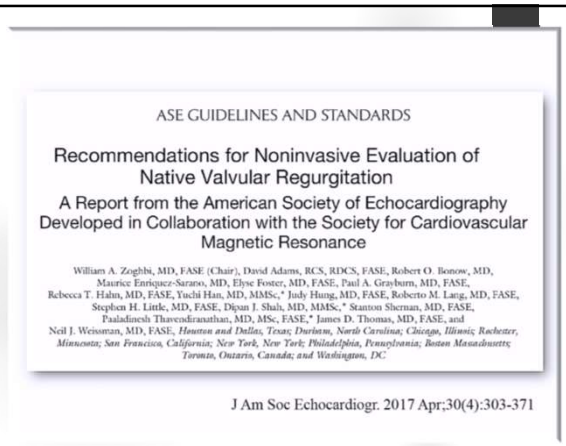
The <u>New</u> ASE Guidelines for Native Valvular Regurgitation

Dr. Yong Quek Wei
MBBS, LRCPI, MRCPI, FRCPI, FAMS,
Senior Consultant Cardiologist and Physician
Director
Non Invasive Cardiac Laboratory
Dept of Cardiology
Tan Tock Seng Hospital
Disclosure: advisory boards for MSD, Servier, Am gen, pfizer, sanofi,
Grant reviewer NMRC, SingHealth, ASTAR



ASE GUIDELINES AND STANDARDS

Recommendations for Noninvasive Evaluation of Native Valvular Regurgitation

A Report from the American Society of Echocardiography Developed in Collaboration with the Society for Cardiovascular Magnetic Resonance

William A. Zoghbi, MD, FASE (Chair), David Adams, RCS, RDCS, FASE, Robert O. Bonow, MD, Maurice Enriquez-Sarano, MD, Elyse Foster, MD, FASE, Paul A. Grayburn, MD, FASE, Rebecca T. Hahn, MD, FASE, Yuchi Han, MD, MMSc,* Judy Hung, MD, FASE, Roberto M. Lang, MD, FASE, Stephen H. Little, MD, FASE, Dipan J. Shah, MD, MMSc,* Stanton Sherman, MD, FASE, Paaladinesh Thavendiranathan, MD, MSc, FASE,* James D. Thomas, MD, FASE, and Neil J. Weissman, MD, FASE, *Houston and Dallas, Texas; Durham, North Carolina; Chicago, Illinois; Rochester, Minnesota; San Francisco, California; New York, New York; Philadelphia, Pennsylvania; Boston Massachusetts; Toronto, Ontario, Canada; and Washington, DC*

J Am Soc Echocardiogr. 2017 Apr;30(4):303-371

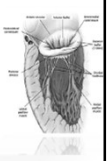
New ASE Valvular Regurgitation Guidelines- *Endorsed by SCMR*

- *What is New?*
  - •Emphasis on identification of ***<u>Etiology/Mechanism</u>*** of regurgitation
  - •2D/3D TTE--an ***<u>integrative approach & algorithms</u>*** to assess severity
  - •When is ***<u>TEE</u>*** needed
  - •Important role of ***<u>CMR</u>*** & CMR methodology
  - •The challenge of ***<u>co-existing valvular lesions</u>***
  - •A clinical perspective…
  - •Library of case studies on the web

Mitral Regurgitation
Indicators of Severity

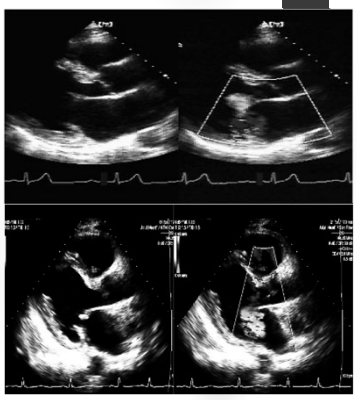
- •Mitral valve pathology → ***Anatomy***
- •LV/ LA size
- •Color Doppler: Vena contracta, Jet Area, Flow convergence → ***Color Flow***
- •Mitral E; Pulmonary vein pattern → ***Pulsed Doppler***
- •Regurgitant flow/fraction
- •CW density and contour → ***CW Doppler***

Annulus
Leaflets
Chords
– Primary, secondary& tertiary
Papillary muscles
Ventricular function
geometry

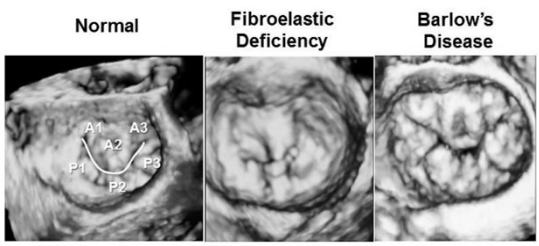


Valve Structure &MR Jet Characteristics

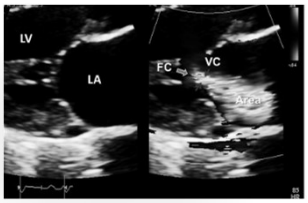
- Primary MR
- Secondary MR

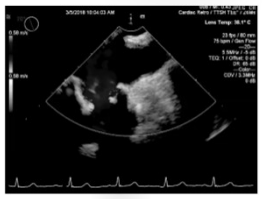


3D Echocardiography-MV



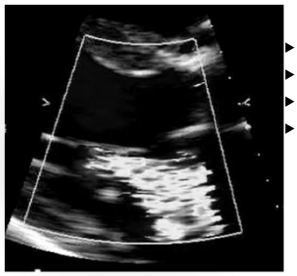
Mitral Regurgitation- Color Doppler
3 Components of the Jet





- Mild central jet
- Severe central jet
- Severe eccentric jet

Vena Contracta Proximal Jet Width

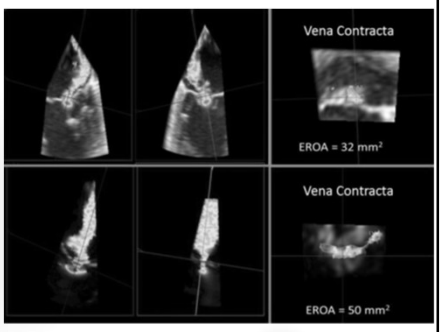


- VC width (cm)
- Mild< 0.3
- Moderate 0.3-0.7
- Severe> 0.7

3D Echocardiography in MR

Assessing VC Area- *VC Area is often not circular in Secondary MR*

- Primary
- Secondary

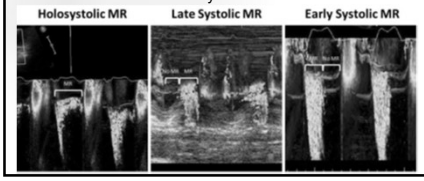


Flow Convergence (PISA)

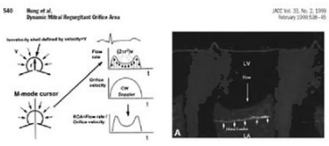
	Mild	Moderate		Severe
EROA (cm²)	< 0.2	0.20-0.29	0.30-0.39	≥ 0.4
RVol (mL/beat)	< 30	30-44	45-59	≥ 60

EROA cut-offs in 1ary and 2nd MR are similar
RVol may be lower in 2nd MR

- Assumptions of hemispheric geometry
- Less accurate in eccentric jets
- Variability during the cardiac cycle and limitations in non-holosystolic MR



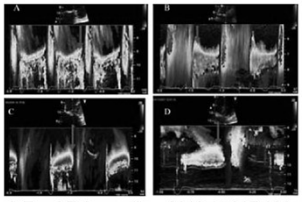
Dynamic Nature of FMR



Early and Late systolic peak in flow and orifice area

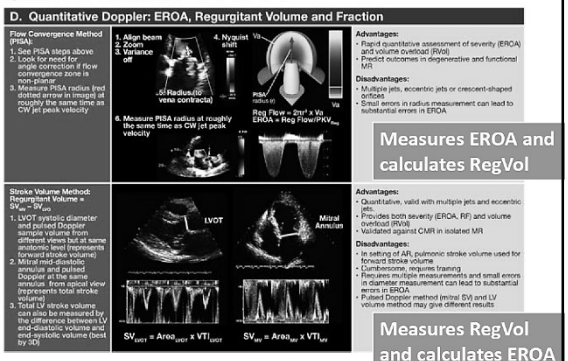
Hung J et al. JACC 1999;33(2);538-45

Dynamic PISA
A. FMR: early and Late peaks
B. FMR: early peak
C. Rheumatic: Late peak
D. Organic: late peak

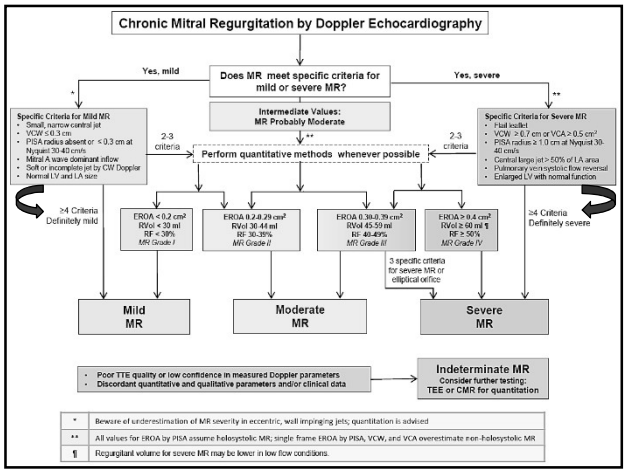


Lancellotti et al. Eur J Echocardiogr 2010;11:307-332

Quantitation of MR

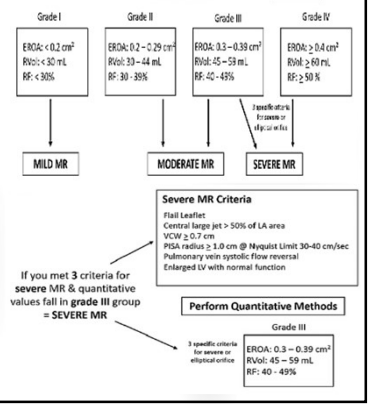


Zoghbi WA et al. J Am Soc Echocardiogr 2017; 30: 303-371.

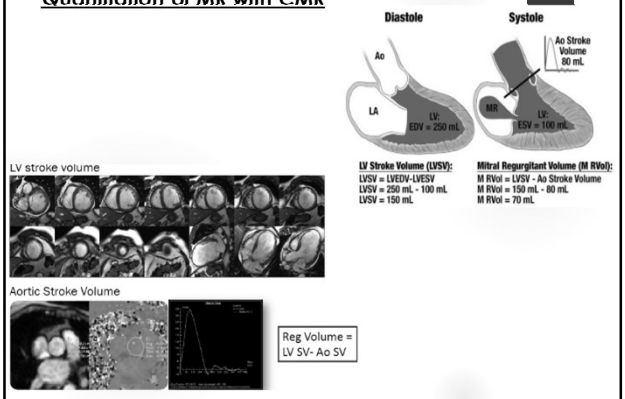


2 or 3 Criteria>>>>***QUANTITATIVE MEASURES***:

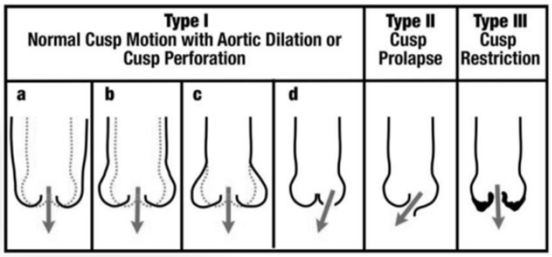
- The quantitative methods provide us with the following values:
- **1. Effective Regurgitant Orifice Area (EROA)**
- **2. Regurgitant Volume (RVol)**
- **3. Regurgitant Fraction (RF)**



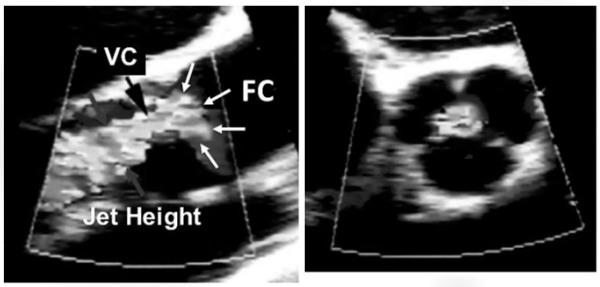
Quantitation of MR with CMR



Aortic Regurgitation



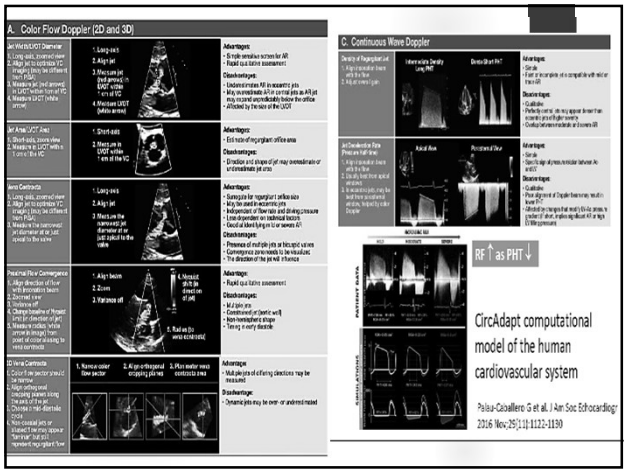
Aortic Regurgitation-Color Doppler

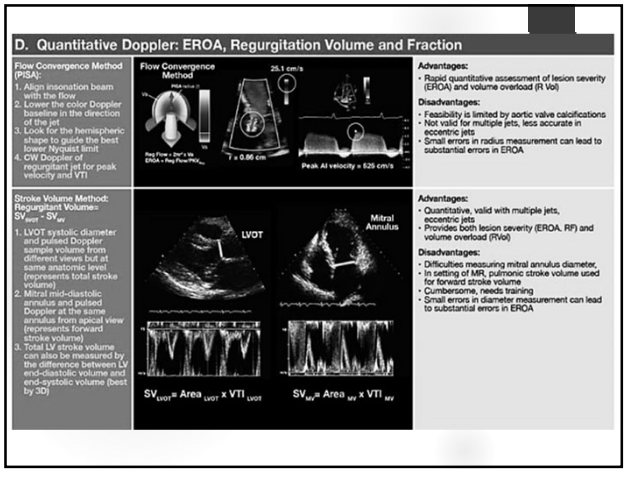


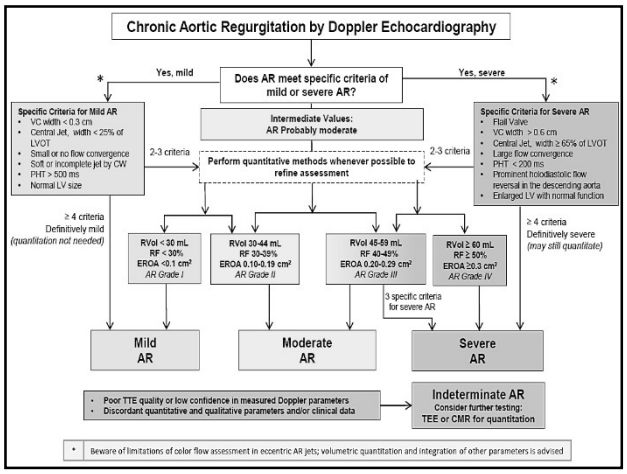
Integrative Approach to AR

- Integrative approach should be used
  - Supportive data
    - LV/LA size
    - PHT >500
  - Specific Data (>90% Sp)
    - Reversal of flow in the aorta (EDVel >20 cm/s)
    - Vena contracta > 0.6 cm
    - % LVOT ≥ 65%
  - Quantitative Data: 2D **and 3D**
    - Regurgitant Volume
    - Regurgitant Fraction
    - EROA

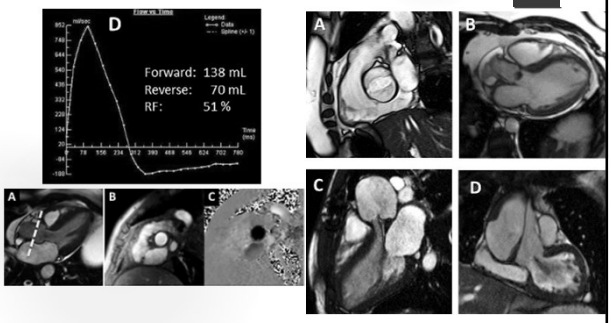
Attempt to understand discrepant measurements!







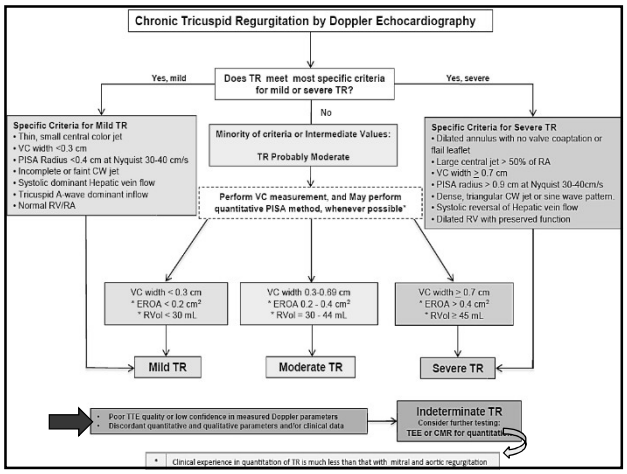
Quantitation of AR with CMR



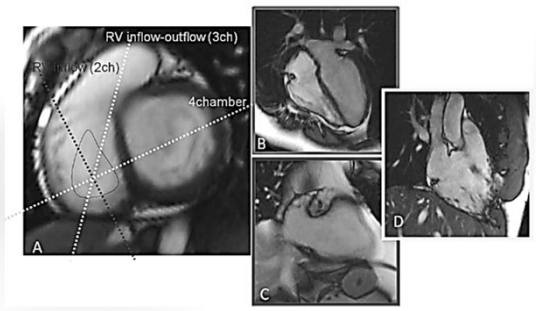
Tricuspid Valve Regurgitation

Table 14 Grading the severity of chronic TR by echocardiography

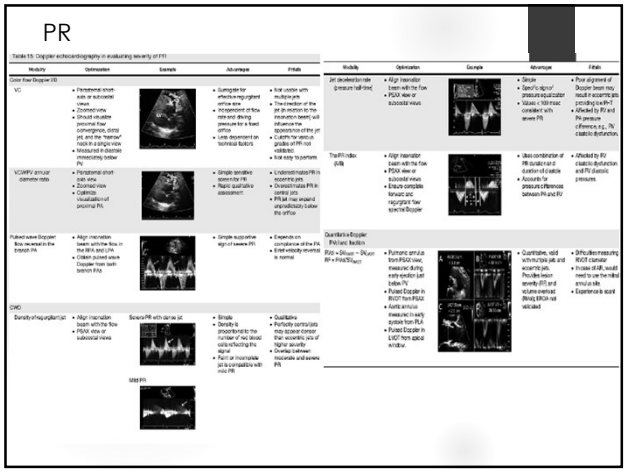
Parameters	Mild	Moderate	Severe
Structural			
TV morphology	**Normal or mildly abnormal leaflets**	Moderately abnormal leaflets	**Severe valve lesions** (e.g., flail leaflet, severe retraction, large perforation)
RV and RA size	Usually normal	Normal or mild dilatation	Usually dilated*
Inferior vena cava diameter	Normal < 2 cm	Normal or mildly dilated 2.1- 2.5 cm	Dilated > 2.5 cm
Qualitative Doppler			
Color flow jet area†	**Small, narrow, central**	Moderate central	**Large central jet** or eccentric wall-impinging jet of variable size
Flow convergence zone	**Not visible, transient or small**	Intermediate in size and duration	**Large throughout systole**
CWD jet	**Faint/partial**/parabolic	Dense, parabolic or triangular	Dense, often triangular
Semiquantitative			
Color flow jet area (cm²)†	Not defined	Not defined	**>10**
VCW (cm)‡	<0.3	0.3-0.69	≥**0.7**
PISA radius (cm)‖	≤0.5	0.6-0.9	**>0.9**
Hepatic vein flow§	Systolic dominance	Systolic blunting	**Systolic flow reversal**
Tricuspid inflow§	**A-wave dominant**	Variable	E-wave >1.0 m/sec
Quantitative			
EROA (cm²)	<0.20	0.20-0.39‡	≥**0.40**
RVol (2D PISA) (mL)	<30	30-44‡	≥45



CMR UNDERESTIMATES TR



PR

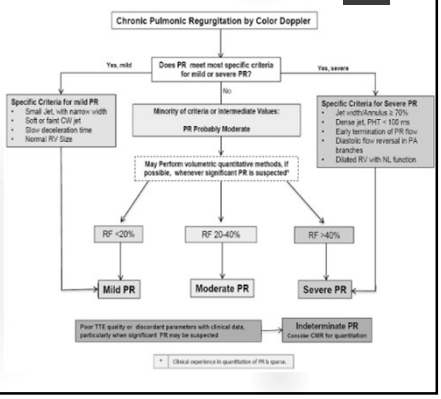


PR severity

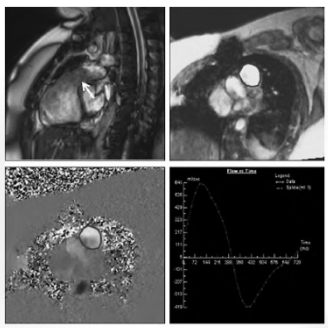
Table 16 Echocardiographic and Doppler parameters useful in grading PR severity

Parameter	Mild	Moderate	Severe
Pulmonic valve	Normal	Normal or abnormal	Abnormal and may not be visible
RV size	Normal*	Normal or dilated	Dilated†
Jet size, color Doppler‡	Thin (usually <10 mm in length) with a narrow origin	Intermediate	Broad origin; variable depth of penetration
Ratio of PR jet width/pulmonary annulus			>0.7§
Jet density and contour (CW)	Soft	Dense	Dense; early termination of diastolic flow
Deceleration time of the PR spectral Doppler signal			Short, <260 msec
Pressure half-time of PR jet			<100 msec‖
PR index¶		<0.77	<0.77
Diastolic flow reversal in the main or branch PAs (PW)			Prominent
Pulmonic systolic flow (VTI) compared to systemic flow (LVOT VTI) by PW#	Slightly increased	Intermediate	Greatly increased
RF**	<20%	20%-40%	>40%

- Good-quality echocardiographic imaging and complete
- If imaging is technically difficult, consider CMR or TEE.
- CMR or TEE >>PR severity indeterminate due to poor image quality, technical issues with data, internal inconsistency among echo findings, or discordance with clinical findings.



CMR in PR



Multi valve disease

Table 17 Impact of multivalvular disease on assessment of valvular regurgitation with Doppler echocardiography and CMR

By this Valvular Lesion	Impact on this Regurgitant Lesion			
	AR	MR	PR	TR
AS	Little impact, although hemodynamically significant AR will increase AS gradient. **For CMR: phase-contrast plane better in LVOT**	For constant ROA, RVol increases in proportion to square root of excess pressure; jet area exaggerated beyond this. ROA may increase if LV dilates.	Little impact unless PH ensues.	Little impact unless PH ensues.
AR	NA	LV dilation may increase ROA (especially in secondary MR). Mixed regurgitant lesions render volumetric methods challenging, as one must find some location reflective of net forward flow (e.g., RVOT). **For CMR: MV RVol = LVSV + aortic forward flow; MR Reg fraction = MR RVol/ (LVSV - AR RVol).**	Little impact unless PH ensues.	Little impact unless PH ensues.
MS	Little direct impact, although the delayed LV filling might theoretically lengthen AR pressure half-time.	If MV is heavily calcified, may shadow and decrease jet area and appearance of jet.	Lesion most likely to increase PAP and thus worsen RVol and jet area.	Lesion most likely to increase PAP and thus worsen RVol and jet area. If RV dysfunction occurs, may increase ROA.
MR	Little direct impact, but mixed regurgitant lesions render volumetric methods challenging, as one must find some location reflective of net forward flow (e.g., RVOT). Rapid early filling may decrease AR pressure half-time	NA	Likely to increase PAP and thus worsen RVol and jet area.	Likely to increase PAP and thus worsen RVol and jet area. If RV dysfunction occurs, may increase ROA.
PS	Little direct impact	Little direct impact	Little impact, although PR will exacerbate PS gradient. **For CMR: phase-contrast plane better in RVOT.**	Increased RVSP will worsen RVol and jet area. If RV dysfunction occurs, may increase ROA.
PR	Little direct impact	Little direct impact	NA	Increased RV volume may increase ROA, which will worsen RVol and jet area. **For CMR: TV RVol – RVSV - pulmonic forward flow. TR Reg fraction = TR RVol/ (RVSV - PR RVol).**
TS	Little direct impact	Little direct impact	Little direct impact	Little direct impact, although TR will exacerbate TS gradient.
TR	Little direct impact	Little direct impact	Rapid RV filling from TR may further shorten PR pressure half-time, and color PR jet more brief.	NA

New ASE Valvular Regurgitation Guidelines- *Endorsed by SCMR*

- What is New?
- •Emphasis on identification of *Etiology/Mechanism* of regurgitation
- •*2D/3D TTE*--an integrative approach & *algorithms* to assess severity
- •When is *TEE* needed
- •Important role of *CMR & CMR methodology*
- •The challenge of *co-existing valvular* lesions
- •A *clinical perspective*
- •Library of case studies on the web: www.asecho.org/vrcases

THANK YOU