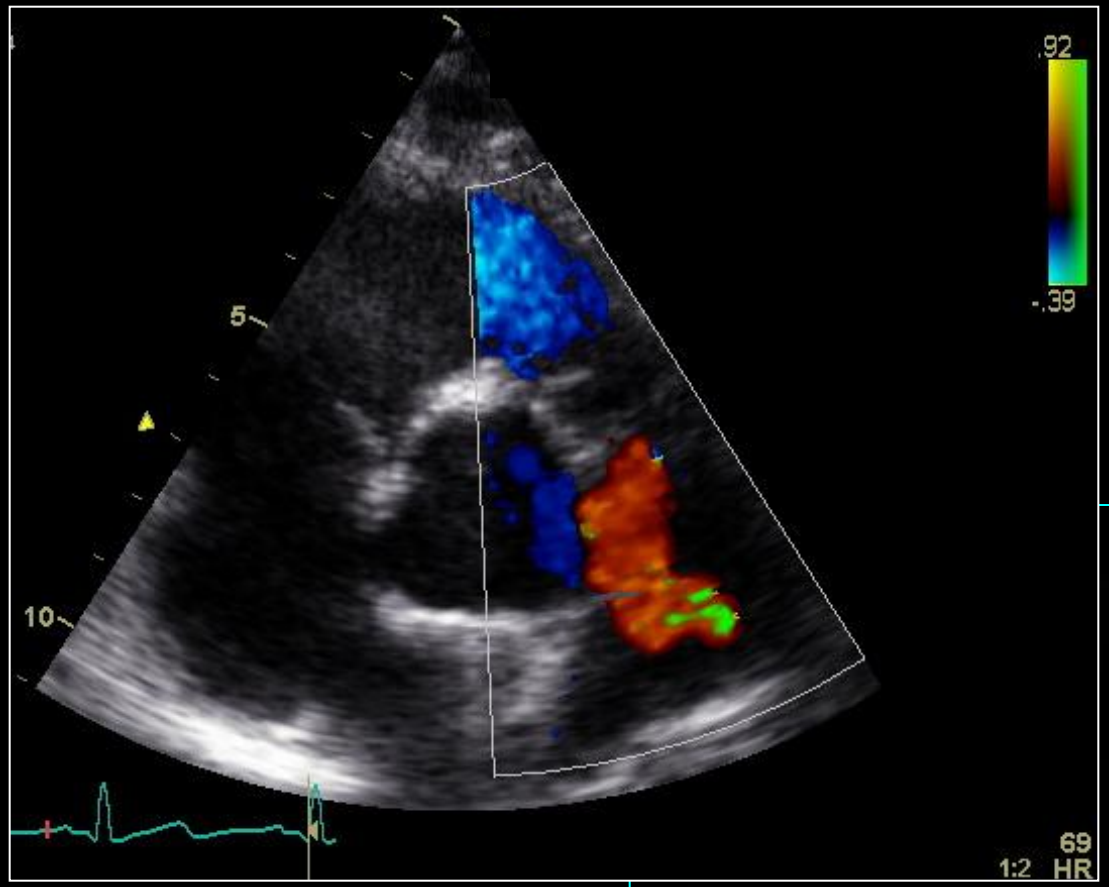
Standard echo examination

Prof. Dr. Alan Fraser

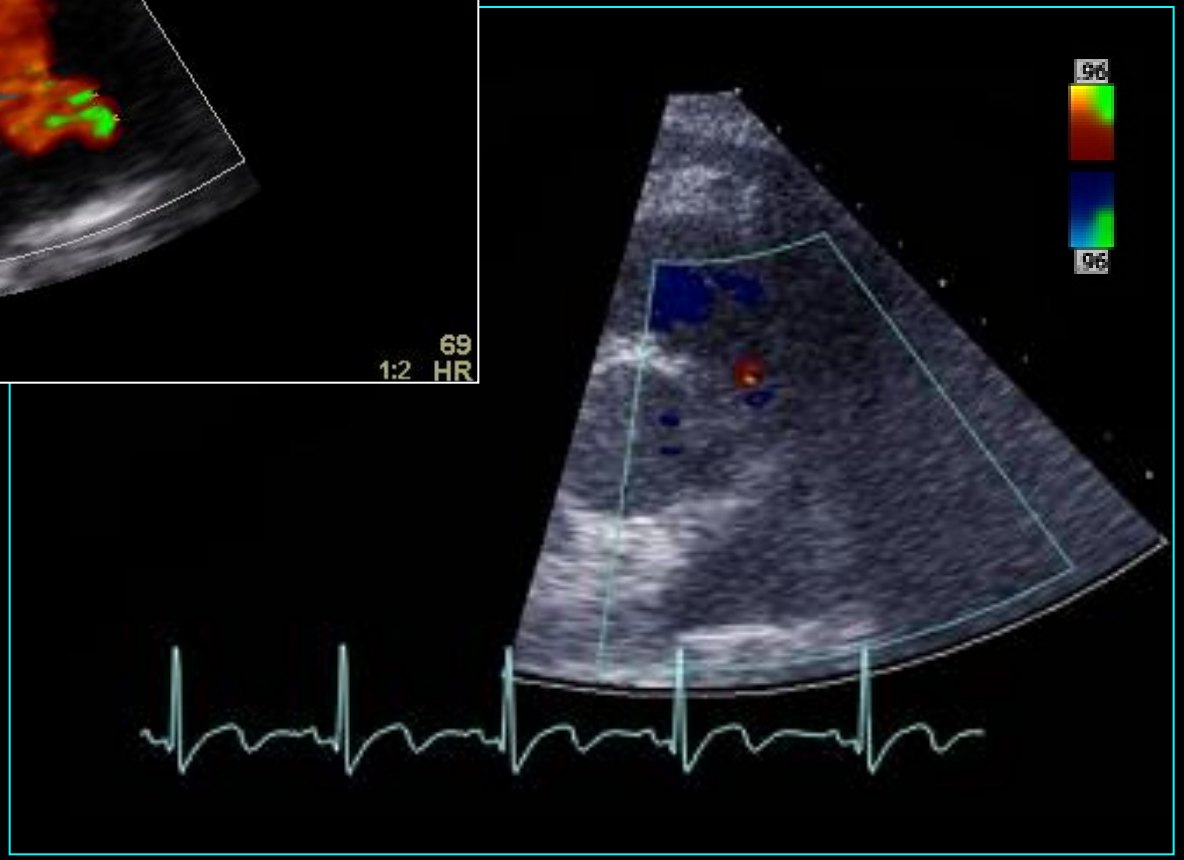
Cardiff University

Before starting the examination ..

- check the patient's details
- understand the clinical questions
- record patient's height and weight
- record / document arterial blood pressure
- allocate sufficient time (30-60 minutes)
- use good & well maintained echo



A 12-year old girl with a murmur

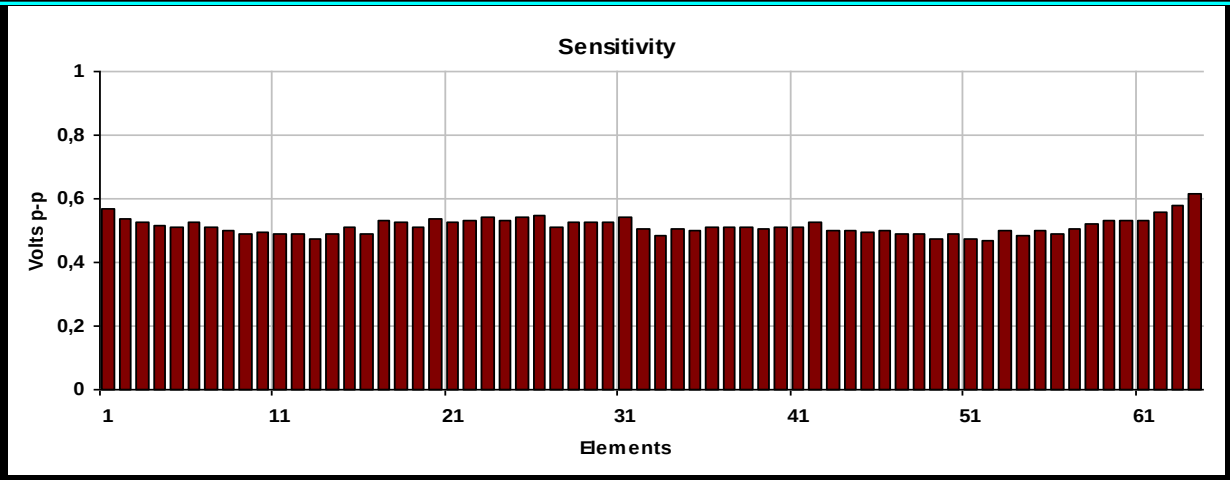


Echocardiogram performed 16 months previously

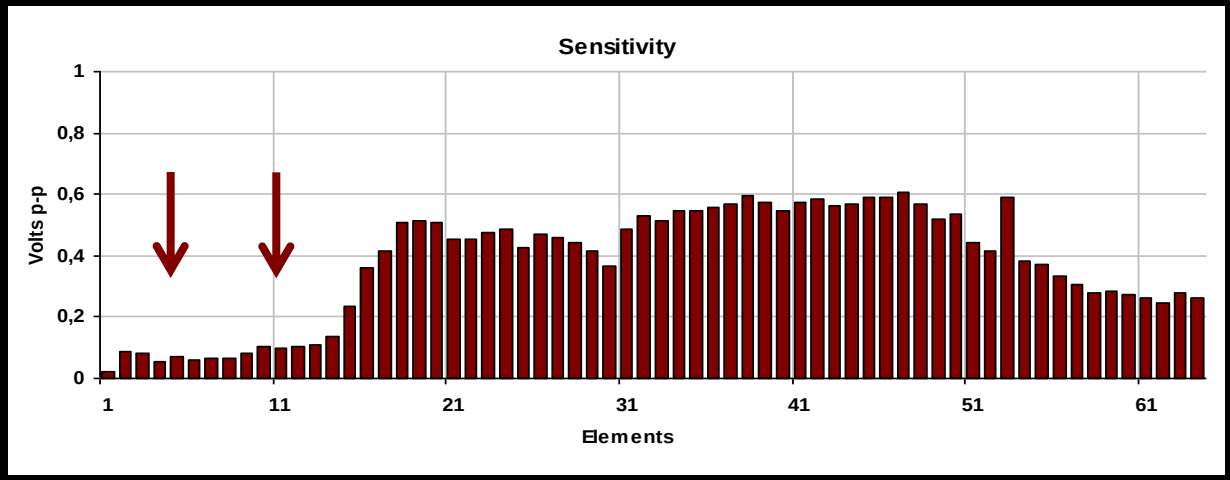
Performance of ultrasonic transducers

Sensitivity of individual elements

Performance of a normally functioning transducer



Testing of the transducer used in the clinical study



Sonora FirstCall Test

Testing of ultrasonic transducers in Sweden

676 transducers in routine clinical use in 32 hospitals

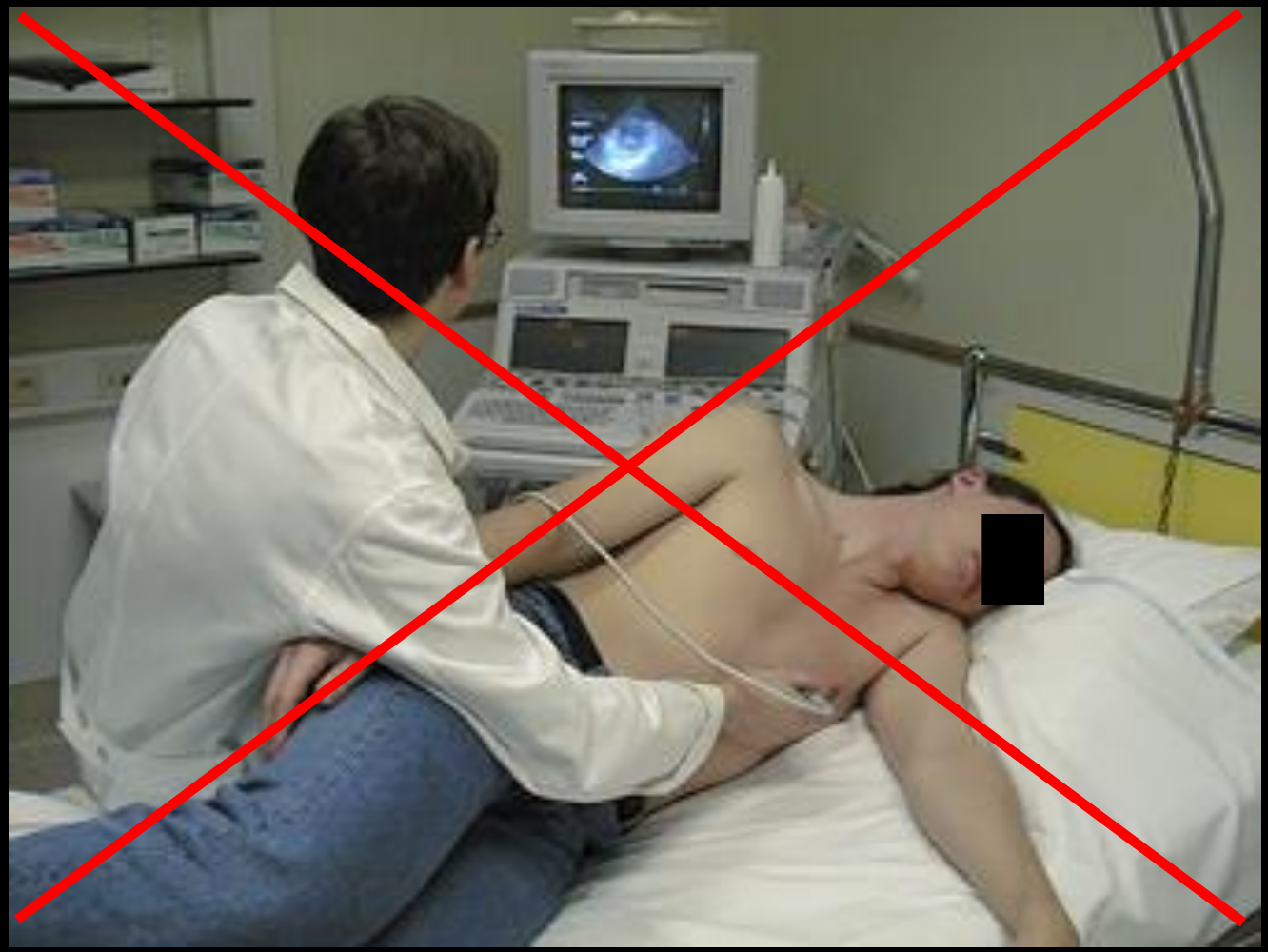
Transducer defect	**Number**	**Frequency %**	**95% CI %**
Delamination	179	26.5	23.5 - 29.8
Break in the cable	57	8.4	6.3 - 10.5
Short circuit	23	3.4	2.0 - 4.8
Weak elements	6	0.9	0.2 - 1.6
Dead elements	4	0.6	0 - 1.2
Total	**269**	**39.8**	—

Mattias Mårtensson, Eur J Echocardiogr 2009;10:389-94

How to set up the **patient**

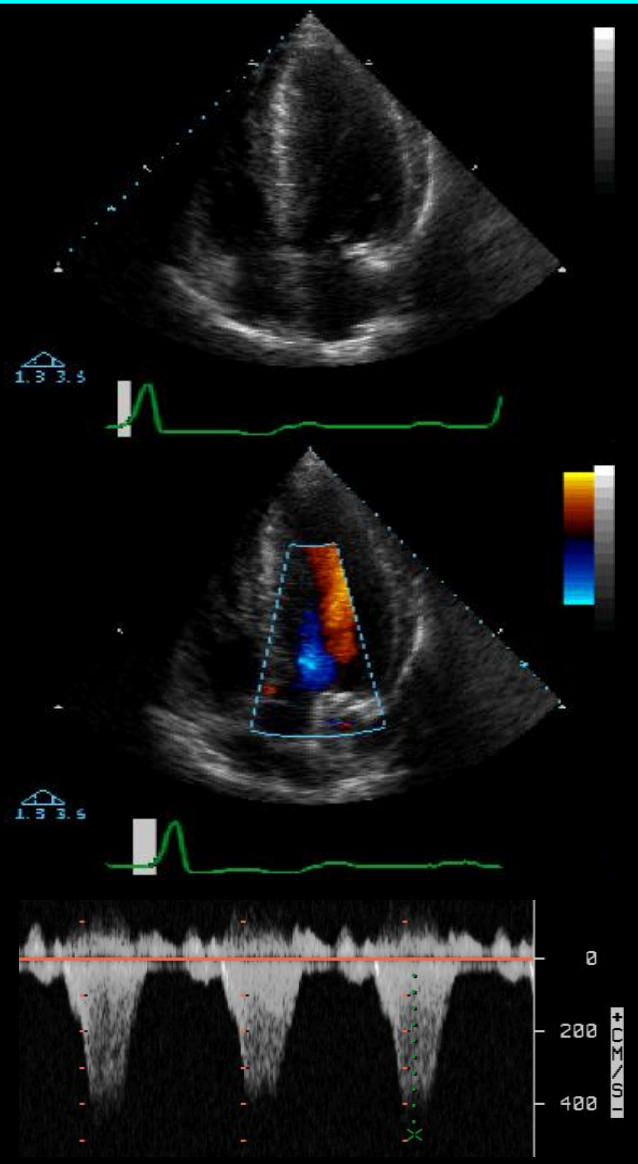
- steep left lateral (decubitus) position
- unrestricted access to the apex
- patient comfortable
- good-quality ECG (large R wave amplitude)
- operator comfortable (straight back)

How to set up the **patient**

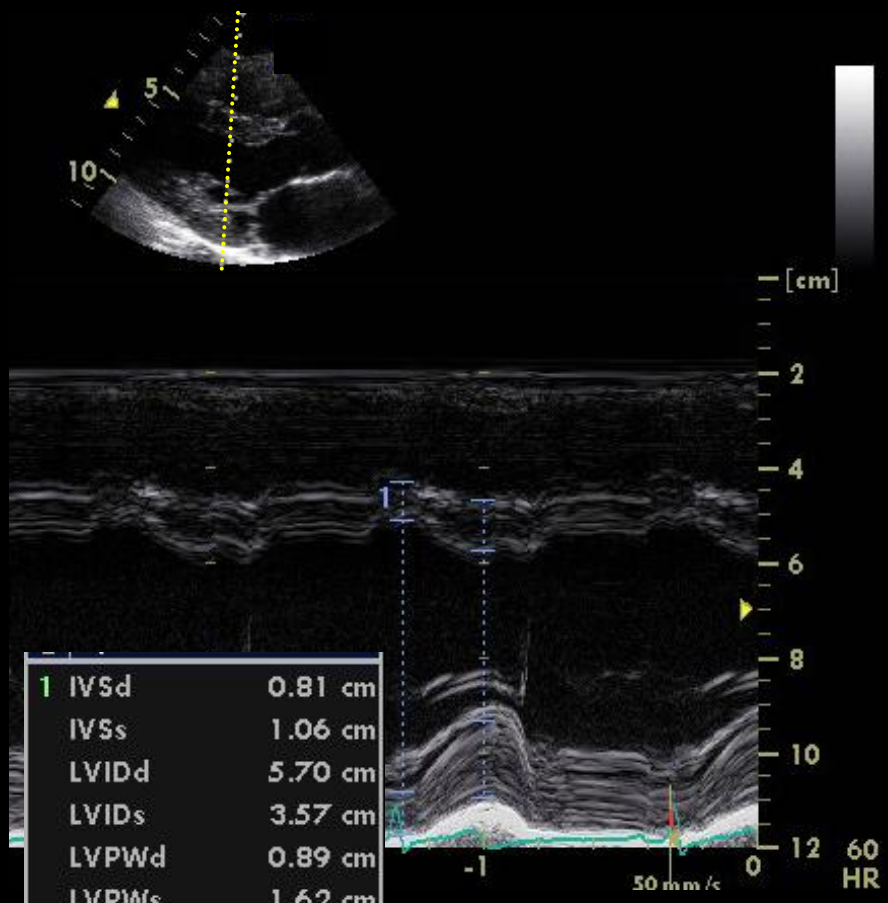


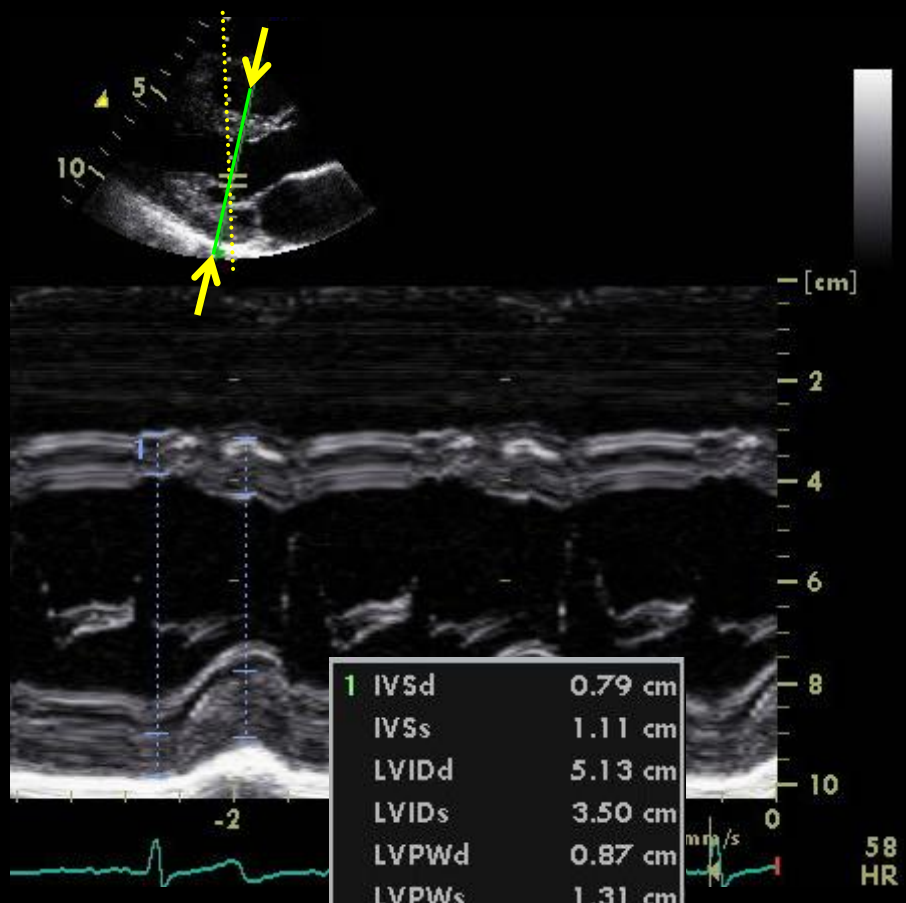
Use a **systematic** approach

- Structure / morphology
  2D, (3D)
  M-mode, anatomical M-mode
- Function / flow
  M-mode, colour M-mode
  Colour flow mapping
  Myocardial velocity imaging
- Haemodynamics
  Continuous wave
  Pulsed Doppler *with sound*



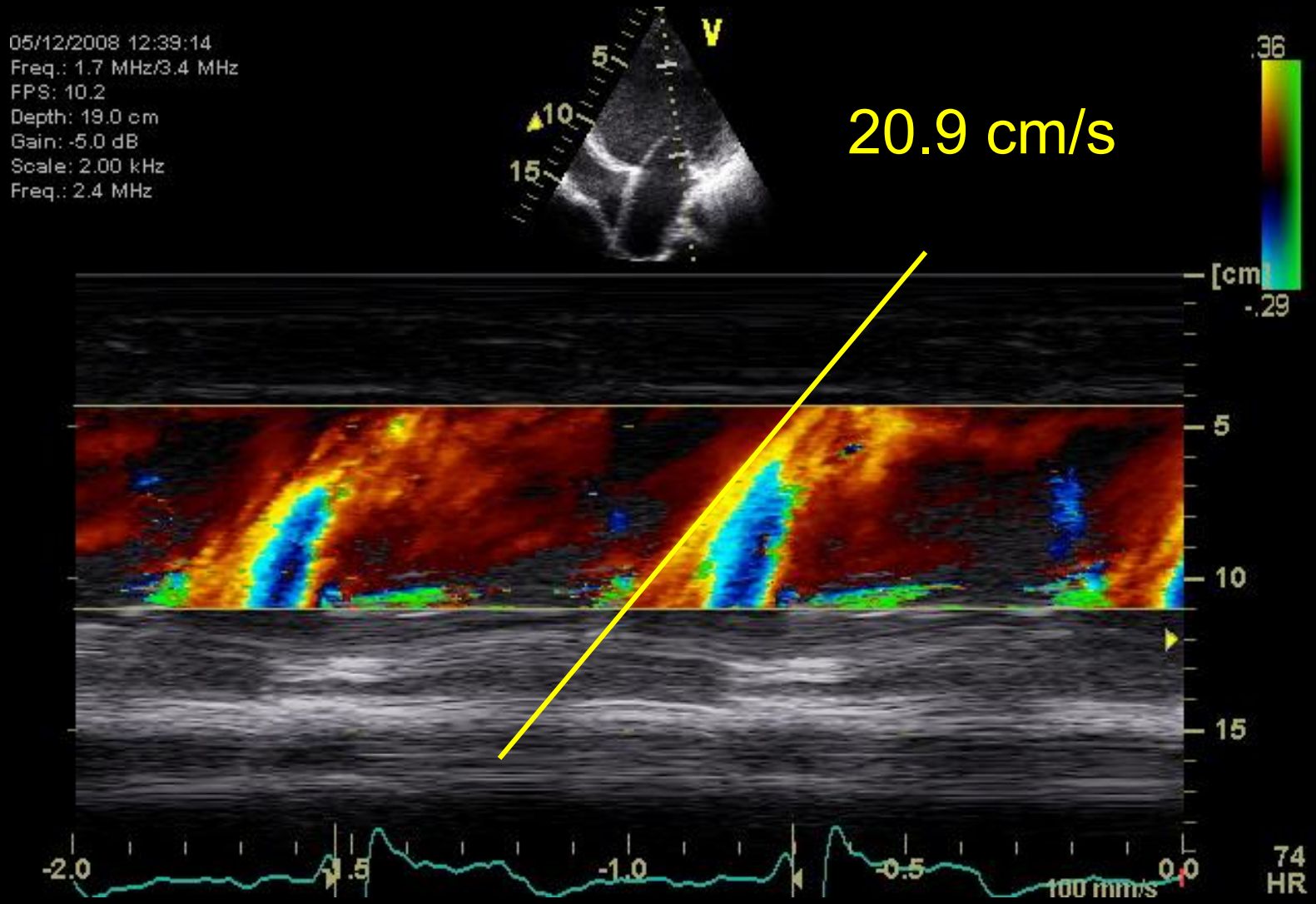
Use anatomical M-mode for good alignmen

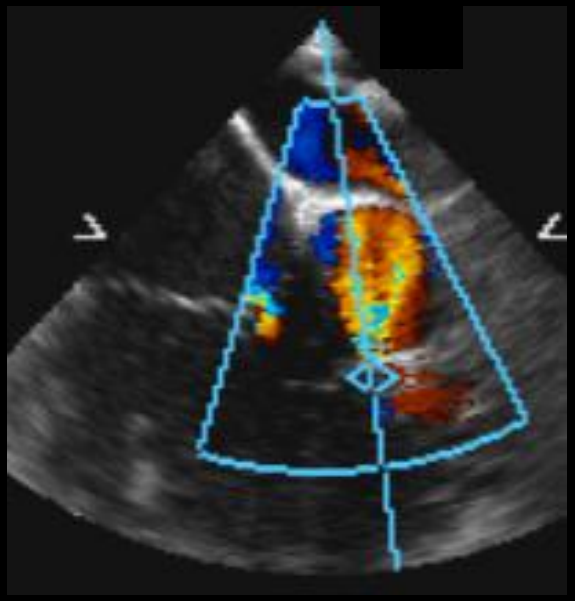


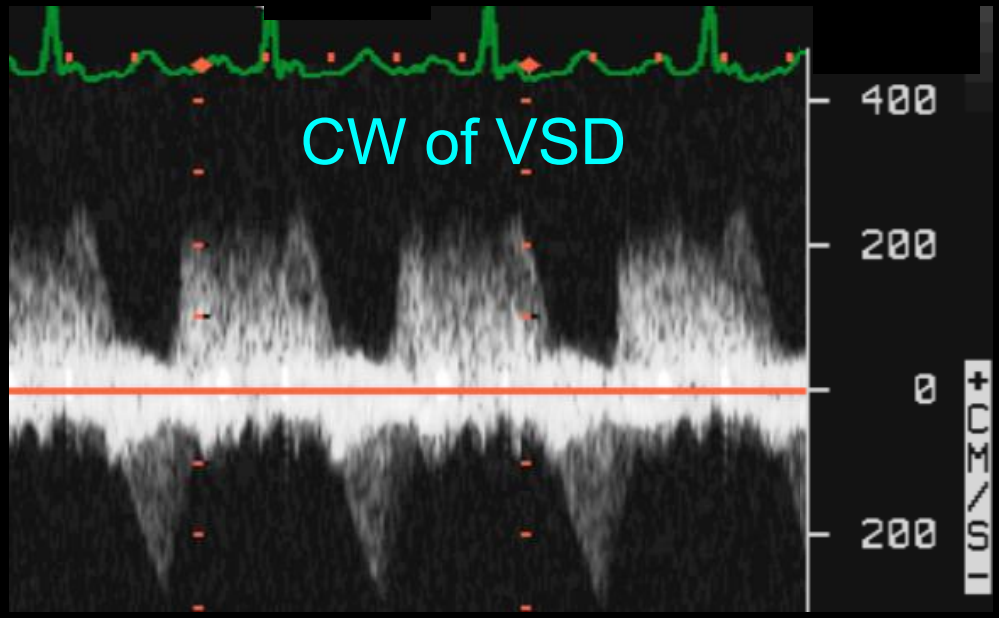


Don’t use Teichholz !

Colour M mode: flow propagation velocity

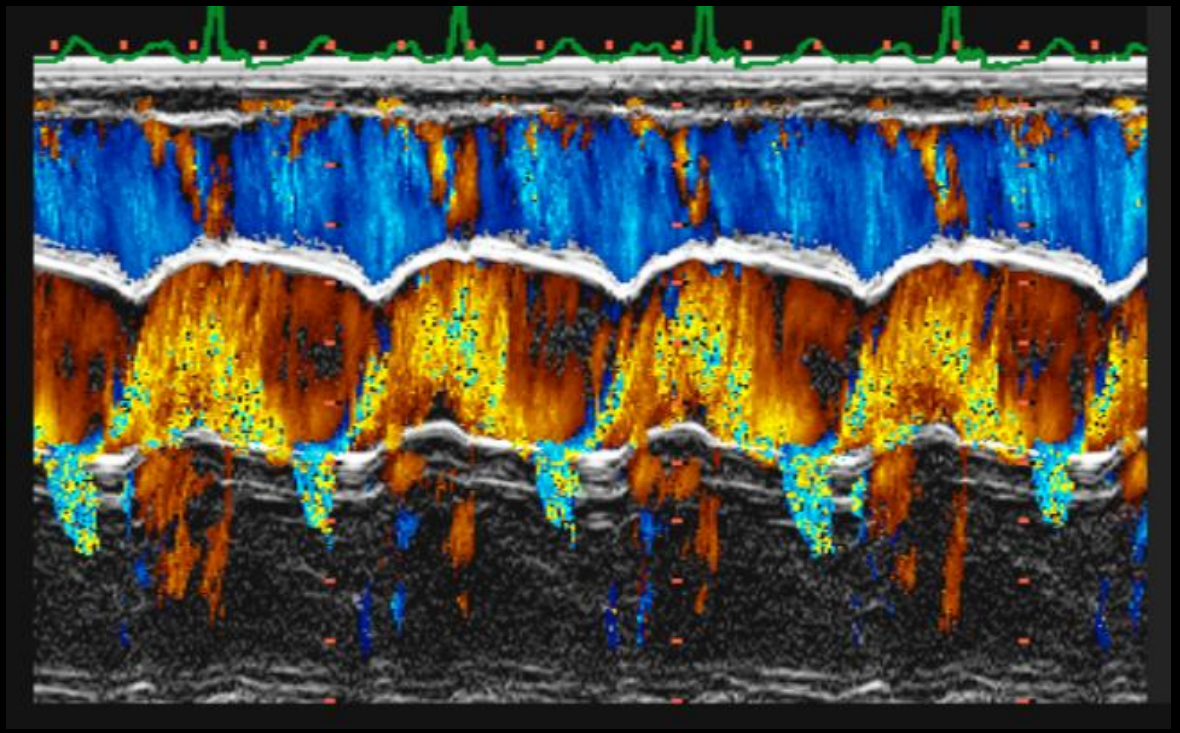






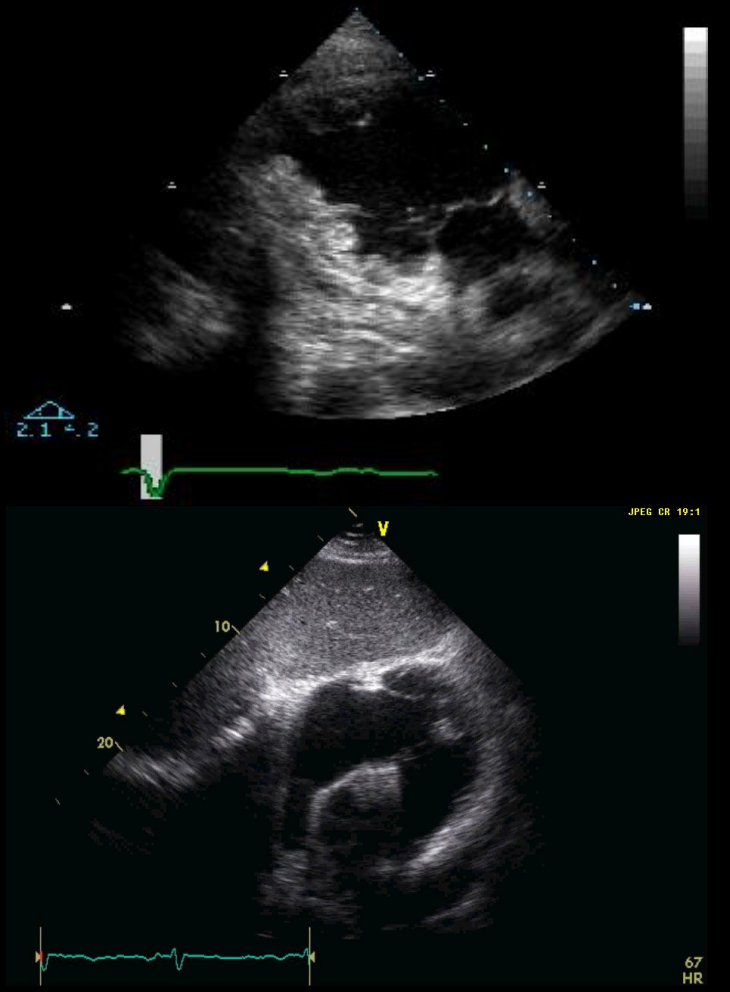
Colour M-Mode (MQ)

High spatial & temporal resolution for resolving flow events



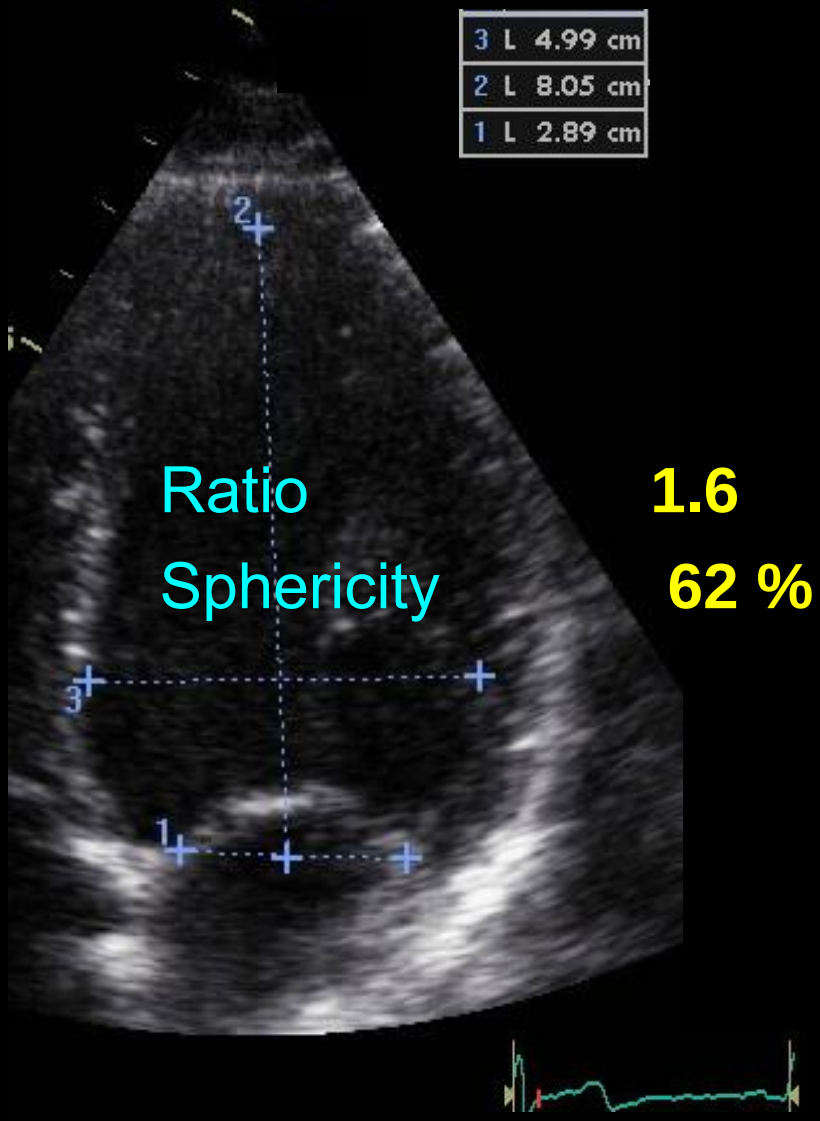
Use **every view, every time**

- Parasternal long axis
  - RV inflow & outflow
- Parasternal short axis
  - AV, basal, mid, apical LV ..
- Apical views
  - A4C, A2C, APLAX ..
- Subcostal views
- Suprasternal views



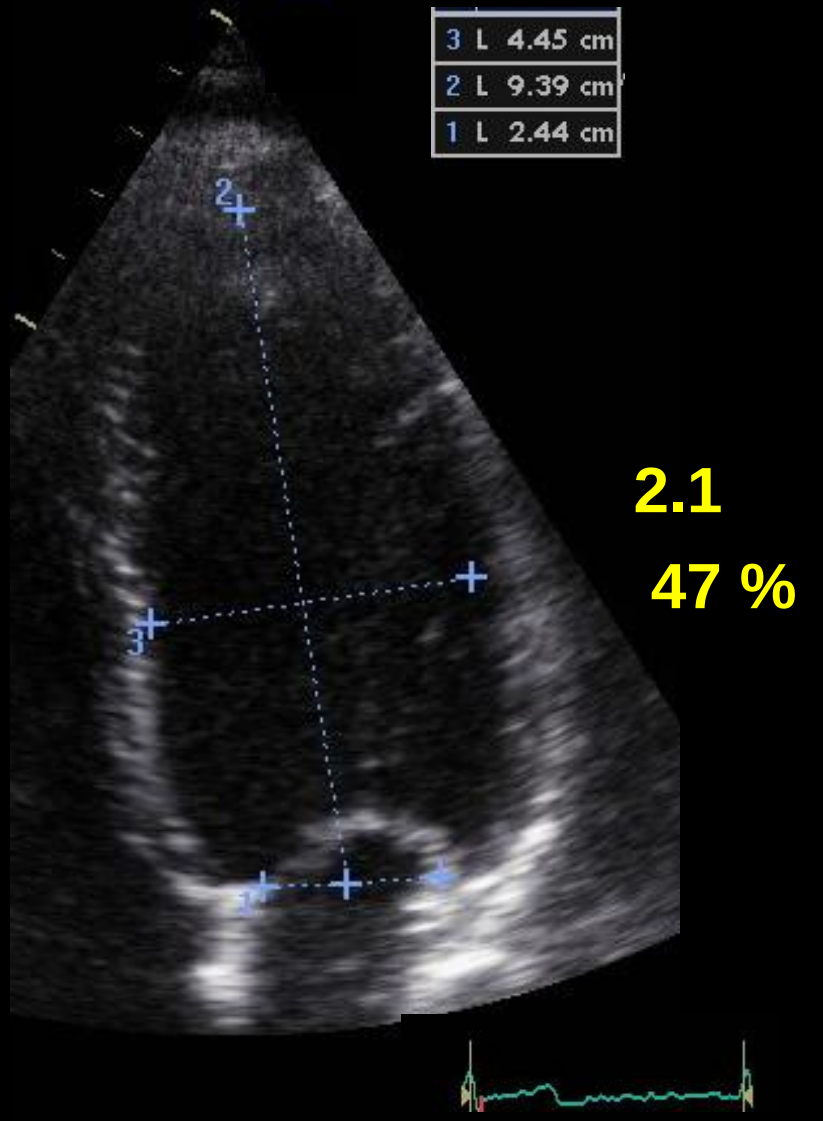
<u>and</u> SCAN the whole structure !

Try to avoid apical foreshortening



1.6

62 %



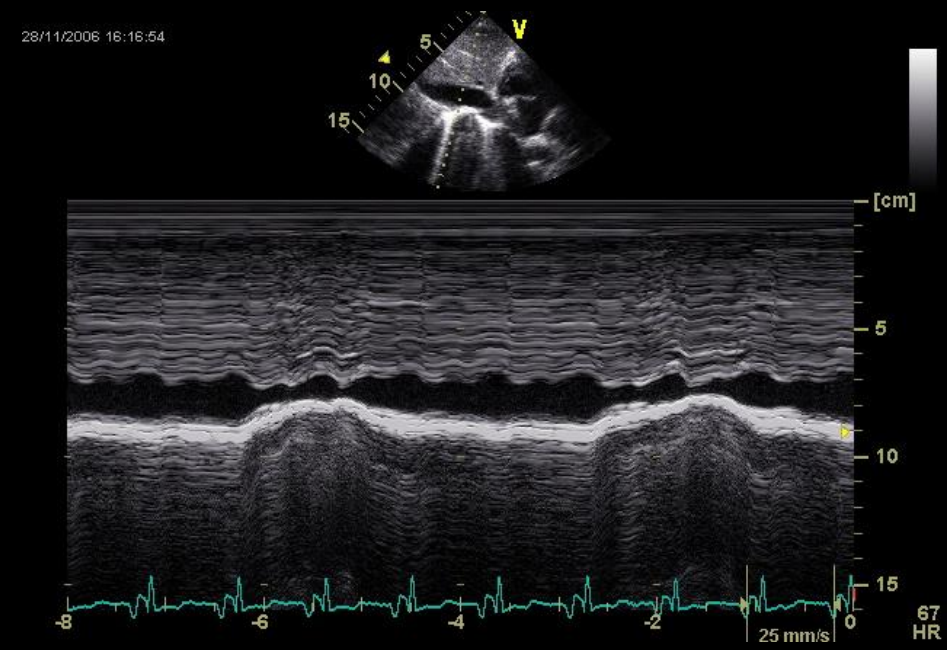
2.1

47 %

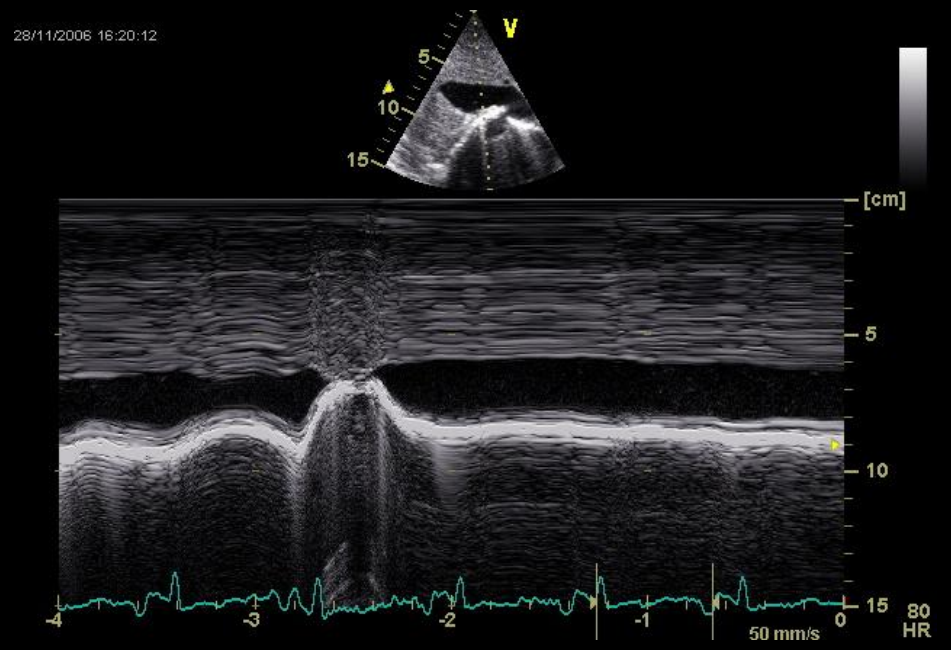
Estimation of right atrial pressure

Change in diameter of inferior caval vein

Inspiration



Sniff



Non-invasive estimation of right atrial pressure

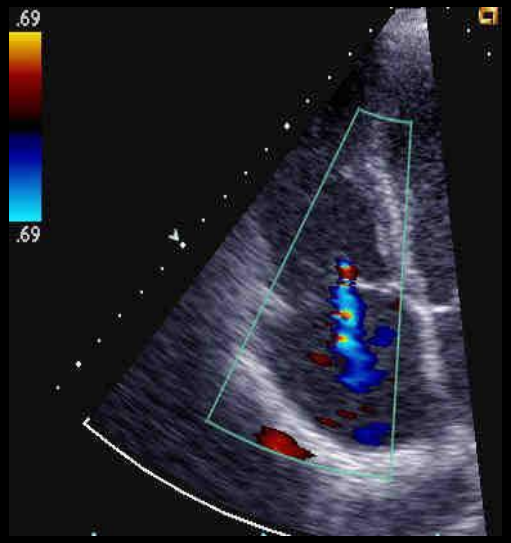
	Sensitivity %	Specificity %
RA vol min >30 cm^3	44	90
RAEF <40%	56	87
IVC collapse <50%	72	76
Tricuspid E/A ratio <1.1	66	92
Hepatic vein SFF <55%	86	90

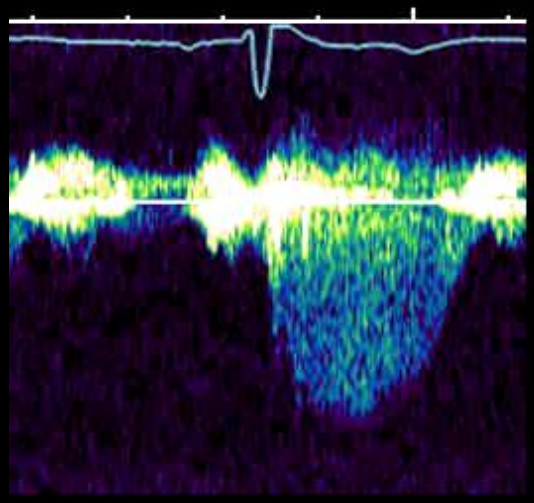
Nagueh SF et al, Circulation 1996; 93: 1160-9

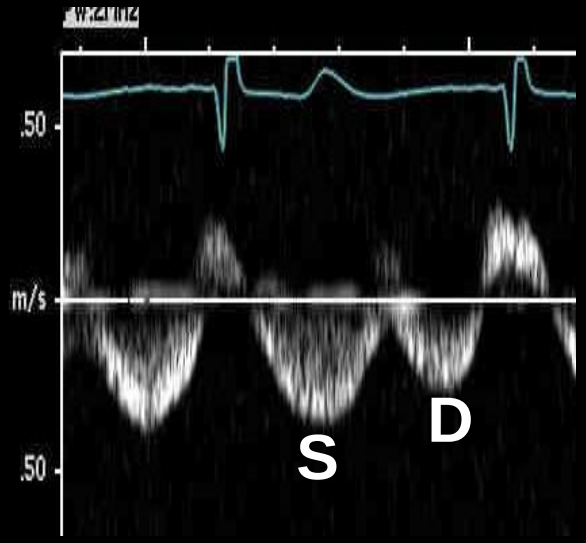
Diagnosis of tricuspid regurgitation

Color Doppler | CW Doppler | Hepatic Vein Flow

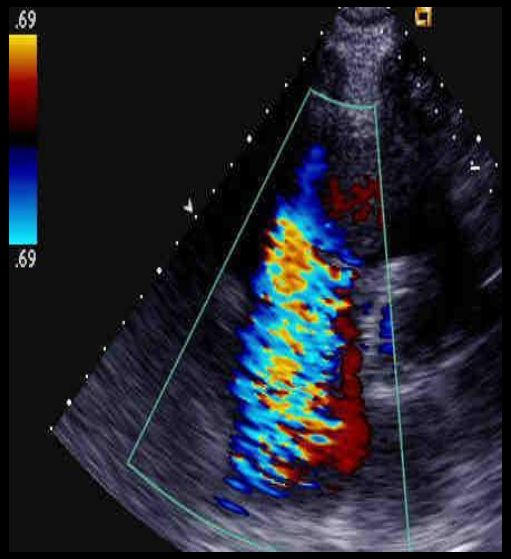
Mild TR

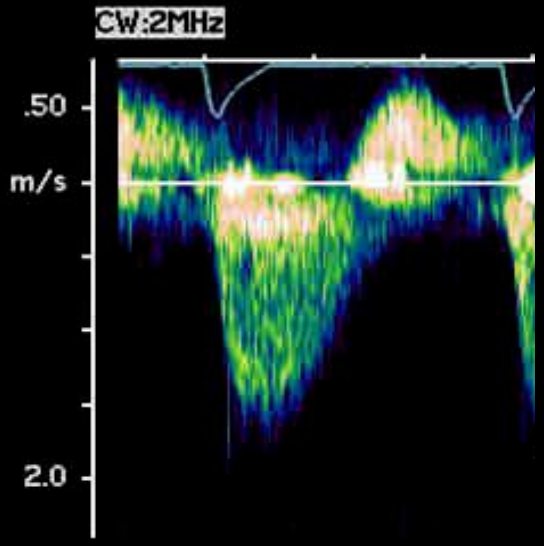


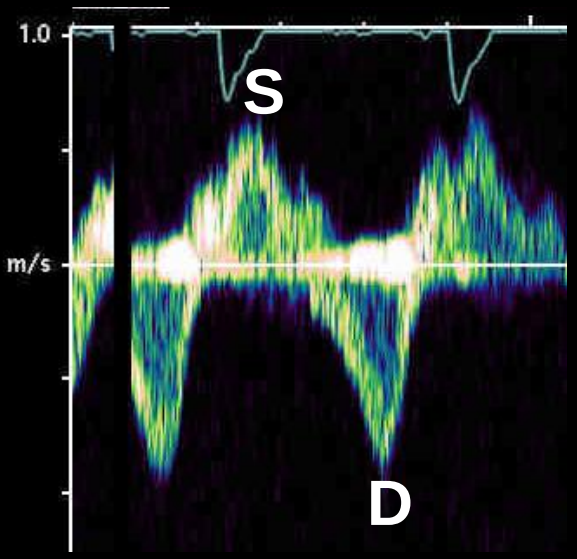




Severe TR

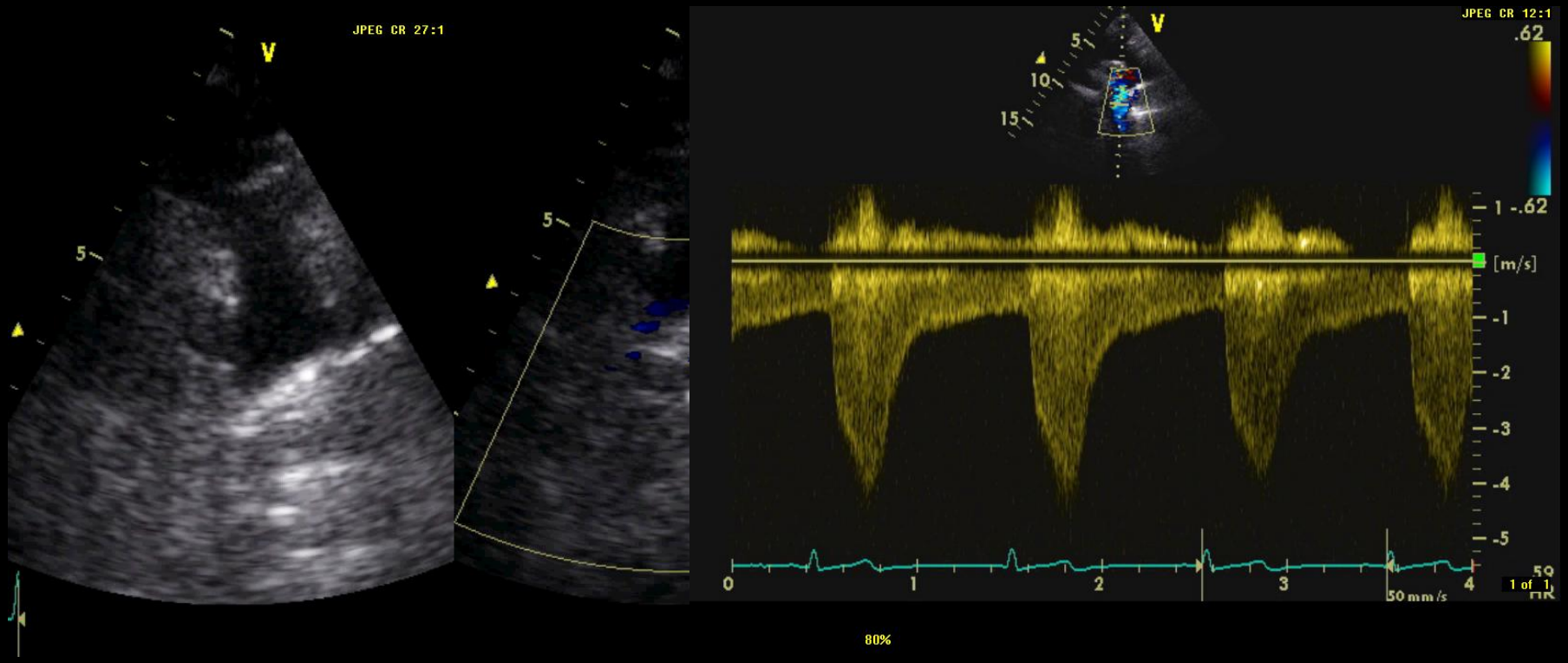






Suprasternal imaging of aorta

34yr ♂, bicuspid aortic valve

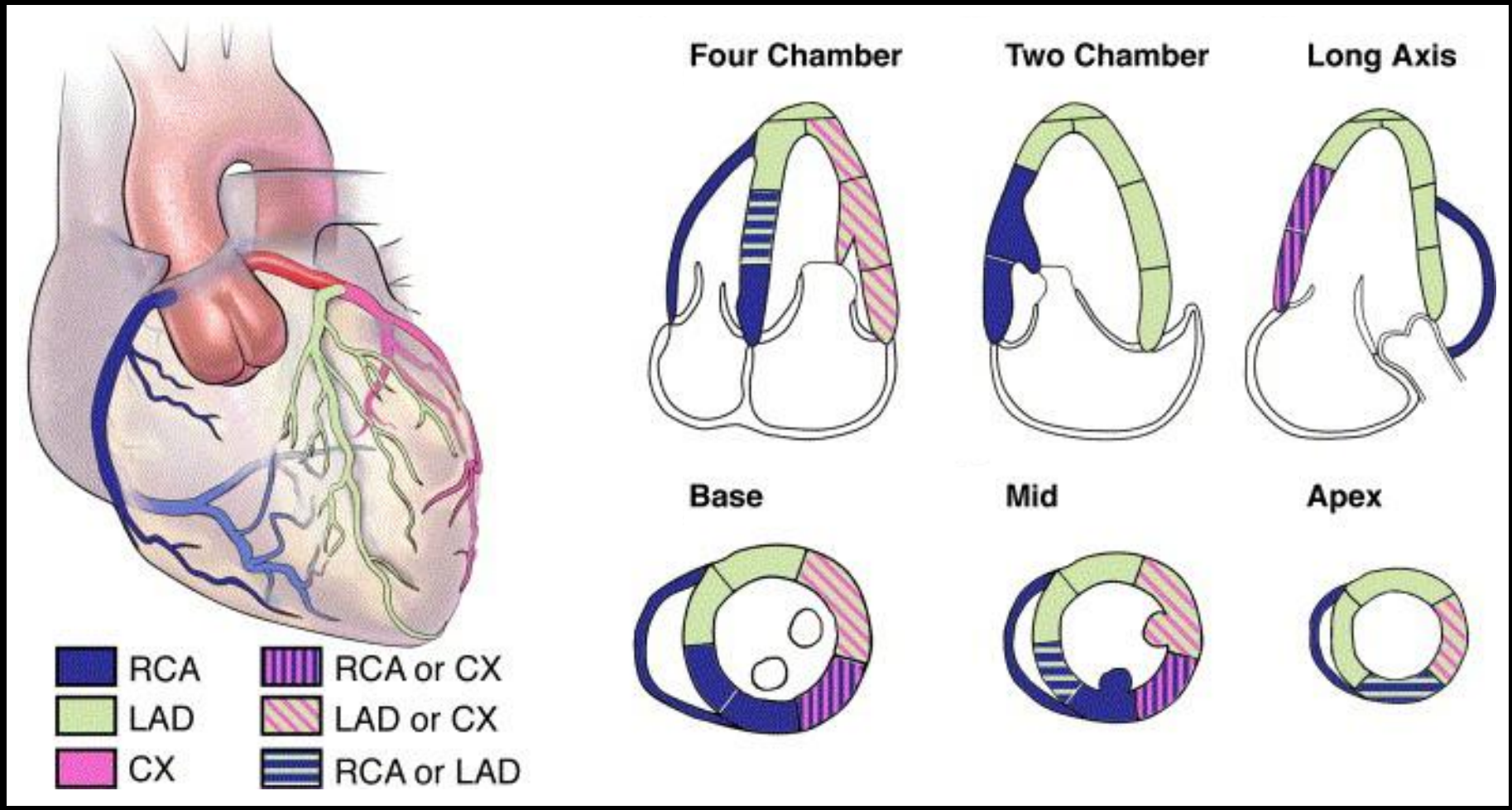


Recording and reporting

- Store digital images and loops
  - including multiple beats
- Always review the study when reporting
- Measure, don't guess ..
  - ejection fraction *and* LV volumes
- Index for body surface area
- Compare with age-derived normal values
- Answer the clinical question ..

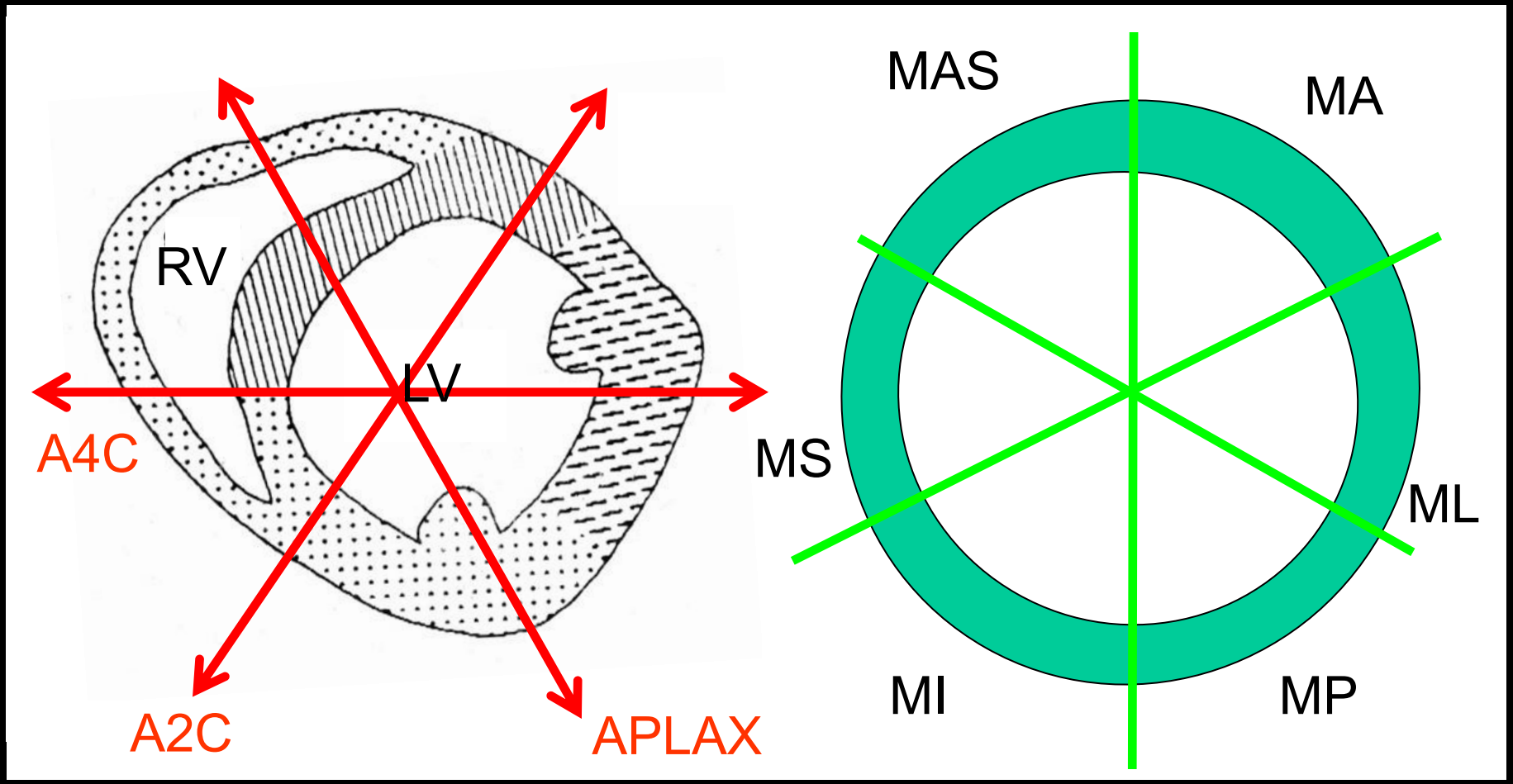
EJE 2006; 7: 79

+ 60° **+ 120°**

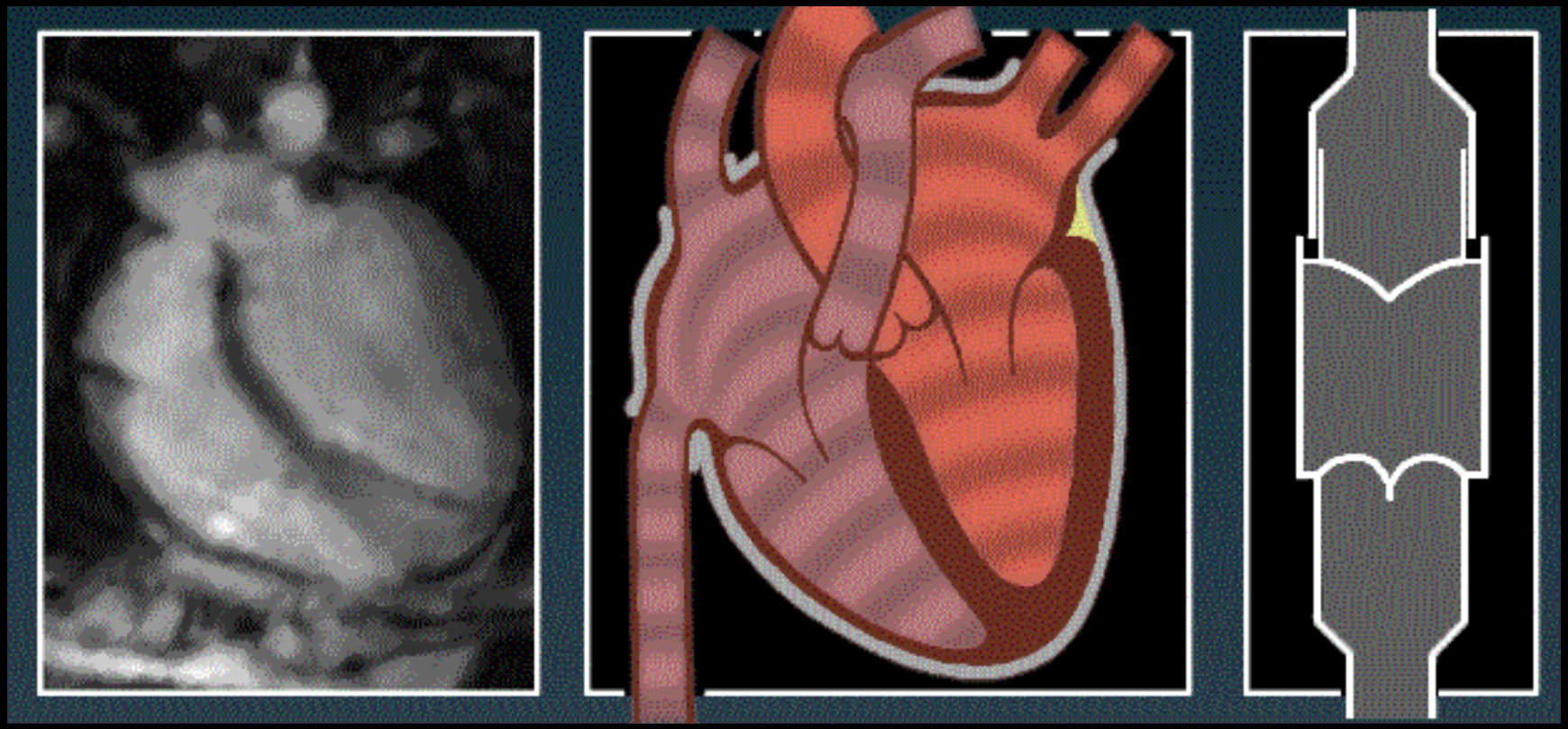


ASE 16 segment model – *now 17*

Echocardiographic segmentation



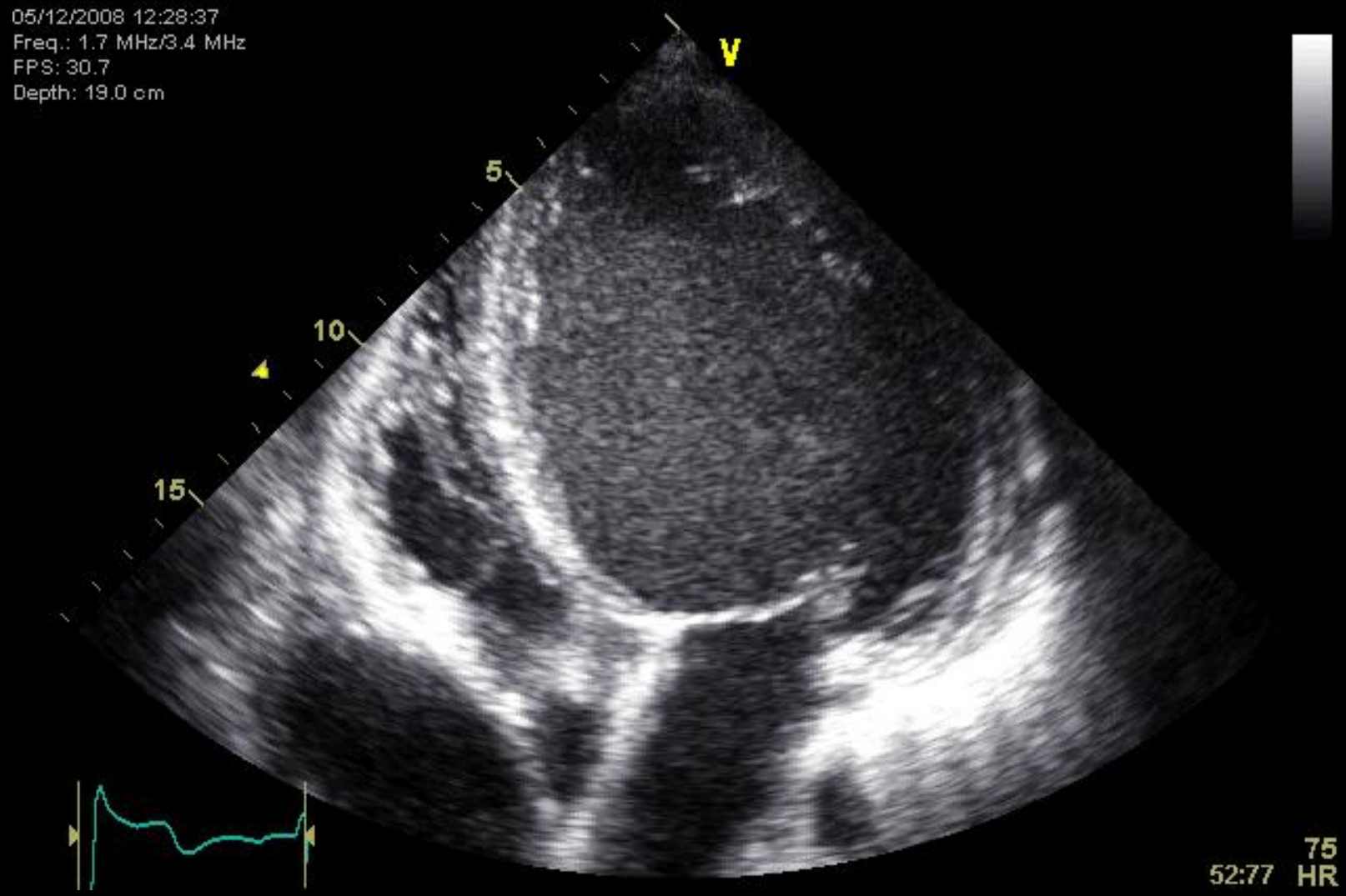
The normal heart is a piston pump ..



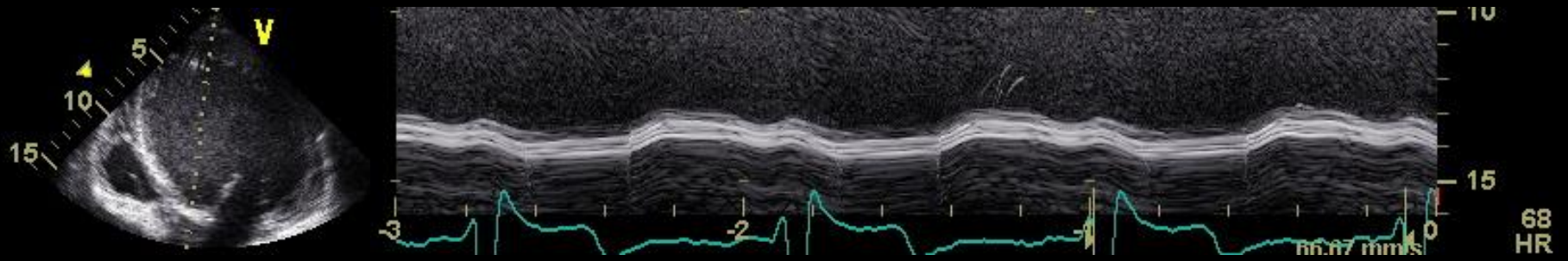
Stig Lundbäck and Lars-Åke Brodin

.. so analyse & report long-axis function,
and not just global & radial function

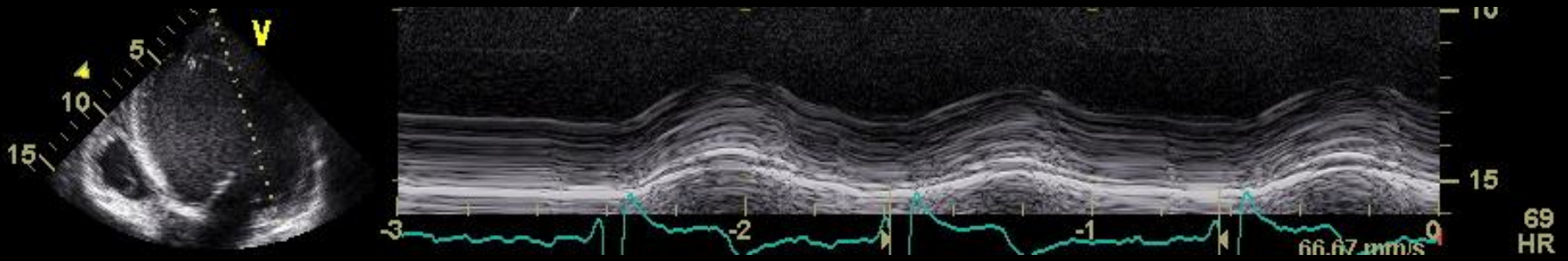
M aged 42 y, AVR for dissection with AR



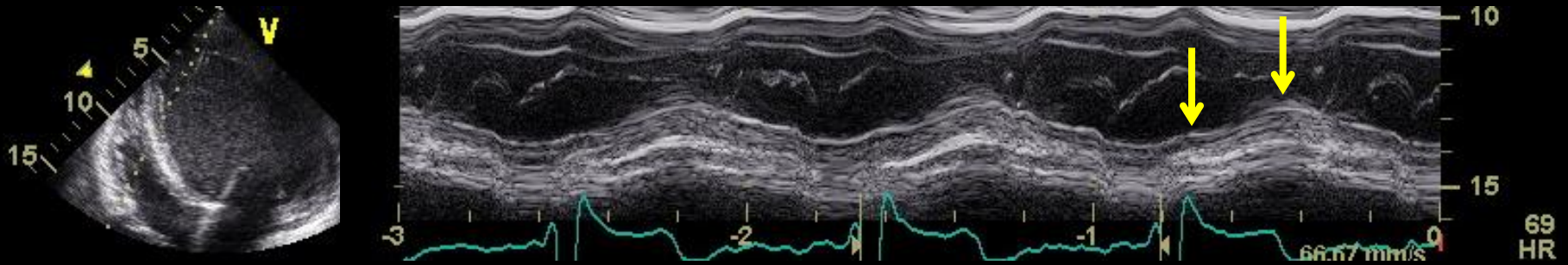
Medial mitral annulus



Lateral mitral annulus



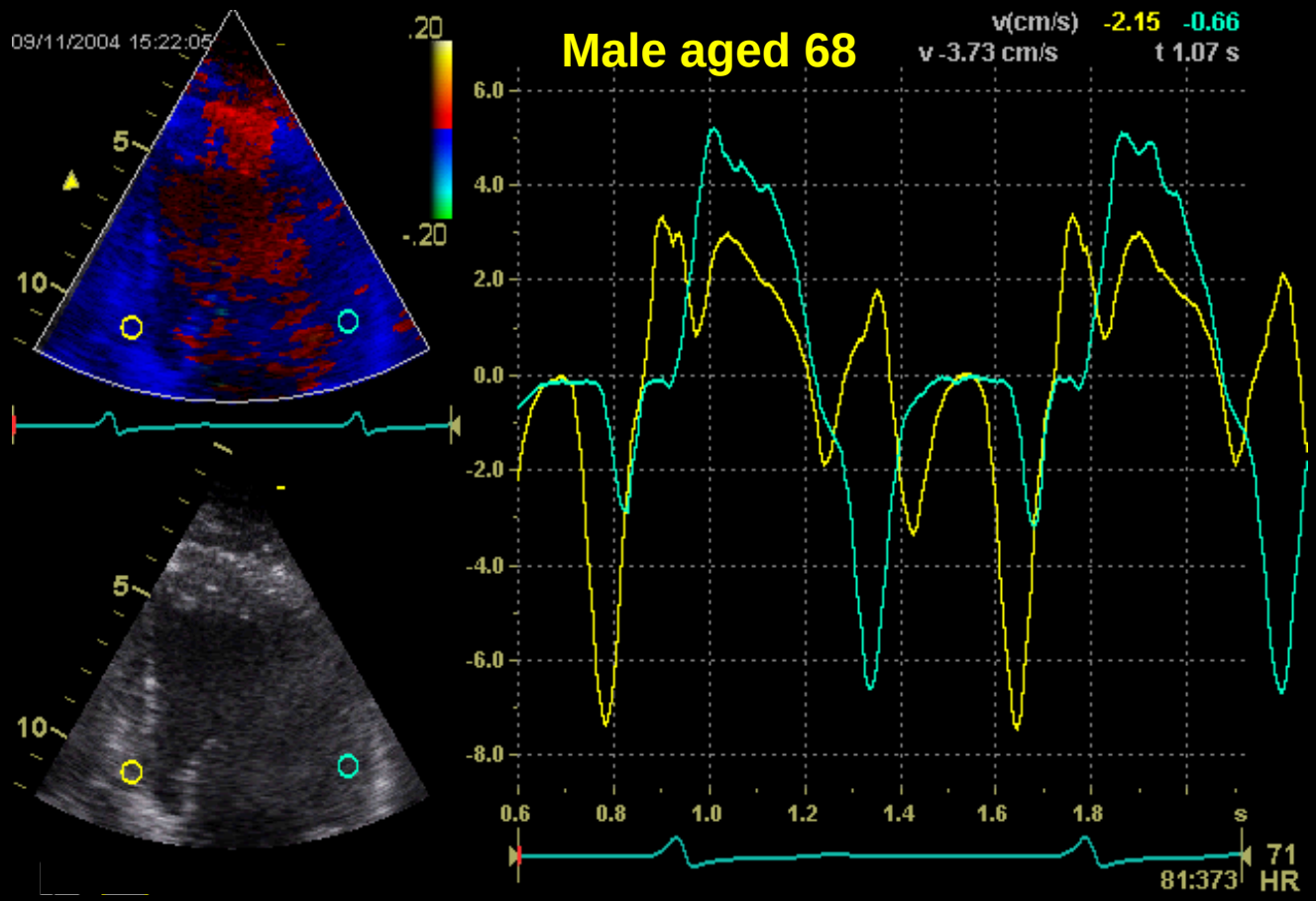
Tricuspid annulus

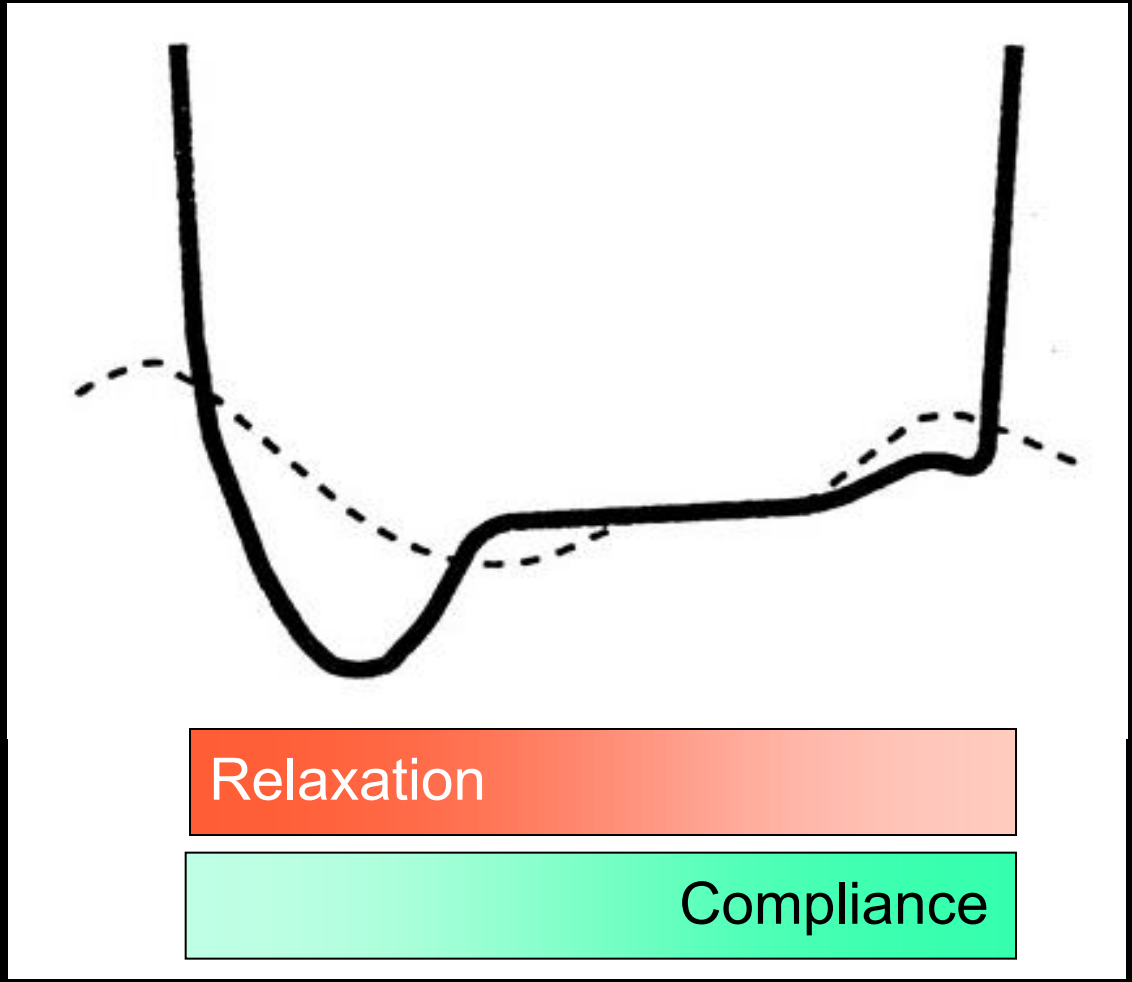


Don’t make diastole too simple

– remember normal patterns of ageing

– assess both relaxation & stiffness/filling

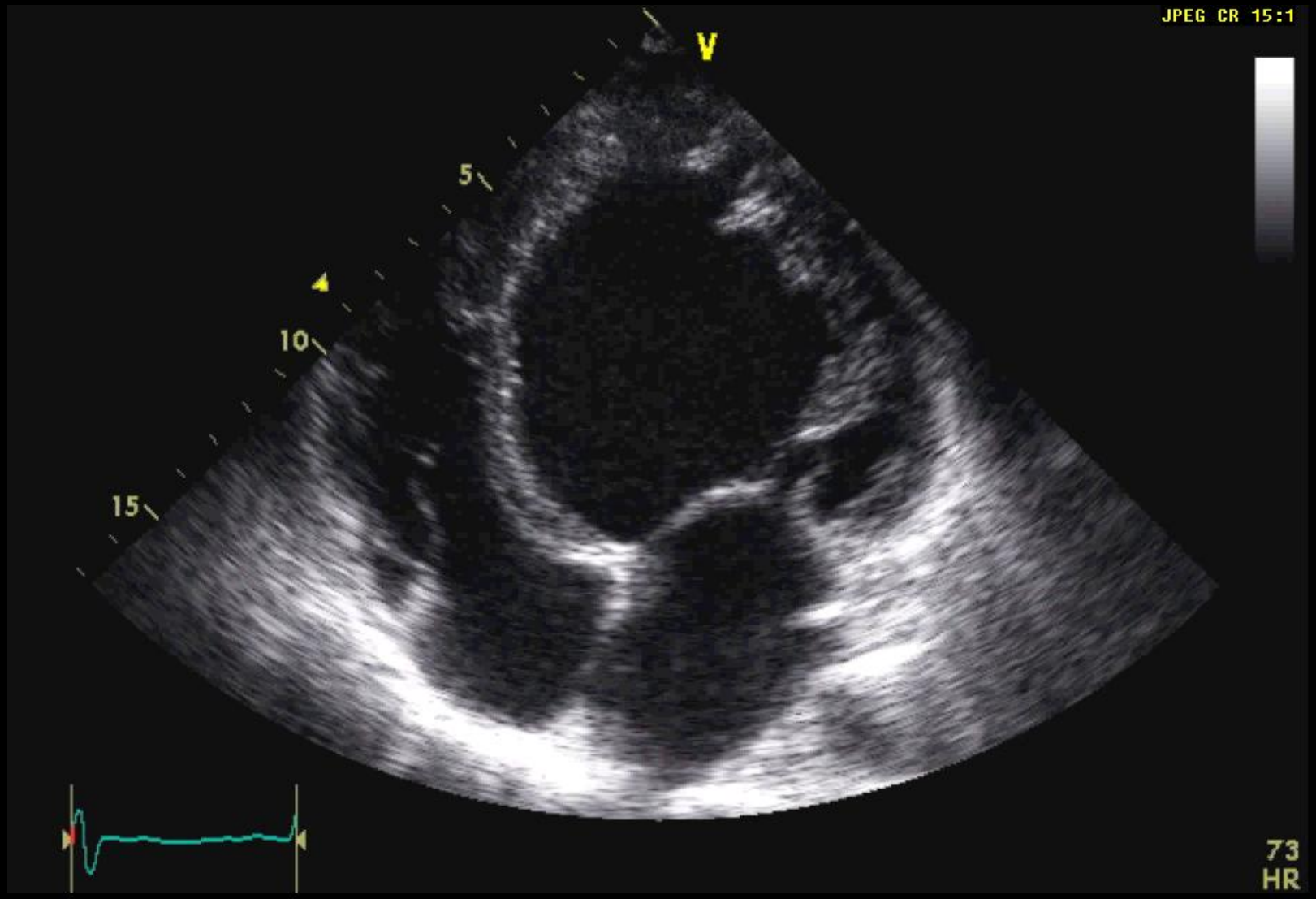




E/A ratio, E deceleration time
Isovolumic relaxation time
Flow propagation velocity
Myocardial Ve, Se, SRe

Short duration A wave
Increased PV reversed flow
E/e' ratio (E/a)
Left atrial volume

A 24-year old man referred with a “chest infection”

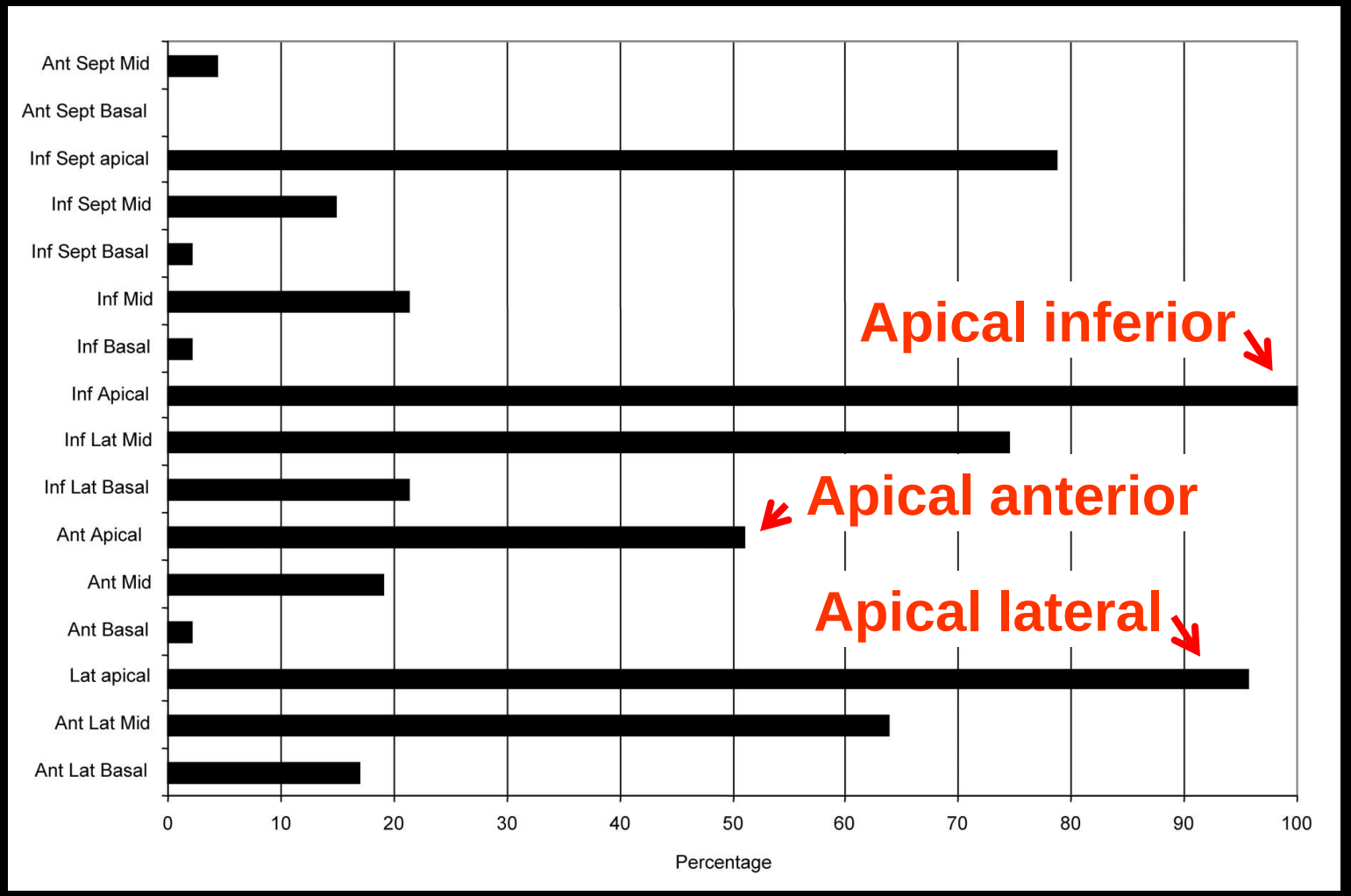


Be critical and avoid fashion ...

Normal cardiac morphogenesis

Courtesy of Dr Tim Mohun

Normal regional variations in trabeculations



Kohli SK et al, Eur Heart J 2008; 29: 89-95

Improving quality & clinical outcomes

- Base practice on evidence & clinical impact
- Implement quality-improvement programmes
- Use echo with other imaging modalities

Not just better pictures

but more information about function