



ACC Latin America
Conference 2017



MEXICO CITY
JUNE 22 – 24, 2017

GLOBAL EXPERTS, LOCAL LEARNING



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Solutions for Every Day Problems: The Inflow and Outflow of the New Diastology Guidelines





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How to Assess Diastolic Function?

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Former Member, Membership Committee, and

Former Chair, Assembly International Governors, American College of Cardiology



Disclosure Information



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- I will not discuss off label use or investigational use in my presentation
- I have no financial relationships to disclose



Objectives



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- **Identify and describe different mechanisms of diastolic dysfunction**
- **Develop skills and confidence in the interpretation of abnormalities on the echo-Doppler**
- **Demonstrate utilisation of the echo-Doppler diastolic parameters for clinical decision making**





ASE/EACVI GUIDELINES AND STANDARDS

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

Sherif F. Nagueh, Chair, MD, FASE,¹ Otto A. Smiseth, Co-Chair, MD, PhD,² Christopher P. Appleton, MD,¹ Benjamin F. Byrd, III, MD, FASE,¹ Hisham Dokainish, MD, FASE,¹ Thor Edvardsen, MD, PhD,² Frank A. Flachskampf, MD, PhD, FESC,² Thierry C. Gillebert, MD, PhD, FESC,² Allan L. Klein, MD, FASE,¹ Patrizio Lancellotti, MD, PhD, FESC,² Paolo Marino, MD, FESC,² Jae K. Oh, MD,¹ Bogdan Alexandru Popescu, MD, PhD, FESC, FASE,² and Alan D. Waggoner, MHS, RDCS¹, *Houston, Texas; Oslo, Norway; Phoenix, Arizona; Nashville, Tennessee; Hamilton, Ontario, Canada; Uppsala, Sweden; Ghent and Liège, Belgium; Cleveland, Ohio; Novara, Italy; Rochester, Minnesota; Bucharest, Romania; and St. Louis, Missouri*

(J Am Soc Echocardiogr 2016;29:277-314.)





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Estimating Left Ventricular Filling Pressure by Echocardiography



Oyvind S. Andersen, MD,^a Otto A. Smiseth, MD, PhD,^a Hisham Dokainish, MD,^b Muaz M. Abudiab, MD,^c Robert C. Schutt, MD,^d Arnav Kumar, MBBS,^e Kimi Sato, MD,^e Serge Harb, MD,^e Einar Gude, MD, PhD,^a Espen W. Remme, MSc, PhD,^a Arne K. Andreassen, MD, PhD,^a Jong-Won Ha, MD,^f Jiaqiong Xu, PhD,^c Allan L. Klein, MD,^e Sherif F. Nagueh, MD^c

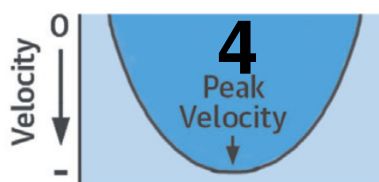


Echocardiography Parameters for Estimation of LV Filling Pressure

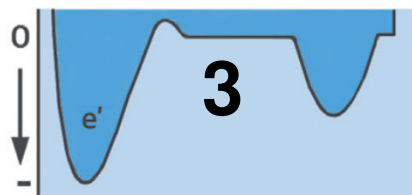


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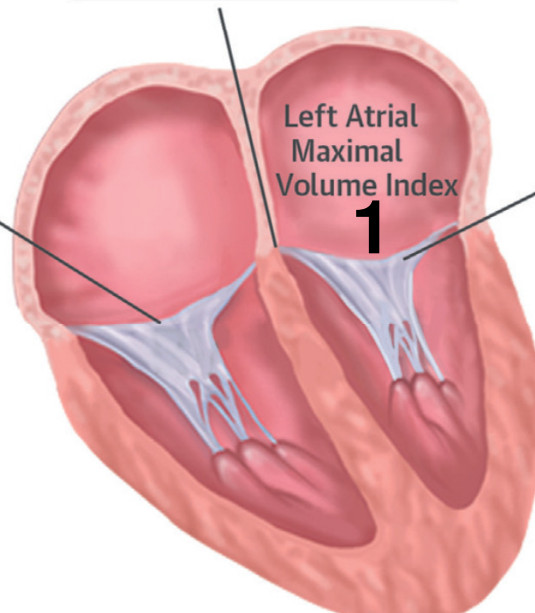
Tricuspid Regurgitation Velocity



Mitral Annular Velocity



Mitral Flow Velocity



Parameter	Cutoff Value
• Peak Tricuspid Regurgitation Velocity	>2.8 m/sec
• E/e'	>14
• Left Atrial Maximal Volume Index	>34 ml/m ²

Andersen. *J Am Coll Cardiol.* 2017;69:1937-48

Algorithm for Estimating LV Filling Pressure in Depressed LVEF or Normal EF and Myocardial Disease



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Mitral Inflow

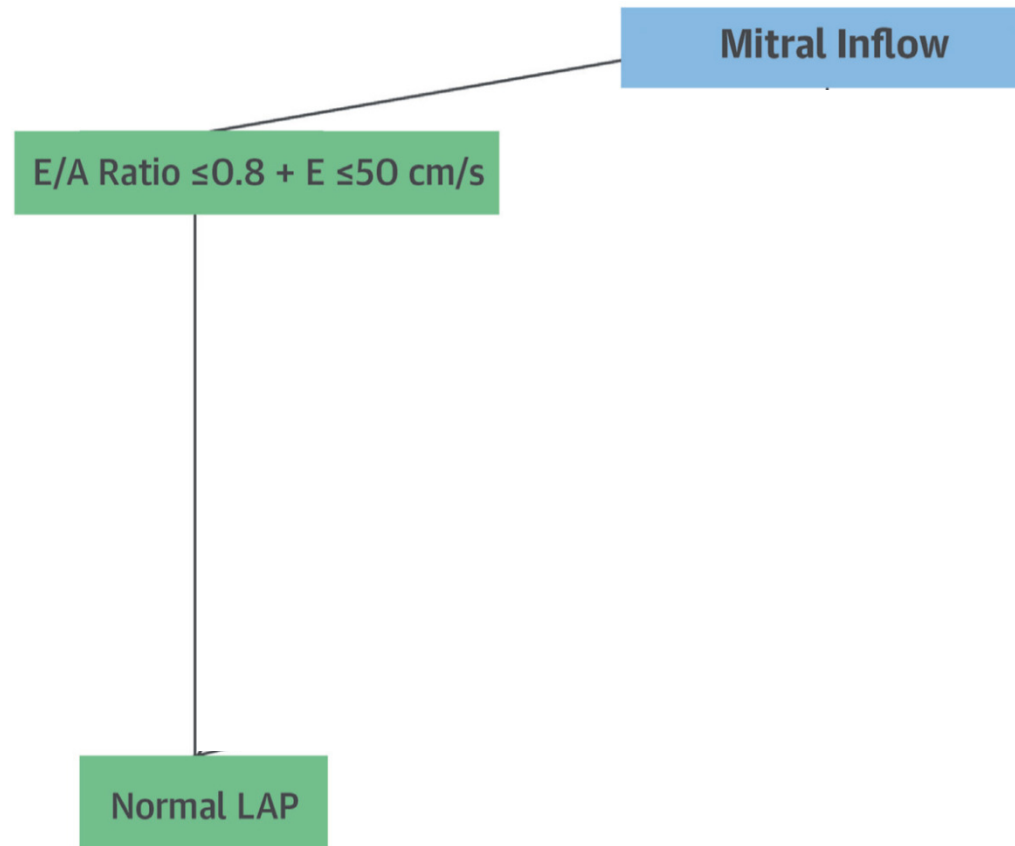
Andersen. J Am Coll Cardiol. 2017;69:1937-48



Algorithm for Estimating LV Filling Pressure in Depressed LVEF or Normal EF and Myocardial Disease



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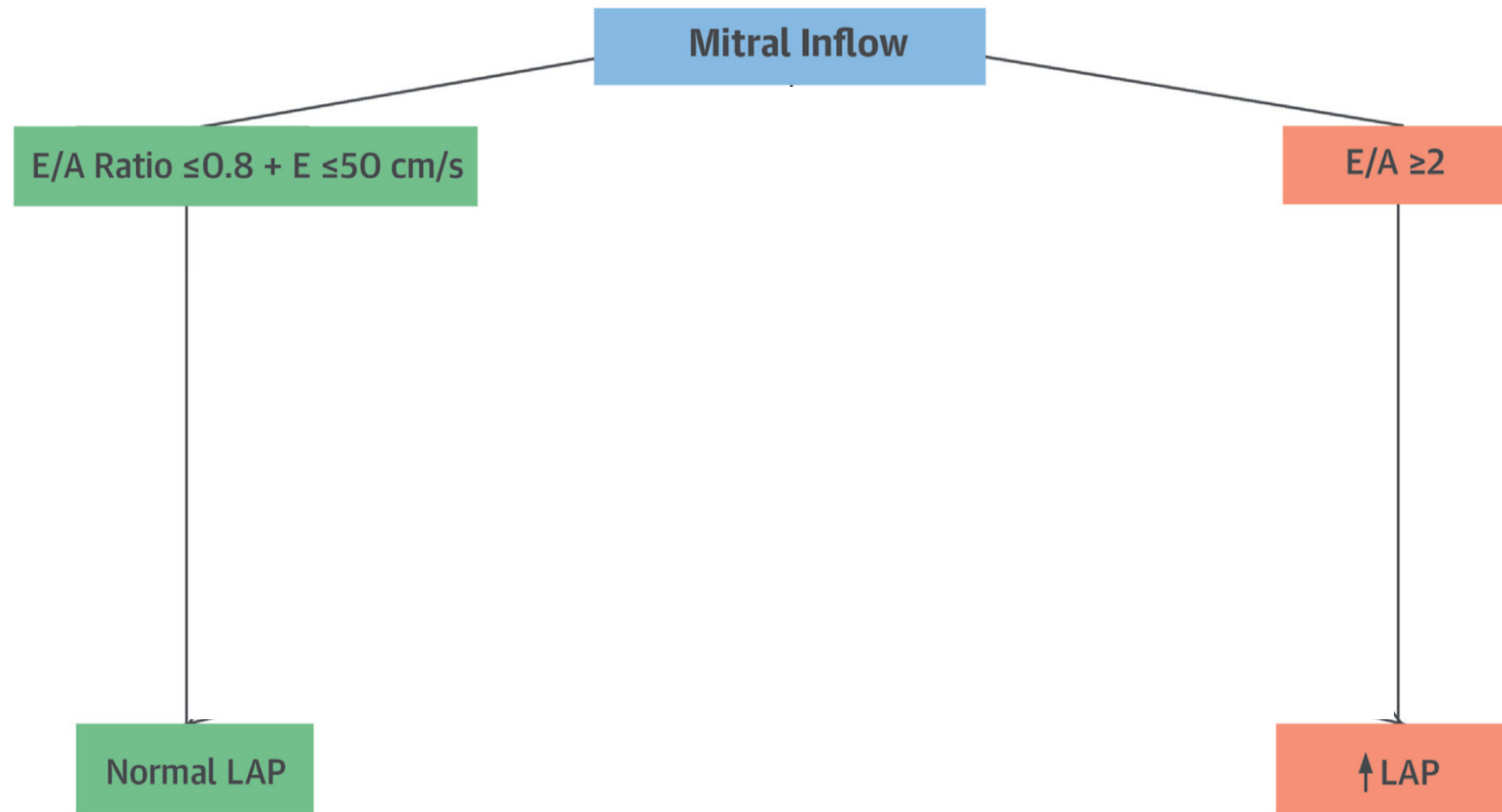


Andersen. J Am Coll Cardiol. 2017;69:1937-48

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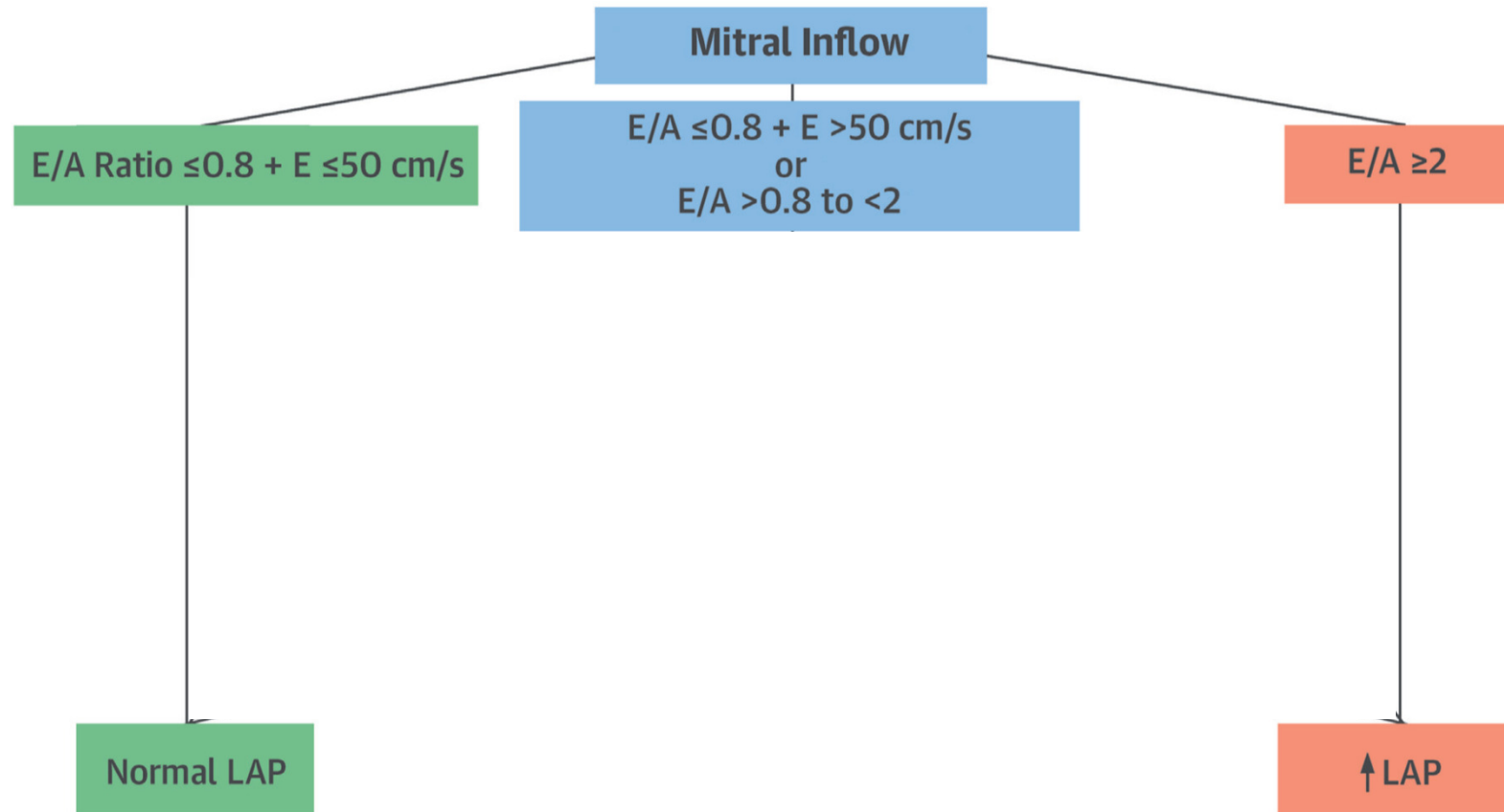


Andersen. *J Am Coll Cardiol.* 2017;69:1937-48

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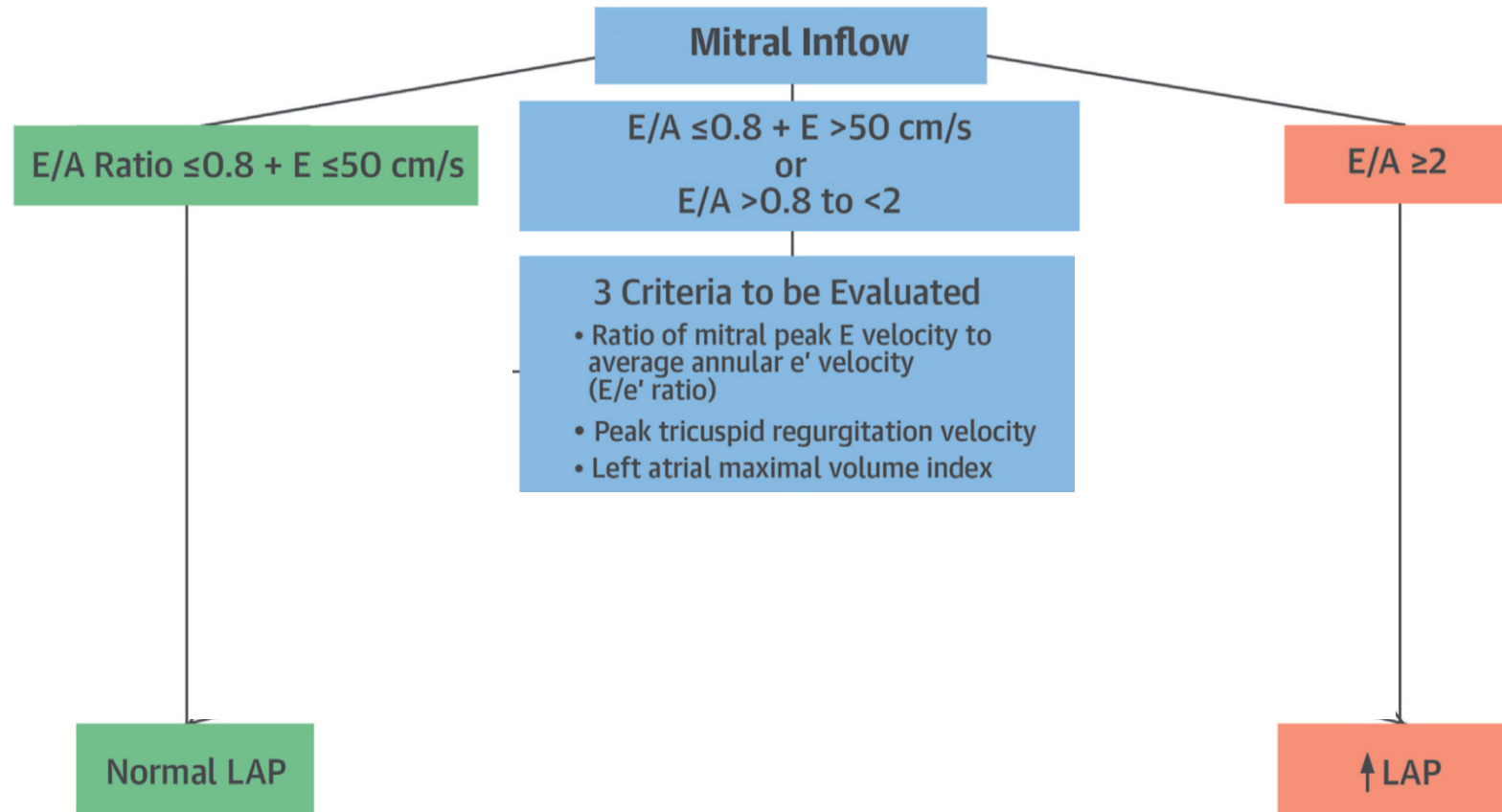


Andersen. *J Am Coll Cardiol.* 2017;69:1937-48

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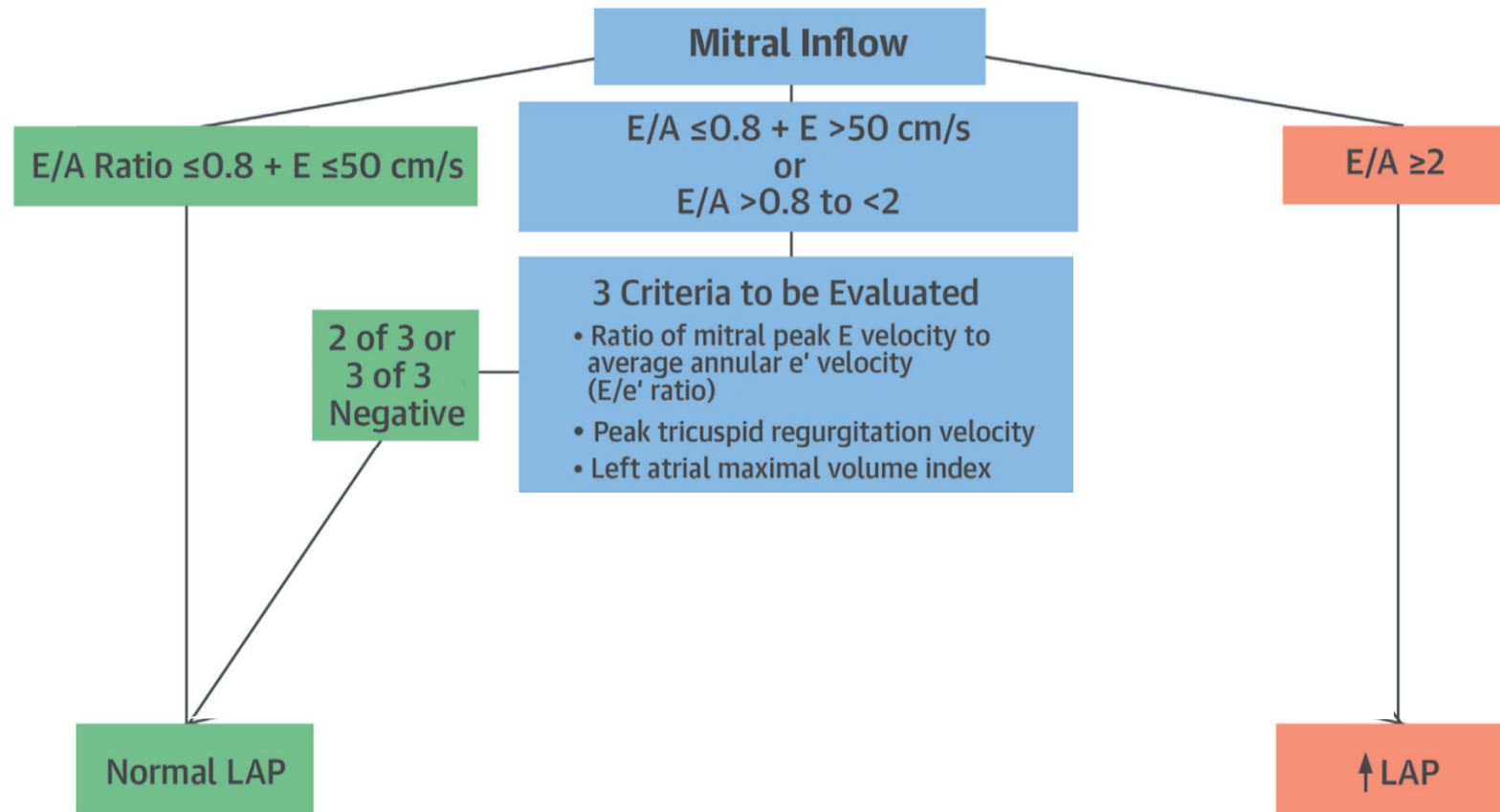


Andersen. J Am Coll Cardiol. 2017;69:1937-48

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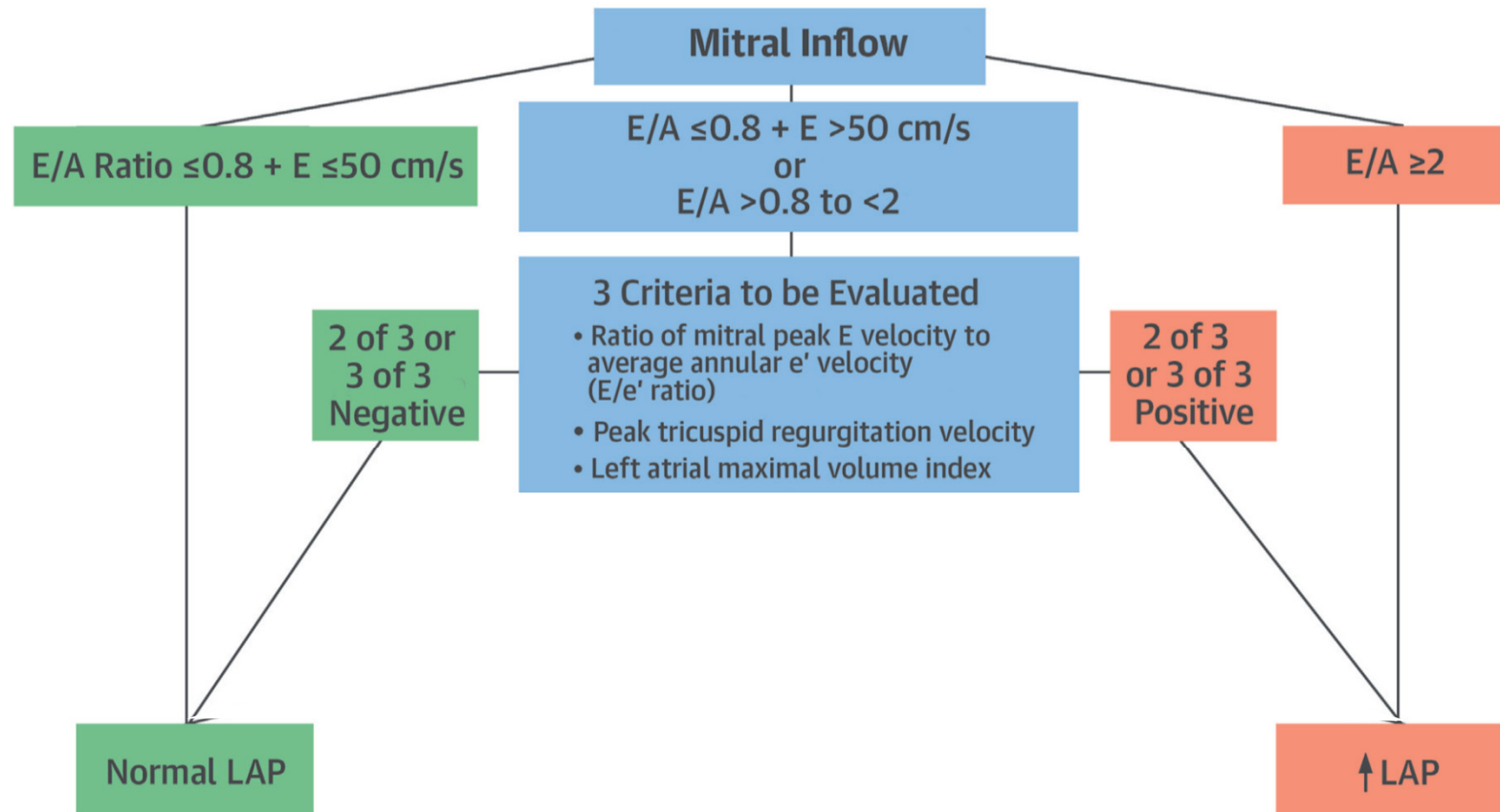


Andersen. J Am Coll Cardiol. 2017;69:1937-48

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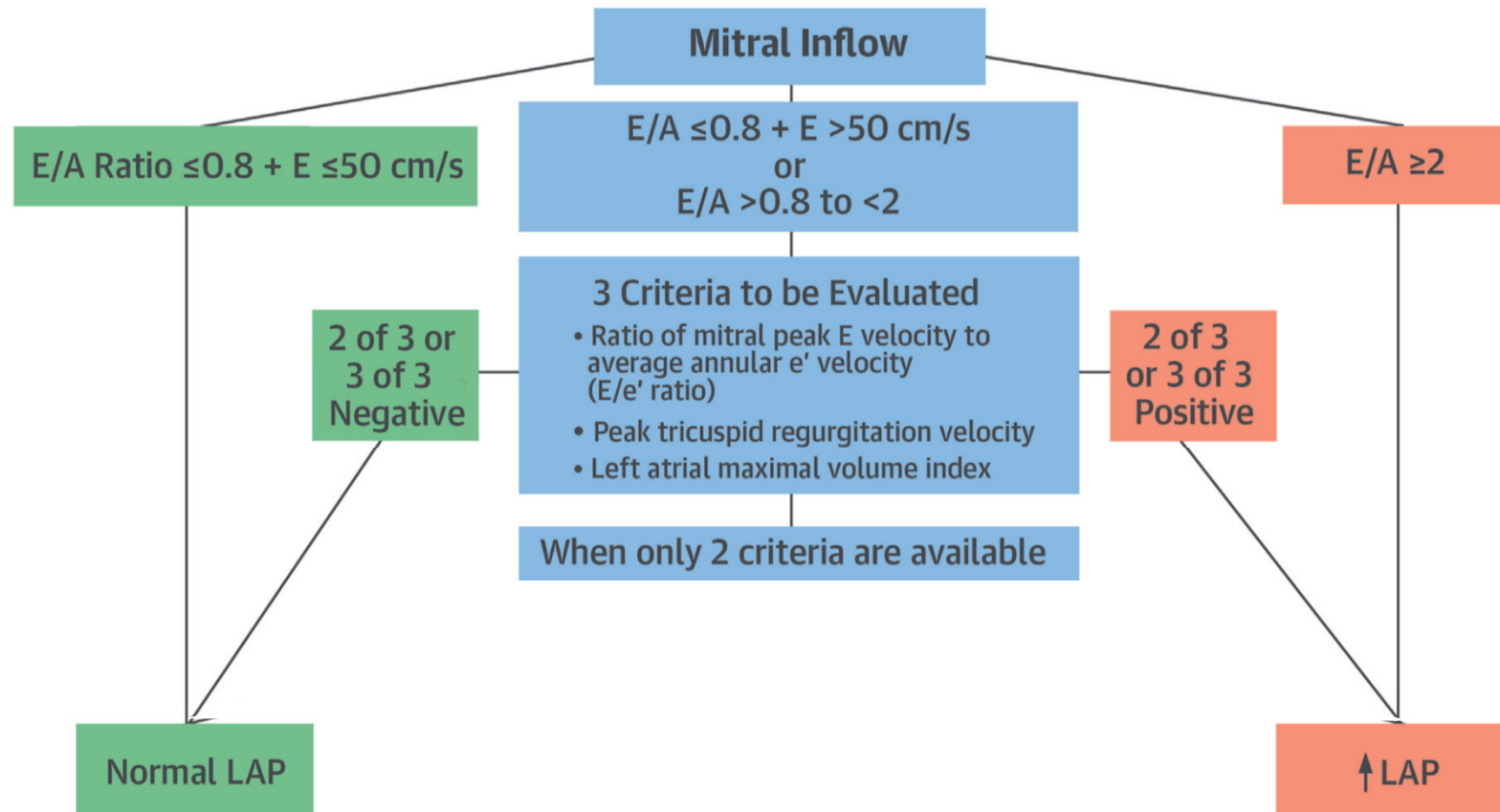


Andersen. J Am Coll Cardiol. 2017;69:1937-48

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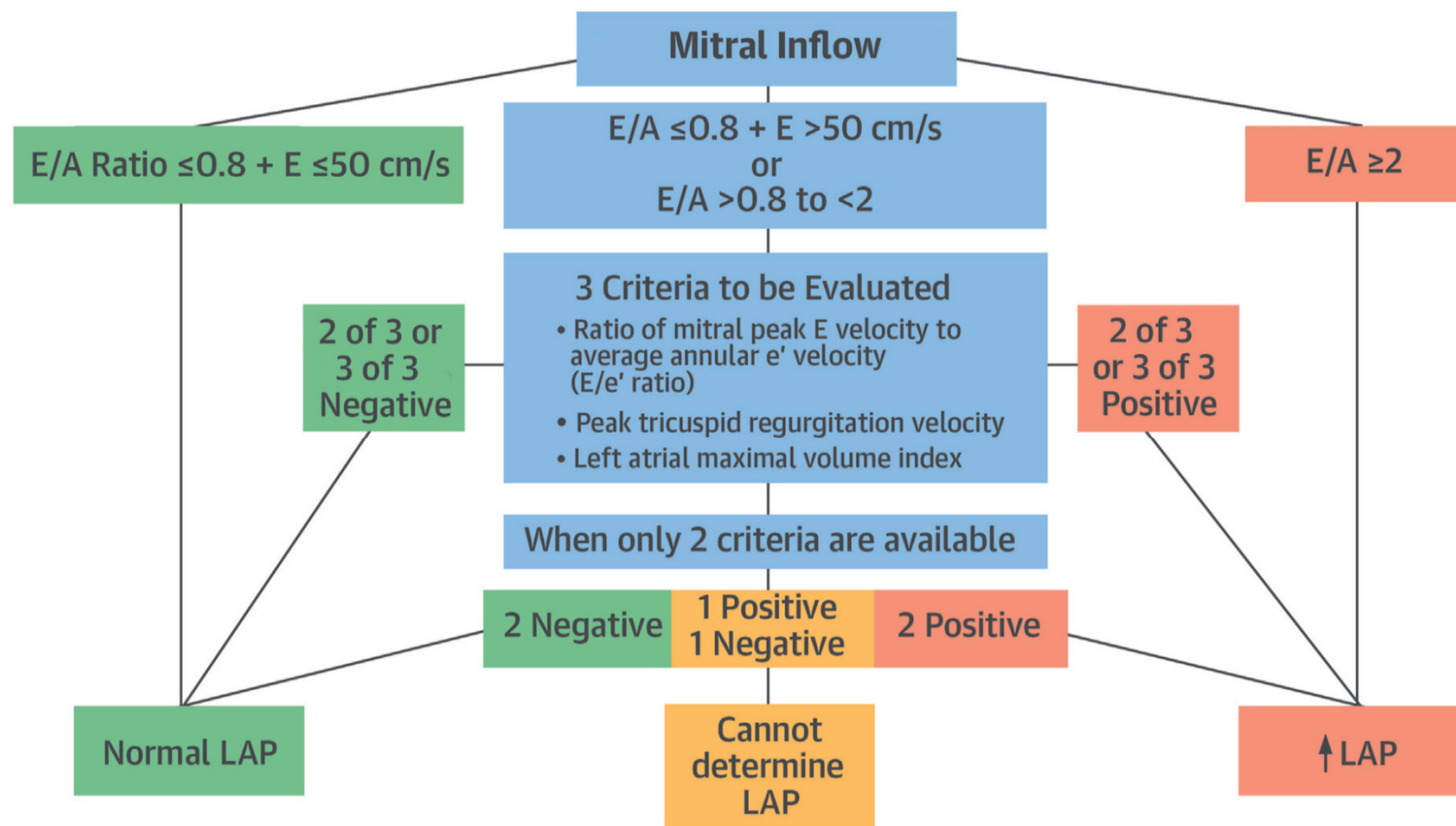


Andersen. J Am Coll Cardiol. 2017;69:1937-48

Algorithm for Estimating LV Filling Pressure in Depressed LVEF or Normal EF and Myocardial Disease



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Andersen. J Am Coll Cardiol. 2017;69:1937-48



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12 Tricks to Assess Diastolic Function



Trick 1



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TRICK 1:

Assess LA volumen, always



A4C



A2C

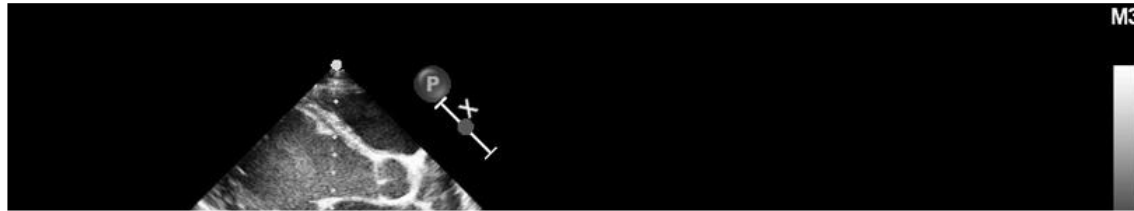
Lang R. J Am Soc Echocardiogr 2015;28:1-39



Trick 2



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TRICK 2:

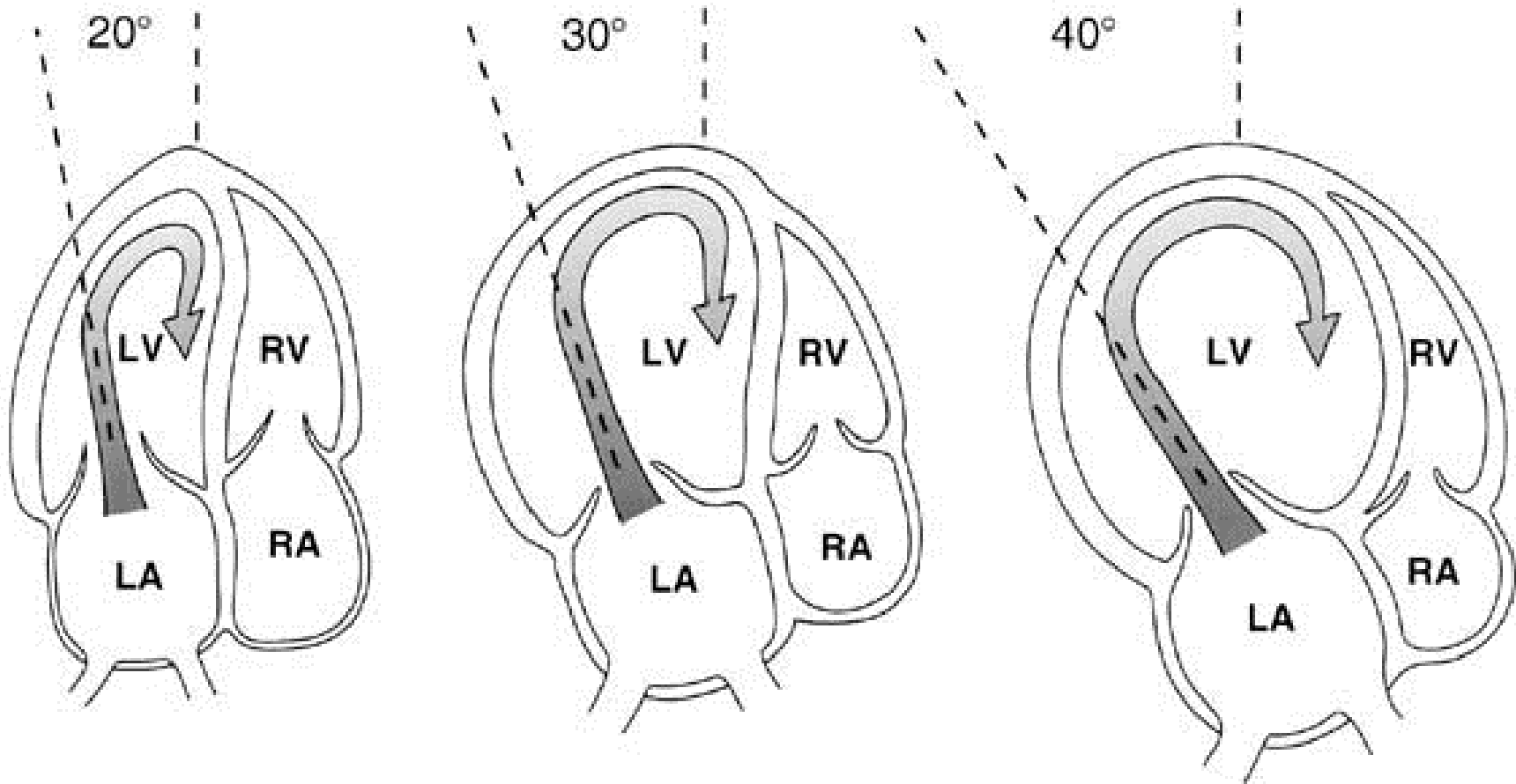
M mode could still be useful



Trick 3



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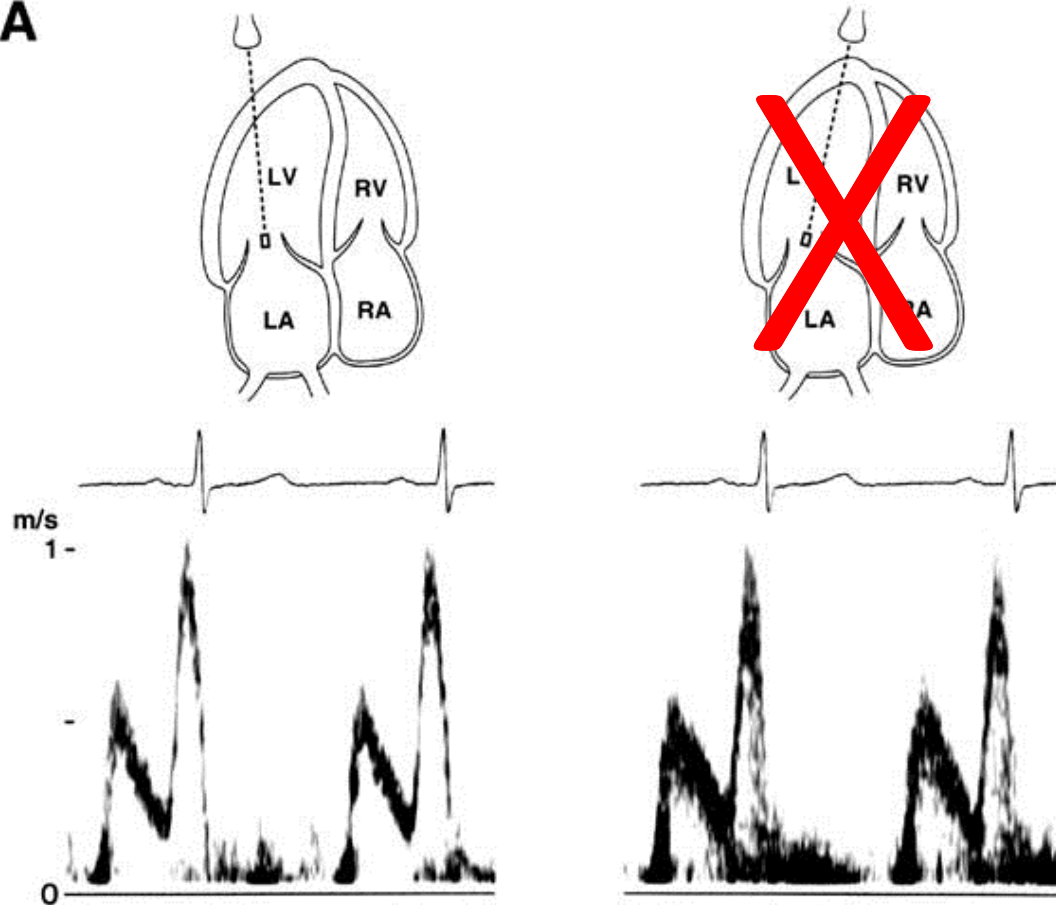
Appleton C. J Am Soc Echocardiogr. 1997;10:271-92

Trick 3



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A



Appleton C. J Am Soc Echocardiogr. 1997;10:271-92

Trick 3



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TRICK 3:

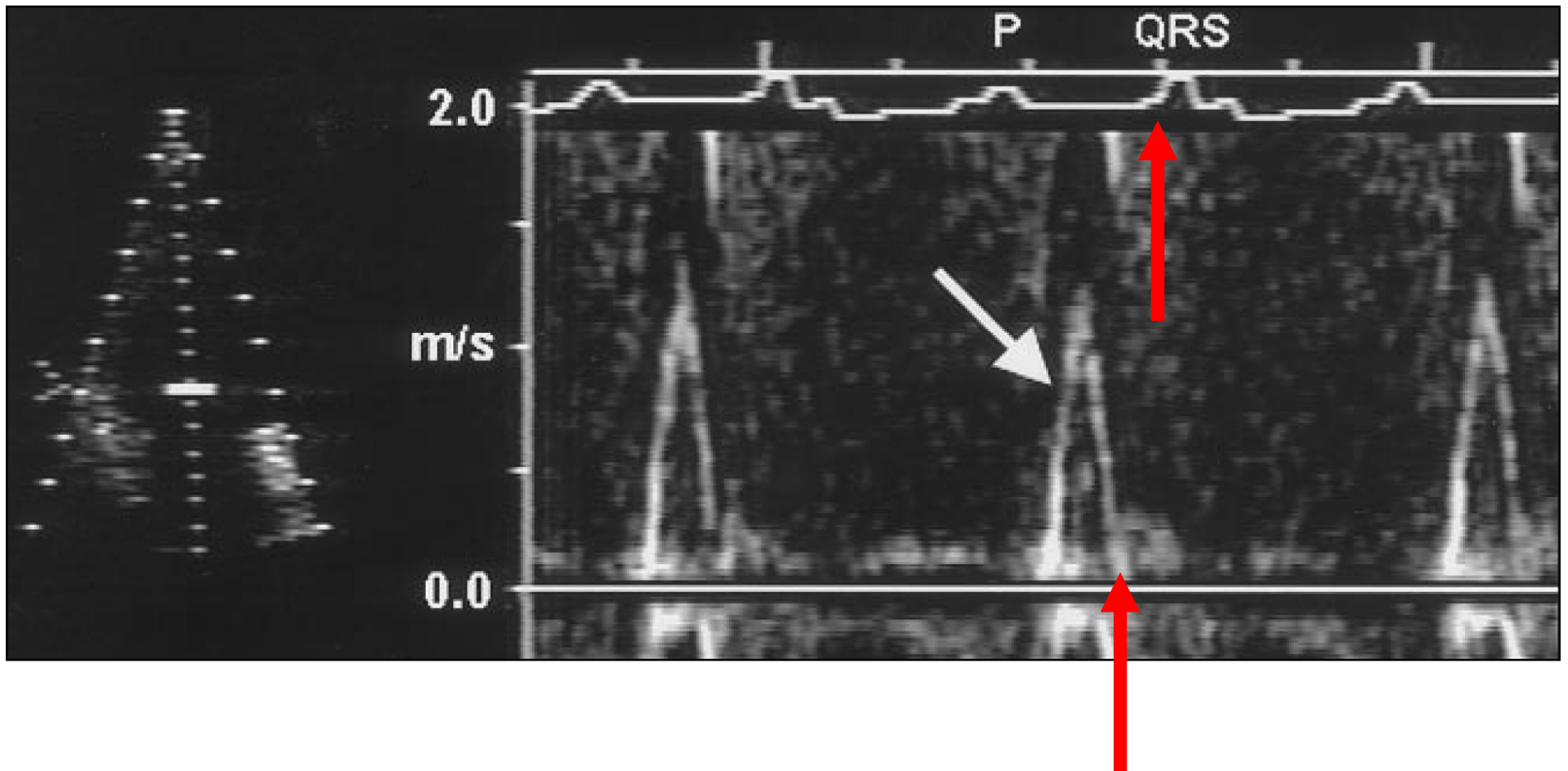
**Focus pulse Doppler sample
volume with color Doppler**



Trick 4



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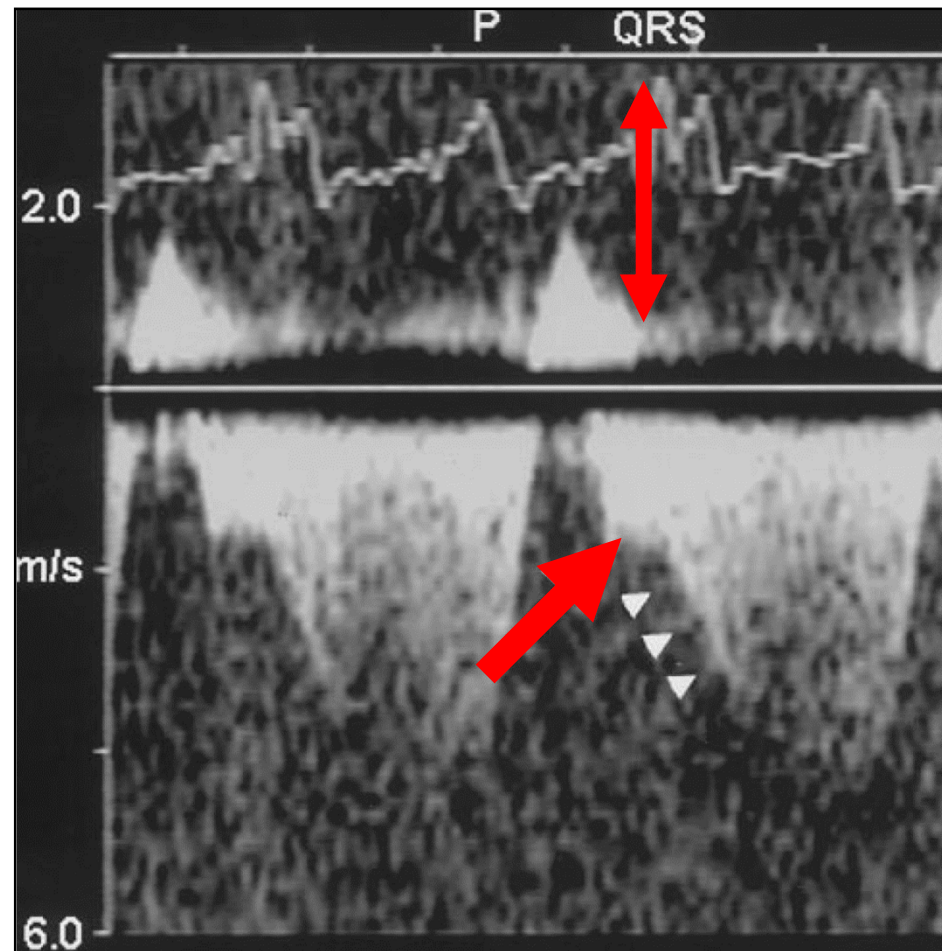


Agmon Y. Circulation. 1999;99:e13

Trick 4



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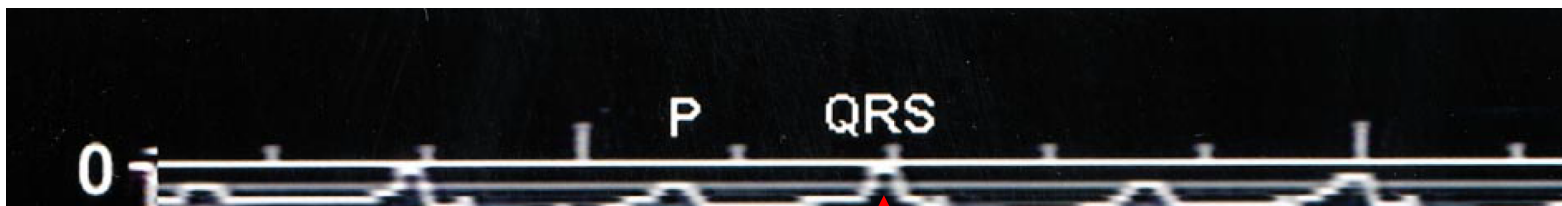


Agmon Y. Circulation. 1999;99:e13

Trick 4



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TRICK 4:

Look at the QRS, always

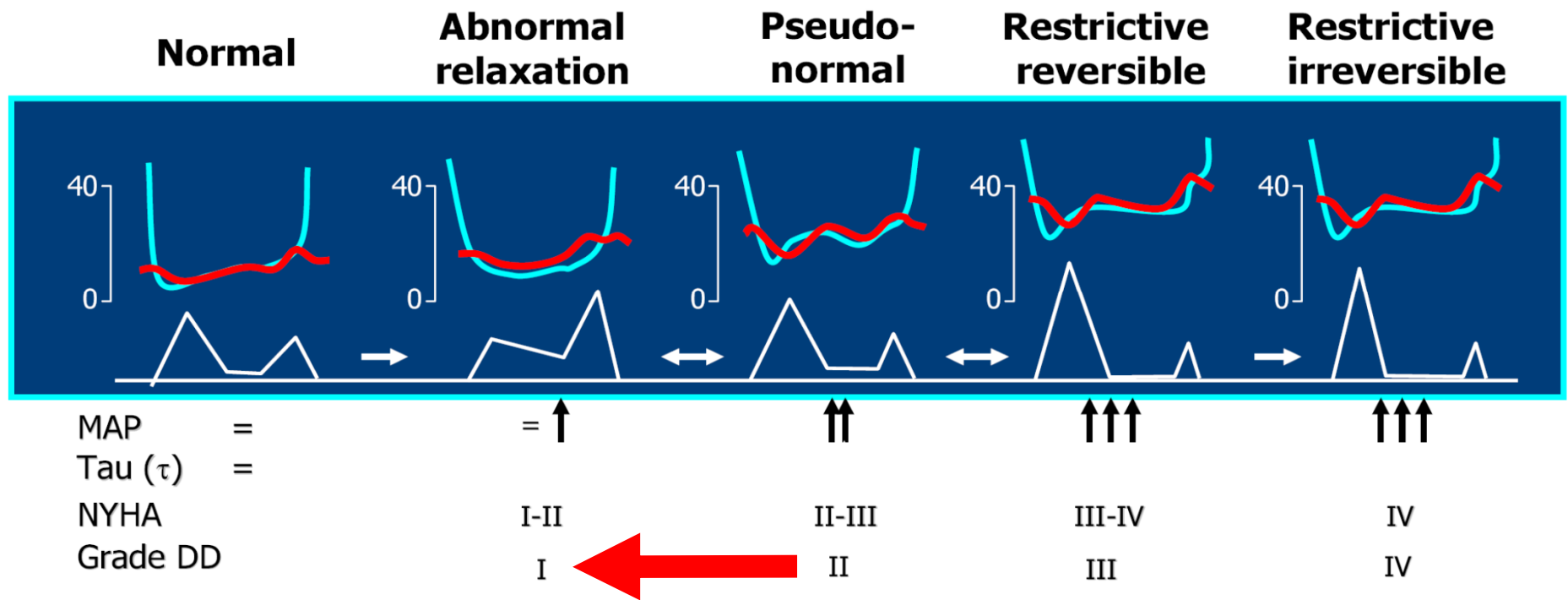


Agmon Y. Circulation. 1999;99:e13

Trick 5



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Valsalva maneuver

Nishimura RA. *J Am Coll Cardiol.* 1997;30:8-18

Trick 5



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TRICK 5:

Look, also, at A wave
during Valsalva maneuver

Schwammenthal E. Am J Cardiol. 2000;86:169-74

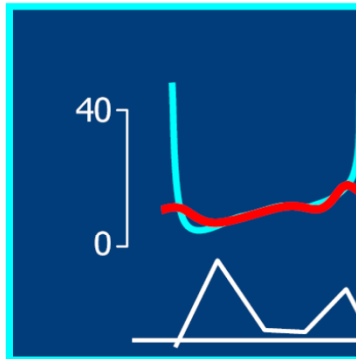


Trick 6



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Normal



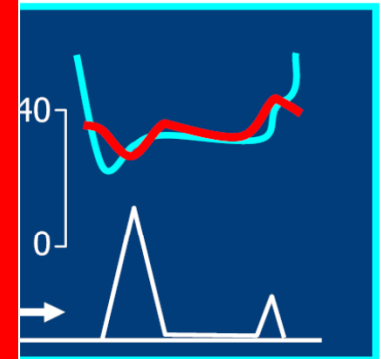
MAP =
Tau (τ) =
NYHA
Grade DD

Abnormal
relaxation

Pseudo-
normal

Restrictive
reversible

Restrictive
irreversible



↑↑↑

IV
IV

TRICK 6:

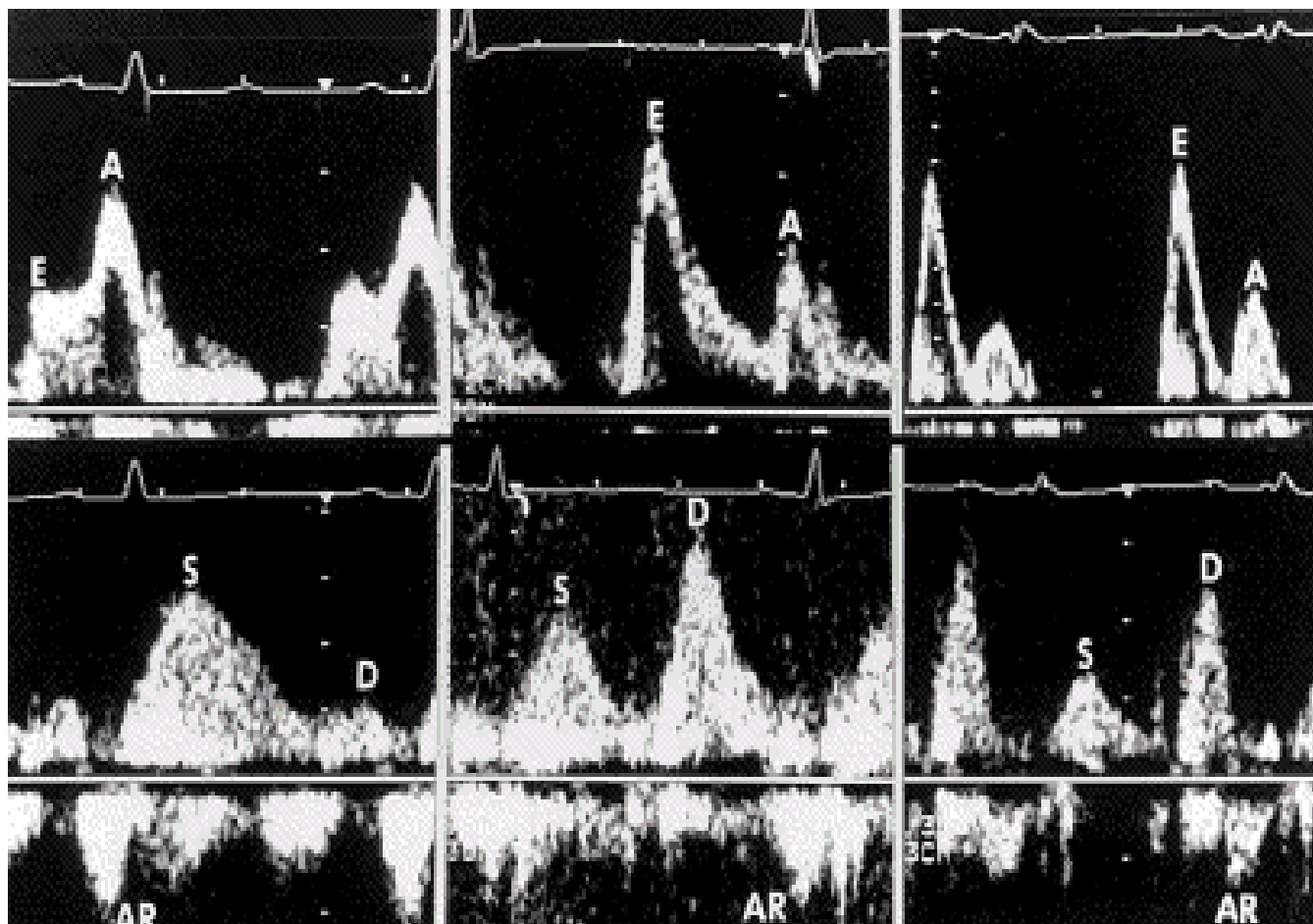
Raise legs, too

Nishimura RA. J Am Coll Cardiol. 1997;30:8-18

Trick 7



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Cohen GI. J Am Coll Cardiol. 1996;27:1753-60

Trick 7



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TRICK 7:

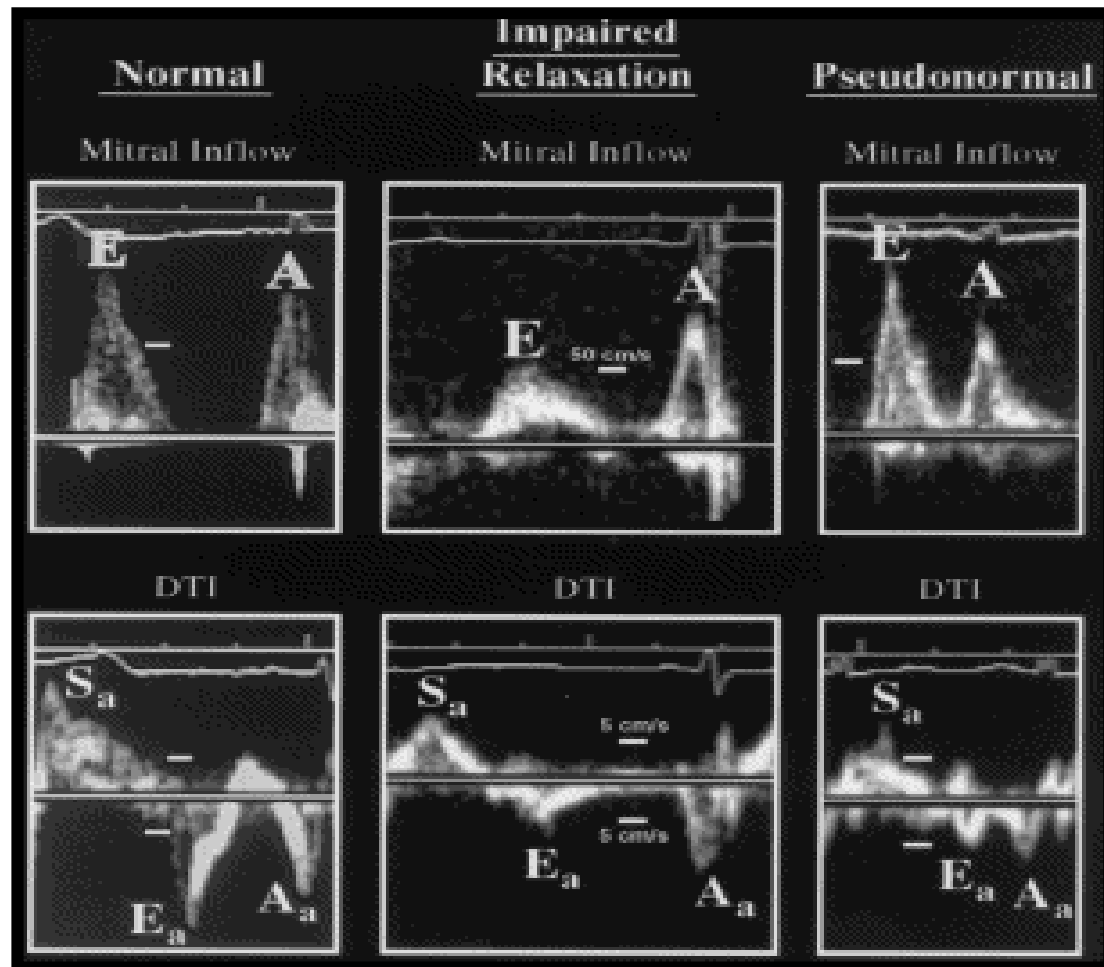
Train to see the PVs
with the TTE



Trick 8



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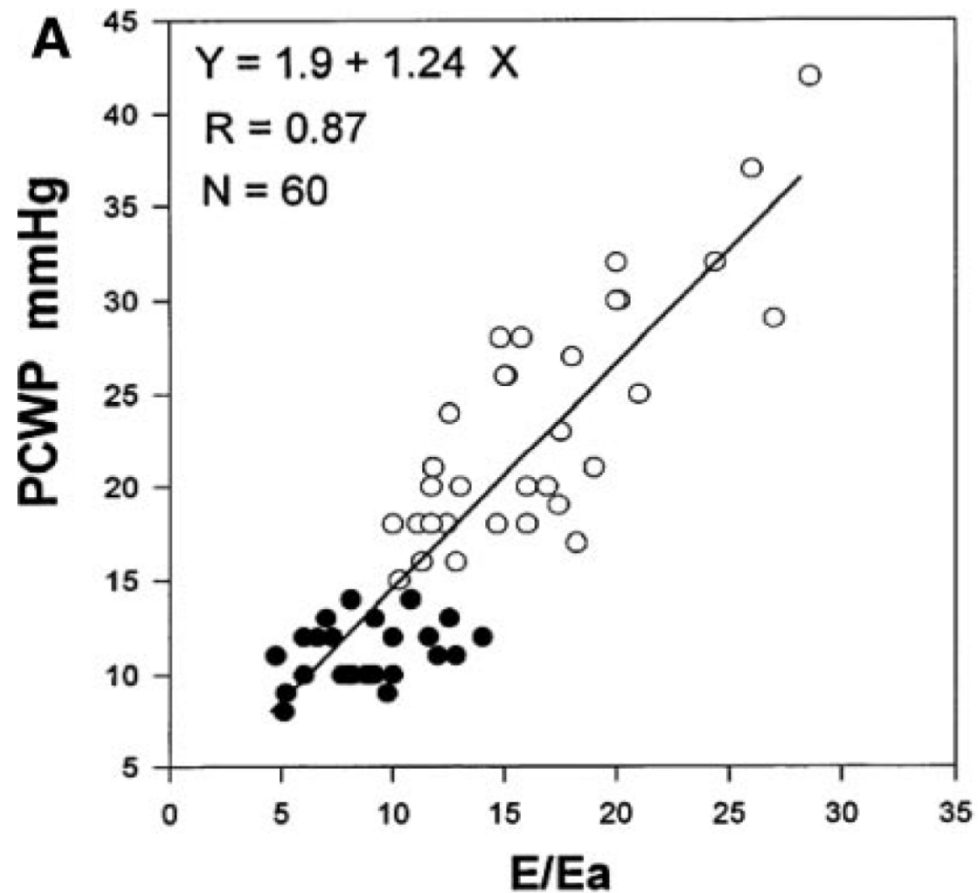


Nagueh S. J Am Coll Cardiol. 1997;30:1527-33

Trick 8



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Nagueh S. J Am Coll Cardiol. 1997;30:1527-33

Trick 8



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TRICK 8:

Not always:

$E < A = \text{normal LVFP}$

Skaluba S. Circulation. 2004;109:972-7



TRICK 9:

Are there “oscillations”
of the mitral annulus?

Riordan M. Am J Physiol Heart Circ Physiol. 2007;292:H2952-8



Trick 10

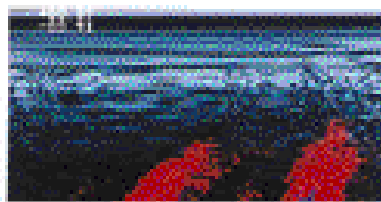


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A Control group



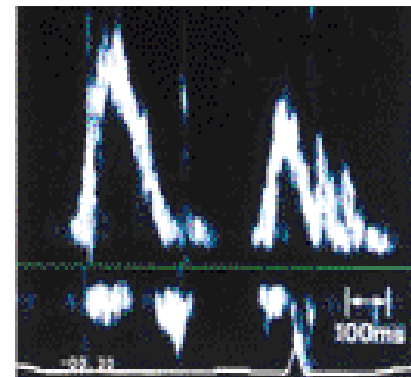
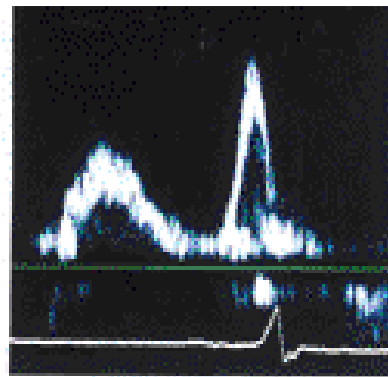
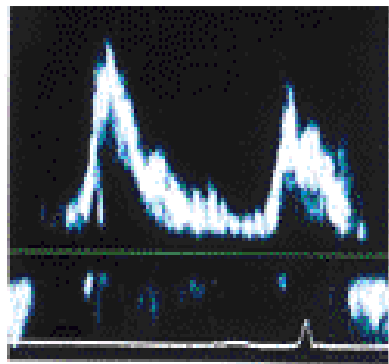
B Group I



C Group II



Normal Vp > 50 cm/s



Takatsuji H. J Am Coll Cardiol. 1996;27:365-71

Trick 10



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TRICK 10:

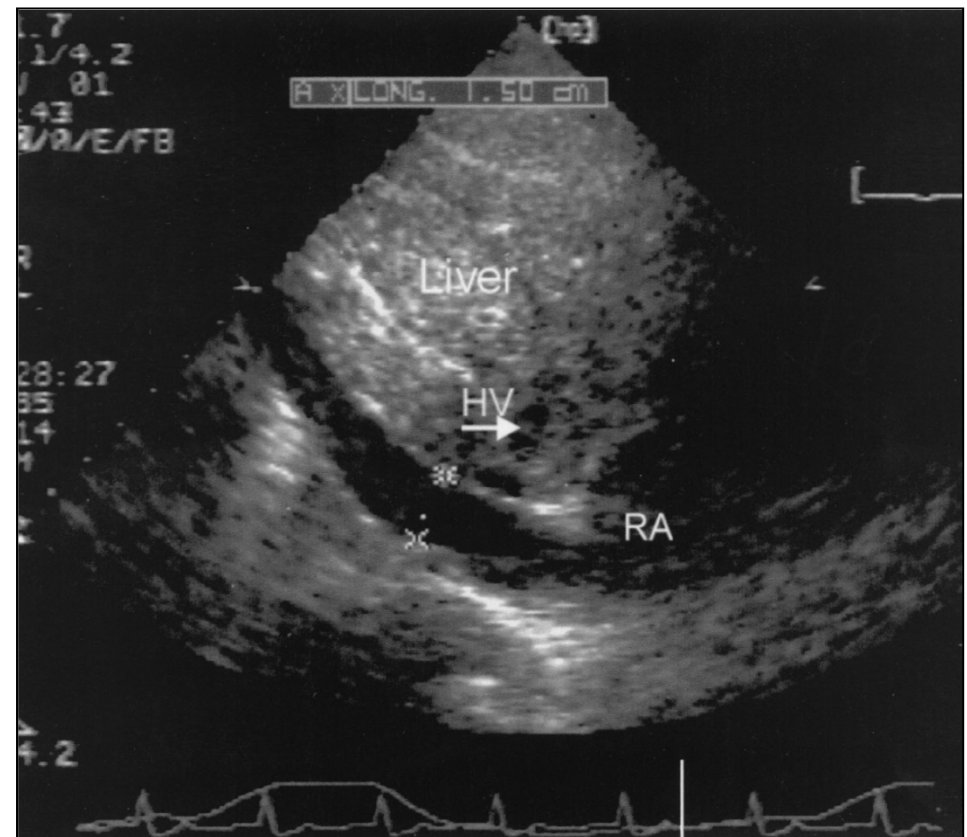
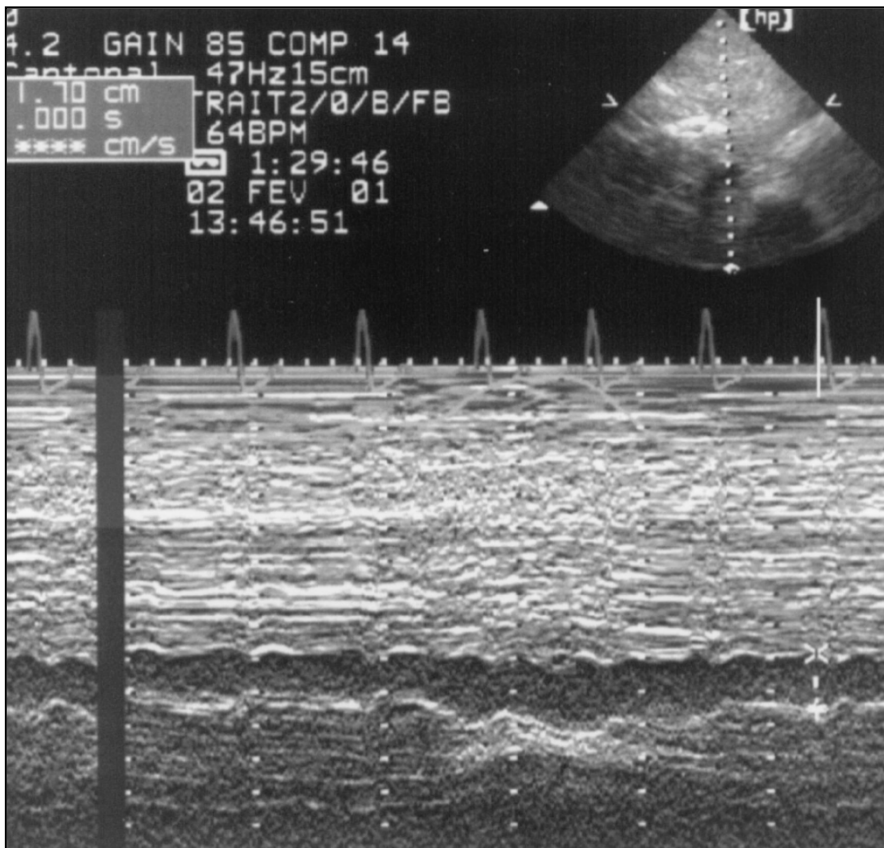
**Color M mode could be useful
to estimate LVFP too**

Garcia M. J Am Coll Cardiol. 1997;29:448-54

Trick 11



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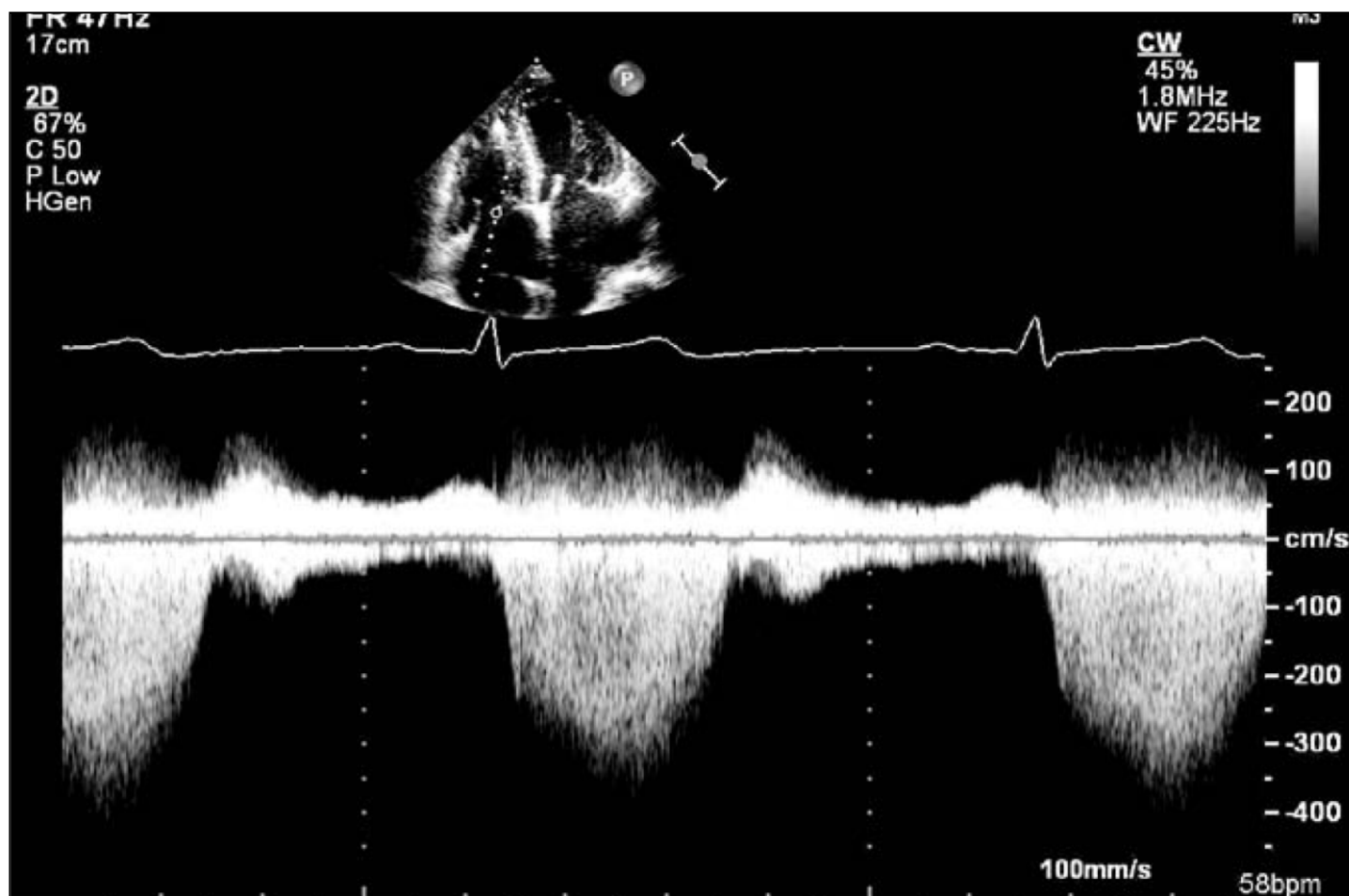


Bendjelid K. J Am Soc Echocardiogr. 2002;15:944-9

Trick 11



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Nagueh SF. J Am Soc Echocardiogr. 2009;22:107-33

Trick 11



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TRICK 11:

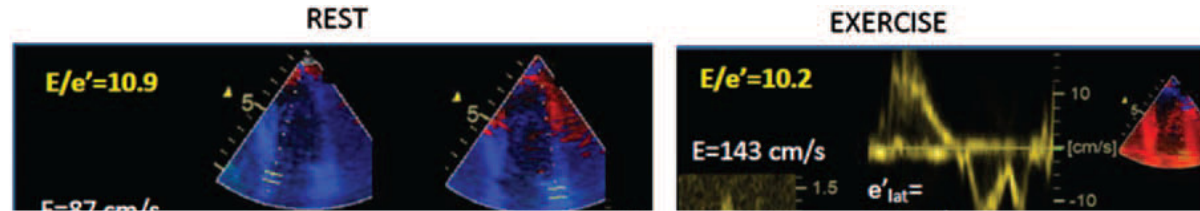
Assess right side
hemodynamics

Abbas A. J Am Coll Cardiol 2003;41:1021-7

Trick 12



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TRICK 12:
Evaluate diastolic stress



Erdei T. Eur J Heart Failure 2014;16,1345-61

Take-Home Messages



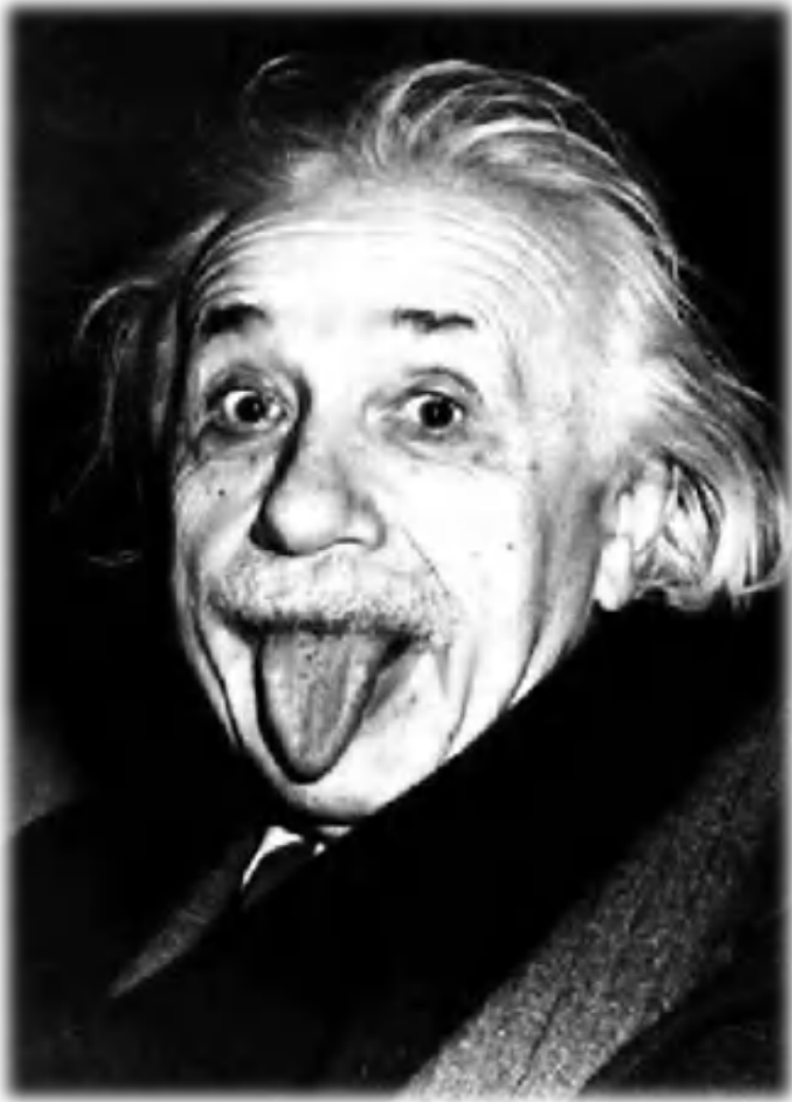
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1. When assessing diastolic function take also into account the systolic function
2. Don't just trust your eyes, measure!!!
3. LA volume is the best parameter for chronic increase of LV filling pressures
4. The ratio E/E' is the best parameter of current of LV filling pressures
5. Note the "peripheral hemodynamics"
6. Integrate echocardiographic information and other biomarkers
7. Stress-echo could add important information





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*Everything should be made
as simple as possible,
but not simpler*

Albert Einstein (1879-1955)





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Thank you



LV Diastolic Dysfunction in Subjects With Normal LVEF



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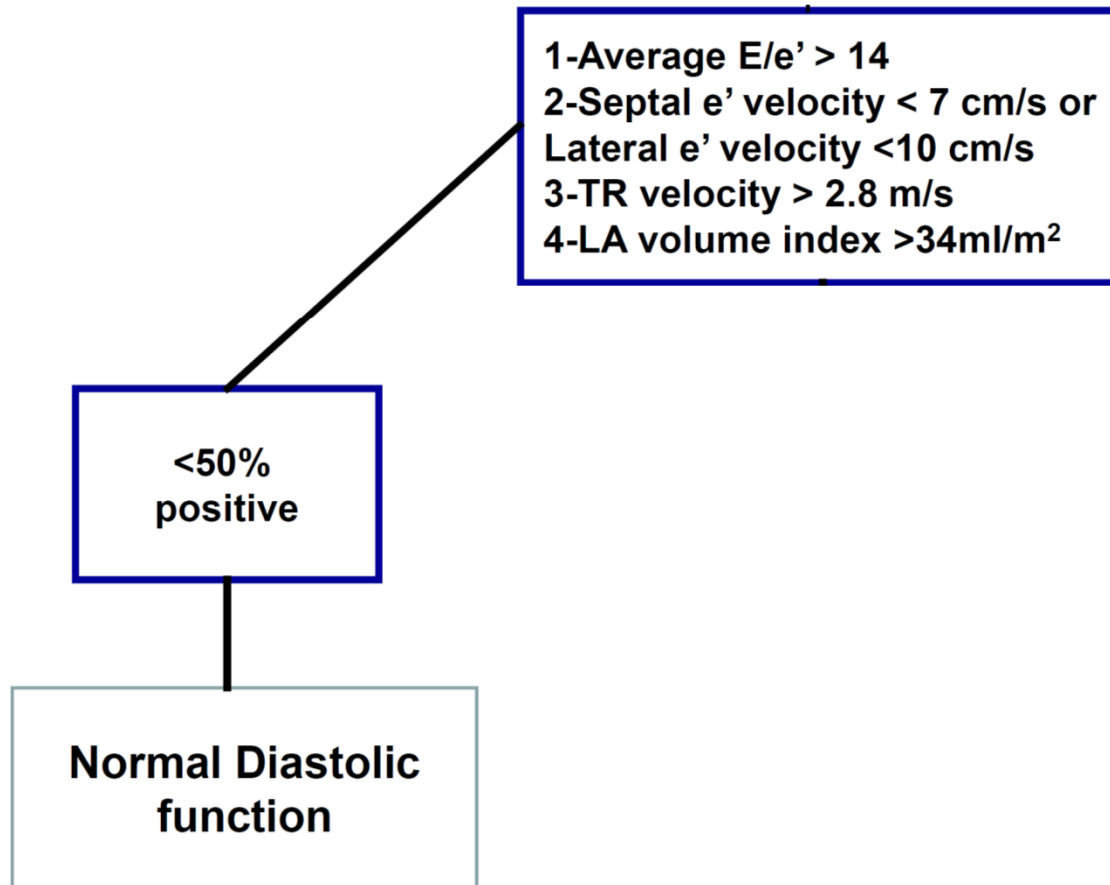
- 1-Average $E/e' > 14$
- 2-Septal e' velocity < 7 cm/s or
Lateral e' velocity < 10 cm/s
- 3-TR velocity > 2.8 m/s
- 4-LA volume index > 34 ml/m²



LV Diastolic Dysfunction in Subjects With Normal LVEF



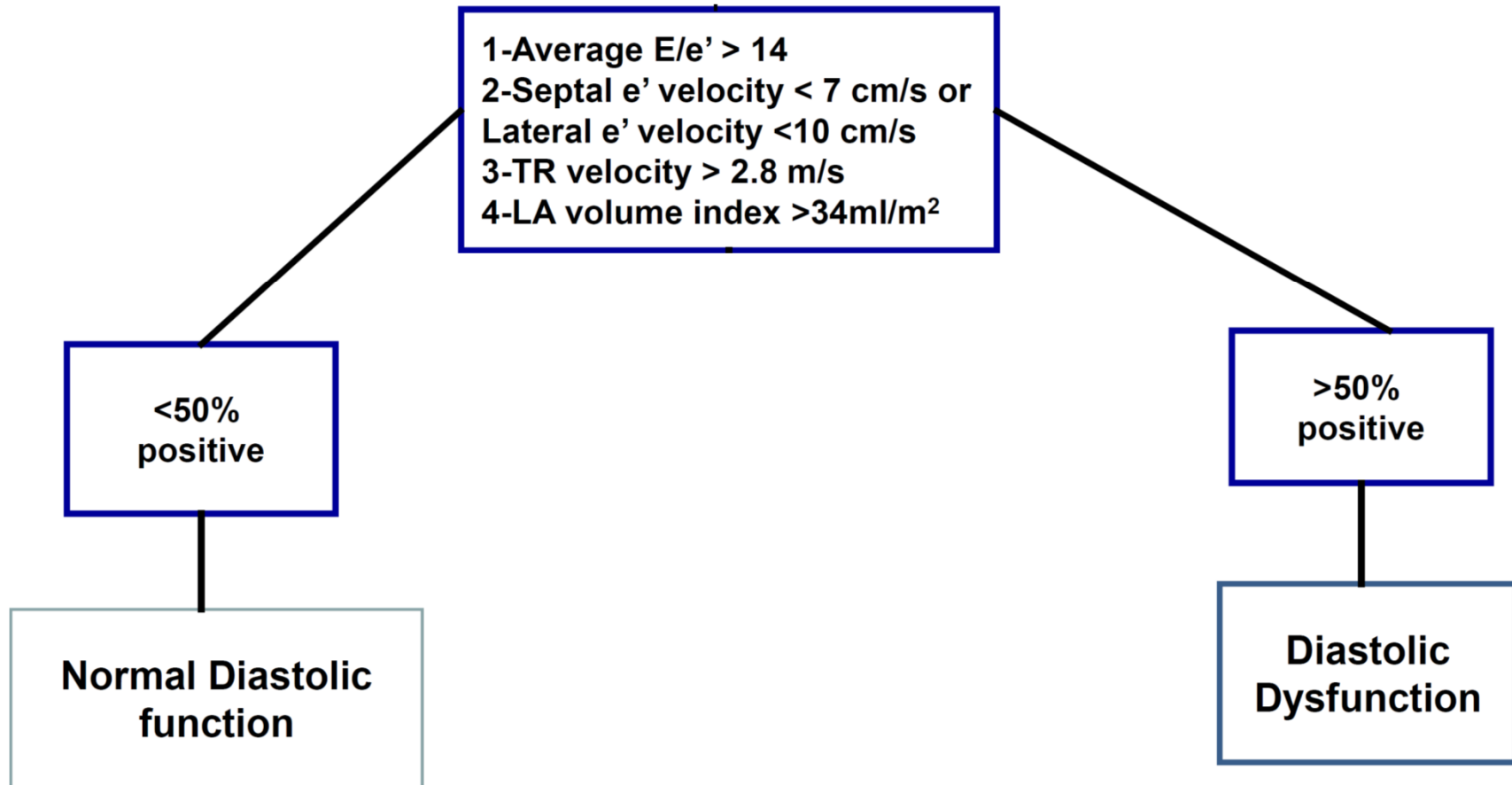
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LV Diastolic Dysfunction in Subjects With Normal LVEF



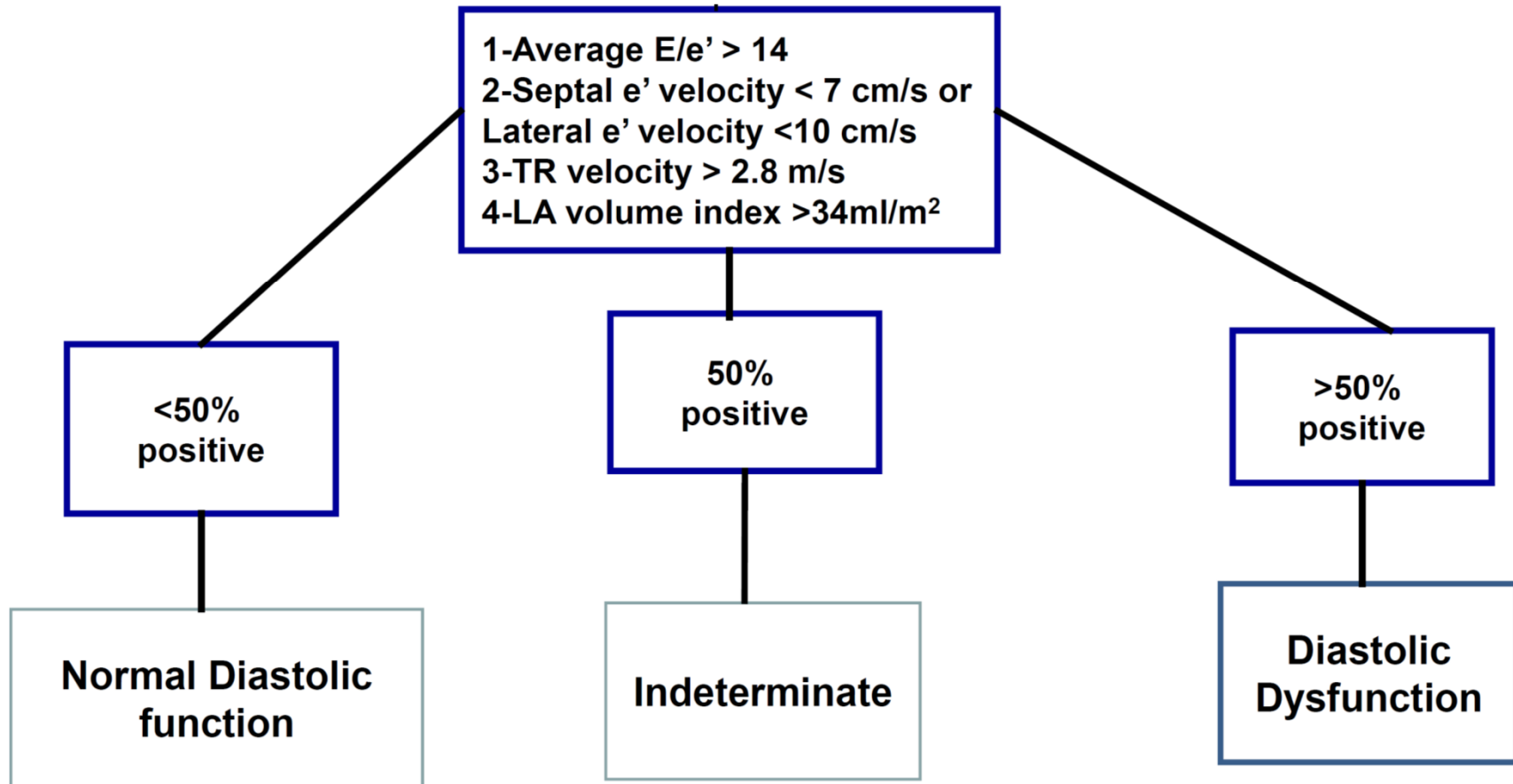
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LV Diastolic Dysfunction in Subjects With Normal LVEF



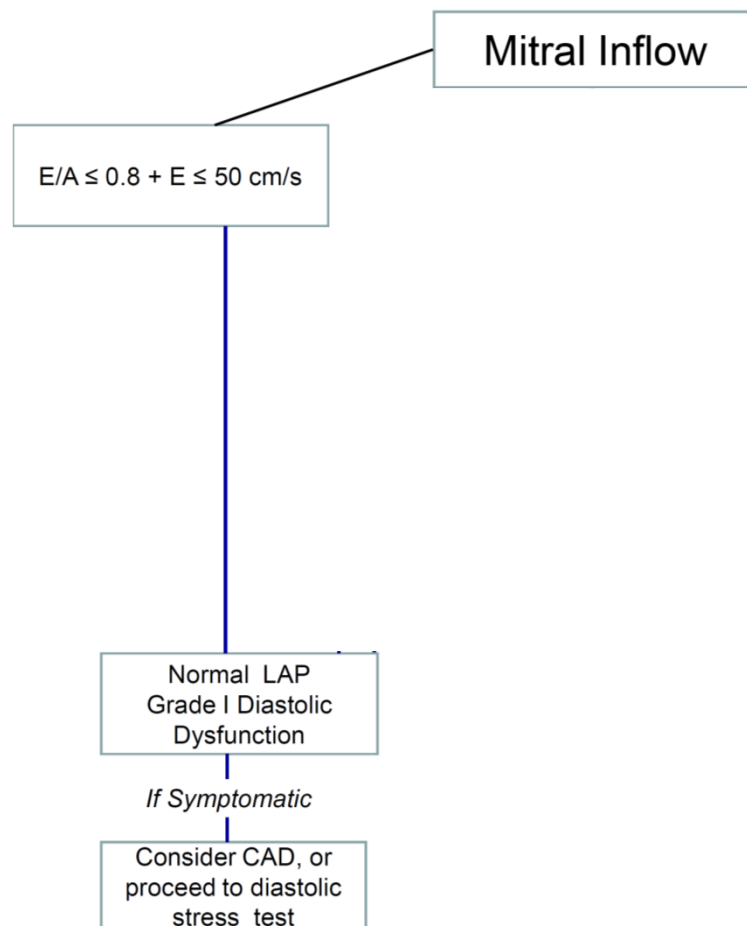
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Estimation of LV Filling Pressures/Grading LV Diastolic Function in Patients With Depressed LVEFs and With Myocardial Disease and Normal LVEF



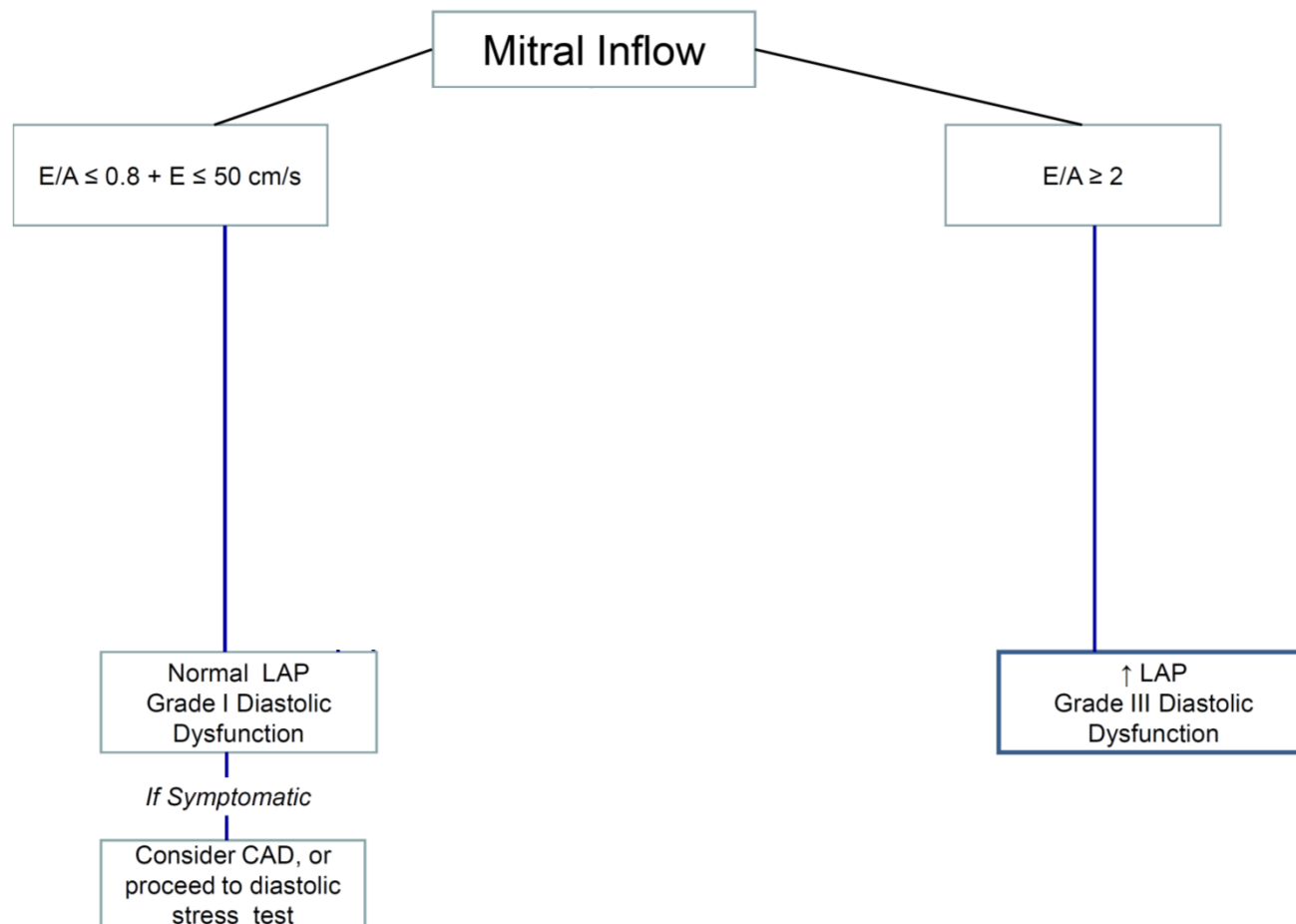
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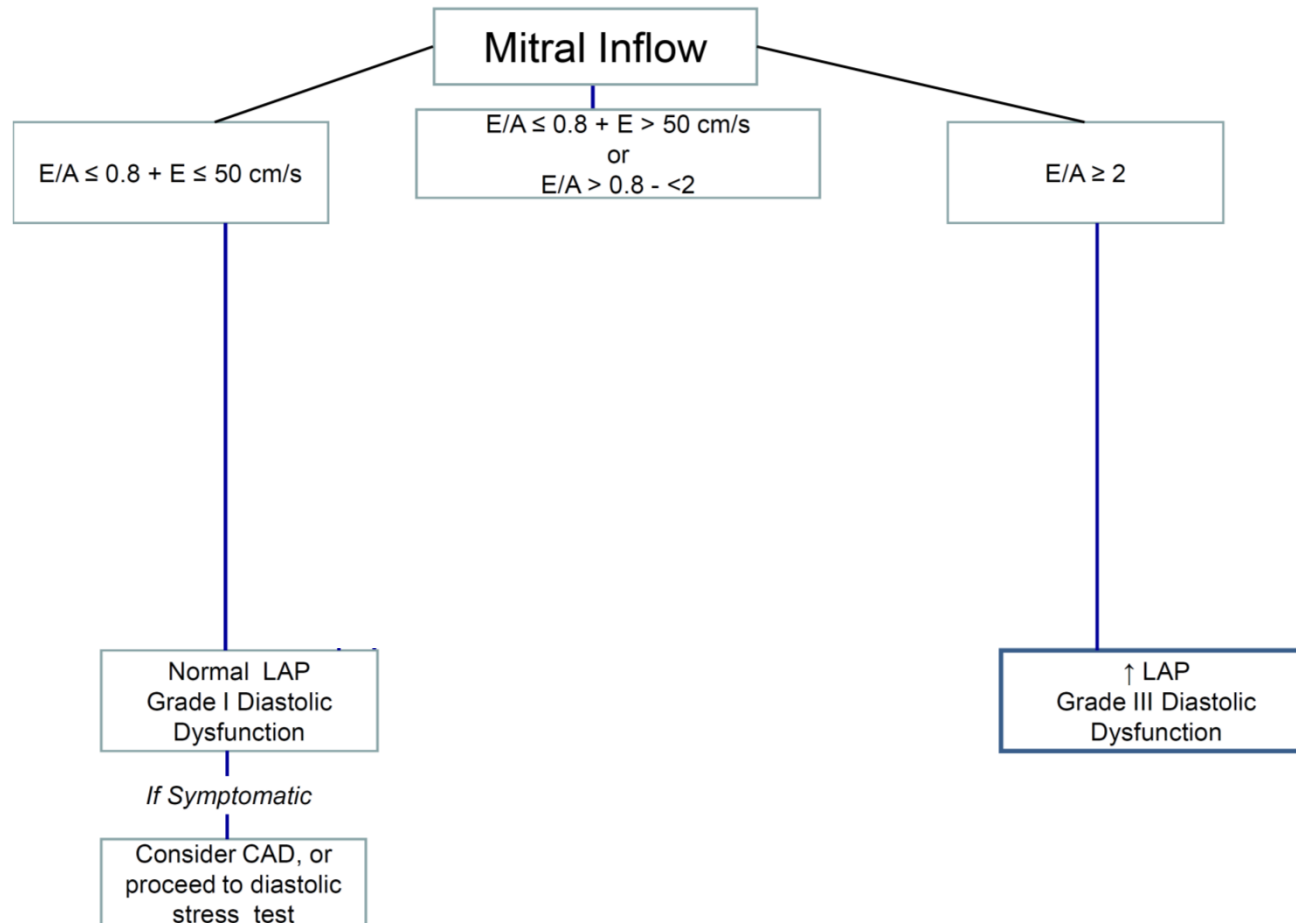
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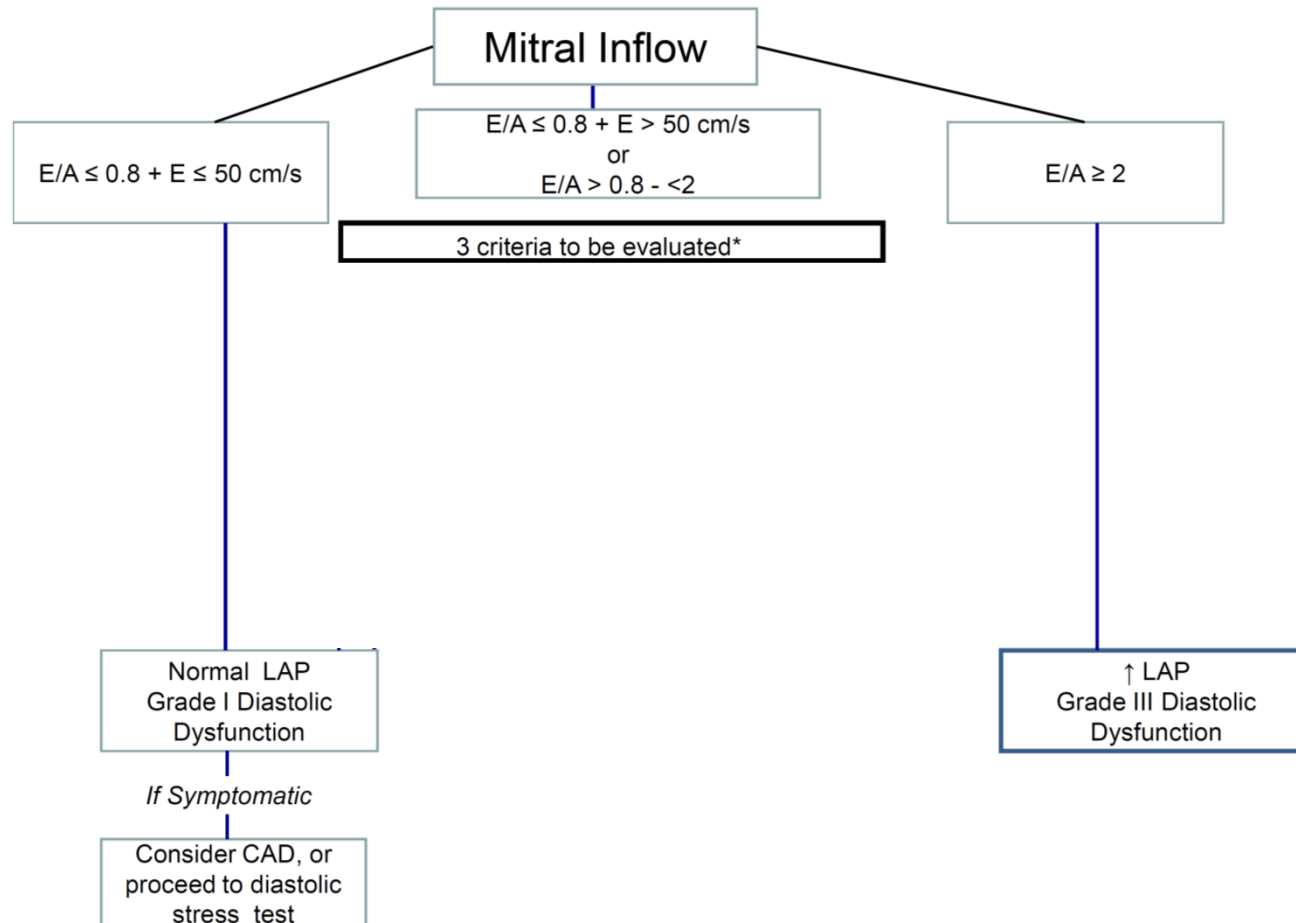
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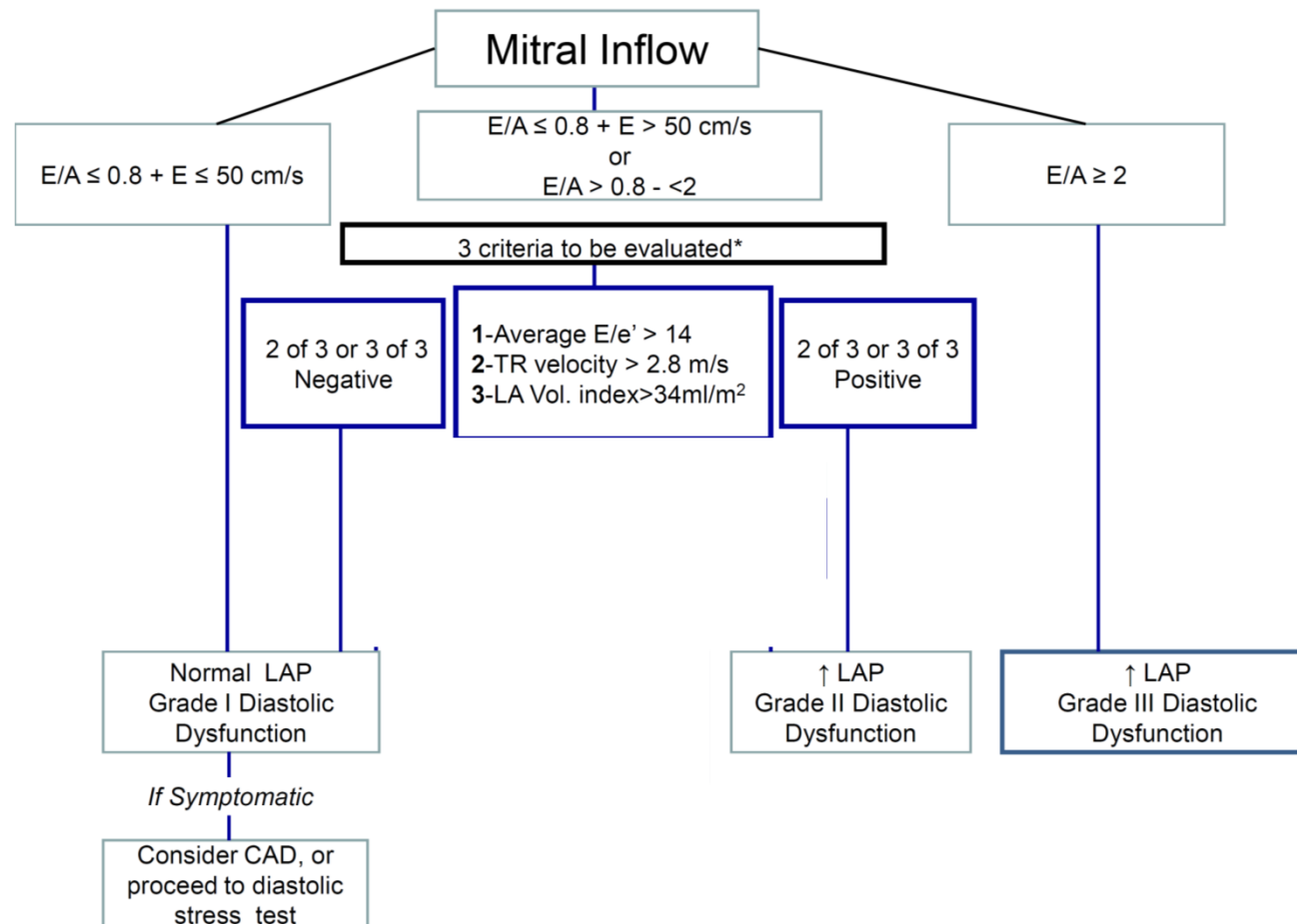
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Estimation of LV Filling Pressures/Grading LV Diastolic Function in Patients With Depressed LVEFs and With Myocardial Disease and Normal LVEF



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