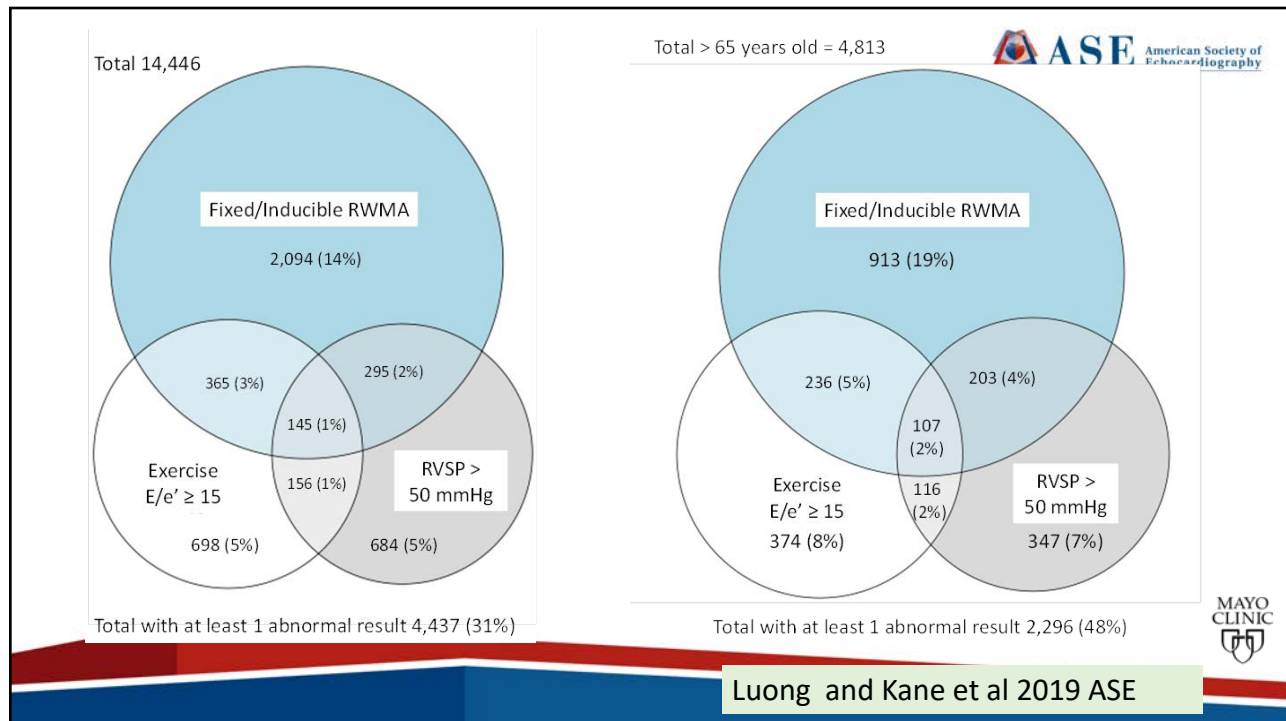
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ASE 2019 Presentation

Evaluated all patients who underwent symptom-limited treadmill exercise echo at Mayo Clinic Rochester between 2006 – 2017 Since 2006, all exercise stress echo exams have included screening diastolic parameters at rest and post-stress(14,446 patients)

- Mitral inflow E and A
- Septal e'
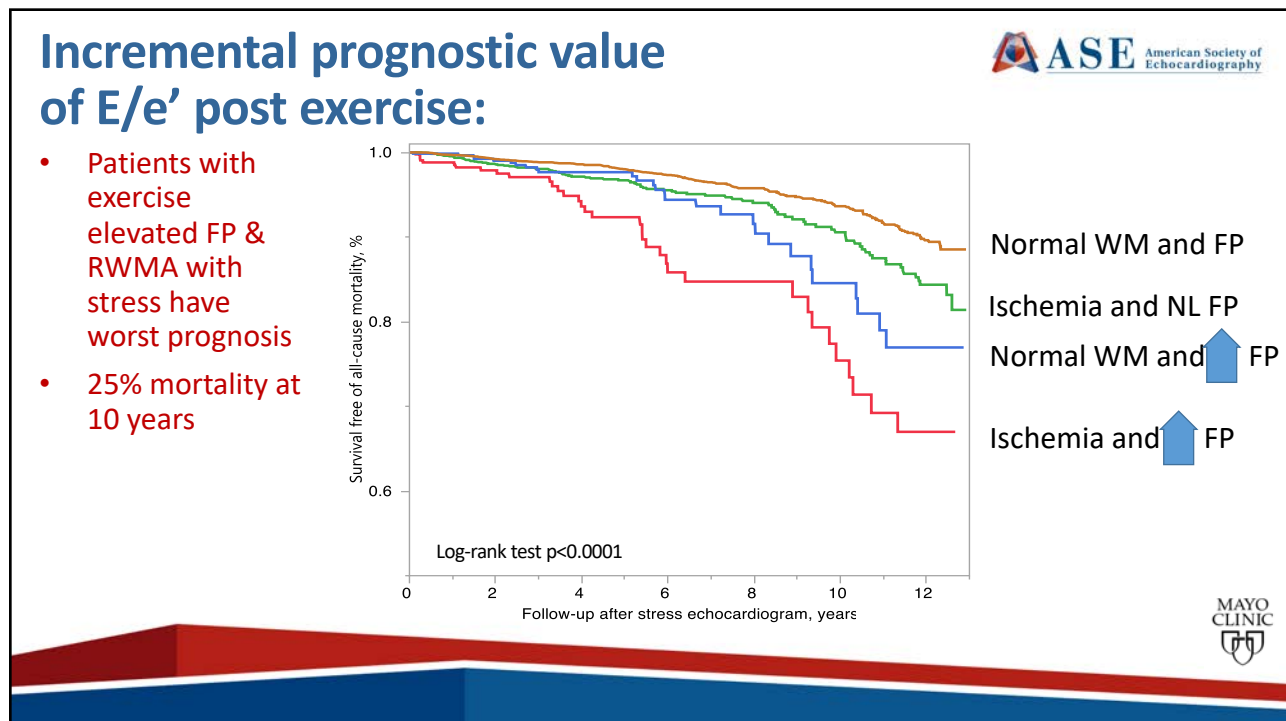- Peak tricuspid regurgitation velocity

Luong and Kane et al 2019 ASE

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Total 14,446

Fixed/Inducible RWMA
2,094 (14%)

365 (3%)   295 (2%)

145 (1%)

Exercise E/e' ≥ 15   156 (1%)   RVSP > 50 mmHg

698 (5%)   684 (5%)

Total with at least 1 abnormal result 4,437 (31%)

Total > 65 years old = 4,813

Fixed/Inducible RWMA
913 (19%)

236 (5%)   203 (4%)

107 (2%)

Exercise E/e' ≥ 15   116 (2%)   RVSP > 50 mmHg
374 (8%)   347 (7%)

Total with at least 1 abnormal result 2,296 (48%)

Luong and Kane et al 2019 ASE

3

Incremental prognostic value of E/e' post exercise:

- Patients with exercise elevated FP & RWMA with stress have worst prognosis
- 25% mortality at 10 years

Normal WM and FP

Ischemia and NL FP

Normal WM and ↑ FP

Ischemia and ↑ FP

Log-rank test p<0.0001

Survival free of all-cause mortality, %

Follow-up after stress echocardiogram, years

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Unforgettable Patient

Since I saw the next patient less than a month ago!

ASE American Society of Echocardiography

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54 year old woman with MVR and TVR

- History of rheumatic fever
- Mitral valve replacement with a bioprosthesis (16 yo in1982)
- Re-do MVR with a mechanical prosthesis (28 yo in 1994)
- Severe right heart failure with severe TR in 2004 (38 yo)
- Tricuspid valve replacement with a mechanical prosthesis(2004)
- Preop-evaluation before an orthopedic surgery (Jan. 2020)
- Exertional fatigue and dyspnea.
  - JVP is mildly elevated
  - Grade 3/6 diastolic rumble

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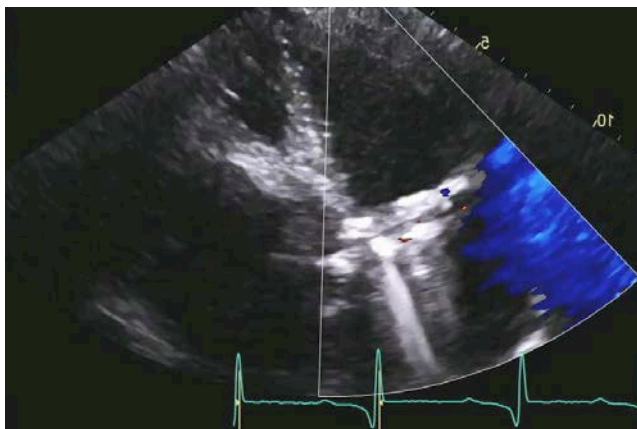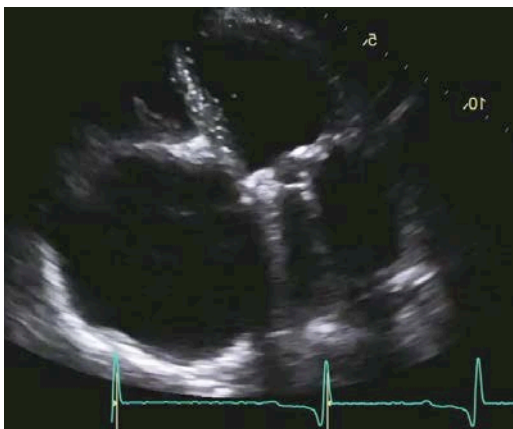
54 year old woman with MVR and TVR

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54 year old woman with MVR and TVR

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54 year old woman with MVR and TVR

Tricuspid Valve

Mitral Valve
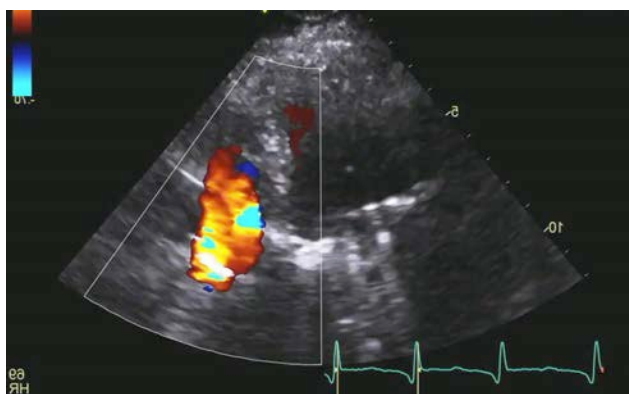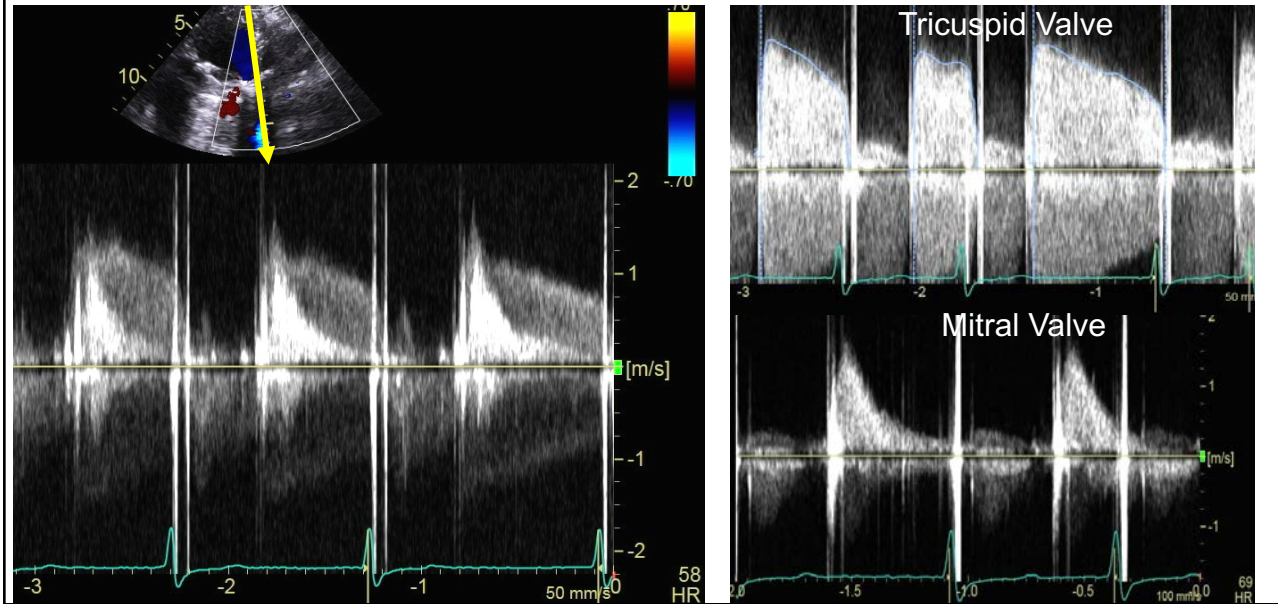
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54 year old woman with MVR and TVR
What is your next step?

TV PHT 350 ms
Mean Gr   7 mmHg
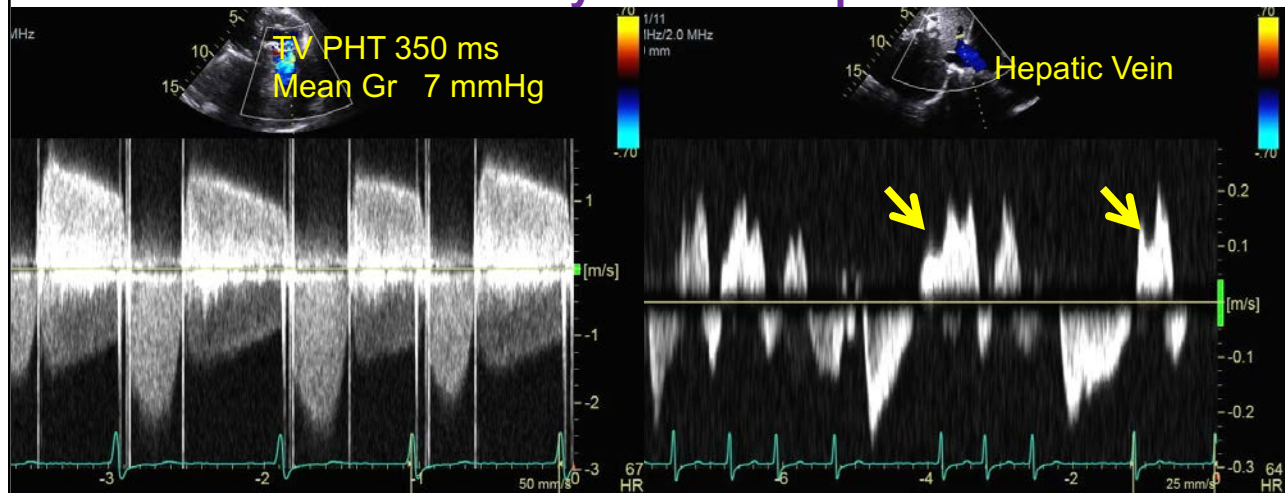
Hepatic Vein

1= TEE 2= Fluoroscopy 3=Cardiac Cath 4= TVR ± MVR

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Fluoroscopic Examination

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Hepatic Vein Doppler Tracings

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Severe TR

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Severe TR :Simultaneous RV and RA Pressures
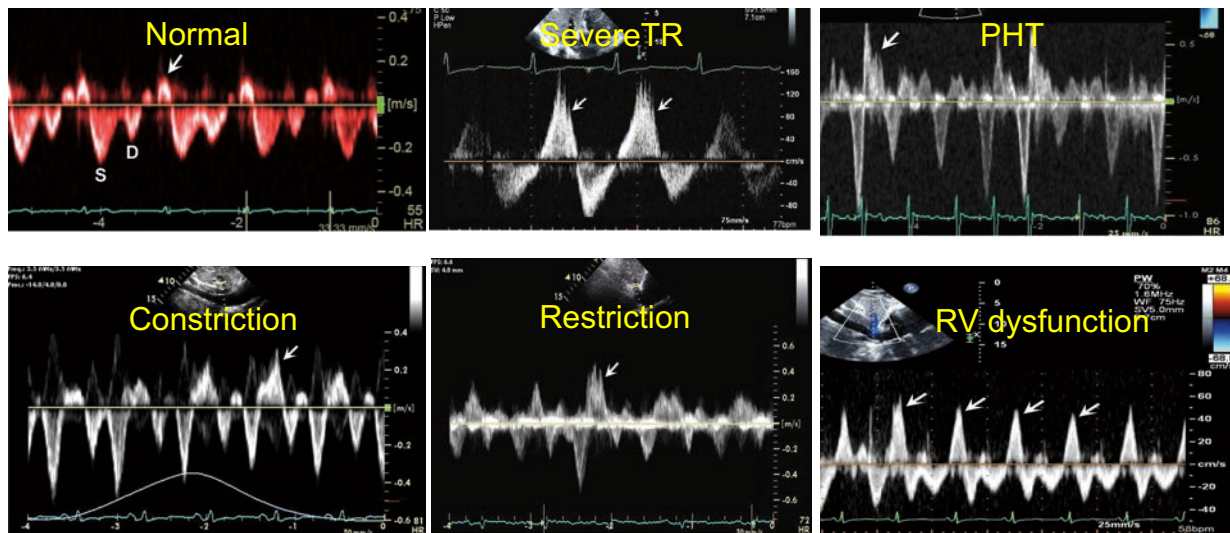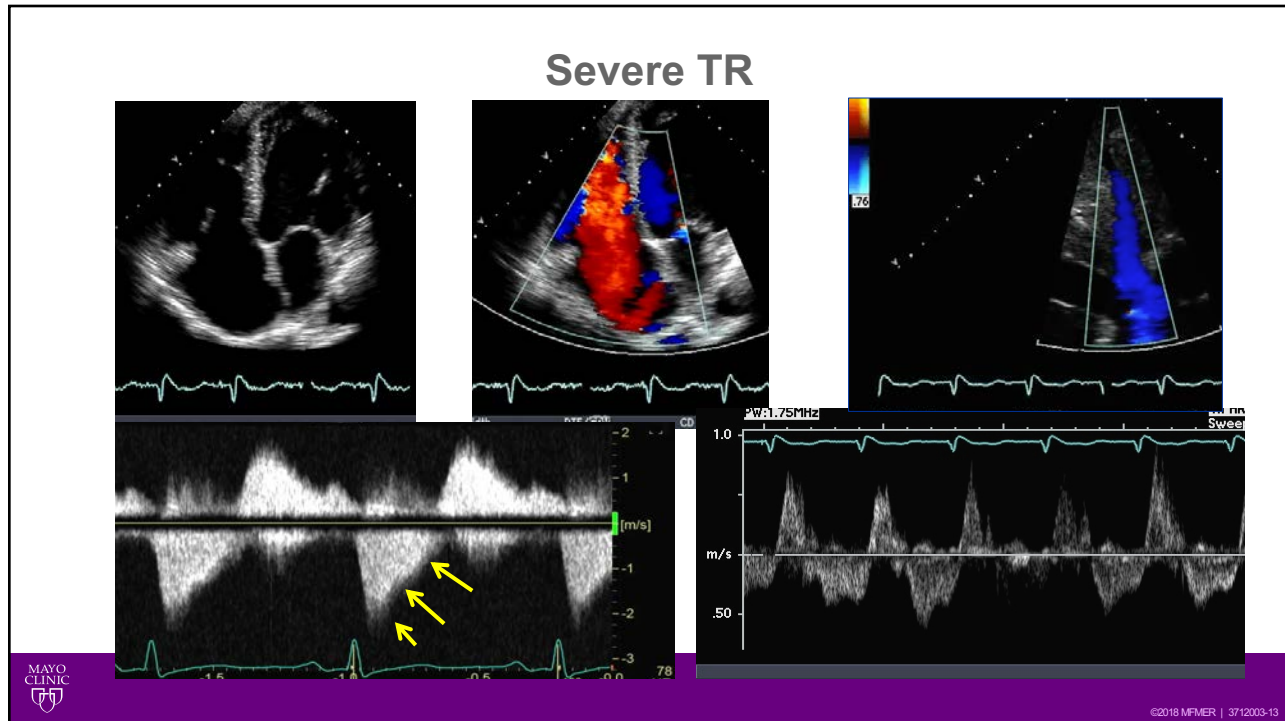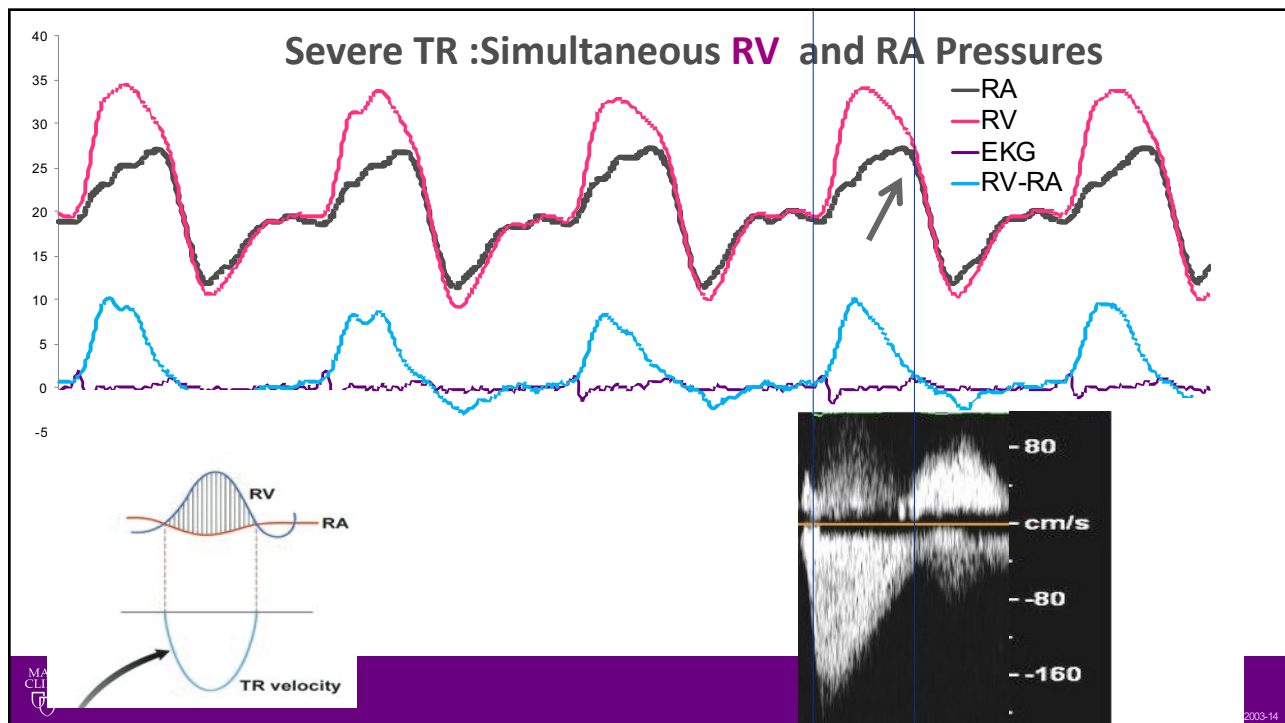
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What does this CW Doppler show?
70 year old with TIPS procedure
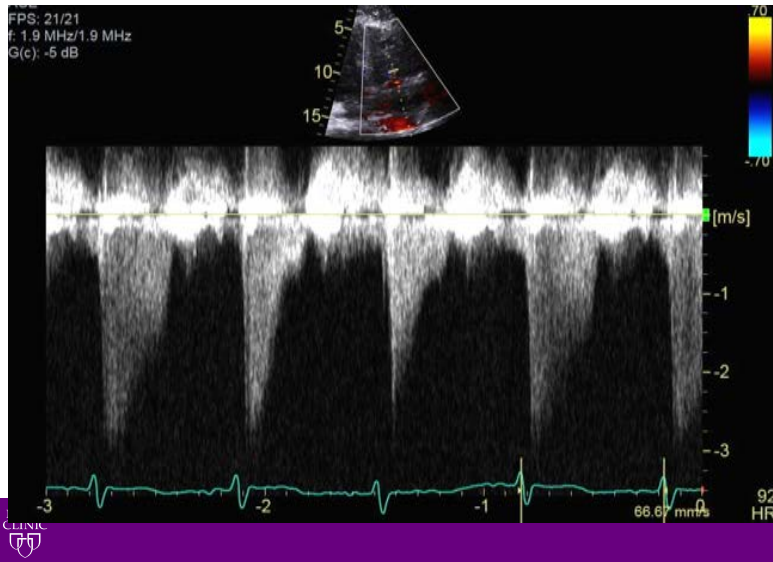
1. Tricuspid Regurgitation
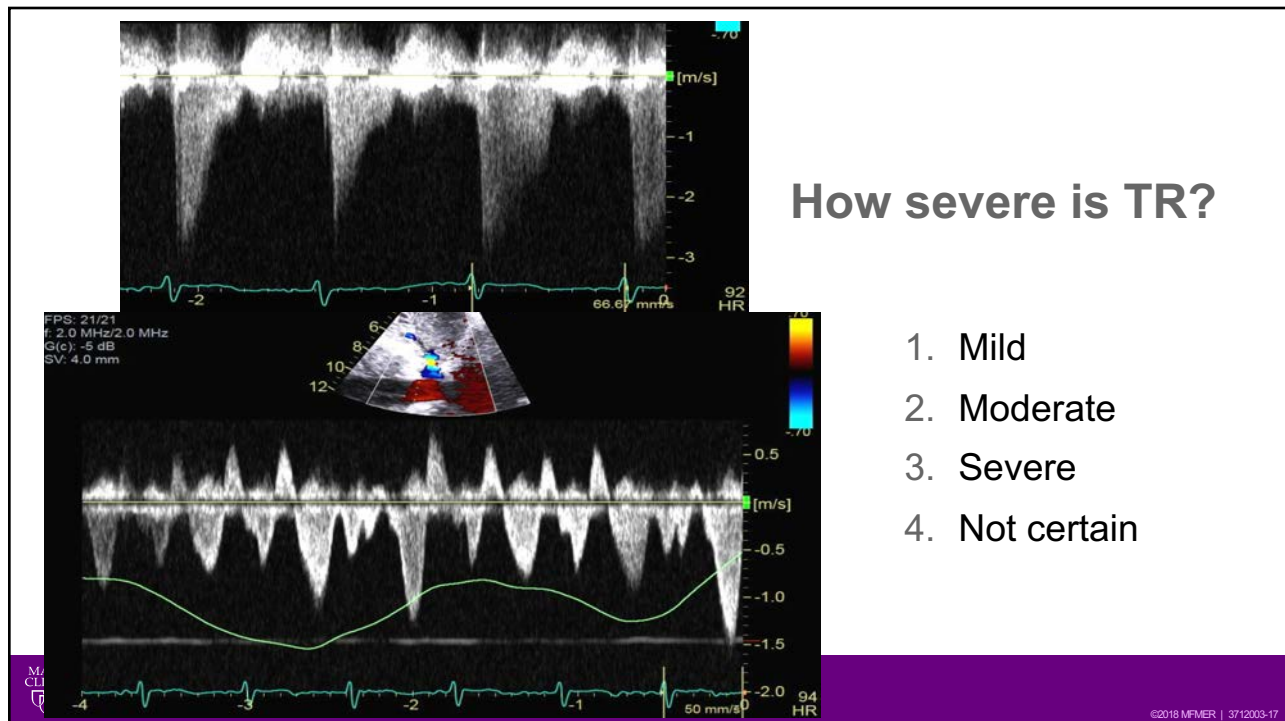2. Subaortic Stenosis
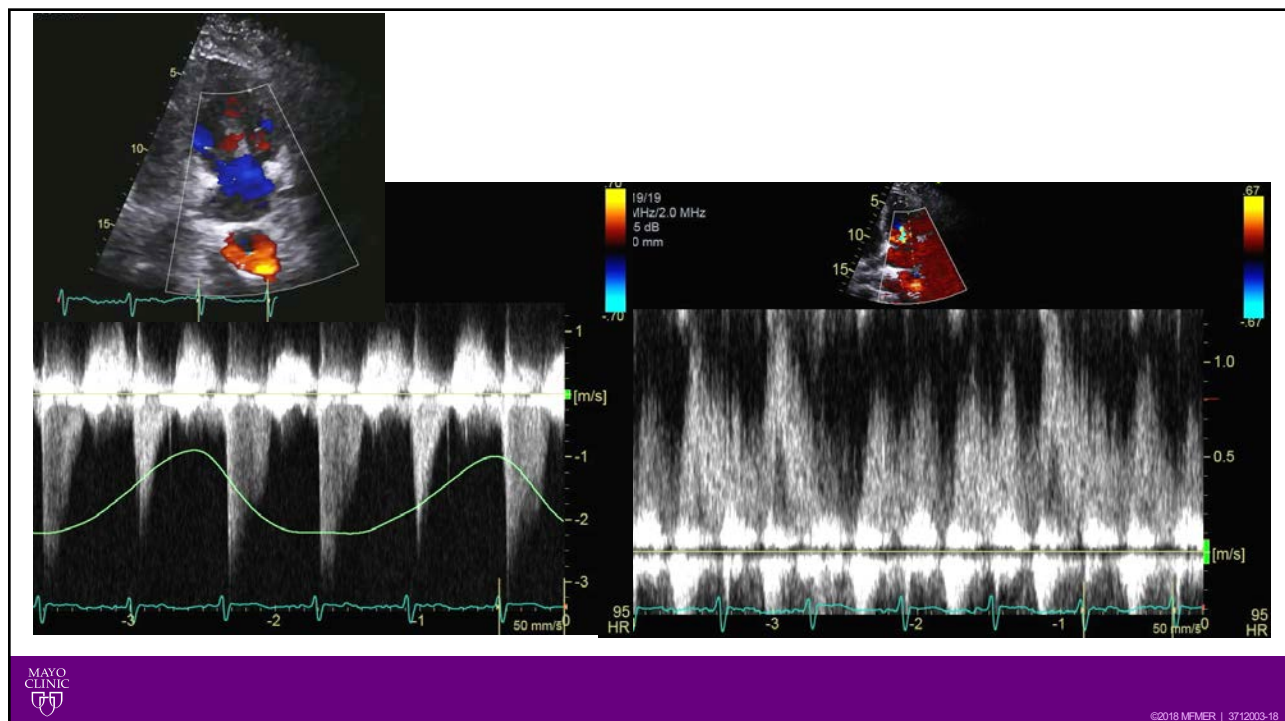3. Mitral Regurgitation
4. LVOT Obstruction

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How severe is TR?
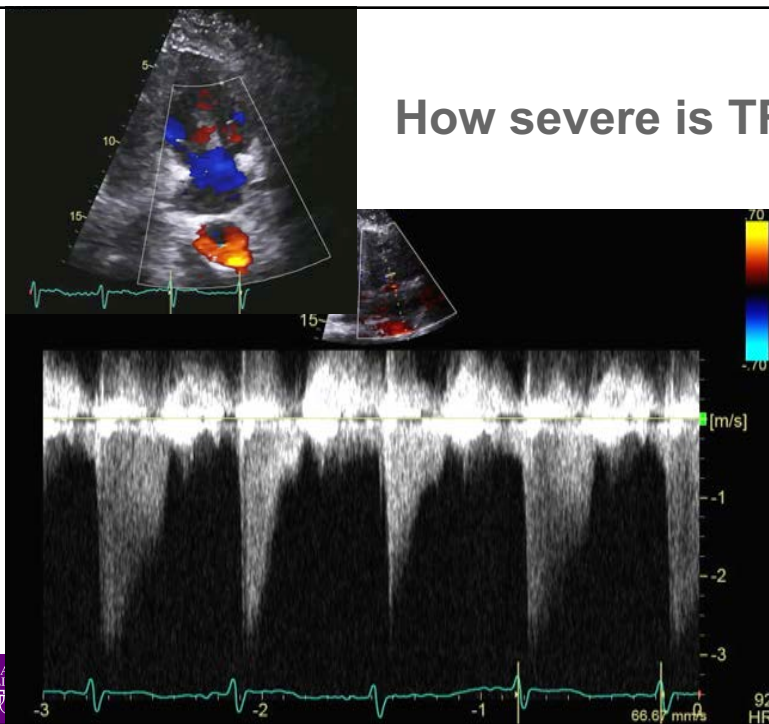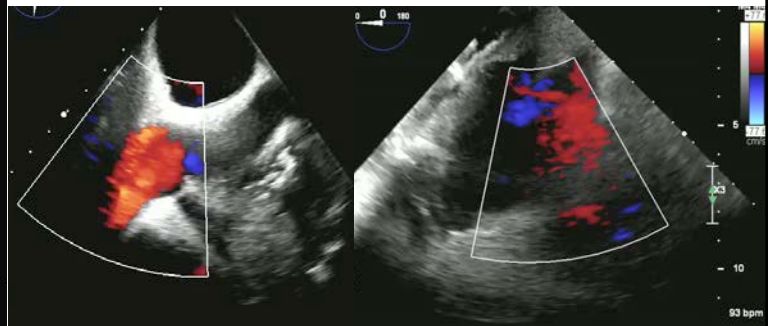

1. Mild
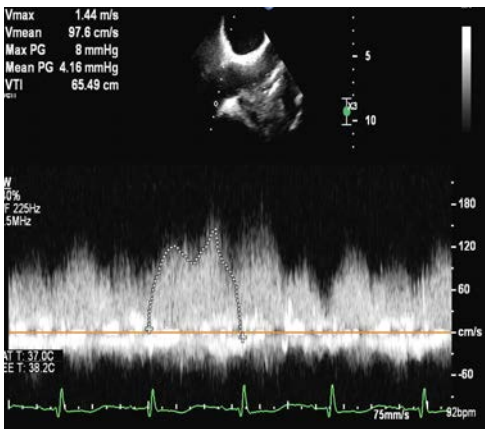2. Moderate
3. Severe
4. Not certain

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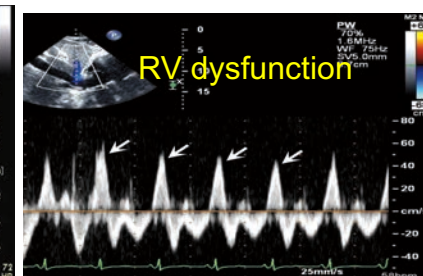**How severe is TR?**

1. Mild
2. Moderate
3. Severe
4. Not certain

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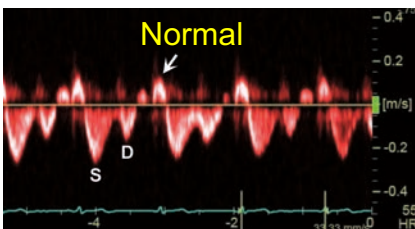
Increased flow from IVC and mild TR

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Hepatic Vein Doppler Tracings
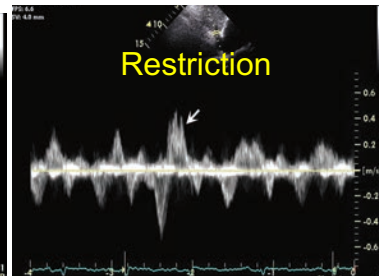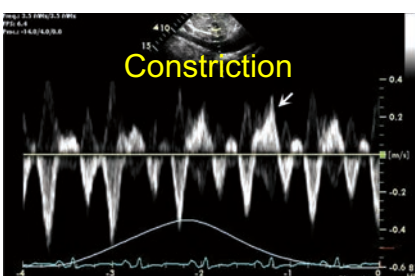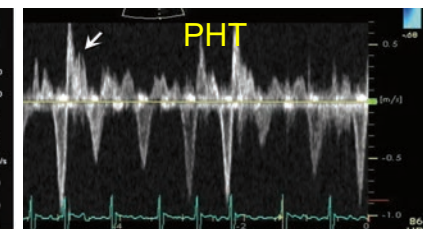
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71 year old male with exertional dyspnea
Resting Echo Data

E=50 cm/s, E/A = 0.6

TR = 2.2 m/s

E' = 5 cm/s E/e' = 10
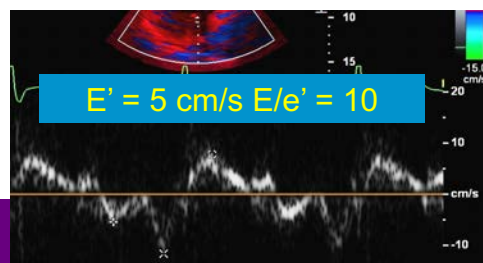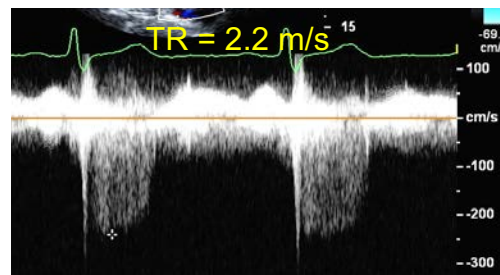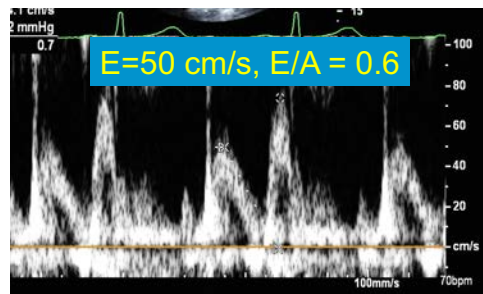
1. Exercise cath
2. Exercise echo
3. LA strain
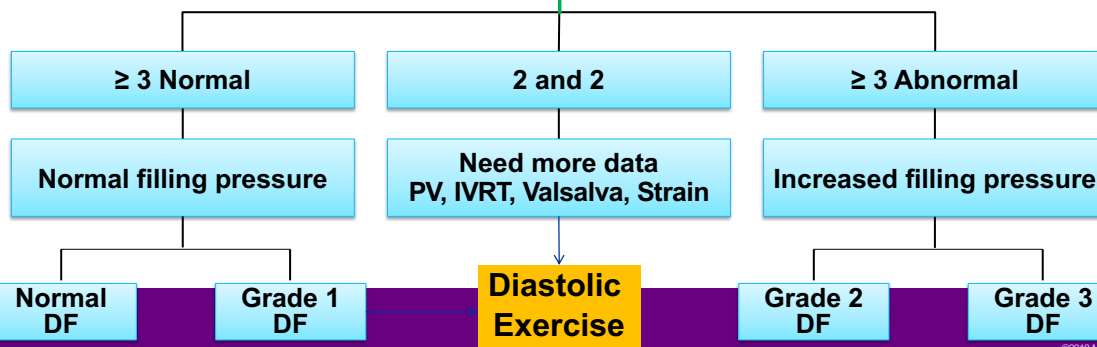4. Non cardiac dyspnea

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Revised Algorithm for Diastolic Function Assessment

JACC Imaging Jan 2020

In Most Patients

1 – Septal e' velocity ≥7 cm/s
2 – E/e′ ≤ 15 (Med)
3 – TR velocity ≤2.8 m/s
4 – LA volume index ≤34 mL/m^2

LA strain < 25%

≥ 3 Normal	2 and 2	≥ 3 Abnormal
Normal filling pressure	Need more data PV, IVRT, Valsalva, Strain	Increased filling pressure

Normal DF	Grade 1 DF	Diastolic Exercise	Grade 2 DF	Grade 3 DF

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Left Atrial Strain in 71 year old male with grade 1 DDF
LA systolic strain 32%
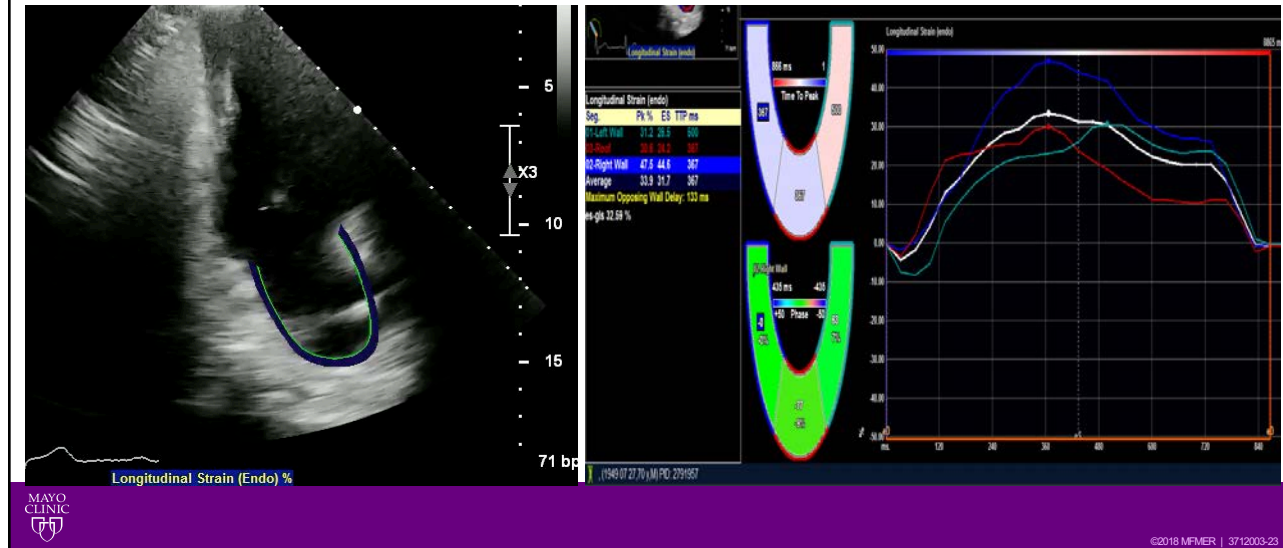
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LA strain for detecting elevated LV Filling Pressure
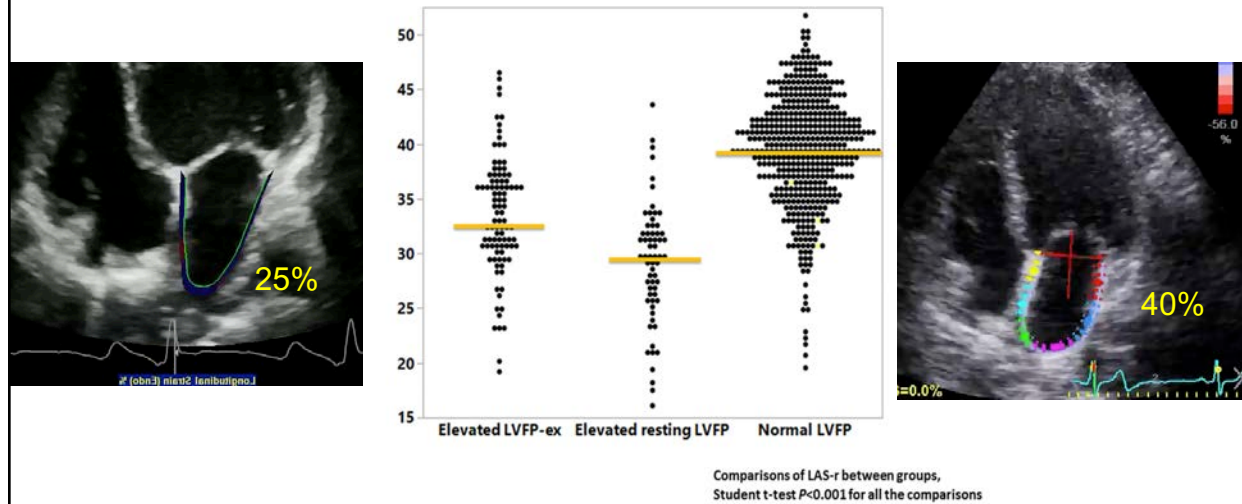563 consecutive patients with exercise echo
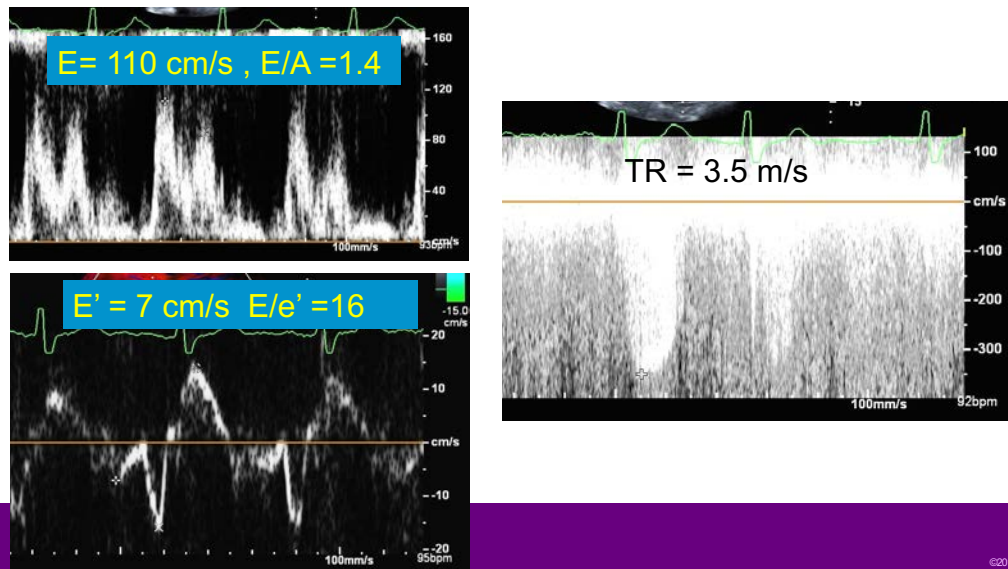
25%

40%

Comparisons of LAS-r between groups,
Student t-test P<0.001 for all the comparisons

Z. Ye et al (Submitted)

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71 year old male with exertional dyspnea
Exercise diastolic function

E= 110 cm/s , E/A =1.4

E' = 7 cm/s E/e' =16

TR = 3.5 m/s

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Hemodynamic Study for HF*p*EF

PCWP=LVEDP=12 mmHg

40 Watts Exercise
PCWP & LVEDP>40 mmHg

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Slide 27

Echocardiographic Hemodynamic Indices During Exercise

Submaximal (20W)

Peak

A — E/e' medial — 0, 10, 20, 30, 40, 50 — NCD, HFpEF

B — E/e' medial — 0, 10, 20, 30, 40, 50 — NCD, HFpEF

Obokata M et al: Circ 135:825-838, 2017

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Slide 28
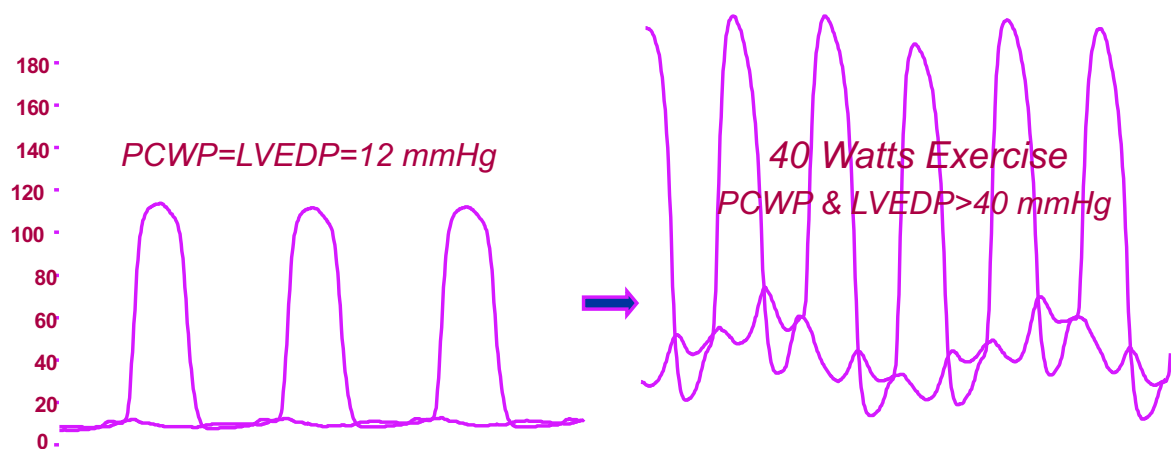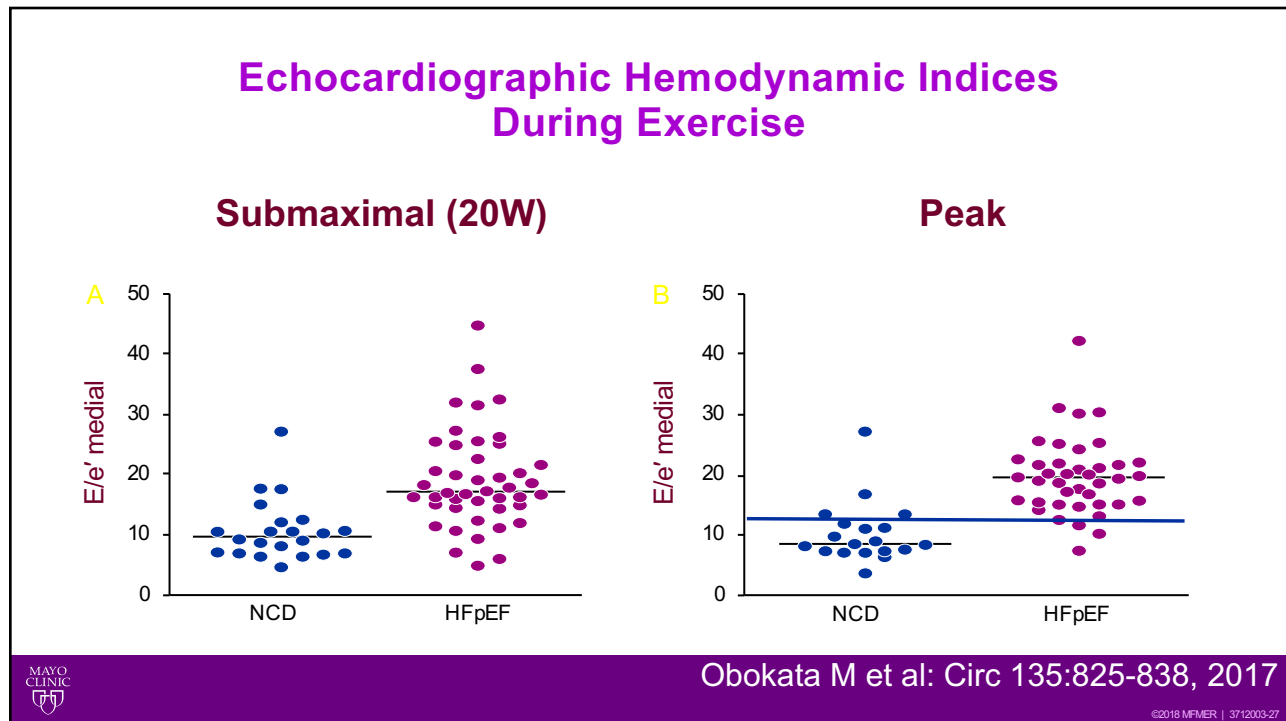
Conclusions

Elevated exercise LV filling pressure occurs in 10% of patients referred for exercise stress echo

- Higher prevalence in elderly patients

Exercise E/e' ≥ 15 is an independent predictor of mortality above and beyond ischemia, age, and exercise associated pulmonary hypertension

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