Assessment of Diastolic LV Function New ASE Guidelines 2016

Harald Becher, MD, PhD

2016 New Guidelines

Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging

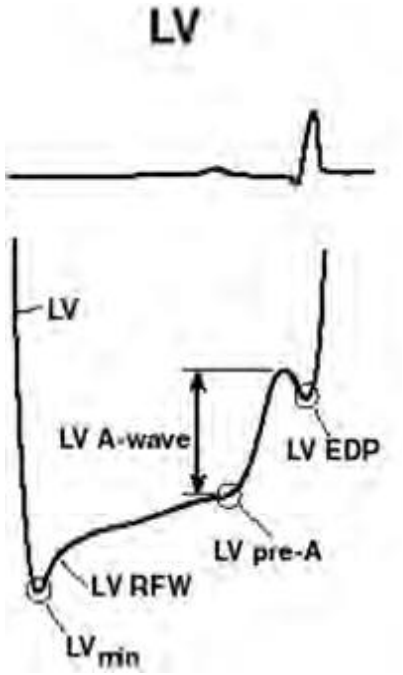
Nagueh SF, Smiseth OA, Appleton CP, Byrd BF 3rd, Dokainish H, Edvardsen T, Flachskampf FA, Gillebert TC, Klein AL, Lancellotti P, Marino P, Oh JK, Popescu BA, Waggoner AD.
J Am Soc Echocardiogr. 2016 Apr;29(4):277-314

Diastolic Function – who cares?

- Patients with dyspnea or history of heart failure but normal systolic function
- Patient with known heart disease and dyspnea
- High left atrial pressure related to dyspnea

LV Filling pressures translate into LA and lung vessels

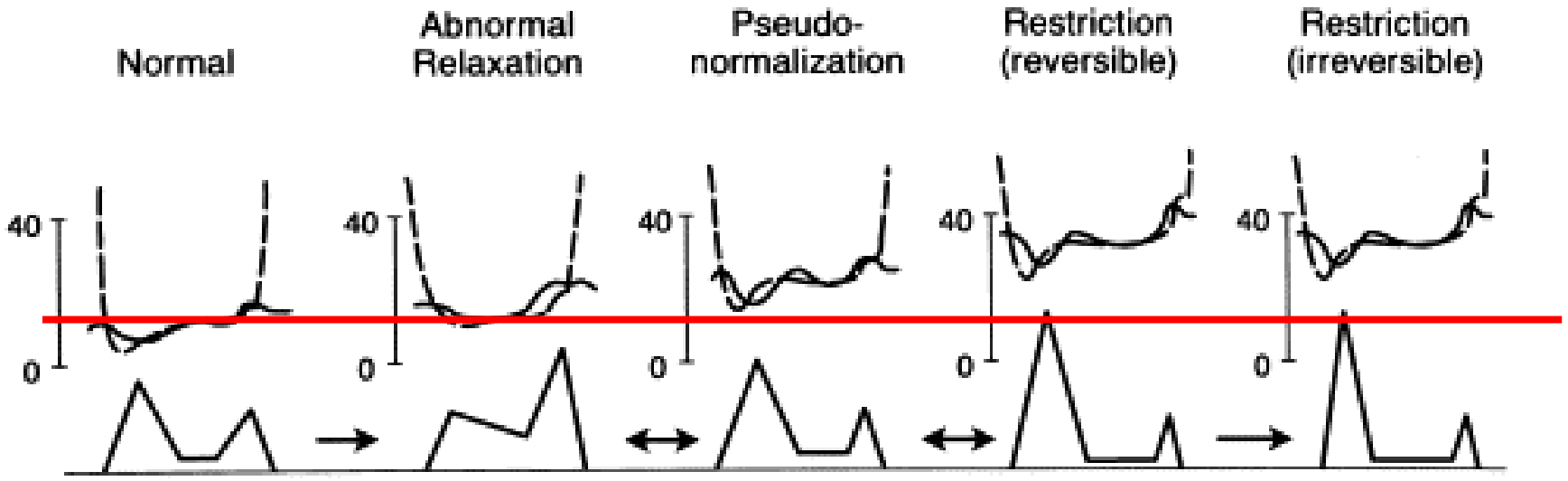
Early diastole – Mean PCWP



Late diastole – LVEDP

Diast.Dysfunction grade = filling pressure (LAP or PCWP)=VmaxTR
Because better correlation for pulmonary pressures

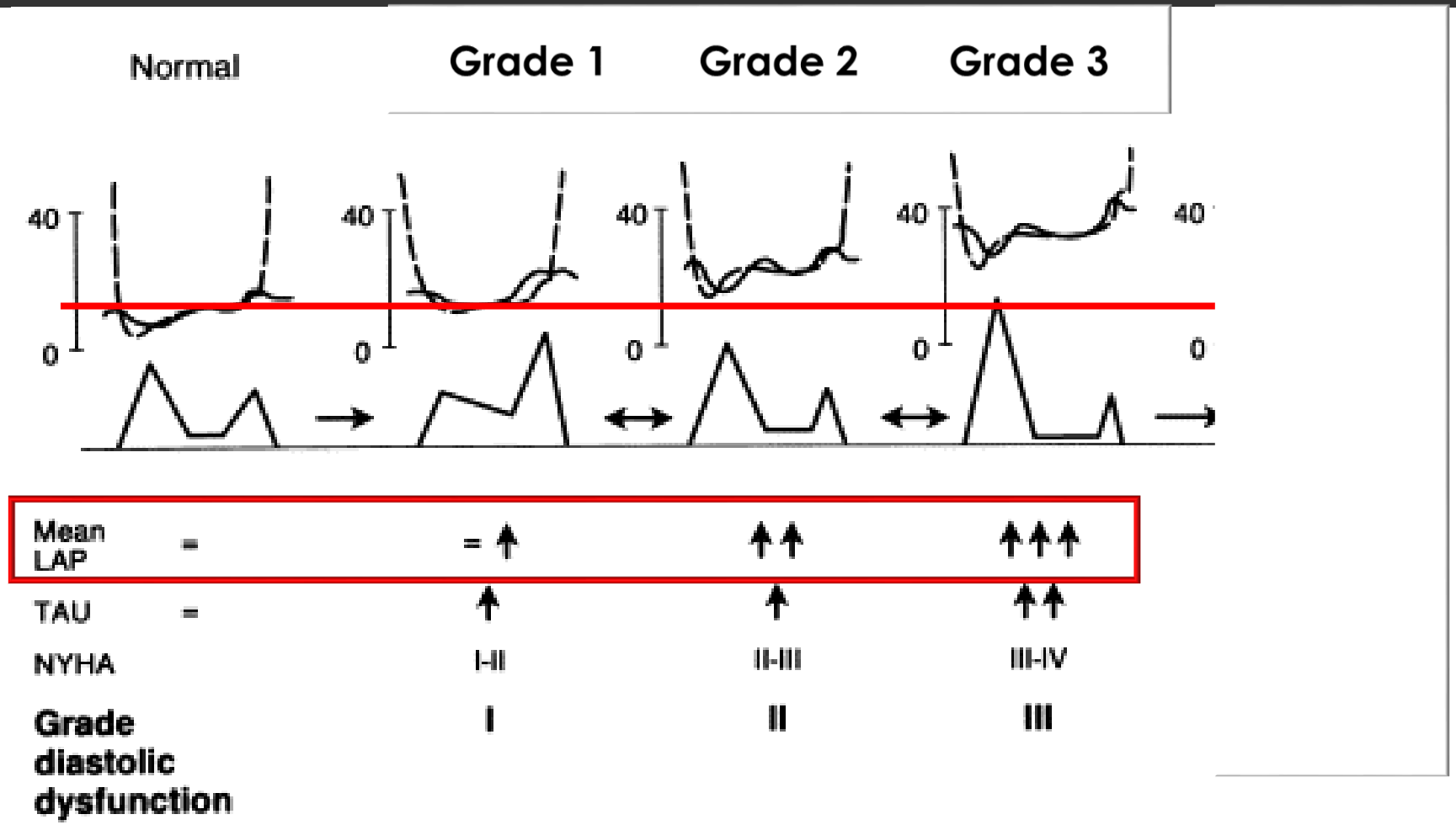
Diastolic dysfunction – old grading



Mean LAP	=	= ↑	↑↑	↑↑↑	↑↑↑
TAU	=	↑	↑	↑↑	↑↑
NYHA		I-II	II-III	III-IV	IV
Grade diastolic dysfunction		**I**	**II**	**III**	**IV**

2016 ASE Recommendations Diastolic Function

Diastolic dysfunction – new grading



2016 ASE Recommendations Diastolic Function

Table 4 LV relaxation, filling pressures and 2D and Doppler findings according to LV diastolic function

	Normal	Grade I	Grade II	Grade III
LV relaxation	Normal	Impaired	Impaired	Impaired
LAP	Normal	Low or normal	Elevated	Elevated
Mitral E/A ratio	≥0.8	≤0.8	>0.8 to <2	>2
Average E/e′ ratio	<10	<10	10–14	>14
Peak TR velocity (m/sec)	<2.8	<2.8	>2.8	>2.8
LA volume index	Normal	Normal or increased	Increased	Increased

- Conclusions on LV diastolic function should be included routinely in reports when feasible, particularly in patients referred with symptoms of dyspnea or diagnosis of heart failure.
- The report should comment on LV filling pressures and the grade of LV diastolic dysfunction.
- If available, comparison with previous studies is encouraged to detect and comment on changes in diastolic function grade over time.

2016 Guidelines

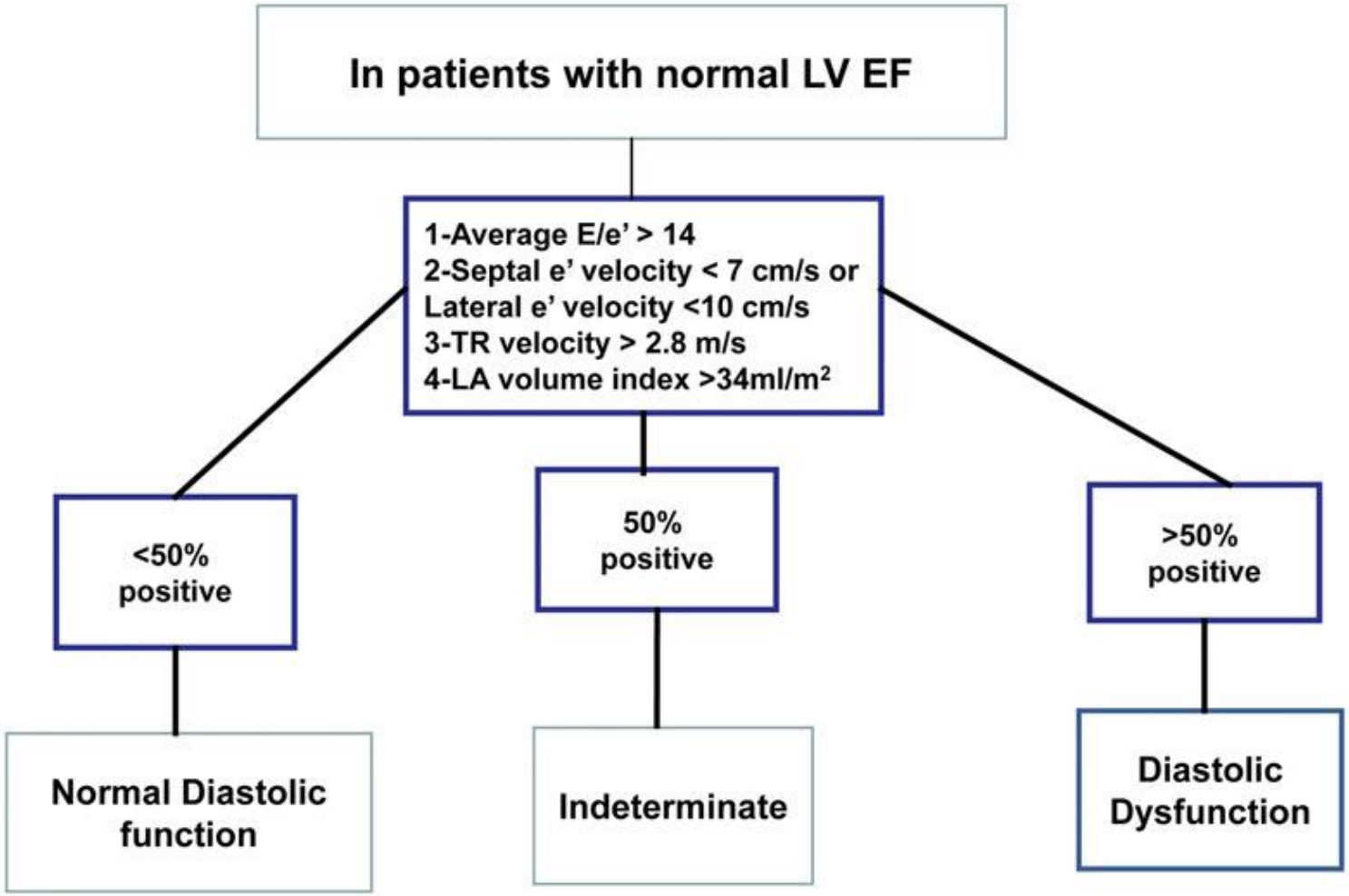
- Do not rely on only one measurement
- Consistency between at least 2 measurements for assessing Diastolic Function
- Algorithm for both screening and classification of diastolic dysfunction.
- CW Doppler of Tricuspid Regurgitation for assessment of LVEDP

Key parameters

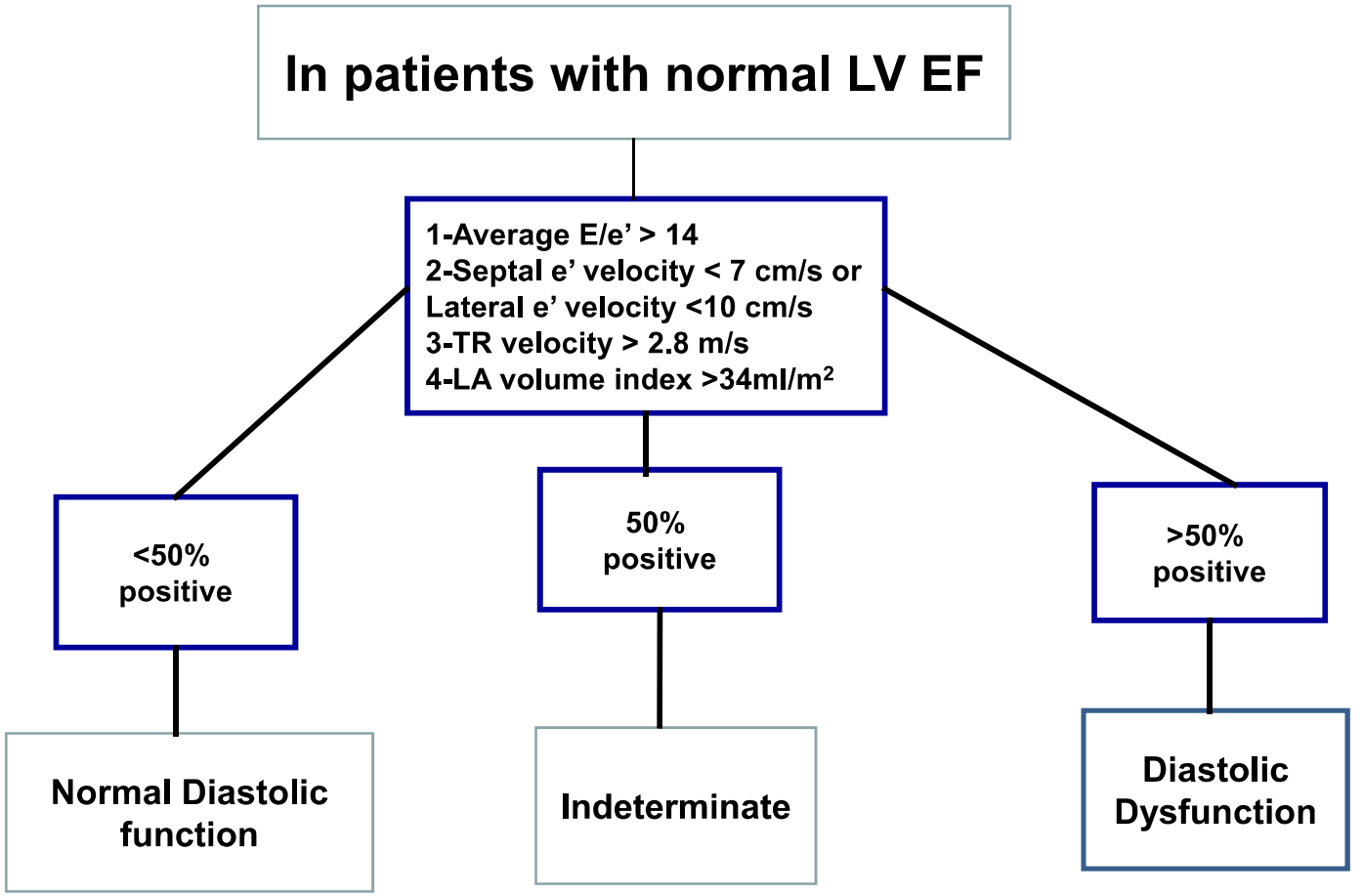
- Mitral inflow – PW Doppler
- Mitral ring tissue Doppler
- LA volume index
- Tricuspid regurgitation

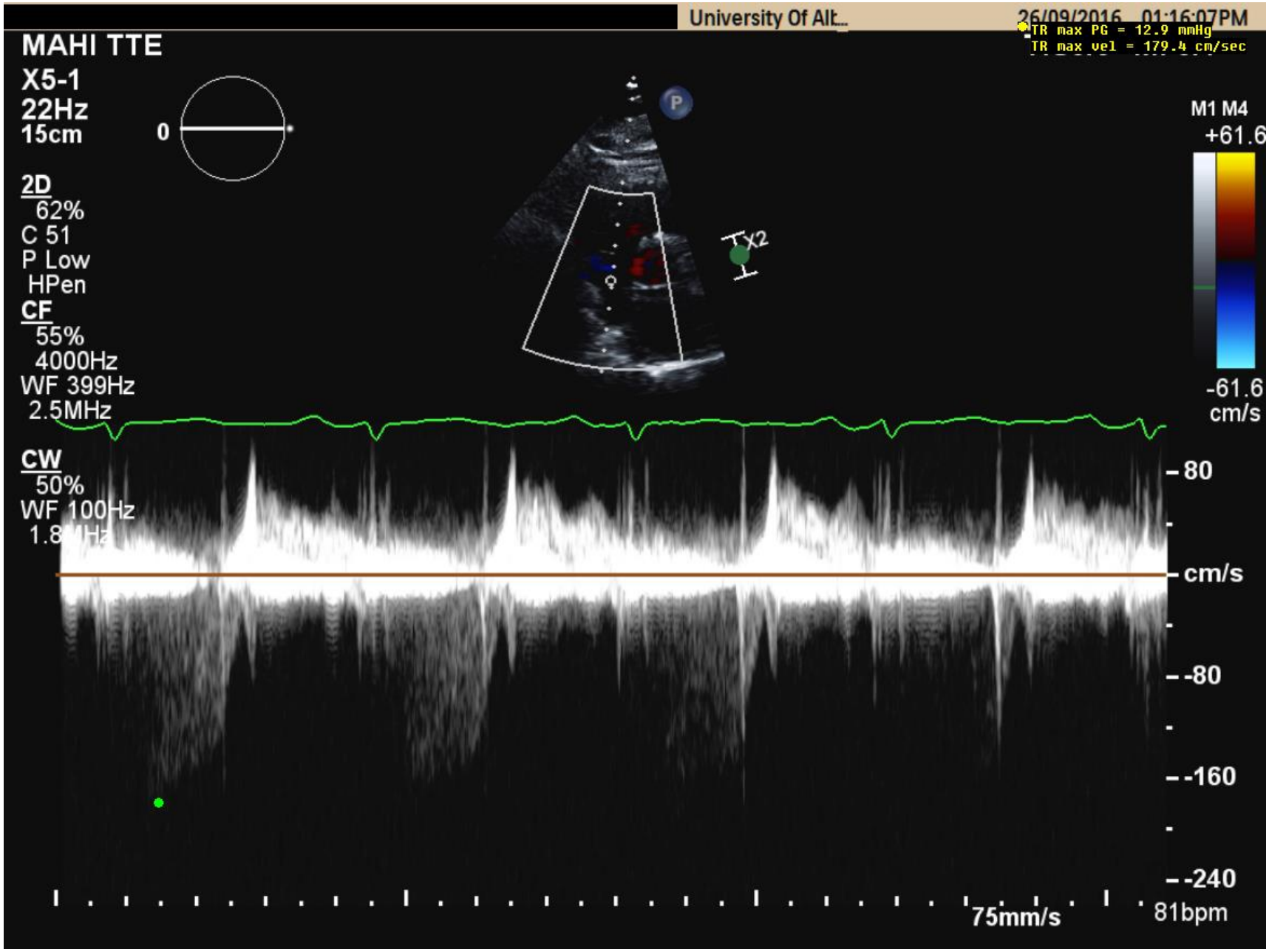
First Questions when assessing diastolic function

- Is LV ejection fraction abnormal?
- Does the patients have known myocardial disease with normal EF?
  - CAD, regional wall motion abnormalities
  - LVH
  - Abnormal GLS



2016 ASE Recommendations Diastolic Function


In patients with normal LV EF
1-Average E/e' > 14
2-Septal e' velocity < 7 cm/s or
Lateral e' velocity <10 cm/s
3-TR velocity > 2.8 m/s
4-LA volume index >34ml/m2
<50% positive
50% positive
>50% positive
Normal Diastolic function
Indeterminate
Diastolic Dysfunction
=myocardial disease
LA size,
GLS
S'
Continue like in Pts with reduced EF


University Of Alt...
26/09/2016 01:16:07PM
TR max PG = 12.9 mmHg
TR max vel = 179.4 cm/sec
MAHI TTE
X5-1
22Hz
15cm
0
2D
62%
C 51
P Low
HPen
CF
55%
4000Hz
WF 399Hz
2.5MHz
CW
50%
WF 100Hz
M1 M4
+61.6
-61.6
cm/s
80
cm/s
-80
-160
-240
75mm/s
81bpm

Diastolic Function in patients with reduced EF

- The main reason to assess diastolic function in patients with reduced EF is to estimate LV filling pressure or left atrial pressure

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- The main reason to assess diastolic function in patients with reduced EF is to estimate LV filling pressure or left atrial pressure
- Assessment of mitral inflow + three other key parameters (not necessary in all patients)

Assessing Diastolic LV Function in Patients with reduced EF: **Mitral Inflow first!**

- **E/A ≤ 0.8 and E ≤ 50 cm/s**
- **E/A > 2**
- Every other E/A and E> 50 cm/s

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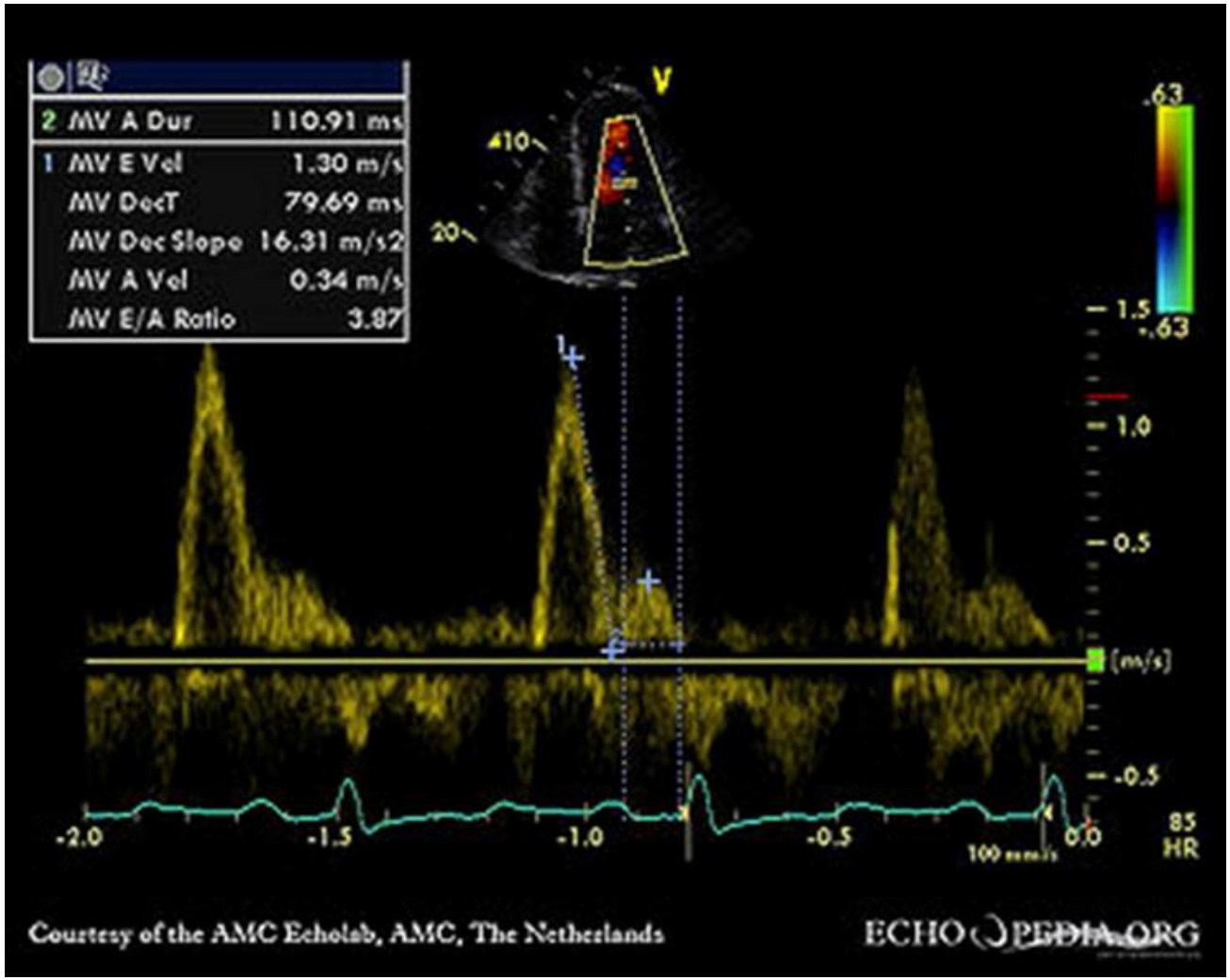

If E/A > 2 no further measurements needed
In particular no deceleration time

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  Normal LAP, Grade 1 Diast.Dysfunction

- **E/A > 2**

- Every other E/A and E> 50 cm/s

Assessing Diastolic LV Function in Patients with reduced EF: **Mitral Inflow first!**

- **E/A ≤ 0.8 and E ≤ 50 cm/s**

  Normal LAP, Grade 1 Diast.Dysfunction

- **E/A > 2**

  High LAP, Grade 3 Diast.Dysfunction

- Every other E/A and E> 50 cm/s

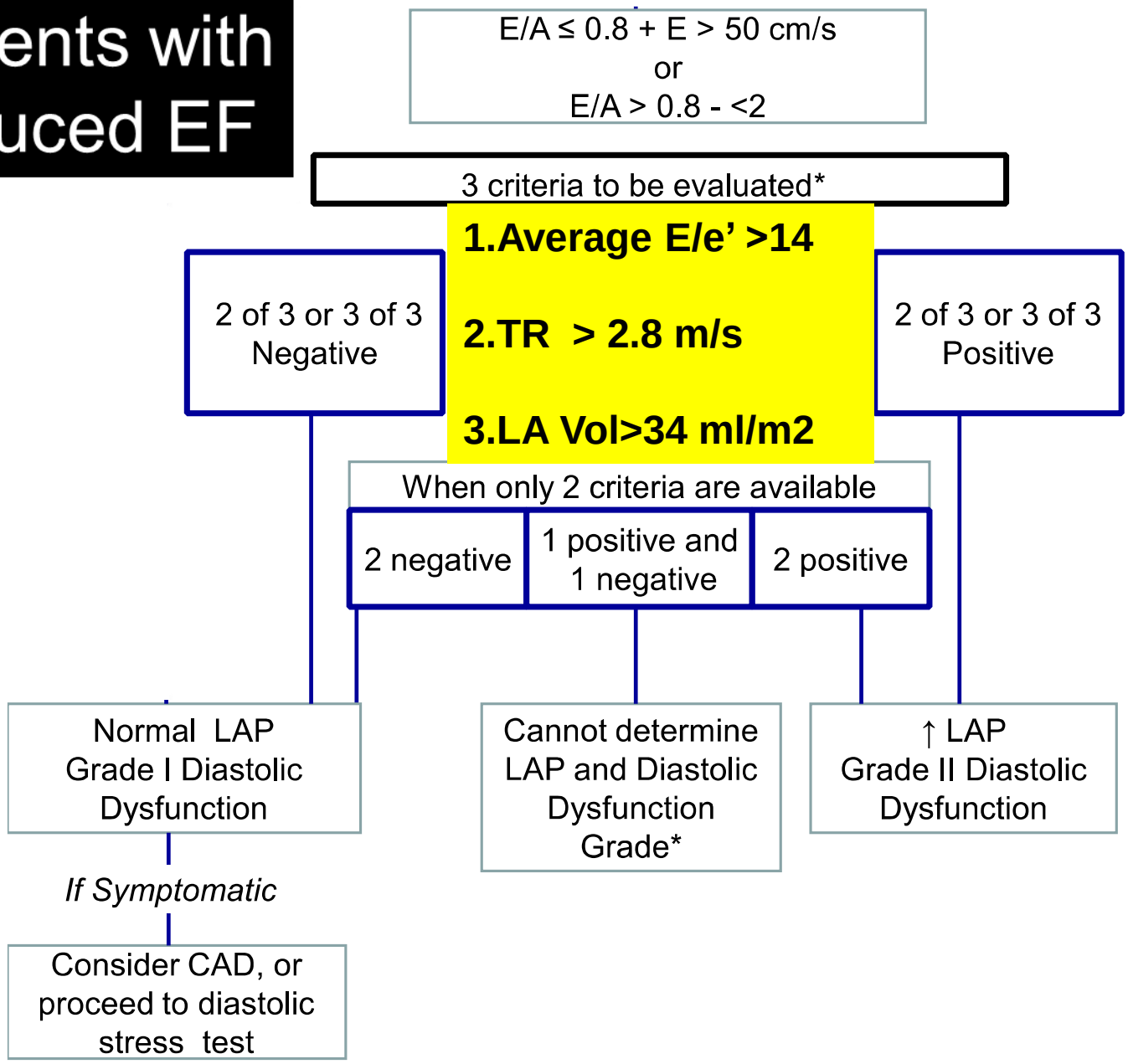
Patients with reduced EF

E/A ≤ 0.8 + E > 50 cm/s
or
E/A > 0.8 - <2

3 criteria to be evaluated*

1-Average E/e' > 14
2-TR velocity > 2.8 m/s
3-LA Vol. index>34ml/m^2

Patients with reduced EF

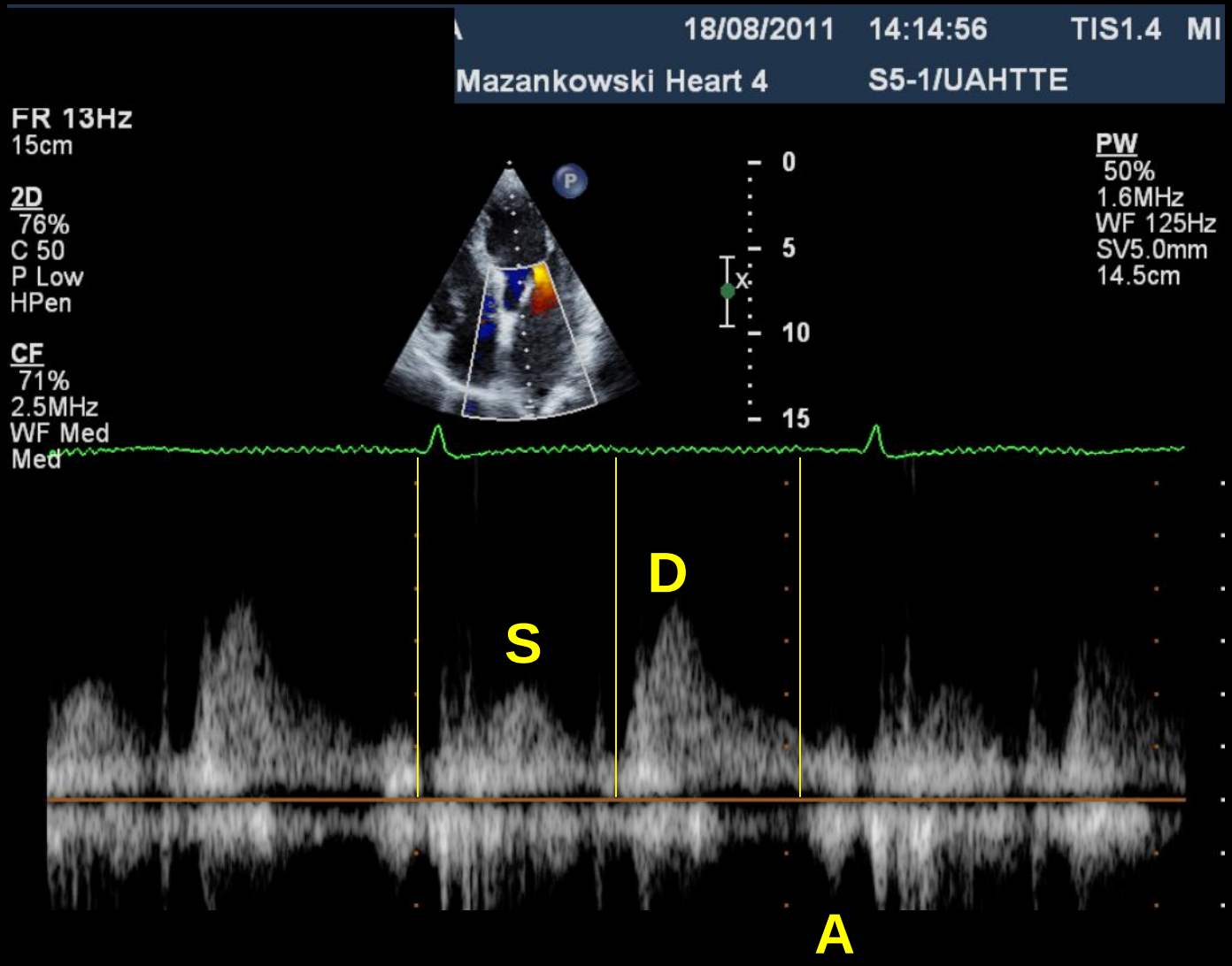


LA index: > 34 cm3/m2	E/e’ (average): >14
	TR max.velocity: >2.8 cm/s

LA index: >34 cm3/m2 31 cm3/m2	E/e’ (average): >14 7
	TR max.velocity: >2.8 cm/s 2.6 cm/s

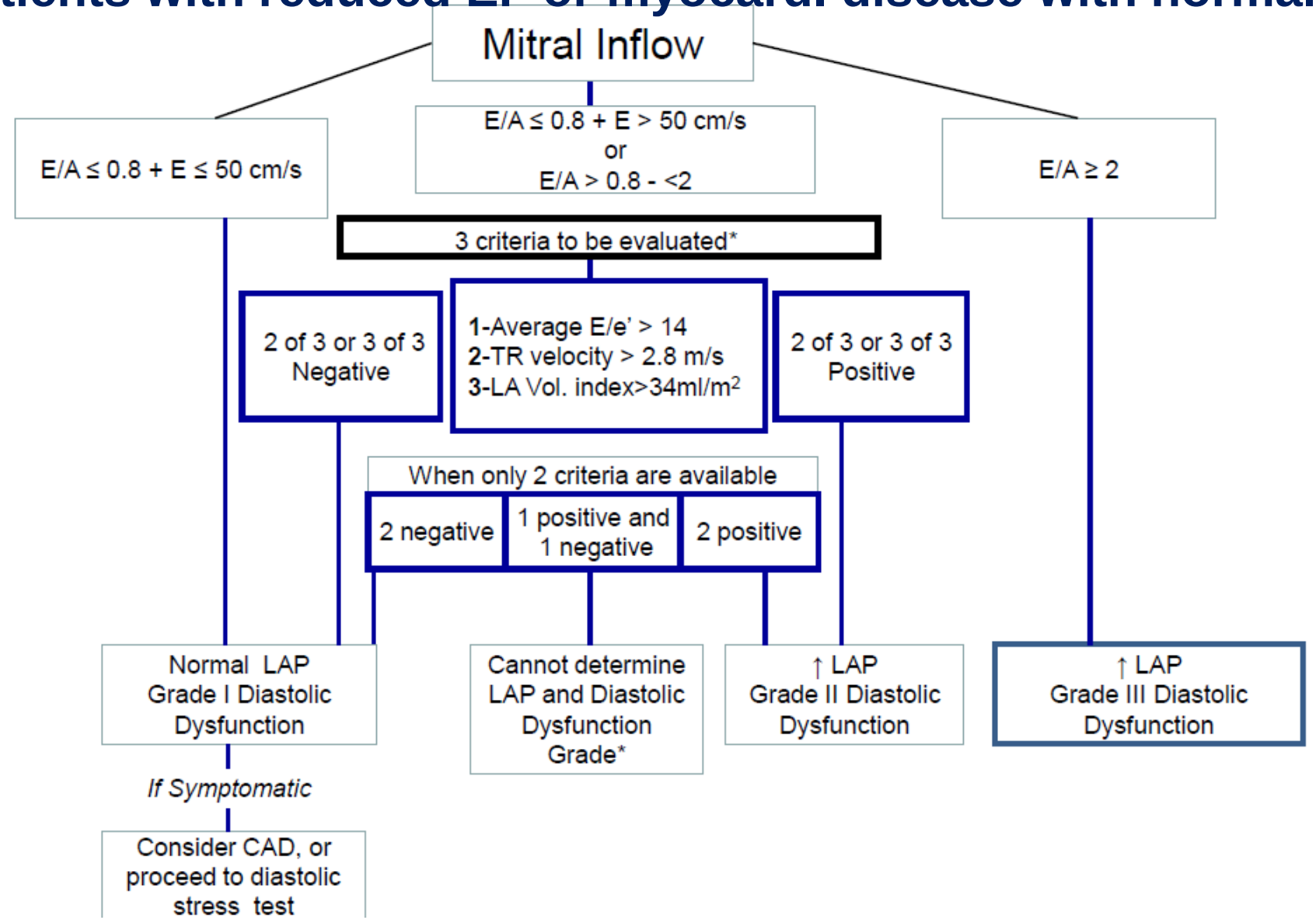
LA index: >34 cm3/m2 31 cm3/m2	**E/e'** (average): >14 7
	TR max.velocity: >2.8 cm/s No CW Signal

PW Doppler -RUPV



LA index: >34 cm3/m2 31 cm3/m2	**E/e'** (average): >14 7
Pulmonary Vein S/D ratio < 1	**TR max.velocity**: >2.8 cm/s No CW Signal

Patients with reduced EF or myocard. disease with normal EF



When you cannot use the flowcharts

- Atrial fibrillation – use different rules
- More than moderate mitral regurgitation
- Severe mitral ring calcification
- Mitral valve repair or prosthesis
- LBBB, paced ventricular rhythm
- LV assist devices

Change in Reporting Diastolic Function

- Normal diastolic function and filling pressure
- Grade 1 (impaired relaxation with low to normal filling pressure)
- Grade 2 (moderate increase in filling pressure)
- Grade 3 (marked elevation in filling pressure)

2016 ASE Recommendations for Assessment of Diastolic Function

- Simplified screening in patients with normal EF or unknown heart disease – *do not use E/A!*
- In patients with reduced EF assessing mitral inflow is the first step followed by using 3 key parameters

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  4 key parameters

- In patients with reduced EF assessing mitral inflow is the first step followed by using 3 key parameters **4 key parameters**

Warning

- The guidelines are not necessarily applicable in children or in the perioperative setting

Table 6 Assessment of LV filling pressures in special populations

Disease	Echocardiographic measurements and cutoff values
AF[43,94-99]	Peak acceleration rate of mitral E velocity (≥1,900 cm/sec^2) IVRT (≤65 msec) DT of pulmonary venous diastolic velocity (≤220 msec) E/Vp ratio (≥1.4) Septal E/e′ ratio (≥11)
Sinus tachycardia[41,44]	Mitral inflow pattern with predominant early LV filling in patients with EFs <50% IVRT ≤70 msec is specific (79%) Pulmonary vein systolic filling fraction ≤40% is specific (88%) Average E/e′ >14 (this cutoff has highest specificity but low sensitivity) When E and A velocities are partially or completely fused, the presence of a compensatory period after premature beats often leads to separation of E and A velocities which can be used for assessment of diastolic function
HCM[100-106]	Average E/e′ (>14) Ar-A (≥30 msec) TR peak velocity (>2.8 m/sec) LA volume (>34 mL/m^2).
Restrictive cardiomyopathy[13,107-109]	DT (<140 msec) Mitral E/A (>2.5) IVRT (<50 msec has high specificity) Average E/e′ (>14)
Noncardiac pulmonary hypertension[32]	Lateral E/e′ can be applied to determine whether a cardiac etiology is the underlying reason for the increased pulmonary artery pressures When cardiac etiology is present, lateral E/e′ is >13, whereas in patients with pulmonary hypertension due to a noncardiac etiology, lateral E/e′ is <8
Mitral stenosis[110]	IVRT (<60 msec has high specificity) IVRT/$T_{E\text{-}e'}$ (<4.2) Mitral A velocity (>1.5 m/sec)
MR[110-112]	Ar-A (≥30 msec) IVRT (<60 msec has high specificity) IVRT/$T_{E\text{-}e'}$ (<5.6) may be applied for the prediction of LV filling pressures in patients with MR and normal EFs Average E/e′ (>14) may be considered only in patients with depressed EFs