CORE OBJECTIVES

1. Infer the role of echocardiography in guiding interventional procedures including paravalvular leak closures as well as TAVR, MitraClip, Tendyne, and Watchman implantations.
2. Discover the technological advances which have enabled real-time three dimensional imaging and the limitations of the technology.
3. Associate the training and skill set required of an echocardiographer to be successful in interventional echocardiography.

**Physician:** This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of Allina Health and Minneapolis Heart Institute Foundation. Allina Health is accredited by the ACCME to provide continuing medical education for physicians.

Allina Health designates this live activity for a maximum of 1.0 AMA PRA Category 1 Credit(s)™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

**Nurse:** This activity has been designed to meet the Minnesota Board of Nursing continuing education requirements for 1.2 hours of credit. However, the nurse is responsible for determining whether this activity meets the requirements for acceptable continuing education.

**DISCLOSURE STATEMENTS**

**Speaker:** Dr. Bae has declared that he has received speaker compensation from Abbott Vascular/Evalve.

**Planning Committee**
Dr. Michael Miedema, Dr. Scott Sharkey and Jolene Bell Makowesky have declared that they do not have any conflicts of interest associated with the planning of this activity. Dr. Robert Schwartz declared the following relationship - consultant: Boston Scientific.
Interventional Echocardiography

Richard Bae, M.D.
February 2016

Disclosures

Speakers Bureau: Evalve / Abbott Vascular
Interventional Echocardiography

The use of echocardiography for navigational guidance and/or assessment during invasive procedures.

If you don't know where you are going, you might wind up someplace else.

Yogi Berra
Pericardoventesis
Approach

Pericardiocentesis
Confirmation
Pericardiocentesis Progress

Myocardial Biopsy
V-V ECMO

V-V ECMO
V-V ECMO

Going Beyond

CardioSource World News

Invitation to Innovation
Interventional Echocardiography

- Development of new devices requiring more complex imaging for navigation and assessment
- Need for imager to have understanding of procedural components, imaging requirements, and potential complications - often mandated specialized training per protocols
- Need for detailed 3D understanding of anatomy, ability to utilize nonstandard views, and facility with machine operation / knobology / image optimization
- Need for high quality 3D TEE images as appropriate
- Need for effective and timely communication with interventionalist / surgeon – earn their trust and confidence

3D Echo
Watchman

WHO WATCHES THE WATCHMEN?
Cross Septum

Into the LAA
Watchman Deploy Device

Watchman Final 3D
ASD Closure
ASD Closure
Cross Defect

ASD Closure
Sizing Balloon
ASD Closure
Deployment

ASD Closure
Complex ASD

VSD Closure
VSD Closure
VSD Closure

Mitral Valvuloplasty
Mitral Valvuloplasty
Mitral Valvuloplasty

Mitral Valvuloplasty

Mitral Valvuloplasty
Mitral Valvuloplasty
Transcatheter Aortic Valves

Figure 1: Current Widely Available Transcatheter Valves

Figure 2: Valves Undergoing Early Evaluation
Aortic Valve and Aortic Root

Aortic Valve Area

Aortic Valve Area (cm²) = \frac{LVOT \text{ diameter}^2 - 0.78540 \cdot LVOT \text{ VTI}}{Aortic \text{ Valve \ VTI}}
LVOT Assessment

3D Echo

CT

Balloon Valvuloplasty

<table>
<thead>
<tr>
<th>MEASUREMENTS FOR POSSIBLE TAVR</th>
<th></th>
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<tbody>
<tr>
<td>Aortic valve: Tricuspid with calcification.</td>
<td></td>
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<tr>
<td>Annular dimension/area</td>
<td>405 mm²</td>
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<tr>
<td>Perimeter: 92 mm</td>
<td></td>
</tr>
<tr>
<td>Diameter: 20 x 26 mm</td>
<td></td>
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<tr>
<td>Mean: 23 mm</td>
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Valve Deployment - Balloon

Self Expanding Valve
Paravalvular Regurgitation

Transaortic TAVR
Wire Causing Severe MR
Wire – Torn Chord

Papillary Muscle Rupture
Avulsed Aortic Valve Leaflet After BAV
Avulsed Aortic Valve Leaflet
After BAV

Valve Embolizing Into LV
Aortic Atheroma

Aortic Dissection
TAVR
Dynamic Functional MR
Valve in Valve

Valve in Valve
Valve Embolizing Into LA

Vascular Plug
Paravalvular Regurgitation

Paravalvular Regurgitation
Paravalvular Regurgitation

Paravalvular Regurgitation
Pseudoaneurysm Closure
Contrast into PSA

Pseudoaneurysm Closure
Wire Across Defect
Pseudoaneurysm Closure
Wire into Aorta

Pseudoaneurysm Closure
Catheter in PSA
MitraClip

Mitral Anatomy

Carpentier

Echo Planes
Height

4 Ch
Reverse 4 Ch

RF Puncture
3D View From LA

Safari Wire in LA
3D Guide in LA

Clip Coming Out
Watch Out For LA Free Wall

PCE During Clip
Clip Coming Down To MV

Clip in LA
Sorajja Shake

Clip Position
Clip in LV

3D Zoom Including Clip and MV
Reduce Gain
Bring Clip Back

Grasp
Clip and Plug

Clip and Plug
Clip and Plug

Challenges

• Anatomical variations
• Technically difficult imaging situations
• Radiation protection
• Reimbursement
Future

• Increasing volumes
• TAVR under conscious sedation
• New devices
• Fusion imaging

Fusion Imaging
Who Are We?

TEE Probe

Dr Jay

Who Are We?

Dr Harris
Who Are We?

Dr Lin

Who Are We?

Dr Campbell
Who Are We?

“Robotic limb turns drummer into three-armed musical cyborg” - CNET