



# ECHOCARDIOGRAPHY

HOW TO USE WISELY?

DR KEVIN WOLFE M.D. SEPT 25, 2020



# ECHOCARDIOGRAPHY

HOW TO USE WISELY?

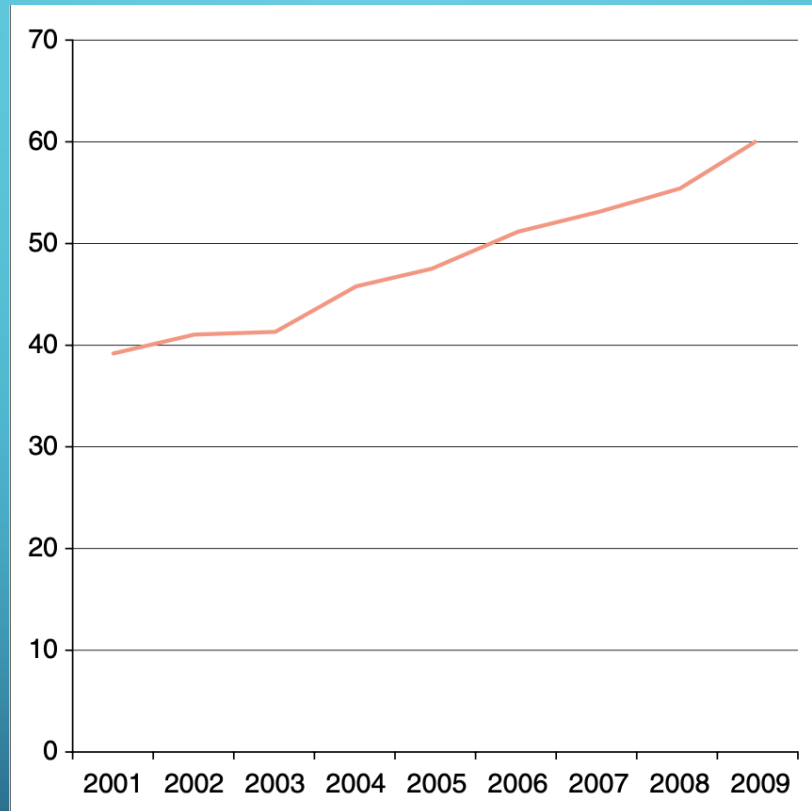
I HAVE NO DISCLOSURES



# THE WISE USE OF ECHO

- Easy to overuse as its noninvasive and safe and might yield useful information
- However echo consumes considerable healthcare dollars.
  - Medical diagnostic imaging increased 85% from 2000-2009
  - TTE volume doubled in this period and remains the highest volume cardiac imaging test
- Manitoba's approach to limit echo to the teaching hospitals has helped prevent the huge expense and overuse that Ontario has faced, but long wait times have been the result.

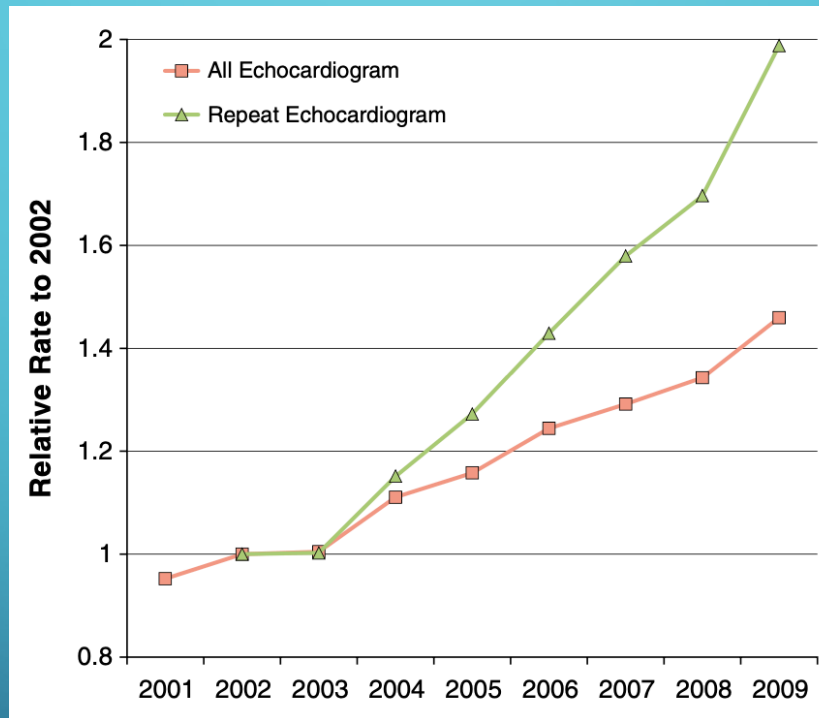
# ECHO IN ONTARIO



**Figure 1. Growth in Rate of Echocardiography**

Figure represents age- and sex-adjusted rate of echocardiography between 2001 and 2009. Rates are per 1,000 persons.

# ECHO IN ONTARIO



**Figure 2. Annual Change in Relative Rate of Echocardiography and Repeat Echocardiography**

Rates are relative to 2002 and adjusted for age and sex. Echocardiograms were considered repeat procedures (green line) if performed within 365 days of a prior procedure, resulting in a 1-year lag in rates for repeat echocardiography as compared to all echocardiography (orange line).

# THE WISE USE OF ECHO

- An excellent history and physical, often combined with an ECG,/CXR/basic bloodwork is the foundation of a wise echo request
- A focused cardiac exam is particularly relevant to echo, however at times the physical exam seems to be an endangered species.
- Portable, hand held echo devices are increasingly common, but they are only as good as the person holding them, and their effect on the volume and appropriateness of echo requests remains uncertain

# APPROPRIATE USE CRITERIA OR AUC

- Clinical guidelines are heavily evidence-based and somewhat tyrannical
- AUC rely heavily on consensus and expert opinion, largely due to the limited available evidence on the effect of echocardiography ( or really any diagnostic imaging) on patient outcomes.
  - They are meant to guide clinicians regarding a reasonable scenario for utilization of echocardiography and not impose a rigid definition of standard of care.
- It is challenging to glean the true impact of an echocardiogram from the patient record



# APPROPRIATE USE CRITERIA FOR ECHOCARDIOGRAPHY

JACC 2011, VOL 57, NO. 9, 1127-66

“An appropriate imaging study is one in which the expected incremental information, combined with clinical judgment, exceeds the expected negative consequences\* by a sufficiently wide margin for a specific indication that the procedure is generally considered acceptable care and a reasonable approach for the indication.”

\* Expected negative consequences include risks of the procedure (i.e., radiation or contrast exposure) and the downstream impact of poor test performance, such as delay in diagnosis (false negatives) or inappropriate diagnosis (false positives).

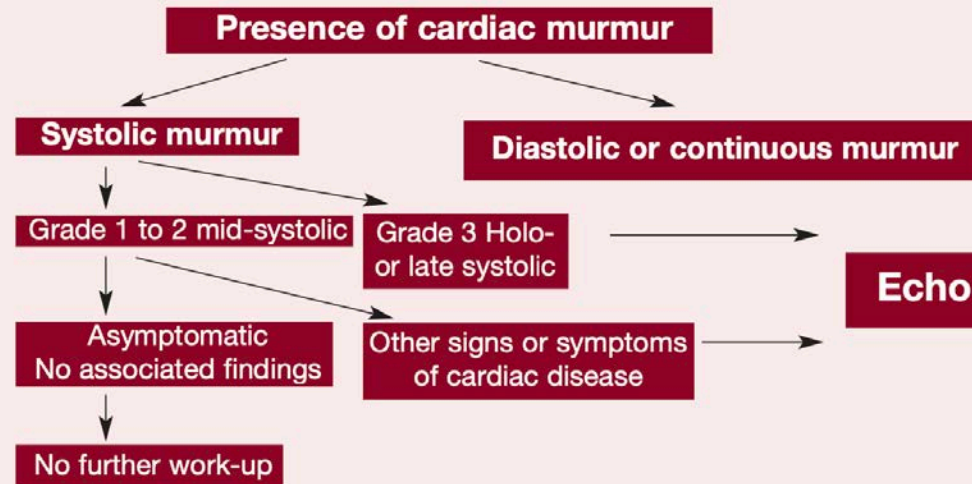
**Figure 1.** Definition of appropriateness for cardiovascular imaging.



# MURMURS

Figure 1

## Algorithm for Assessment of Cardiac Murmur with Echocardiography



Adapted from: Cheitlin M, Alpert J, Armstrong W, et al: ACC/AHA Guidelines for the Clinical Application of Echocardiography. A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Clinical Application of Echocardiography). Circulation 1997; 95(6):1686-744.



# MURMURS

JACC AUC 2011

## Murmur or Click With TTE

• Initial evaluation when there is a reasonable suspicion of valvular or structural heart disease	A (9)
• Initial evaluation when there are no other symptoms or signs of valvular or structural heart disease	I (2)
• Re-evaluation in a patient without valvular disease on prior echocardiogram and no change in clinical status or cardiac exam	I (1)
• Re-evaluation of known valvular heart disease with a change in clinical status or cardiac exam or to guide therapy	A (9)



# PALPITATIONS

JACC AUC 2011

• Infrequent APCs or infrequent VPCs without other evidence of heart disease	I (2)
• Frequent VPCs or exercise-induced VPCs	A (8)
• Sustained or nonsustained atrial fibrillation, SVT, or VT	A (9)
• Asymptomatic isolated sinus bradycardia	I (2)

# PALPITATIONS

RECOMMENDATIONS OF THE JOINT CCS/CSE ECHOCARDIOGRAPHY CONSENSUS PANEL OCT 23 2004

- **Class 1 Indications**
  - Arrhythmias with clinical suspicion of structural heart disease
  - Atrial fibrillation or flutter, VT or VF
- **Class 2 Indications**
  - TEE guidance of transeptal puncture in ablation procedures
  - Evaluation of patients as a component of an electrophysiologic ablative procedure workup
- **Non Indications**
  - Palpitations without corresponding arrhythmia or other signs and symptoms of cardiac disease
  - Isolated PVC's for which there is no clinical suspicion of heart disease



# SHORTNESS OF BREATH

## 6.10 Indications for Echocardiography in Patients with Dyspnea, Edema or Cardiomyopathy

### Class 1 Indications

1. Assessment of patients with suspected:
  - a) heart failure
  - b) peripheral edema with elevated jugular venous pressure
  - c) unexplained dyspnea
  - d) clinical or radiographic heart failure
2. Clinically suspected cardiomyopathy
3. Patients with clinically unexplained hypotension
4. Assessment of baseline LV function and periodic review when using cardiotoxic drugs
5. Reevaluation of LV function in patients with documented cardiomyopathy and change in clinical status or undergoing procedures that could potentially affect function such as alcohol septal ablation or surgical myomectomy.
6. Screening of first degree relatives with suspected inherited cardiomyopathy

### Class 2 Indications

1. Reevaluation of patients with known cardiomyopathy without clinical change in status

### Non Indications

1. Patients with dyspnea or edema in whom an alternative diagnosis is established

# SHORTNESS OF BREATH

JACC AUC 2011

• Initial evaluation of ventricular function (e.g., screening) with no symptoms or signs of cardiovascular disease	I (2)
• Routine surveillance of ventricular function with known CAD and no change in clinical status or cardiac exam	I (3)
• Evaluation of LV function with prior ventricular function evaluation showing normal function (e.g., prior echocardiogram, left ventriculogram, CT, SPECT MPI, CMR) in patients in whom there has been no change in clinical status or cardiac exam	I (1)

# HOW MANY TTE'S ARE APPROPRIATE ?

AM J CARDIOL 2012;109:1814-1817

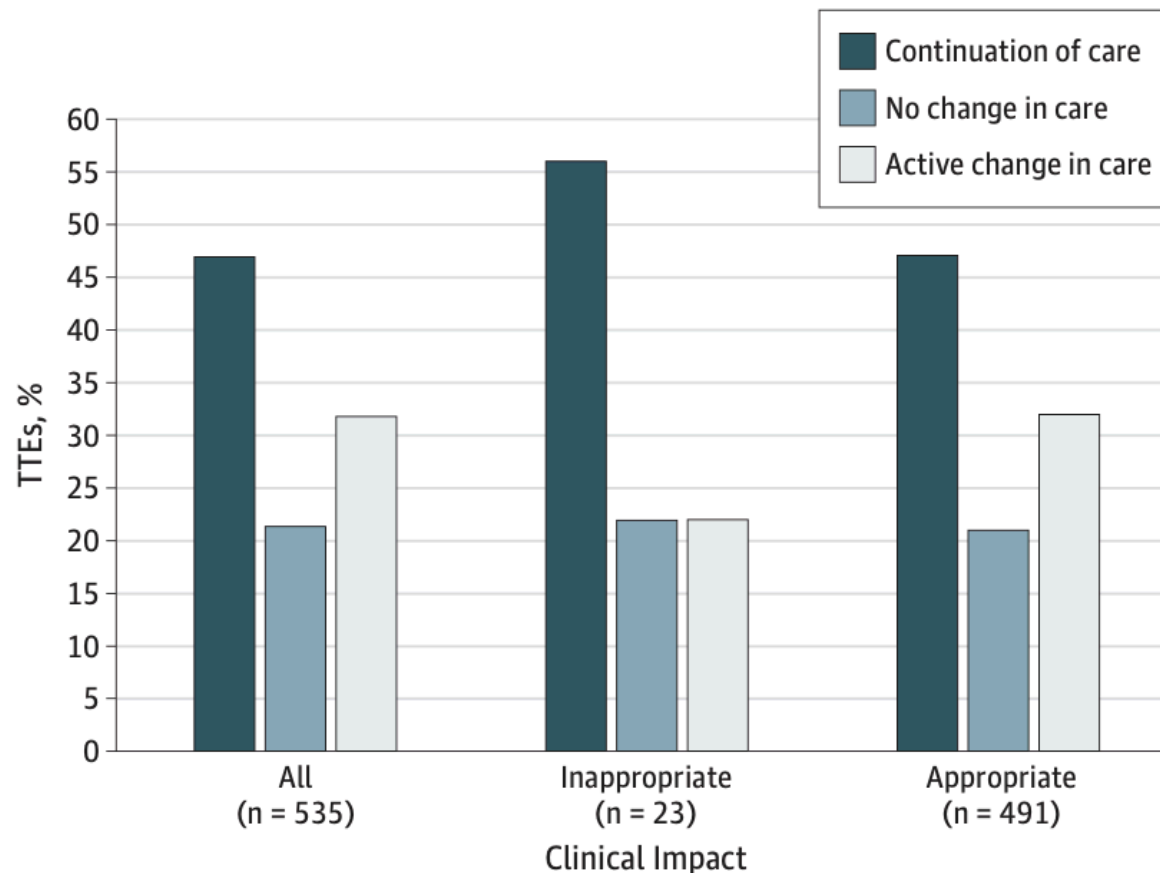
Table 2  
Appropriateness of transthoracic echocardiographic studies stratified by hospitalization status

Variable	Total (n = 1,820)	Inpatient (n = 850)	Outpatient (n = 970)	p Value
Appropriate	1,493 (82%)	754 (88.7%)	739 (76.2%)	<0.0001
Inappropriate	223 (12.3%)	81 (9.5%)	142 (14.6%)	0.0009
Uncertain	96 (5.3%)	13 (1.5%)	83 (8.6%)	<0.0001
Unclassified	8 (0.4%)	2 (0.2%)	6 (0.6%)	0.2175

## APPROPRIATE USE AND CLINICAL IMPACT OF TTE

- JAMA Int Med 2013;173(17): 1600-1607

Figure 2. Appropriate Use Criteria Classification and Clinical Impact



Clinical impact for all, inappropriate, and appropriate transthoracic echocardiograms (TTEs).

## APPROPRIATE USE AND CLINICAL IMPACT OF TTE

- JAMA Int Med 2013;173(17):  
1600-1607

**Table 4. Subtypes of Active Change in Care<sup>a</sup>**

Subtype	Active Change TTEs, % (n = 170)
Further diagnostic testing	29.4
Subspecialty consultation	25.9
Change in medication or other therapy duration	20.6
Surgical/invasive therapeutic procedure	8.8
Change in level of care <sup>a</sup>	8.8
Cancellation of planned further diagnostic testing	4.1
Cancellation of planned subspecialty consultation	1.2
Cancellation of a surgical or invasive procedure	1.2

Abbreviation: TTE, transthoracic echocardiogram.

<sup>a</sup> Indicates change in level of care, including transfer in or out of the intensive care unit or admission or discharge from a hospital.

**Figure 3. Comparison of Growth in Transthoracic Echocardiography (TTE) Volume Between Medicare and the Veterans Affairs (VA) Healthcare System**

# AUC AND CLINICAL IMPACT

- It seems the published literature finds most TTE's to be appropriate
- If appropriate TTE's lead to a change in management 30-50% of the time, how do we judge this?
- Is a change in management the main indication of an appropriate study?
  - I would suggest it is not
  - We have much more work to do to judge the clinical impact of TTE on management

# THE TOP REASONS FOR A RARELY APPROPRIATE TTE

JACC AUC 2011

**Table 1**

Most common “rarely appropriate” (formerly termed “inappropriate”) indications for which transthoracic echocardiograms are performed in clinical practice according to the 2011 AUC

- Lightheadedness/presyncope when there are no other symptoms or signs of cardiovascular disease
- Routine surveillance of ventricular function with known CAD and no change in clinical status or cardiac examination
- Routine preoperative evaluation of ventricular function with no symptoms or signs of cardiovascular disease
- Routine surveillance (<3 year) of mild valvular stenosis without a change in clinical status or cardiac examination
- Routine surveillance (<3 years after valve implantation) of prosthetic valve if no known or suspected valve dysfunction
- Suspected endocarditis in a patient with transient fever without evidence of bacteremia or new murmur
- Routine evaluation of systemic hypertension without symptoms or signs of heart disease
- Routine surveillance (<1 year) of heart failure (systolic or diastolic) when there is no change in clinical status or cardiac examination

# THE TOP REASONS FOR A RARELY APPROPRIATE TTE

JACC AUC 2011

**Table 1**

Most common “rarely appropriate” (formerly termed “inappropriate”) indications for which transthoracic echocardiograms are performed in clinical practice according to the 2011 AUC

- Lightheadedness/presyncope when there are no other symptoms or signs of cardiovascular disease
- Routine surveillance of ventricular function with known CAD and no change in clinical status or cardiac examination
- Routine preoperative evaluation of ventricular function with no symptoms or signs of cardiovascular disease
- Routine surveillance (<3 year) of mild valvular stenosis without a change in clinical status or cardiac examination
- Routine surveillance (<3 years after valve implantation) of prosthetic valve if no known or suspected valve dysfunction
- Suspected endocarditis in a patient with transient fever without evidence of bacteremia or new murmur
- Routine evaluation of systemic hypertension without symptoms or signs of heart disease
- Routine surveillance (<1 year) of heart failure (systolic or diastolic) when there is no change in clinical status or cardiac examination



# CONCLUSIONS

- Clinical medicine is hard
- A good history and cardiac exam are the foundation of a good echo request
- Judging the clinical impact of an echo remains difficult
- Think hard about repeat TTE's. They drive increasing echo volumes