

Starting an Interventional Echo Program: Training, Technique and Economics

Federico M Asch MD FASE, FACC
MedStar Health Research Institute
Georgetown University

Echo Hawaii 2020



1

Disclosures

Director, Academic Echo Core Lab

- Abbott / St Jude
- Edwards
- Medtronic
- Boston Scientific
- Mitralign
- GDS
- Neovasc
- Sorin/Livanova
- JenaValve
- Valtech
- Biotronik

www.EchoCoreLab.org



2

Outline

- The institutional environment
- The interventional Echocardiography Program
- The Echocardiographer, techniques
- Economic considerations

3

What makes a center qualified for interventions?

Figure 2. Number of STS/ACC TVT Registry Sites Performing Transcatheter MV Repair with the Edge-to-Edge Clip Device



Bonow RO et al. 2019 MV Systems of Care Document. ACC/AATS/SCAI/ASE. JACC Dec 2019, in press

4

Multi Disciplinary Heart Team

- Interventional Cardiologist
- MV Surgeon
- General Cardiologist, valve expert
- HF Specialist (mandatory if SMR)
- Imaging Specialist

• For patients with primary (or mixed) MR meeting guideline criteria for intervention, there should be documentation of:

- Evaluation by a general cardiologist or valve expert with knowledge and experience in the care of patients with MR, as well as with MV repair and replacement
- Evaluation by an interventional cardiologist
- Evaluation by an MV surgeon with assessment of operative risk

• For patients with secondary MR meeting guideline criteria for intervention, there should be documentation of:

- Evaluation by a general cardiologist, valve expert, or advanced HF cardiologist with knowledge and experience regarding MR, as well as MV repair and replacement. Evaluation should include HF status and optimization of GDMT (including CRT, when indicated) over ≥3 months. Clinical evaluation and verification of treatment response by an advanced HF expert is preferred whenever available.
- Evaluation by an interventional cardiologist
- Evaluation by a MV surgeon with assessment of operative risk when there is a potential need (as assessed by the MDT) for other surgical therapies (e.g., CABG, AF ablation, tricuspid valve repair)

Bonow RO et al. 2019 MV Systems of Care Document. ACC/AATS/SCAI/ASE. JACC in press

5

Why is an imaging expert needed?

- MR Etiology (DMR, FMR, mixed, specifics)
- Severity grading by an expert with integrative approach
- Capacity to participate in interventions

For patients with MR meeting guideline criteria for intervention, there should be documentation of:

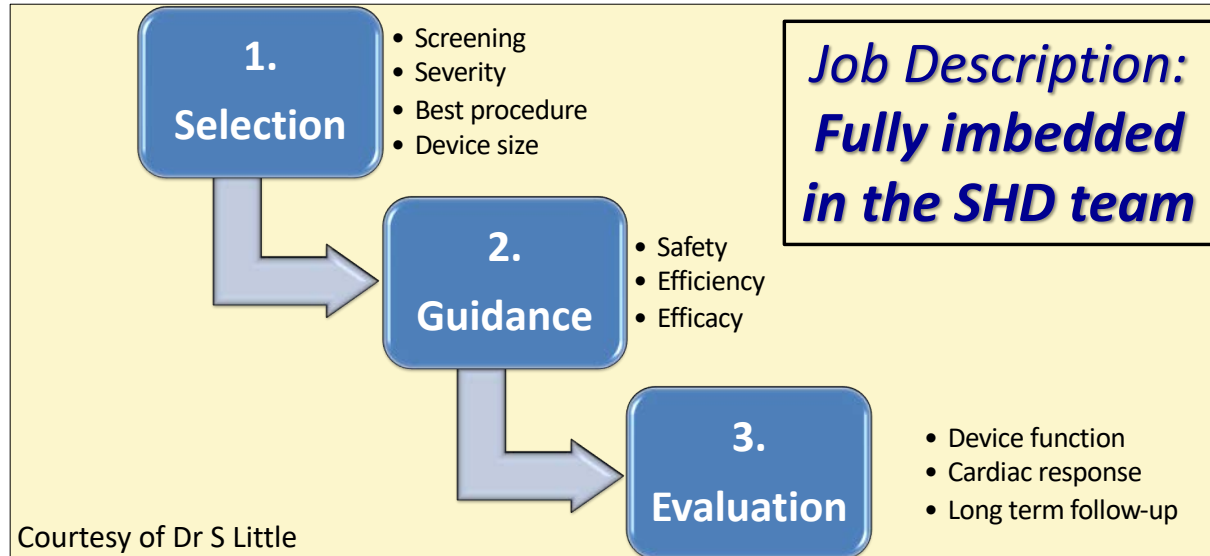
- MR etiology (primary versus secondary [versus mixed]) and severity assessed by an echocardiographer knowledgeable and experienced in the integrative assessment of MR

Bonow RO et al. 2019 MV Systems of Care Document. ACC/AATS/SCAI/ASE. JACC in press

6

The Heart Valve Team Imager

HOUSTON
Methodist
DEBAKEY HEART &
VASCULAR CENTER



7

MV programs should have documented expertise

A Dedicated Interventional Echocardiographer with:

- Level III training,
- TEE expertise
- Intraprocedural TEE
- 3D TEE

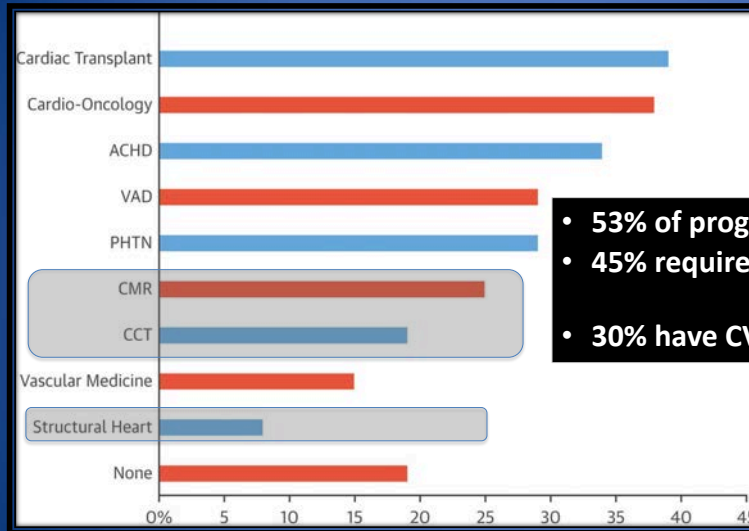
MDT participants at transcatheter MV intervention sites should have the following minimum competencies:

- Documented expertise in valvular heart disease, HF, multimodality imaging, coronary and structural heart disease intervention, and cardiac surgery
 - A general cardiologist or valve expert knowledgeable and experienced in the assessment and treatment of patients with MR.
 - A dedicated HF cardiologist, preferably ABIM certified in AHF/Tx, knowledgeable and experienced with GDMT, indications for CRT and advanced mechanical support
 - A dedicated interventional echocardiographer with Level III training, knowledgeable and experienced in TTE, intraprocedural TEE, 3-D TEE.
 - A dedicated cardiac CT imaging specialist*
 - Physicians and teams experienced in arterial and venous interventions involving coronary and peripheral circulations
 - Physicians and teams experienced in arrhythmia management, including pharmacologic, ablative, and implantable device interventions
 - Expertise available in cardiac anesthesia, cardiac intensive care, and stroke neurology
 - Nurse, nurse practitioner, and/or physician assistant clinical expertise and patient care coordination.
- Participation in continuing education/lifelong learning activities.

Bonow RO et al. 2019 MV Systems of Care Document. ACC/AATS/SCAI/ASE. JACC in press

8

Missing areas in general cardiology training programs



- 53% of programs required 6+ months of echo
- 45% required < 6 months
- 30% have CV imaging subspecialty program

Gaby Weissman et al. JACC 2019;73:2896-2899

2019 American College of Cardiology Foundation



9

Competencies in Echocardiography

HOUSTON
Methodist
DEBAKEY HEART &
VASCULAR CENTER

Advanced Echo competency in
Structural Heart Interventions:
Level III*i*

A work in progress...

Level III

- Direct an academic
echo lab

Level III *i*

- Perform specific
structural heart
procedures

Common competencies:

- Perform and interpret **complex studies**
- Lead a research program
- Train others in advanced echo

Level II

• Perform or interpret **specific
diagnostic test**
or procedure

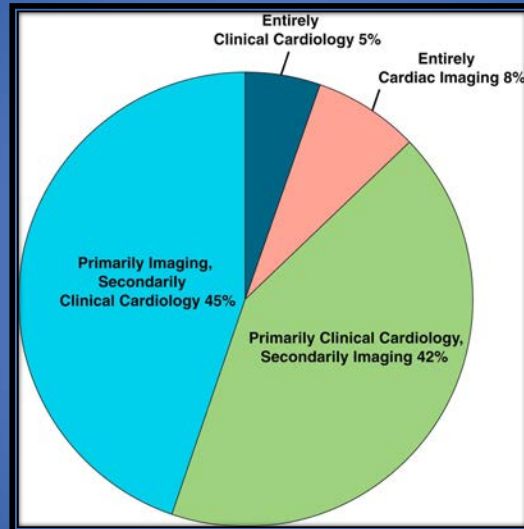
Level I

• **Introductory**
• Early level of competency

Courtesy of Dr S Little

10

How do trainees in advanced imaging practice?



Gaby Weissman et al. JIMG 2017;10:1080-1081



2017 American College of Cardiology Foundation

11

Wiegers SE, et al.

2019 ACC/AHA/ASE Advanced Training Statement on Echocardiography

2019 ACC/AHA/ASE Advanced Training Statement on Echocardiography (Revision of the 2003 ACC/AHA Clinical Competence Statement on Echocardiography)

A Report of the ACC Competency Management Committee

Developed in Collaboration With the American Thoracic Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Anesthesiologists, and Society of Critical Care Medicine

Wiegers SE et al. JACC 2019; 74:377

12

Level III in Echo - Requirements

Procedure/Technical Skill	Level III Numbers*
Transthoracic echocardiography performed†	150
Transthoracic echocardiography, interpreted†	750
Transesophageal echocardiography, performed and interpreted‡	150
3-dimensional echocardiography§	
For valve disease, rendering/image manipulation	50 (TEE or TTE)
For ventricular volumes, function, ejection fraction	50 (TTE)
Contrast echocardiography§	100 (TTE)
Strain and strain rate quantification§	50
Stress echocardiography	200
Includes 25 for noncoronary indications	

Wiegers S et al. 2019 ACC/AHA/ASE Advanced Training Statement in Echocardiography. JACC 2019; 74:377

13

Level III – Special Procedures

TABLE 3

Minimum Procedural Volume Typically Necessary for the Development and Demonstration of Level III Echocardiography Competencies for Additional, Optional Special Cardiovascular Ultrasound Procedures


Procedure/Technical Skill	Numbers*
Echocardiographic guidance of interventional procedures,† which includes:	75
Structural valvular interventions‡	30
Transseptal catheterization guidance	10
Percutaneous closure of septal defects/perivalvular leaks	15
Alcohol septal ablation	10
Placement of devices to exclude the left atrial appendage	10
Ventricular assist device placement and assessment	20
Intraoperative transesophageal echocardiography,† which includes:	75
Surgical valve repair or replacement	50
Intracardiac echocardiography	10

*These numbers are for training in particular procedures that are not required for general Level III competency, although exposure is recommended. Training and development of competency in these areas will depend on specific trainee interest and institutional availability. Numbers are based on consensus and intended as general guidance based on the educational needs and progress of typical Level III echocardiography trainees. Competency to perform each procedure must be based on evaluation by the supervising echocardiography laboratory director and may exceed or be below the threshold number shown in this table.
†These procedures may be counted toward the total TTE or TEE numbers in Table 2 provided a complete study is performed.
‡The Level III trainee should successfully complete both right-sided and left-sided procedures if the goal is to obtain competency in the full range of structural heart disease interventions.

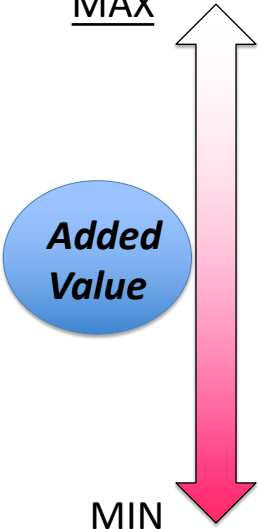
Wiegers S et al. 2019 ACC/AHA/ASE Advanced Training Statement in Echocardiography. JACC 2019; 74:377

14

Value of Interventional Echo



MAX




MIN

Tricuspid Repair; TMVR;
MitraClip; PVL repair
Mitral V-in-V

TAVR

LAA Occluder
ASD Repair



Courtesy of Dr S Little

15

SHD and Interventions: a rapid Evolution

- New technologies bring novel challenges:
 - Renewed understanding of old problems
 - New anatomies and pathologies are created
 - New procedures require different skills

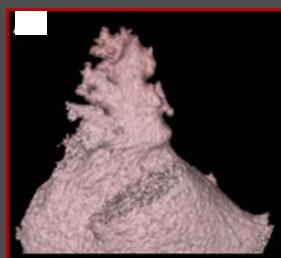
**Lots of Challenges bring
Plenty of Opportunities for research**

16

How does an echocardiographer prepare for being an interventional echo?

17

1 - Know the Anatomy



Cactus (30%)



Windsock 19%



Cauliflower 3%

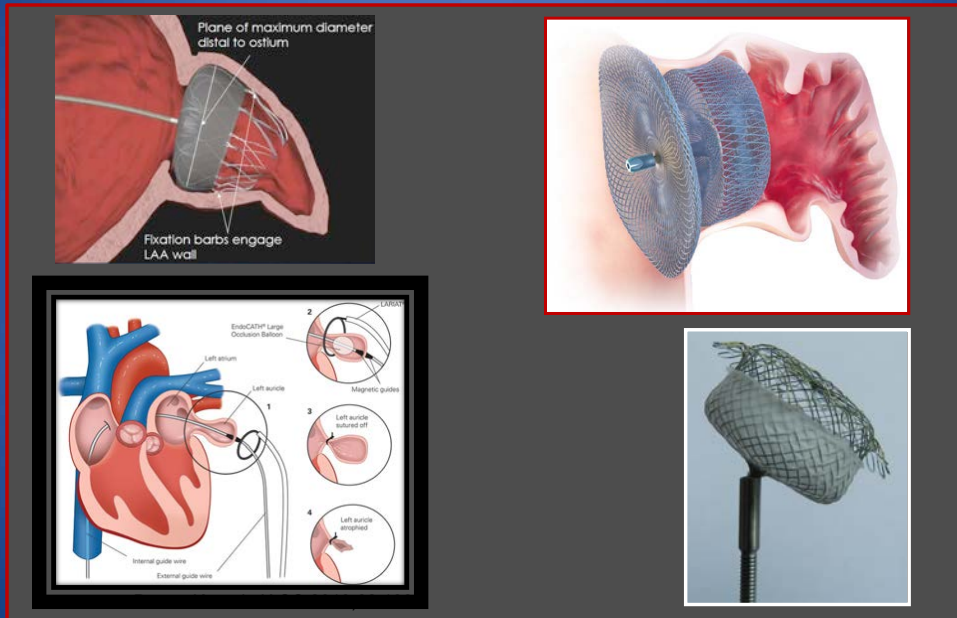


Chicken Wing (48%)

Di Biase L et al. J Am Coll Cardiol 2012; 60:531-538

18

2 - Know Your Devices



19

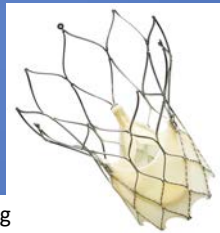
Differences among devices



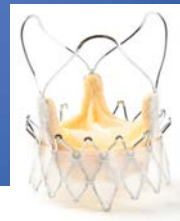
Edwards CENTERA – self expanding, retrievable



Edwards SAPIEN 3 – New paravalvular seal

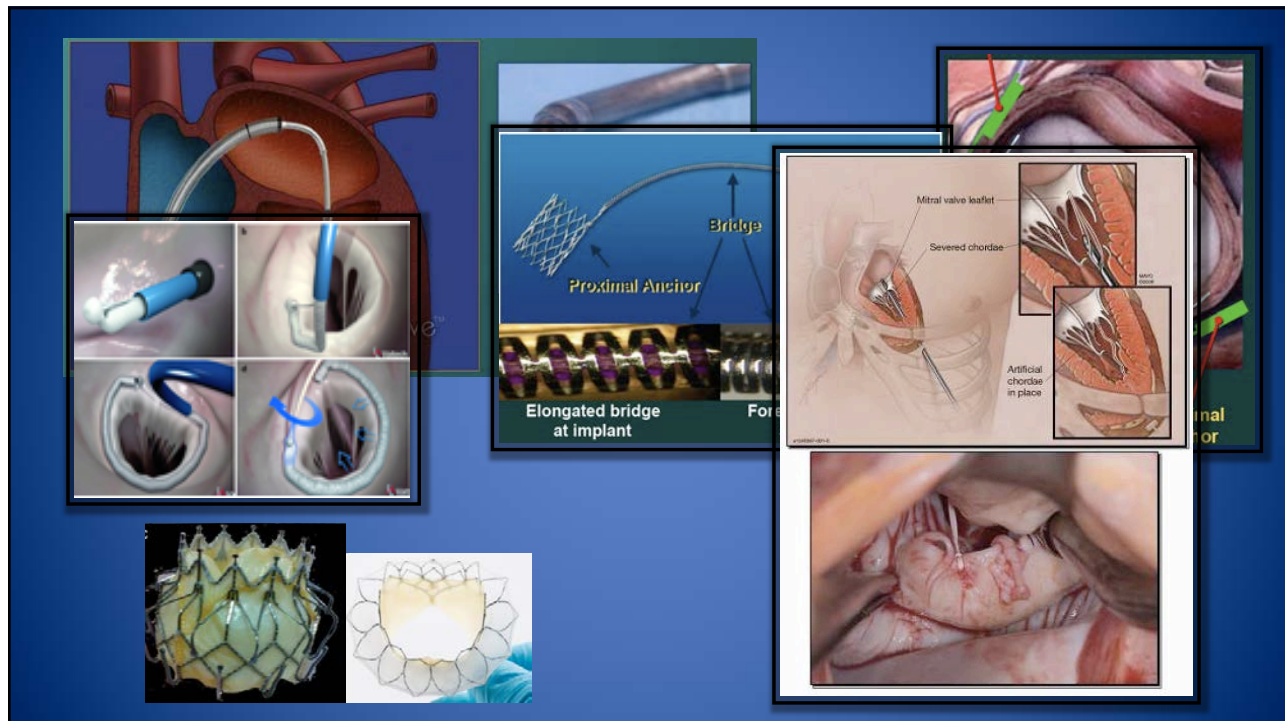


St Jude PORTICO- retrievable, self expanding



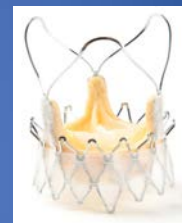
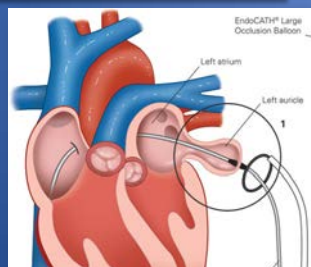
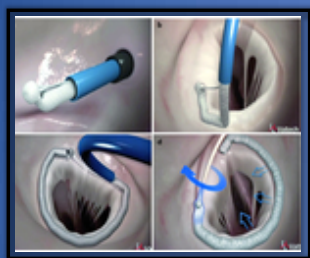
Symetis ACURATE- Double annular skirt, self expanding

20



21

Newer Technologies – Challenges to come



22

3 - Know Your Procedures and Goals

Steps for LAAO

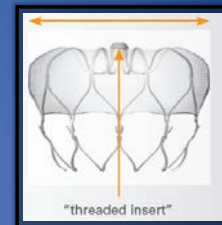
1. Rule Out LAA Thrombus
2. LAA measurements including w LA pressure > 10
0, 45, 90 and 135°
3. IAS puncture
4. Cath Guidance
 - 1.First in LUPV, change to pig tail
 - 2.Then “hop” into LAA
5. Post Deployment
 - 1.Check for peri-device leak
 - 2.Device Compression
 - 3.ASD size and shunt

23

3 - Know Your Procedures and Goals

Device Sizing and Compression

Deployed, device should measure
8-20% smaller than ex-vivo



Max LAA Ostium

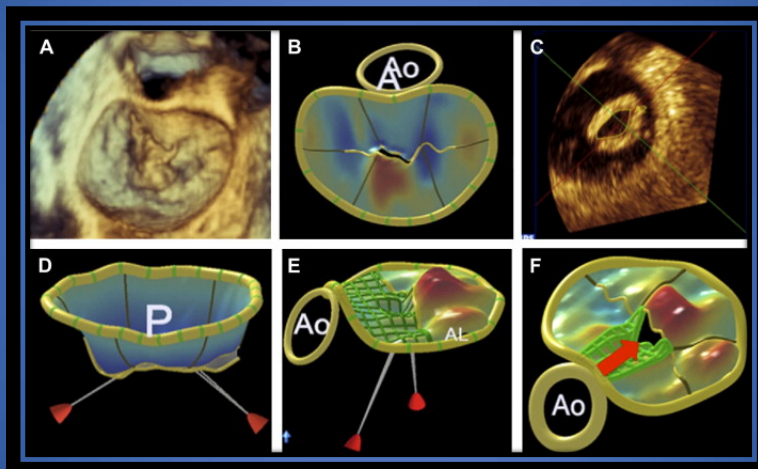
17 – 19 mm
20 – 22 mm
23 – 25 mm
26 – 28 mm
29 – 31 mm

TABLE 1: WATCHMAN LAA CLOSURE DEVICE DIAMETER

Original Device Diameter	Deployed Diameter (80 – 92% of original)
21 mm	16.8 mm – 19.3 mm
24 mm	19.2 mm – 22.1 mm
27 mm	21.6 mm – 24.8 mm
30 mm	24.0 mm – 27.6 mm
33 mm	26.4 mm – 30.4 mm

24

4 - Know your tools



From Pibarot P et al. CJC 2013

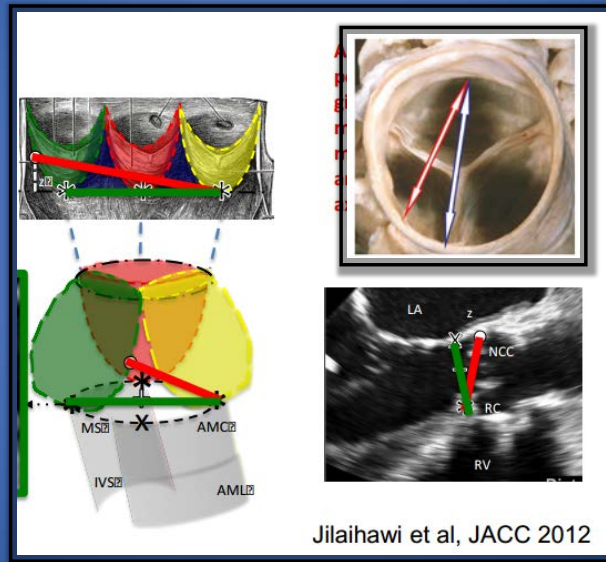
25

Strengths and weaknesses of each technique - TAVR

	TTE	TEE 2D+ 3D	4D CT
Leak severity	++	++	-
Leak location	+	++	-
Valve Hemodynamics	++	+	-
Malpositioning	-	+	++
Eccentric annulus	-	++	++
Aortic root geometry	-	+	++
Frame integrity	-	+/-	++
Leaflet Thrombosis	-	++	++
Leaflet Degeneration	+/-	++	-
Leaflet Coaptation	-	++	-

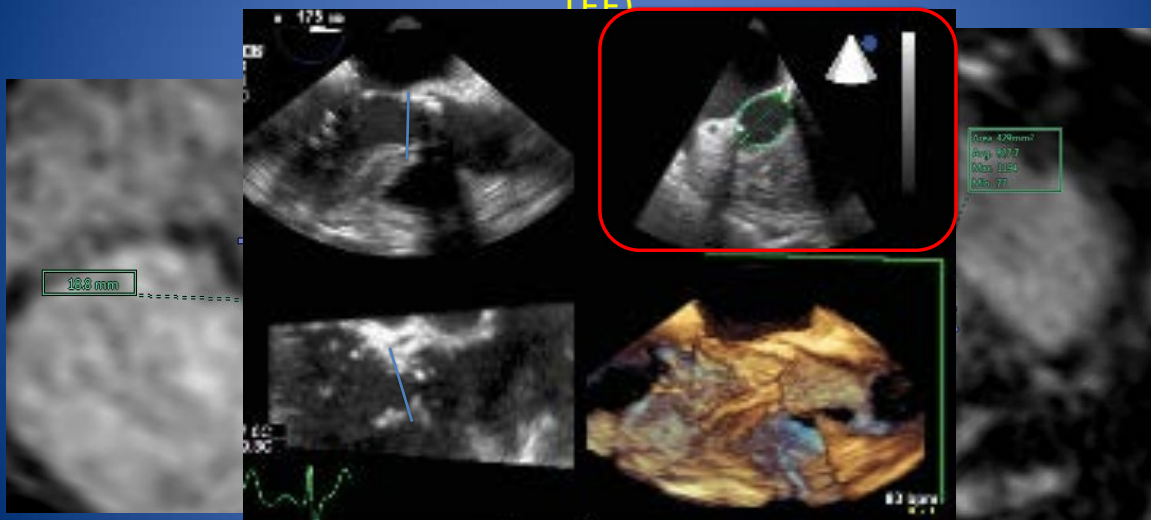
26

TTE 2D- Limitations



27

Annular Dimensions and device size selection Non- Contrast MRI (alternative to contrast CT/3D TEE)



28

Early Development

- Unexpected events or results
- Given limited experience, guidance could result critical for the interventionalist
- Imaging could impact:
 - product development
 - procedure development
- Close work with entire team including reps or engineers

29

SHD Interventions: A dynamic field Our role goes beyond the procedure

- New imaging findings can come from local investigators
- Core laboratories
- Team work and dynamic interactions:
- Continuous education: read and keep up to date!

30

Larger clinical trials

- Main target is to show effectiveness
- ... and Safety
- But these come in different flavours:
 - expected,
 - unexpected but reasonable
 - Totally unexpected
- Key to develop and follow procedure-specific acquisition protocols

31

Opportunities and Obligations

- We need to be **vigilant** and think out of the box
- Thorough investigations, beyond requested protocols
- **Think of off labeled use** of devices: Aortic prosthesis for TMVR, mitral annular devices for tricuspid, etc

32

Economics of the echocardiographer

The Echo

American Society of Echocardiography Newsletter

September 3, 2014



One major step towards a new Interventional TEE code

ASE is pleased to announce the creation of a much needed new interventional transesophageal echocardiography code for use beginning in 2015! This code, 93355, is intended to be used to report TEE services during an interventional procedure. This code includes guidance, real-time image acquisition, documentation, and interpretation during transcatheter intracardiac procedures.

For well over a year, ASE has dedicated significant resources including numerous volunteers who have worked to establish this essential new interventional TEE code. This code more accurately reflects the time and effort of the echocardiographer during these procedures. By working with several other societies, ASE was able to collect and present compelling evidence that the existing codes do not actually reflect the physician work, time, and intensity required during an interventional procedure and show that a new code was needed.

33

Funding Challenges

RVUs per procedure

HOUSTON
Methodist
DEBAKEY HEART &
VASCULAR CENTER

CPT Code	Descriptor	Final 2018 wRVU
Transthoracic Echocardiography		
93303	Echo transthoracic	1.30
93306	TTE w/Doppler complete	1.50
Transesophageal Echocardiography		
93312	Echo transesophageal	2.30
93314	Echo transesophageal	1.85
93355	Interventional Echo (TEE)	4.66

Transthoracic Echocardiography

93303	Echo transthoracic	1.30
93306	TTE w/Doppler complete	1.50

Transesophageal Echocardiography

93312	Echo transesophageal	2.30
93314	Echo transesophageal	1.85
93355	Interventional Echo (TEE)	4.66

Bundled Procedure

wRVU

MitraClip	32.25
TAVR transfemoral	25.13
LAA occluder	14.00
ETOH septal ablation	13.75

- Large discrepancy in payments and wRVU's.
- Structural procedures are highly dependent on echocardiography.
- Distribution among institutional cost-centers?

Adapted from Dr S Little

34

Conclusions

Development of Interventional Echo

- As Interventional SHD field evolves, interventional echocardiography is a necessity
- The **Heart team leadership** should be broad
 - Interventionalist and Surgeons
 - General Cardiologists
 - Echocardiographer and Multimodality Imaging
- **We are critical players in the development process of devices and outcomes of our patients**

35

Conclusions

Imaging Challenges in SHD Interventions

- Classic imaging teachings are being challenged
- Shifting from 2D (diameters) to 3D (diameters, area, perimeter) or fusion imaging
- New measurements are being enforced (coaptation length, gap width, LAA width and depth, Annulus-coronary distance, etc)
- The role of 2D and 3D imaging during novel interventions is critical
- Payment models should evolve to reward imaging fairly.

36

NBE Question

37

What does the following map represent?



- a) Countries with most cases of Interventional SHD programs
- b) Countries with most 3D echo machines
- c) Countries represented in Echo Hawaii's audience
- d) Countries represented in the World Summit of Echocardiography 2020

38

XIX CONGRESO NACIONAL DE CARDIOLOGÍA

ASE American Society of Echocardiography **5th** **EACVI** European Association of Cardiovascular Imaging

WORLD SUMMIT ON ECHOCARDIOGRAPHY

October 30-31, 2020
Guadalajara, Mexico

SAVE the Date

39

ASE American Society of Echocardiography

EACVI European Association of Cardiovascular Imaging

PREVENIR ES NUESTRA META

SOCIEDAD ARGENTINA DE CARDIOLOGÍA

AAE ASIAN PACIFIC ASSOCIATION OF ECHOCARDIOGRAPHY

DIC

SOCIEDAD VENEZOLANA DE CARDIOLOGÍA

SOCIEDAD CUBANA DE CARDIOLOGÍA

SONECOM Sociedad Nacional de Ecocardiografía de México A.C.

JSE Japanese Society of Echocardiography

KOREAN SOCIETY OF ECHOCARDIOGRAPHY

SASE Saudi Arabian Society of Echocardiography

SISIAC LA IMAGEN DE LAS AMERICAS

40



41

Thank you

42