How to Interpret Your Cardiovascular Image Reports (Echo Interpretation)

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- Grant/Research Support: None
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Mitigating Potential Bias

- All the recommendations involving clinical medicine are based on evidence that is accepted within the profession.
- All scientific research referred to, reported, or used is in the support or justification of patient care.
- Recommendations conform to the generally accepted standards.
- Independent content validation.
- The presentation will mitigate potential bias by ensuring that data and recommendations are presented in a fair and balanced way.
- Potential bias will be mitigated by presenting a full range of products that can be used in this therapeutic area.
- Information of the history, development, funding, and the sponsoring organizations of the disclosure presented will be discussed.
Objectives

- Appropriate ordering and interpretation of 2D echo
- Appropriate ordering and interpretation of stress echo
- The role of LV systolic and diastolic function in a patient with dyspnea
What is echo?

- Ultrasound modality, using high frequency sound waves to create images of your heart
Needs an Echo. What would you recommend?
Advantages of Echo

- Non-invasive
- Painless
- Prognostic information
- Inexpensive compared with other modalities
Prognostic Value of Echo

12-month cardiac mortality (%)

Radionuclide ejection fraction (%)

- <20%
- 20–39%
- 40–59%
- >60%

6-month mortality (%)

Echocardiographic ejection fraction (%)

- <30%
- 30–39%
- 40–49%
- 50–59%
- >60%
Limitations of Echo

- Image quality
- Operator dependency
- Interpreter dependency
Information Provided

- Cardiac structure and function
  - LV and RV function
  - LV and RV wall thickness
  - Valvular function (stenosis/regurgitation)
  - Cardiac devices (artificial valves, PPM, closure devices)
  - Cardiac masses (clots, tumors)
Normal
67 y/o male with SOB
77 y/o with chest pain and SOB
Ordering an Echo

- Anyone...
- Who has ordered an echo this week?
- What was the indication?
- Any of the patients had a previous echo?
Cardiac Care Network

Standards for Provision of Echocardiography in Ontario

April 2015
Ask yourself, how is this going to change the management of the patient

CCN 2015: ..use echocardiography if, and only if, results have the potential to influence clinical decisions and patient management

Responsible utilization
Indications for Echo

Appendix B:
Indications for Echocardiography – Standards 2012

1. Heart Murmurs:

1.1. Initial evaluation of a murmur in a patient with cardiorespiratory symptoms.

1.2. A murmur in an asymptomatic patient where structural heart disease cannot be excluded by clinical assessment.

1.3. Re-evaluation of known valvular disease with a change in clinical status or cardiac exam.
Indications for Echo

2. Native Valvular Stenosis:

2.1. Initial assessment of etiology, severity, chamber dimensions, ventricular systolic function and overall hemodynamic impact.

2.2. Assessment of patients with known valvular stenosis of any severity and changing clinical status or discrepancy between clinical and echocardiographic severity.

2.3. Reassessment within 6 - 12 months of patients with an initial echocardiographic assessment indicating valvular stenosis of any severity.

2.4. Reassessment (≥2 yr) of mild valvular stenosis without a change in clinical status or cardiac exam.

2.5. Reassessment (≥1 yr) of moderate valvular stenosis without a change in clinical status or cardiac exam.

2.6. Reassessment (≥6 mos) of severe valvular stenosis without a change in clinical status or cardiac exam.
3. Native Valvular Regurgitation:

3.1. Initial assessment of etiology, severity, chamber dimensions, ventricular systolic function and overall hemodynamic impact.

3.2. Assessment of patient with known valvular regurgitation of any severity and changing clinical status or discrepancy between clinical and echocardiographic severity.

3.3. Reassessment (≥1 yr) of patients with asymptomatic moderate valvular regurgitation.

3.4. Reassessment (≥6 mos) of patients with asymptomatic severe valvular regurgitation.
4. Known or Suspected Mitral Valve Prolapse:

4.1. Diagnosis and assessment of hemodynamic severity, leaflet morphology, ventricular cavity size and function in patients with physical findings of mitral valve prolapsed.

4.2. Patients with previous diagnosis of mitral valve prolapse and changing clinical status or physical findings suggestive of progressive valvular dysfunction.

4.3. To re-evaluate patients with prior echocardiographic diagnosis but no supporting physical findings.

4.4. Reassessment (≥2 yrs) of patients with significant leaflet thickening or redundancy.

4.5. Periodic reassessment as required by severity of regurgitation (as per section 3).
E. Recommendation 4. Don’t perform echocardiography as routine follow-up for mild, asymptomatic native valve disease in adult patients with no change in signs or symptoms.

Difficult for YOU to follow most of the time?

Difficult for MOST PATIENTS to accept?

Do MOST OTHER CLINICIANS currently follow?

Following this recommendation will prevent significant overdiagnosis?

% who answered YES to the question

RES  CARDS
Stress Echocardiography

- Echocardiogram performed both before and immediately after the heart is being stressed
  - Exercise
  - Pharmacological injection
Stress Echocardiography: Rationale

- Assessment of cardiac function at exercise
- CAD
- Valvular Heart Disease
- Hemodynamic measurements
Stress Echo: Peak Exercise Images
Stress Echo: Rest Images
Stress Echo: Peak Exercise Images
Advantages of Stress Echo

- Non-invasive
- Non-toxic/radioactive
- Painless
- Prognostic Information
- Hemodynamic Information
  - Valvular
  - Pulmonary artery (RVSP)
21. Indications for Stress Echo:

21.1. Typical or atypical chest pain or ischemic equivalent syndrome.

21.2. Possible ACS with non-diagnostic ECG changes and negative or borderline significant troponin levels.

21.3. History of Congestive Heart Failure.

21.4. Known LV systolic dysfunction of unclear etiology.

21.5. Significant ventricular arrhythmia.


21.7. Borderline or high troponin levels in a setting other than ACS.

21.8. Significant cerebrovascular or peripheral atherosclerosis.

21.9. Re-evaluation (≥1 yr) in patients with significant cerebrovascular or peripheral atherosclerosis.

21.10. Equivocal or non-diagnostic results from other stress modalities.

21.11. Initial evaluation of patients at intermediate or high global CAD risk.

21.12. Periodic (≥2 yrs) re-evaluation of patients with intermediate or high global CAD Risk.

21.13. New or worsening chest pain or ischemic equivalent.

21.14. Post MI or ACS for risk stratification (within 3 months).

21.15. Viability in patients with known significant LV dysfunction post re-vascularization.

21.16. Periodic (≥1 yr) re-evaluation of stable patients with known CAD (previous coronary angiography, CTA/EBCT, MI, ACS or abnormal stress imaging).

21.17. For physiologic assessment and/or symptom correlation in patients with moderate or severe Aortic Stenosis, Mitral Stenosis, Mitral Regurgitation, Aortic Regurgitation, Hypertrophic Cardiomyopathy.

21.18. Assessment of established or latent pulmonary hypertension.
Stress Echo vs. Nuclear

- Similar prognostic information
- Advantages re: radiation, hemodynamic markers

Caveat:
- Endocardial definition
- Image quality
C. Recommendation 2. Don’t perform annual stress cardiac imaging or advanced non-invasive imaging as part of routine follow-up in asymptomatic patients.

- Difficult for YOU to follow most of the time?
- Difficult for MOST PATIENTS to accept?
- Do MOST OTHER CLINICIANS currently follow?
- Following this recommendation will prevent significant overdiagnosis?

RES  CARDS

% who answered YES to the question

* p<0.03
Appropriate Interpretation

- There are lots of labs…..
- There is no standardization of equipment
- Sonographer experience
- Reader experience
- Ideally, Level II training, before independent interpretation
My Patient has Dyspnea…

- Multiple causes: cardiac equivalents vs. non-cardiac etiologies
- Assessment of LV function
- What is normal?
- ASE 2015 Guidelines
  - Males: 62 ± 5 (52-72)
  - Females: 64 ± 5 (54-74)
Cardiac Dyspnea

- LV dysfunction
- Ischemic Equivalent
- Diastolic Abnormality
- Pericardial Disorder
- Other: Pulmonary Arterial/Venous abnormality
Heart = Pump
LV Systolic Dysfunction

- **Systolic Heart Failure**
- Definition: an inability to expel sufficient blood; decreased ejection fraction
- Definition: “an elevation in LVEDP with an increase in LVED volumes”
- **Most common:**
  - Ischemia
  - Cardiomyopathy (DCM)
  - Valvular dysfunction
67 y/o male with SOB
LV Diastolic Dysfunction

- Diastolic Heart Failure
  - Definition: An inability of the heart to relax and fill normally; ejection fraction is preserved
  - Definition: “Elevated LVEDP without an increase in LVED volumes”

- Etiologies:
  - Hypertensive Heart Disease
  - Hypertrophy
  - Hypertrophic Cardiomyopathy

DIASTOLIC DYSFUNTION

EF = Normal

Normal EF = 50-70%
67 y/o male with SOB
Keys to determining what is the problem

- LVEF
- LV Dimensions