Echo to the rescue outside the heart room

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I have no relevant disclosures for this talk
Objectives

As a result of participating in this educational opportunity the learner will be able to:

1. Recognize the component views of the basic intraoperative transesophageal echocardiography examination
2. Describe probe positions and component views of a basic transthoracic echocardiography examination
3. Evaluate basic views for the presence of major findings related to changes in a patient’s condition
4. Discuss intraoperative and postoperative clinical settings in which echocardiography may improve the clinician’s ability to resolve discordant diagnostic findings
Case vignette

- Adult male in post-anesthesia recovery unit who has increasing agitation
- Underwent laparoscopic Nissen fundoplication
- BP ~100 systolic; HR ~100 beats per minute
- Equal, quiet breath sounds
- Given pain med by RN & now has very poor mental status & near CV collapse

Your differential diagnosis?
1. Drug overdose
2. Bleeding
3. Pericardial effusion
4. Pneumothorax
5. Page someone else since I’m really busy

Rx options:
1. Back to OR for exploratory surgery
2. Call for a consultant to provide insight
3. Drain pleural space: could get better CV function / mental status or could get pneumothorax
4. Drain pericardial space: could get better CV function / mental status or could get RV puncture
Why bother to learn echo?

• **Recommendations: Cardiac surgery**
  – For adult patients without contraindications, **TEE should be used** in all open heart (e.g., valvular procedures) and thoracic aortic surgical procedures
  – (TEE) **should be considered** in coronary artery bypass graft surgeries to: (1) confirm and refine the preoperative diagnosis, (2) detect new or unsuspected pathology, (3) adjust the anesthetic and surgical plan accordingly, and (4) assess the results of surgical intervention
  – For patients undergoing transcatheter intracardiac procedures, TEE **may be used**

• **Recommendations: Noncardiac surgery**
  – TEE **may be used** when the nature of the planned surgery or the patient’s known or suspected cardiovascular **pathology might result in severe** hemodynamic, pulmonary, or neurologic **compromise**.
  – If equipment and expertise are available, TEE **should be used** when unexplained life-threatening circulatory instability persists despite corrective therapy.

• **Recommendations: Critical Care**
  – For critical care patients, TEE **should be used** when diagnostic information that is expected to alter management cannot be obtained by trans thoracic echocardiography or other modalities in a timely manner.

• **“If equipment and expertise are available”**

Echo role – unexplained hemodynamic instability

- Hypovolemia
  - Fluid deprivation
  - Fluid loss
  - Bleeding

- Reduced cardiac function
  - Myocardial failure
  - Arrhythmia
  - Bradycardia

- Vasoplegia
  - Sepsis
  - Anaphylaxis
  - Endocrine disorders
  - Anesthesia

- Obstruction
  - Pericardial tamponade
  - Pneumothorax
  - Lung emboli

Perioperative echo can improve patient management in many conditions

THESE ARE NOT LIMITED TO THE HEART ROOM!!!
Use echo to rapidly assess:

- Normal vs abnormal:
  - Ventricular filling
  - Ventricular function
- Presence or absence of:
  - Pericardial effusion and possible tamponade physiology
  - Severe valve disease
- Echo views from TEE or TTE
  - TEE: good image quality IF patient can swallow probe AND if airway won’t be compromised (or if they have ETT and sedation already)
  - TTE: often faster, may be better tolerated by pt
TEE utility: non-cardiac surgery:

  – 10 OB patients had emergency TEE for unexplained hypotension (6 progressed to cardiac arrest)
  – TEE “was instrumental in determining the etiology and guiding resuscitation in all”
  – All patients survived

• Hilberath: Rescue transoesophageal echocardiography for refractory haemodynamic instability during transvenous lead extraction. Eur Heart J Cardiovasc Imaging 2014; 15:926-32
  – 26 patients had “intractable” hemodynamic instability during lead removal; TEE done
  – 10 pericardial effusion (4 progressed to cardiac arrest)
  – 4 hemorrhagic shock
  – TEE excluded life-threatening cardiac injury; Rx then focused on non-surgical means
  – All patients survived

• Schulmeyer: Impact of Intraoperative Transesophageal Echocardiography During Noncardiac Surgery. J Cardiothorac Vasc Anesth. 2006;20:768-71. 98 patients,
  – Changed drug Rx in 20 (20%)
  – Changed fluid Rx in 27 (28%)
  – Guided postop care unit in 25 (26%)

  – Category 2 use of TEE changed vasodilator Rx in 55% (resolution of SWMA in 13 patients) and vasopressor Rx in 43%; guided fluid Rx in 23%.
  – TEE was more likely to impact Rx in patients with pre-existing LV / RV failure or SWMA

  – Echo in 123 patients; TEE findings had
    • Major impact in 19 (15%)
    • Minor impact in 59 (48%)
    • Limited impact in 22 (18%)
    • No impact in 23 (19%)

• Garcia-Fernandez: Role of transesophageal echocardiography in the assessment of patients with blunt chest trauma: correlation of echocardiographic findings with the electrocardiogram and creatine kinase monoclonal antibody measurements. Am Heart J 1998; 135:476-81
  – 117 patients with significant blunt chest trauma had ECG, CK-MB and TEE
  – 66 had TEE findings of damage from trauma: RV WMA or dilation; effusion / tamponade; valve injury; aortic injury
  – ECG abnormal in 59% of those with TEE findings and 24% of those without
Rescue Echo

- Shilcutt: *Use of Rapid “Rescue” Perioperative Echocardiography to Improve Outcomes After Hemodynamic Instability in Noncardiac Surgical Patients.* J Cardiothorac Vasc Anesth 2012; 26:362-70
- Periop TTE (9) or TEE (22) in 31 patients with unexplained hemodynamic instability; all but one performed by anesthesiologist
  - TEE exam:
    - Midesophageal AV SAX, AV LAX, Bicaval, RV inflow, 4 chamber, 2 chamber, LV LAX, Descending aorta scan
    - Transgastric SAX
  - TTE exam:
    - Parasternal: AV LAX, AV SAX, RV inflow, LV SAX
    - Apical: 4 chamber, 2 chamber, LV LAX
    - Subcostal 4 chamber
- Echo findings during hemodynamic instability:
  - Hypovolemia, LV / RV failure, myocardial ischemia, pulmonary embolus, cardiac tamponade, valve abnormalities
  - Of 16 patients with preop echo showing disease, 7 had worsening on rescue echo
- Impact: Drug Rx change in 21; Fluid or ventilator change in 10

<table>
<thead>
<tr>
<th>Findings</th>
<th># (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV dysfunction - systolic</td>
<td>14 (45%)</td>
</tr>
<tr>
<td>diastolic</td>
<td>10 (32%)</td>
</tr>
<tr>
<td>RV dysfunction</td>
<td>9 (29%)</td>
</tr>
<tr>
<td>Hypovolemia</td>
<td>5 (16%)</td>
</tr>
<tr>
<td>SWMA</td>
<td>4 (13%)</td>
</tr>
<tr>
<td>Tamponade</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>5 (16%)</td>
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</table>
Echo in peri-anesthesia care: noncardiac surgery


- Systematic review of echo use in high risk (n=568) or hemodynamically unstable (n=400) patients

- **NOTE**: studies included employed comprehensive echo exams performed by those with advanced training – **NOT** same as point of care exam
“In this systematic review examining the use of TTE or TEE in non-cardiac surgery, the most frequent diagnoses were valvulopathy, low LVEF, hypovolemia, PE, SWMAs, and RV failure. This information should be used to inform evidence-based curricula for POCU in anesthesiology.”
Do such findings change care?


• Reviewed 364 rescue echo studies at U of Utah

• Looked for diagnoses and management impact
## Management Changes as a Result of Rescue Echocardiography Findings

<table>
<thead>
<tr>
<th>Management Changes N = 364</th>
<th>Number of Rescue Echocardiograms Showing Management Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total (%)</td>
</tr>
<tr>
<td>All management changes</td>
<td>214 (58.8%)</td>
</tr>
</tbody>
</table>

**Types of management changes:**

<table>
<thead>
<tr>
<th>Management Changes</th>
<th>Number of Rescue Echocardiograms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid administration</td>
<td>113 (31.0%)</td>
</tr>
<tr>
<td>Inotropes</td>
<td>64 (17.6%)</td>
</tr>
<tr>
<td>Vasopressors</td>
<td>40 (11.0%)</td>
</tr>
<tr>
<td>Inhaled vasodilators</td>
<td>8 (2.2%)</td>
</tr>
<tr>
<td>Diuretics</td>
<td>5 (1.4%)</td>
</tr>
<tr>
<td>Surgical changes</td>
<td>27 (7.4%)</td>
</tr>
<tr>
<td>Other medical changes</td>
<td>18 (4.9%)</td>
</tr>
</tbody>
</table>
Echo Impact: Evidence in critical care / emergency / ICU

- Oren-Grinberg: *Focused Critical Care Echocardiography*. Crit Care Med. 2013;41:2618-26. “studies demonstrating improved clinical outcomes for critically ill patients managed by focused critical care echocardiography are generally lacking, there is evidence to suggest that some intermediate outcomes are improved. “


Evidence in pre-anesthesia evaluation

  – Anesthesia performed TTE **changed management plan in 54 of 100** patients
  – In patients with no suspicion of cardiac disease: 2 (10%) had step up in Rx plan, 3 (15%) had step down in Rx plan
  – In patients with suspected cardiac disease: 18 (23%) had step up while 31 (39%) had step down in Rx plan

• Canty: *The impact of pre-operative focused transthoracic echocardiography in emergency non-cardiac surgery patients with known or risk of cardiac disease.* Anaesthesia. 2012; 67:714-20.
  Based on anesthesia team performed TTE:
  – In 99 patients, 24 had no suspected cardiac disease but 7 had step up of Rx plan
  – 75 had suspected cardiac disease – 29 had step up while 8 had step down of Rx plan

  – 222 patients had perioperative focused TTE
  – **39 (18%) had some adverse cardiac event**
  – TTE findings that were associated with ACE were pulmonary hypertension, LV/RV dysfunction and/or stenotic valve lesions
  – **Reassuring TTE findings:** “No patients with a completely normal TTE, flow murmur, isolated regurgitant valve disease, or aortic sclerosis died perioperatively, had a myocardial infarction, or had uncontrolled hypotension.”
Basics of Perioperative Echocardiography

Limited Perioperative TTE or TEE
Some definitions relevant to imaging the heart

- **Short axis**: defined as the shortest path across an organ
  - For the LV, this will be when the chamber appears nearly circular
  - Typical TEE scan angle 10-20°
  - TTE: rotate the probe

- **Long axis**: defined as the longest path across an organ
  - For the LV this will show the LVOT and the entire LV chamber
  - Typical TEE scan angle 100-150°
  - TTE: rotate the probe
LV levels

Named in relationship to papillary muscles

- Papillary = mid level
- Between the papillary muscles and the valves = basal
- Between the papillary muscles and the apex = apical
- Apical: no cavity, cap of muscle
Myocardium has 17-segments (Circulation 2002;105:539-542)

17 Segments at 4 levels
- Vertical long axis
- Horizontal long-axis
- Short-axis
- Apical

Basal: 1 – anteroseptal; 2 – anterior; 3 – lateral; 4 – posterior; 5 – inferior; 6 – septal
Mid: 7 – anteroseptal; 8 – anterior; 9 – lateral; 10 – posterior; 11 – inferior; 12 – septal
Apical: 13 – anterior; 14 – lateral; 15 – inferior; 16 – septal
Apical cap 17
So what? Correlation of blood supply

- The coronary artery supply to LV regions is relatively constant
- Some overlap may be present & of course individual variation occurs

Basic Perioperative TEE Examination

• “...not designed to prepare practitioners to use the full diagnostic potential of TEE”
• Complementary to comprehensive TEE
• Principal goal: intraoperative monitoring
• Focus on cardiac causes of hemodynamic or ventilatory instability
• “Echocardiographic assessments that influence the surgical plan are specifically excluded from this consensus statement”

• Appropriate use: “when the nature of the planned surgery or the patient’s known or suspected cardiovascular pathology might result in severe hemodynamic, pulmonary, or neurologic compromise”
• “Should be used when unexplained life-threatening circulatory instability persists despite corrective therapy”
• Goals of basic PTEE in patient with hemodynamic instability:
  – Early diagnosis of etiology of Rx resistant hypotension
  – Guide interventions to treat underlying cause(s)

## Basic PTEE views

<table>
<thead>
<tr>
<th>Basic PTEE views</th>
<th>ME 4 chamber</th>
<th>ME 2 chamber</th>
<th>ME long axis</th>
<th>ME bicaval view</th>
<th>ME RV inflow</th>
<th>ME AV short axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV / RV filling &amp; function; InfSept &amp; AntLat RWMA; MR / MS; TR; ASD / PFO; VSD</td>
<td>LV / RV filling &amp; function; Ant &amp; Inf RWMA; MR / MS; LAA; coronary sinus</td>
<td>LV / RV filling &amp; function; AntSept &amp; InfLat RWMA; MR / MS; AR / AS; LVOT</td>
<td>SVC / RA catheters, wires, masses; ASD / PFO; LASH</td>
<td>RV filling &amp; function; TV &amp; PV disease; RVSP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG midpapillary short axis</td>
<td>Ascending aorta short axis</td>
<td>Ascending aorta long axis</td>
<td>Descending aorta short axis &amp; long axis views</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LV volume / function; RWMA</td>
<td>Aortic root pathology; PA or SVC catheters / thrombus</td>
<td>Aortic dilation / dissection / aneurysm / atheromata</td>
<td>Aortic dissection / aneurysm / atheromata; pleural fluid collections</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Limited problem focused TTE

• Several different sets of views are suggested as components of a problem-focused examination

• Literature support for several different exam sets (in syllabus)

• Key point: follow an organized exam sequence that allows you to answer the key clinical questions
  - Does the patient have normal or abnormal ventricular filling and function?
  - Does the patient have pericardial effusion / tamponade physiology or severe valve disease?
Focused TTE: Key points

- ASE definition: “a focused examination of the cardiovascular system performed by a physician by using ultrasound as an adjunct to the physical examination to recognize specific ultrasonic signs that represent a narrow list of potential diagnoses in specific clinical settings.”
- NOT a complete / comprehensive or limited echocardiogram: Can’t diagnose abnormalities that you do not image!

Differences between limited echocardiography and FCU

*Modified from Table 2, Spencer et al JASE 2013; 26:567-81*

<table>
<thead>
<tr>
<th>Limited echocardiography</th>
<th>Focused cardiac ultrasound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Expertise</td>
</tr>
<tr>
<td>That specific additional images would be useful</td>
<td>Acquire additional images from all acoustic windows</td>
</tr>
<tr>
<td>That specific additional technique would be useful</td>
<td>Acquire additional images with all cardiac ultrasound imaging modalities</td>
</tr>
<tr>
<td>Identify all expected normal structures or artifacts from all views</td>
<td>Answer any referral question with appropriate negative and positive pertinent findings</td>
</tr>
<tr>
<td>Identify pathologic findings on structure of clinical interest</td>
<td></td>
</tr>
<tr>
<td>Look for and identify lesions associated with other findings: whether in the same view of other parts of the study</td>
<td></td>
</tr>
<tr>
<td>Quantitative Techniques</td>
<td>Identify the presence or absence of one or several specific findings by using a defined, pre-established image acquisition protocol</td>
</tr>
<tr>
<td>Identify incidental findings</td>
<td></td>
</tr>
</tbody>
</table>
2014: INTERNATIONAL EVIDENCE-BASED RECOMMENDATIONS FOR FOCUSED CARDIAC ULTRASOUND

FoCUS; J Am Soc Echocardiogr. 2014 Jul;27(7):683.e1-683.e33
FOCUS Definition

- **Goal-directed** – gather sufficient information to assess physiologic status and essential differential diagnoses
- **Problem oriented** – to facilitate decision making mainly in yes or no fashion
- **Limited in scope** – for serial examinations, can be simplified further
- **Simplified** – [current ultrasound machines provide essential information for clinical decision making; disagreement about whether ultrasound machines provide equal diagnostic ability compared to high-end echocardiography machines]
- **Time sensitive and repeatable** – should be able to store images for comparisons
- **Qualitative or semiquantitative** – findings should be documented
- **Performed at the point of care** – provide info that may be critical for patient management in clinical settings
- **Usually performed by clinicians** who are appropriately trained and treating the patient

FOCUS: components

- Does not include all views of comprehensive TTE
- Systematic approach recommended
- Recommended views:
  1. Subcostal 4 chamber (S4CH)
  2. Subcostal inferior vena cava (SIVC - these 2 subcostal views can often be obtained during CPR)
  3. Parasternal long axis (PLAX)
  4. Parasternal short axis (PSAX)
  5. Apical 4 chamber (A4CH)
FoCUS: transducer locations
# FOCUS: diagnostic targets

<table>
<thead>
<tr>
<th>Clinical interest</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV: dimension; systolic function</td>
<td>Acute LV dysfunction, dilatation</td>
</tr>
<tr>
<td>RV systolic function</td>
<td>Acute RV dysfunction</td>
</tr>
<tr>
<td>Volume status</td>
<td>Estimated by chamber size, IVC</td>
</tr>
<tr>
<td>Pericardial effusion</td>
<td>Presence or absence of pericardial fluid</td>
</tr>
<tr>
<td>Pericardial tamponade physiology</td>
<td>Tamponade physiology assessment: observation on 2D imaging of basic signs of compression of right-sided chambers (systolic collapse of the right atrium, diastolic collapse of the right ventricle) not Doppler findings</td>
</tr>
</tbody>
</table>
## FOCUS: diagnostic targets

<table>
<thead>
<tr>
<th>Clinical interest</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross signs of chronic heart disease</td>
<td>Qualitative assessment of relevant LV or LA dilatation, relevant RA dilatation, marked LV or RV hypertrophy (RV dilatation can occur acutely or be consequence of a chronic process)</td>
</tr>
<tr>
<td>Gross valvular abnormalities</td>
<td>Valvular abnormalities recognizable with FoCUS (without the use of Doppler-based techniques) entail leaflet or cusp massive disruption or marked thickening, flail, or anatomic gaps</td>
</tr>
<tr>
<td>Large intracardiac masses</td>
<td>Large valve vegetations; visible intracardiac or IVC thrombi</td>
</tr>
</tbody>
</table>
Echo clues to unexpected events

WHY DOES MY PATIENT HAVE LOW BP?
LV short axis (PSAX or TGSAX)

- Required structures in view
  - LV cavity
  - LV walls – endocardium should be visible in at least 50% of circumference
  - Papillary muscles – nearly equal size, distinct from LV wall
- Pretty easy to recognize

- What can it show you?
  - LV enlargement
  - LV hypertrophy
  - Global & regional systolic function and dysfunction
  - Prior MI
  - LV filling
  - Pericardial fluid
  - Other “things”
Transgastric midpapillary short axis TEE view

- Shows LV cavity and walls, papillary muscles
- Used for assessment of LV
  - Filling
  - Function
  - Size / Hypertrophy
- Useful for quick assessment during hemodynamic instability
TEE transgastric midpapillary short axis view

Inferior wall
VS
Lateral wall
Anterior wall

Normal filling
Normal function
(at this level)
Parasternal short axis TTE view

Normal filling
Normal function
(at this level)
Interpreting changes in echo images: Diagnostic Tips

• Echo images may be simple or complex depending on underlying conditions
• Changes in images can help you sort out clinical changes
• Example: changes in LV size
  – TG short axis nearly circular
  – Changes in diameter over time at end diastole correlate to changes in filling / volume state
    • Provided no change in systolic function
    • Fractional area change at this level has fairly good correlation to EF also
Why is my patient hypotensive?

1. Acute MI
2. Bleeding
3. Volume overload
4. Not sure
Echo in unexplained hypotension

• Category I indication for TEE
• Usual things cause the usual types of intraoperative hypotension
  – Blood / fluid loss
  – Vascular compression
  – Excess medication
• However in some patients clinical findings don’t agree & may point to conflicting diagnoses

• Less usual causes
  • Severe hemorrhage
  • Pulmonary embolism
  • Pericardial tamponade
  • LV outflow tract obstruction
  • Myocardial dysfunction (including ischemia)
Filling pressure can mislead

• If a hypotensive patient does not improve with the usual crystalloid / colloid bolus:
  – Can’t we use CVP or wedge pressure to guide Rx?
  – Does central pressure tell you how patient is doing?

• PA wedge pressure and CVP may NOT predict patients who will respond to fluid loading with BP increase
  – Osman: Cardiac filling pressures are not appropriate to predict hemodynamic response to volume challenge. Crit Care Med 2007; 35: 64-68
Estimating LV preload

• Preload is tension on muscle at the start of contraction
• LVEDP is often used as the correlate of preload
• LV stretch is another correlate
  – LV stretch is directly related to LV dimension
  – LV end diastolic diameter or area can both be used to estimate LV preload
Estimating preload by LVEDV / Area

• LV end diastolic area may be useful during surgery  
  – TEE may more reliably predict the response to fluid administration
• Cheung: Echocardiographic and hemodynamic indexes of left ventricular preload in patients with normal and abnormal ventricular function. Anesthesiology 1994; 81:376–387
• LV end diastolic volume index predicts response to IV fluids  
  – LVEDVI correlated with changes in cardiac index, while changes in CVP or PAOP did not
Normal LV volume
Hypotensive trauma patient

- Small LVEDA
- Near complete systolic emptying

Your differential diagnosis?
1. Acute MI
2. Myocardial ischemia
3. Volume overload
4. Too much anesthesia
5. Not sure – please provide more views
Hypotensive trauma patient

- Diagnosis based on more views:
Hypotensive patients

- Less than expected response to volume administration
- These images were obtained shortly after induction of anesthesia
Hypotensive trauma patient

- Pericardial effusion can result in tamponade
- Tamponade occurs when pericardial space pressure (from effusion) > cardiac filling pressure; limits diastolic filling
- Rapid accumulation can cause tamponade at relatively small fluid volumes
- Slow accumulation can allow large fluid volumes

Hypotensive trauma patient

- Before & After partial drainage by pericardiocentesis or pericardial window:
Long axis LV views

• Structures Visualized
  – LV: Basal, mid post; basal, mid anteroseptal
  – MV: A2 at right, P2 at left
  – LVOT & AV
  – Ascending aorta
  – 120 - 160° TEE scan angle; adjust PLAX or apical LAX

• Utility:
  – LV function: anteroseptal and inferolateral segments; apical cap
  – MV structure / function: Assess P2, A2
TEE Midesophageal LAX
Why is my patient hypotensive?

- Abrupt drop in BP coupled with abrupt decrease in ETCO2
- TEE performed on urgent basis
Why is my patient hypotensive?

- Another patient with abrupt drop in BP coupled with abrupt decrease in ETCO2
- TEE done emergently
During hypotensive episode

- Very low LV volume
- Severely dilated RV
- Very poor RV systolic function
Hypotensive surgery patient

- Persistent hypotension despite lightening anesthetic, vasopressor
- TEE obtained; your diagnosis?
  1. Anesthesia too deep
  2. Ischemia
  3. Blood loss
  4. Embolism
Hypotensive surgery patient

- Diagnosis:
Why is my patient hypotensive?

1. Too much intravascular volume
2. Too little intravascular volume
3. Bad cardiac function
4. Something else
Why is my patient hypotensive?
Why is my patient hypotensive?

*Found this while adjusting TEE probe to image the aorta*
Another view: why hypotensive?

1. Too much intravascular volume
2. Too little intravascular volume
3. Bad cardiac function
4. Something else
Why is my patient hypotensive?

- Persistent hypotension despite starting infusion of inotropic agent
- TEE done
Why is this patient hypotensive?

1. Hemorrhage
2. Pulmonary embolism
3. Pericardial tamponade
4. LV outflow tract obstruction
5. Myocardial ischemia
Why hypotensive?
A Cautionary Tale

• Patient presented about 2 weeks after feeling “ill” with nausea, fatigue
• Progressive worsening dyspnea and leg edema
• Admitted to hospital, echo requested
• “Quick look” study done by moderately experienced person
• Conclusion: “mild decrease in LV function, no wall motion abnormalities”
Remember: absence of evidence is NOT evidence of absence
Views from study

Parasternal LAX

Parasternal SAX
What was missing?
You can’t diagnose what you don’t image

  – Practical applications of echocardiography: patients with acute chest pain, acute heart failure, suspected cardiac tamponade, complications of myocardial infarction, acute valvular heart disease including endocarditis, acute disease of the ascending aorta and post-intervention complications.

  – Bedside evaluation using HHE is helpful for assessing LV chamber and walls dimensions, LV regional function, and morphological abnormalities of the valves. The device can be used by cardiology trainees with limited experience in echocardiography but only in combination with a standard examination.
Key points to remember

• Echo has broad utility in the care of peri-anesthesia patients
  – Differential diagnosis of discordant clinical findings
  – Rescue from potentially harmful clinical situations
    • Rapid diagnosis, immediate assessment of response to treatment
    • Rule in / rule out significant diagnoses: avoid unnecessary procedures

• TEE is widely accepted / utilized during major surgery in high risk patients (cardiac and noncardiac surgery)
  – Monitoring benefits
  – Diagnostic role

• TTE is useful before, during and after anesthesia in a wide range of patients and clinical settings
Conclusions

- Echo can rapidly provide wide range of useful information
- In hemodynamically unstable peri-anesthesia patients:
  - Imaging can lead to rapid diagnosis of hypovolemia, sepsis, pulmonary embolus, cardiac tamponade, and new myocardial ischemia
  - Response to Rx can be monitored / altered based on images
- Essential to have appropriate knowledge base AND