

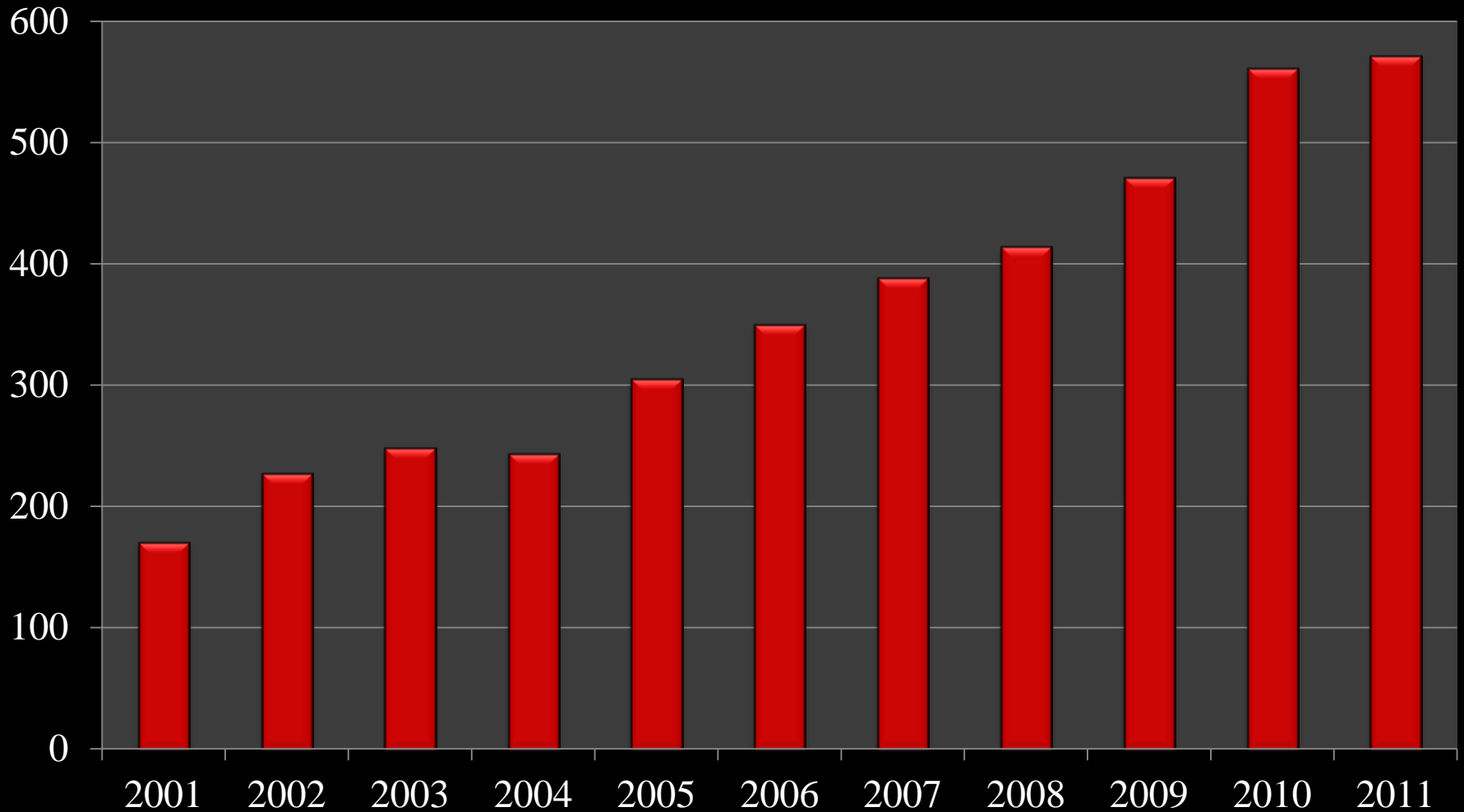
Ultrasound in Medical Education

Richard Hoppmann
University of South Carolina
School of Medicine

Ultrasound Education for Medical Students

- Long history of teaching medical students ultrasound in Europe (U. Heidelberg, U. Vienna) – over 20 years
- Early reports in the USA using ultrasound to teach anatomy, physiology, and physical diagnosis in the 1990s.
- Early 2000s, students had opportunities to learn ultrasound during several rotations, especially emergency medicine
- In the mid-2000s, several medical schools began integrated ultrasound curricula
- Today about a dozen schools have / or are developing integrated ultrasound curricula in the United States

PubMed Search for “Ultrasound Education” by Year



Why ultrasound?

- Ultrasound is a great modality for teaching
- A safe diagnostic imaging modality
- Because of its clinical value, ultrasound is the #1 imaging modality in the world
- Ultrasonography as a skill has direct applicability in many clinical specialties

Why now?

There has been a revolution in ultrasound and digital technology in recent years that has resulted in ultrasound machines that are:

- Smaller
- Cheaper
- Smarter

First Commercially Available Scanner -1963



Hand –Carried Ultrasound



Hand-Held Ultrasound





Smart Phone Probe



STAR TREK



The Integrated Ultrasound Curriculum

First (M1) and Second (M2) Year Medical Students

- Didactic classroom lectures
- Web-based learning modules
- Scheduled hands-on laboratory scanning sessions
- Open ultrasound laboratory practice sessions
- M1: anatomy and physiology
- M2: introduction to clinical medicine, pathology, pathophysiology and physical diagnosis







M1 Student Practical Exam Fall Semester

- All first year students are individually evaluated for their ability to scan a standardized patient. They were also evaluated by an observer regarding their interaction with the standardized patient and attentiveness to patient comfort and modesty.
- Each student had 15 minutes to capture, identify structures and save the images.

Images

RUQ

Rt Kidney

Liver

Diaphragm

M. pouch

Pelvis

Bladder

LUQ

Lt Kidney

Spleen

Neck

Carotid Artery

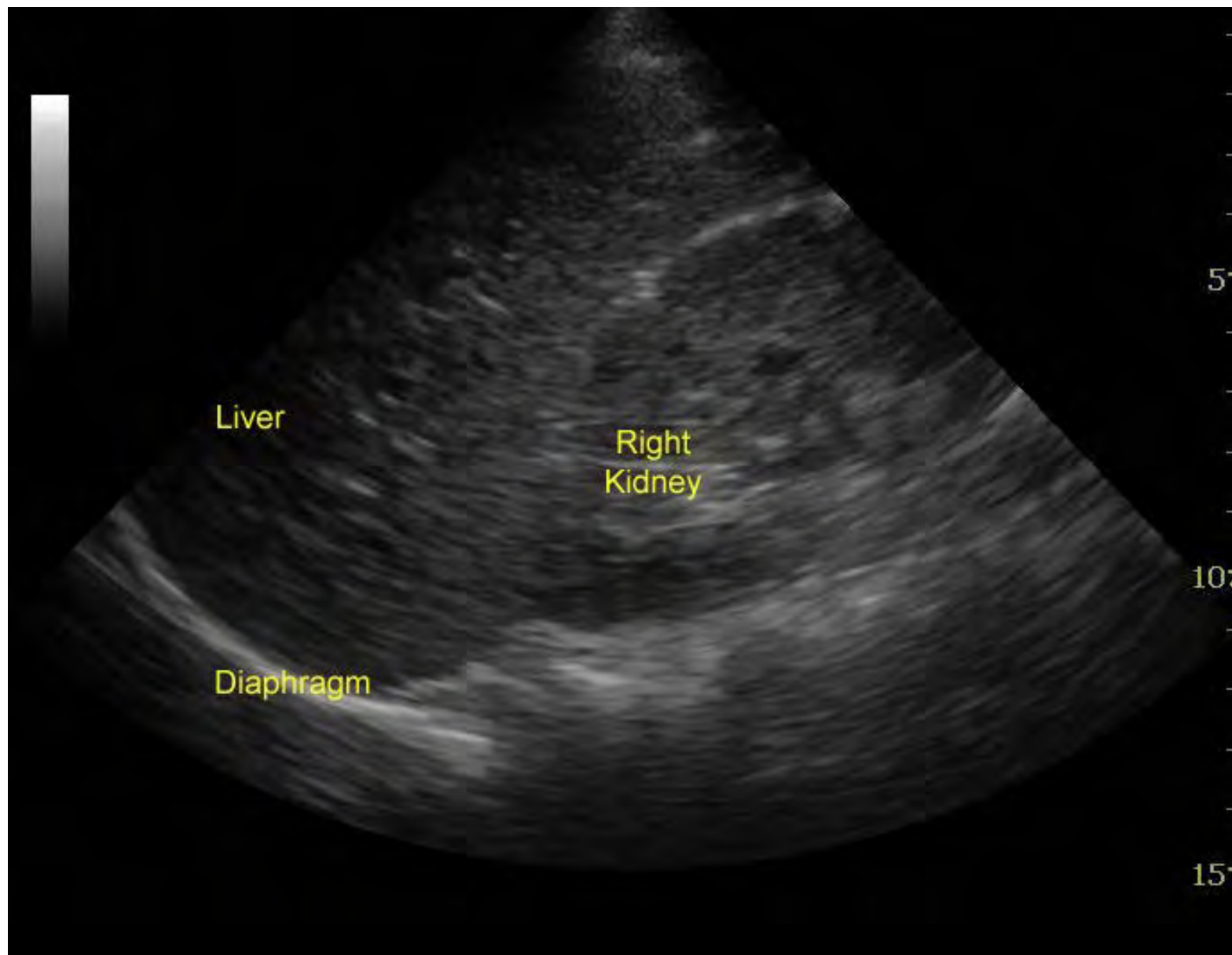
Internal Jugular Vein

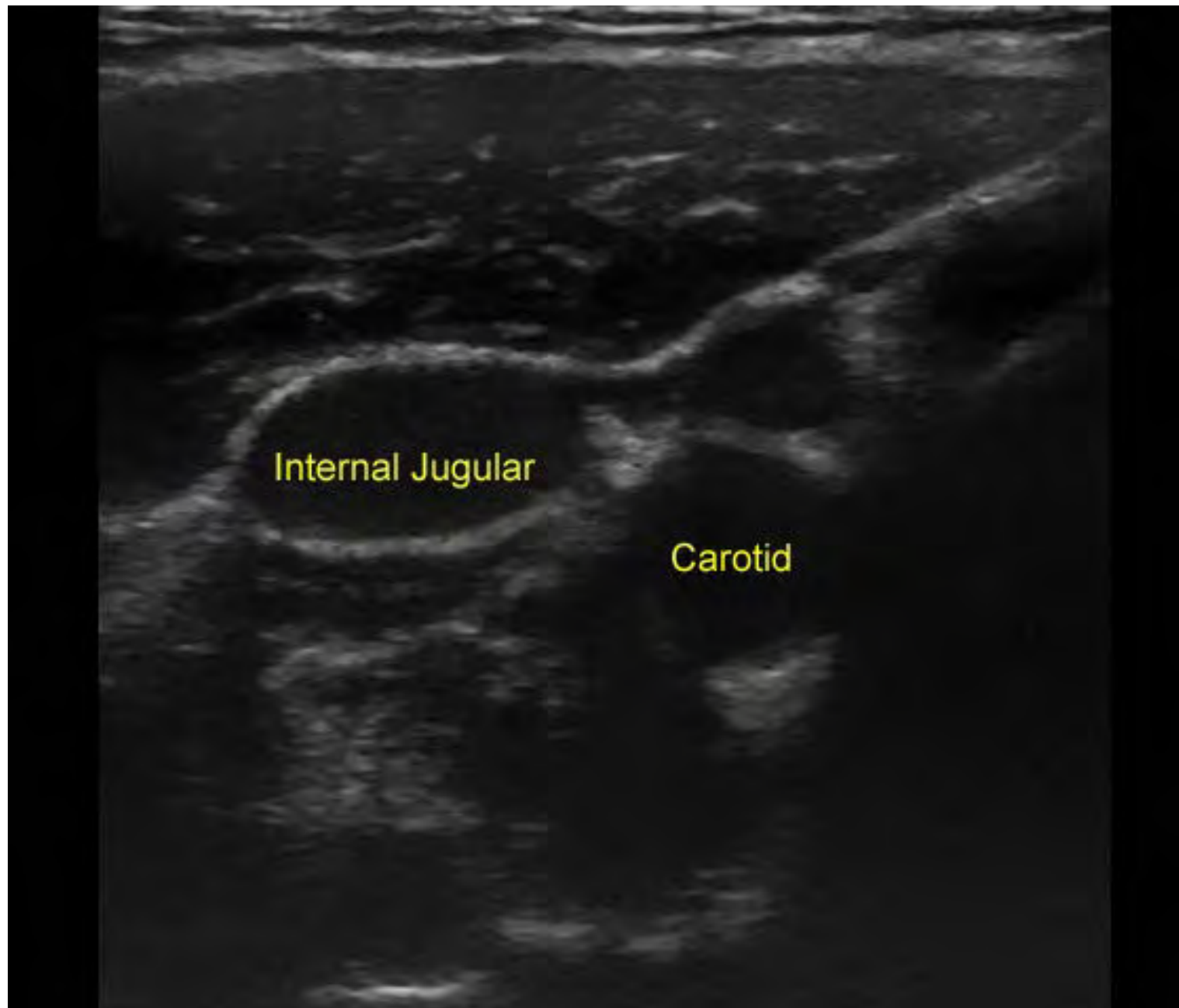
Parasternal Long Axis Heart

Lt Atrium

Lt Ventricle

Mitral valve





Results of M1 Practical

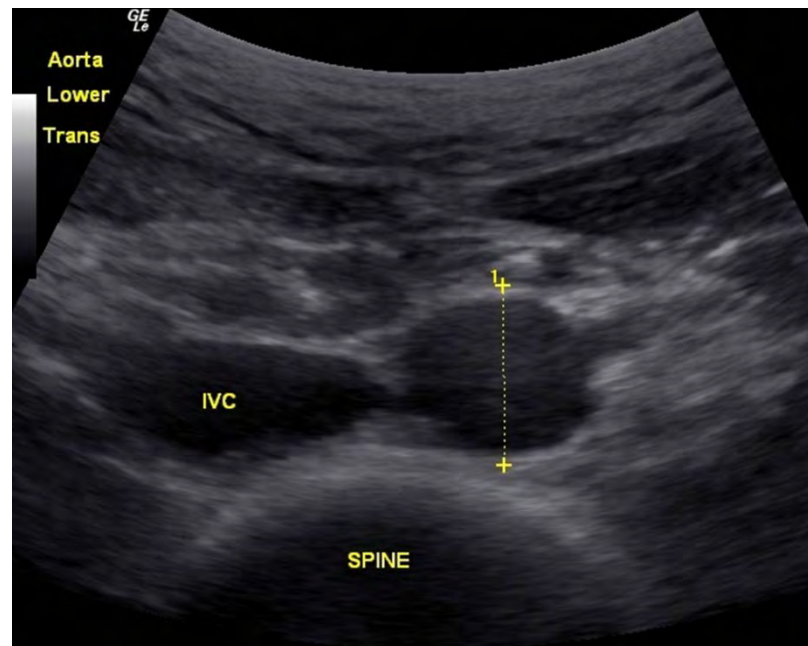
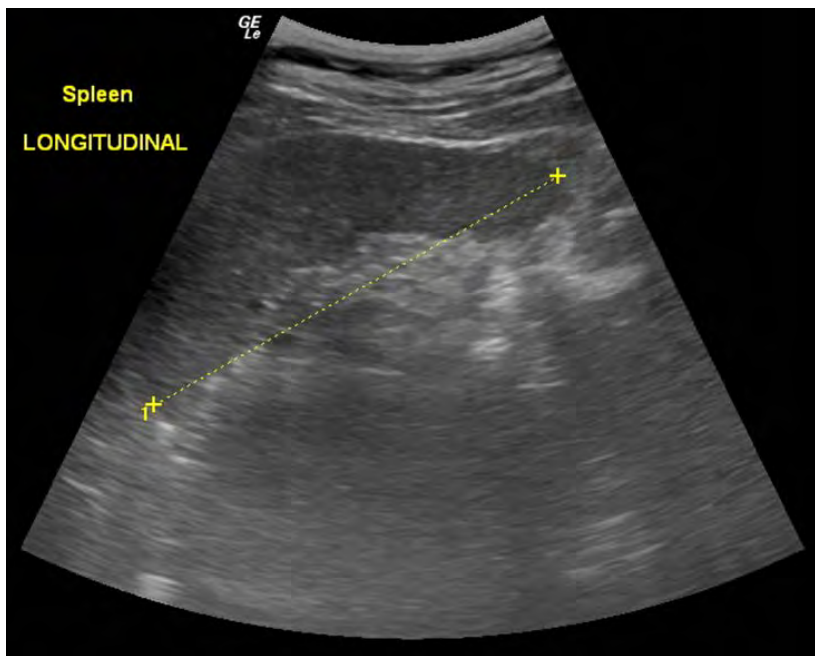
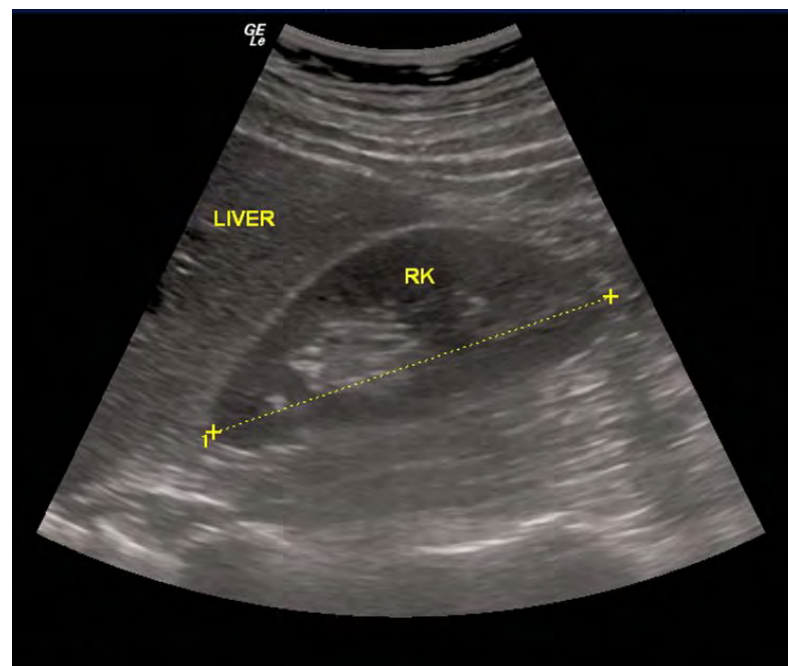
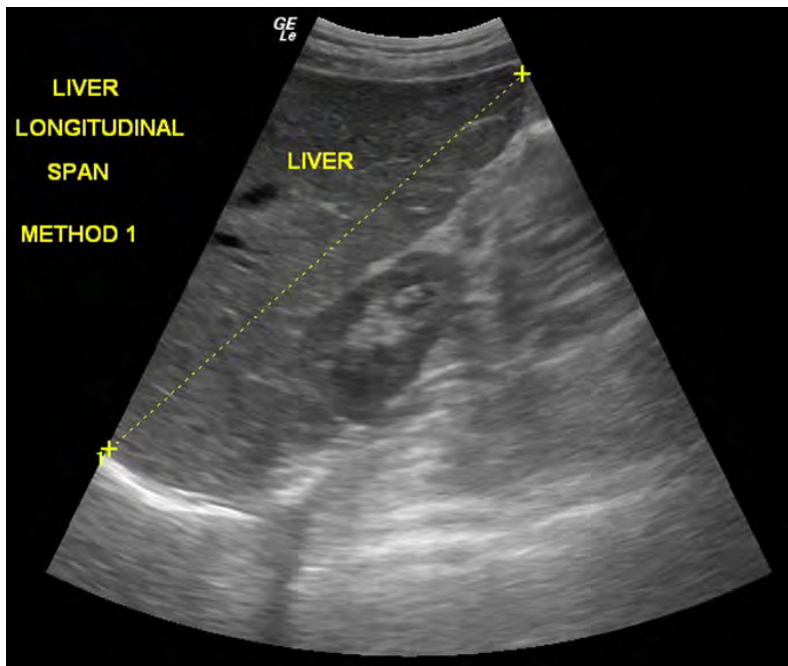
- All students easily completed the exercise within the allotted time of 15 minutes.
- Maximum possible score for the OSCE = 50 points
- Mean score for the class = 49.1 points
- Range for the class = 39.0 - 50.0 points
- Students with a perfect score of 50.0 = 78%

Comparison of Hand-Carried Ultrasound to Bedside Cardiovascular Physical Examination. Kopal SL, et al. Am J Cardiol 2005

- Two first year medical students
- 4 hrs of lecture and 14 hrs of hands-on experience
- Students outperformed 5 board-certified cardiologists in identifying cardiac pathology in 61 cardiac patients
- Students identified 75% of the pathologies and cardiologists identified 49%

Teaching Medical Students US to Measure Liver Size: Comparison with Experienced Clinicians Using Physical Examination Alone. Teach and Learn in Med: Int J 2013

- Ten second year medical students used bedside ultrasound to measure liver size in six GI patients
- Four Board Certified Internists estimated liver size in the same six patients using physical examination alone
- Students' measurements were significantly more accurate ($p < 0.001$) than the physicians' for every patient
- Students overestimated liver size by 1.8 cm and physicians underestimated liver size by 6.7 cm



Problem Based Learning Case

- 32 year old woman from Mexico
- 27 weeks pregnant (gravida 4, para 3, abortus 0)
- Presents with hemoptysis and severe dyspnea
- PMH significant for a childhood febrile illness that required her to stay in bed for one month at age 8

Physical Examination

- Pregnant: fundal height 25 cm
- Lungs: bibasilar rales and wheezing
- Heart:
 - Systolic and diastolic murmurs at the apex
 - +S3 gallop

Ultrasound Images as part of Case

- ECHO - mitral stenosis
- OB – 27 weeks gestation
- Lung ultrasound “B” lines



Third Year (M3) Students

- Clerkship directors have introduced ultrasound into the clerkship curriculum and OSCE evaluations
- Ultrasound in the ICU: 2 week block on IM
- Heart sounds and ECHO sessions on IM clerkship
- Pocket ultrasound has been added to the IM, FM, and Peds clerkships
- An ultrasound station has been added to the end-of-year Gate OSCE

M3 Clerkship OSCEs

■ Internal Medicine:

- thyroid scan
- central line placement with ultrasound guidance

■ Family Medicine:

- Abdominal Aortic Aneurysm (AAA) screen

■ OB/GYN:

- third trimester pregnancy with bright red vaginal bleeding - transabdominal scan

■ Pediatrics:

- Assess volume status of a 9 year old

• Surgery:

- Trauma patient – FAST exam



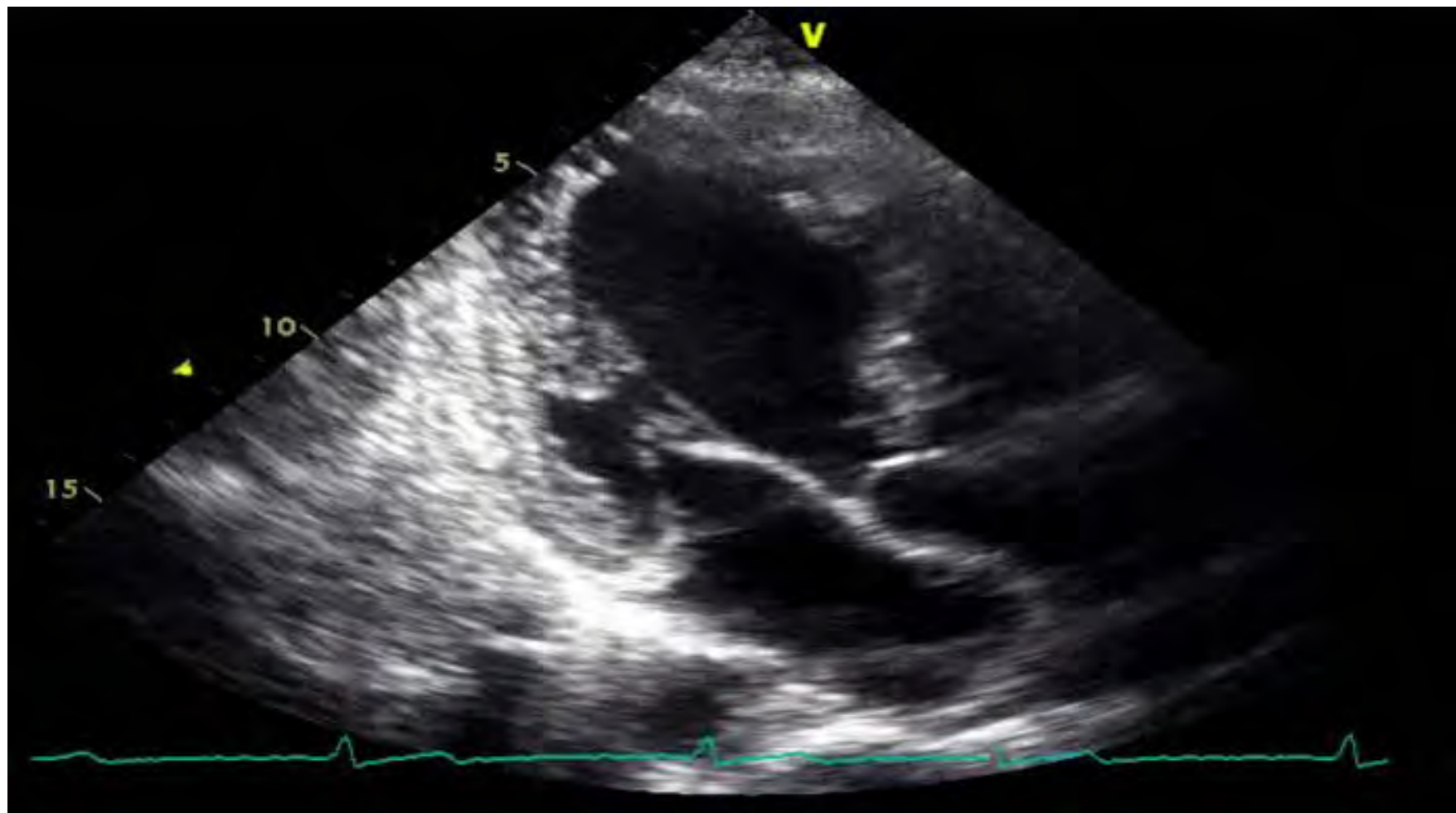


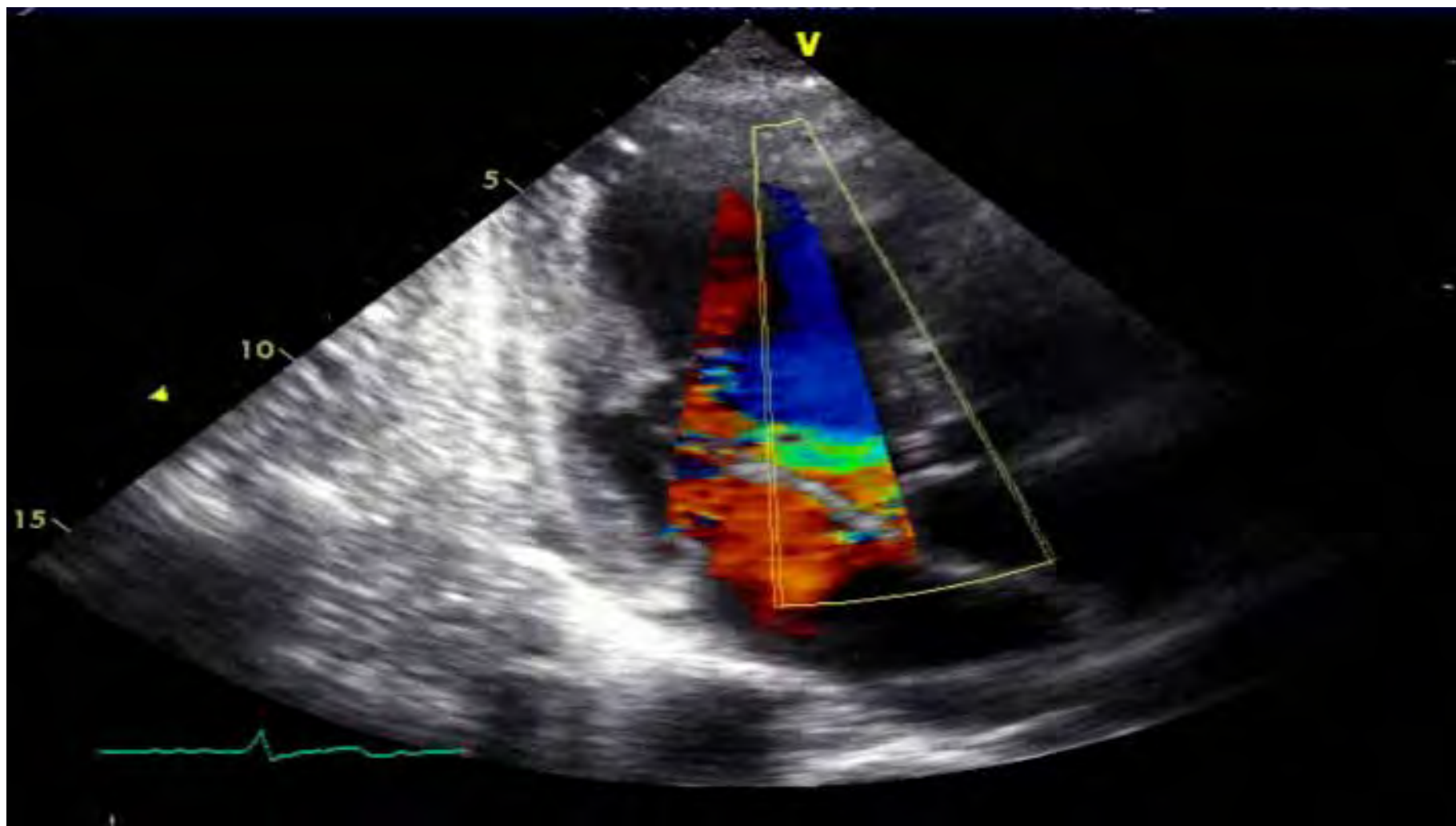
Fourth Year (M4) Students

- Four week Emergency Medicine Ultrasound Elective
- Hands-on ultrasound experience added to Radiology Elective
- Two day Capstone course to prepare for residency: RUSH for shock, lung ultrasound, ultrasound guided procedures
- Ultrasound Independent Study: research, further develop US skills, help with M1/M2 labs

The Focused Ultrasound Exam

- The healthcare provider has a specific clinical question to answer: is there a gallstone, does this patient have an aortic aneurysm, a pericardial effusion, etc.
- Ultrasound can be a valuable point-of-care diagnostic tool to complement the Physical Exam (it does not replace a good History and Physical Examination)
- Ultrasound has the potential to improve physical examination skills

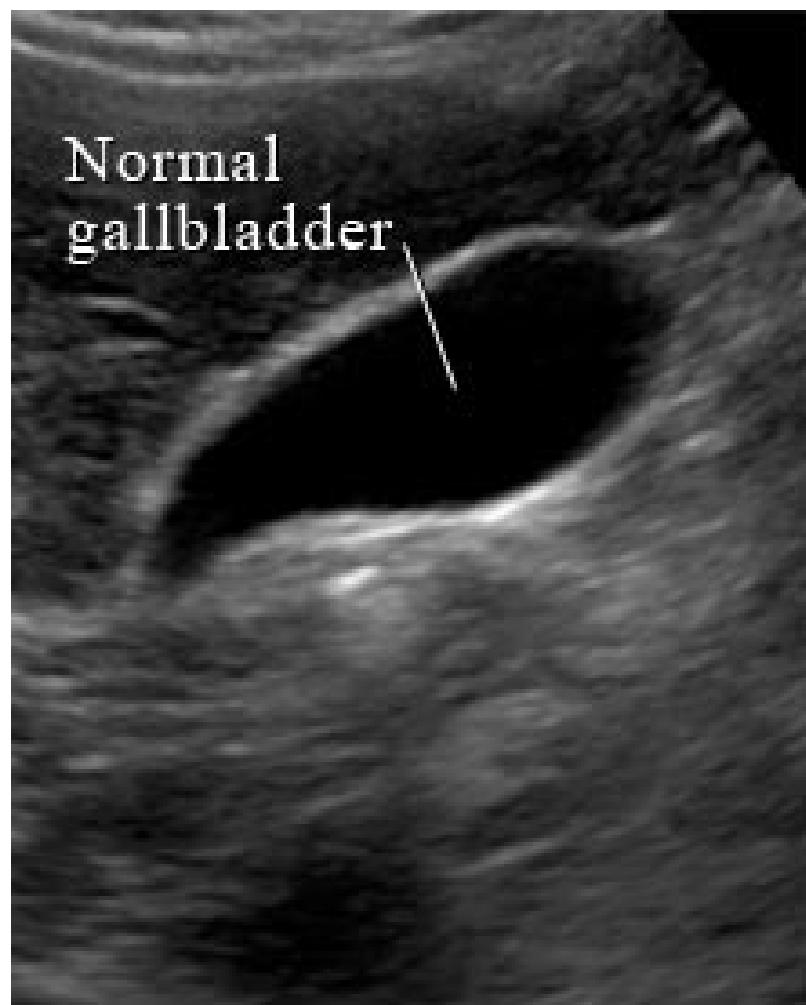






Abdominal Pain

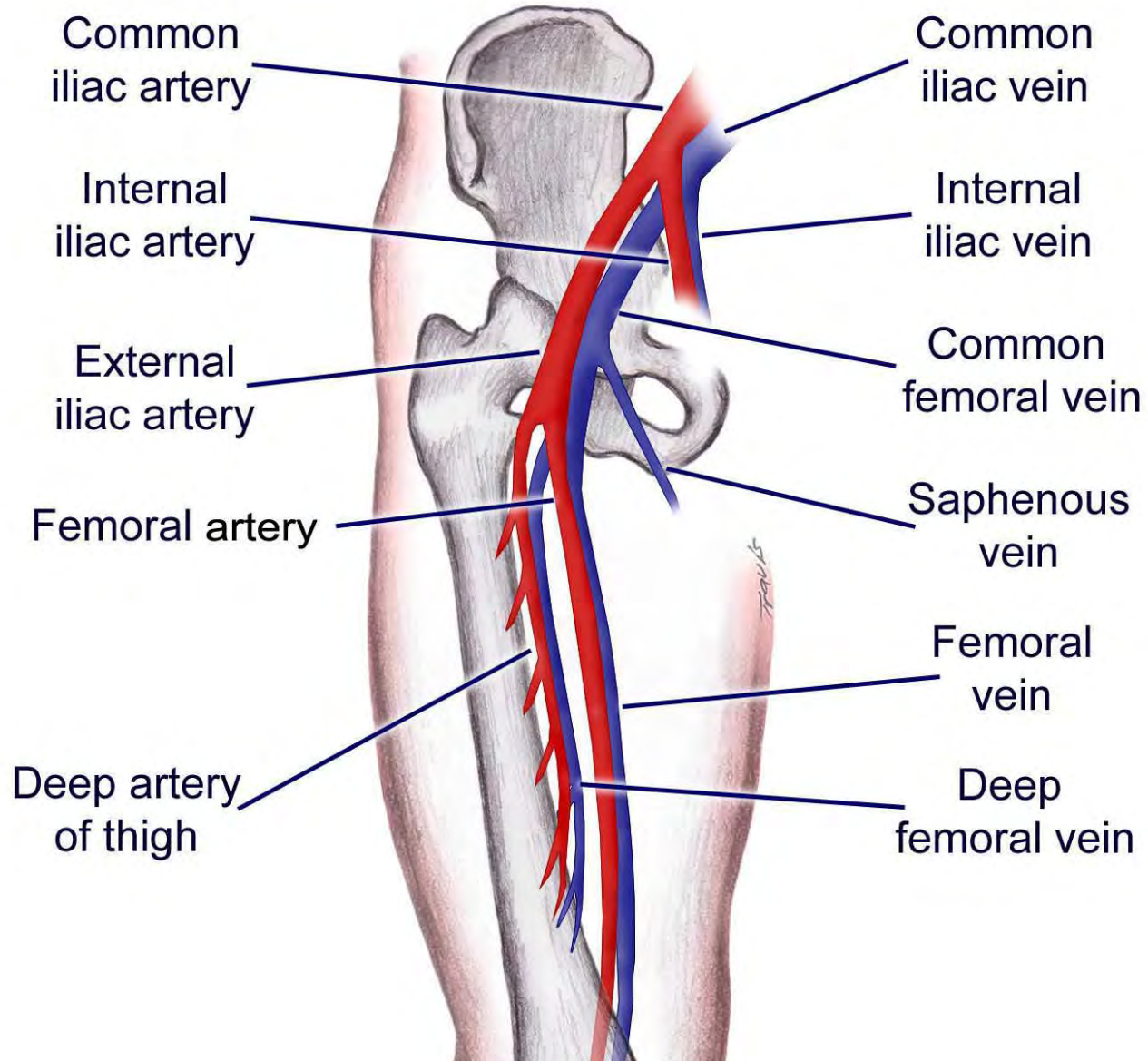
- A 45 year old female patient says she is having abdominal pain and nausea and vomiting. She has been having some problems with abdominal pain after eating for about 6 months.
- What could she have?



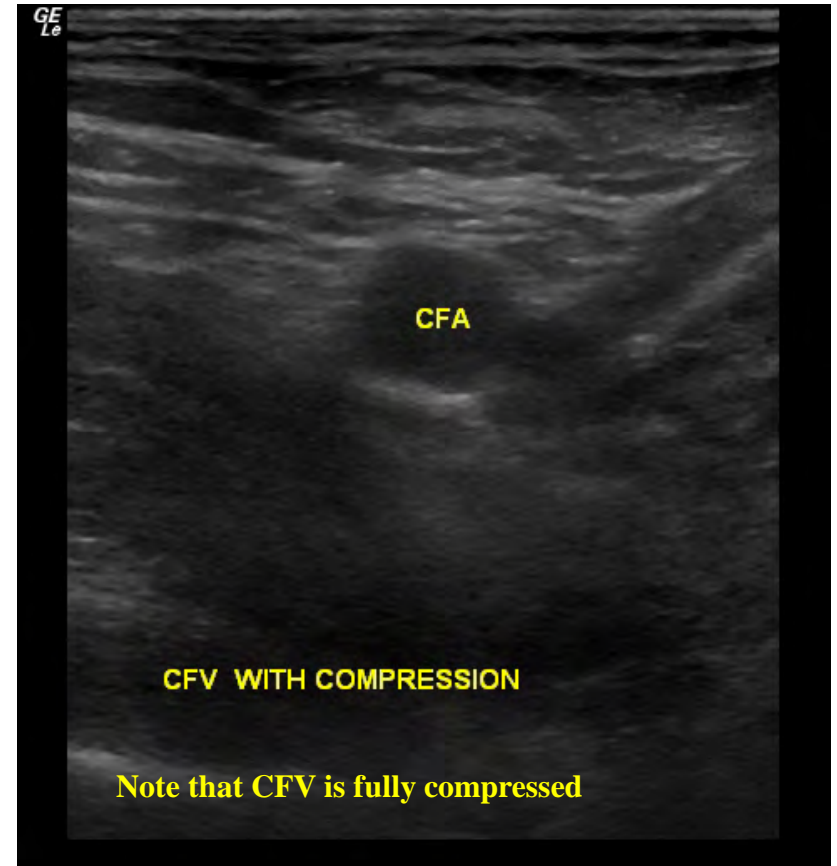
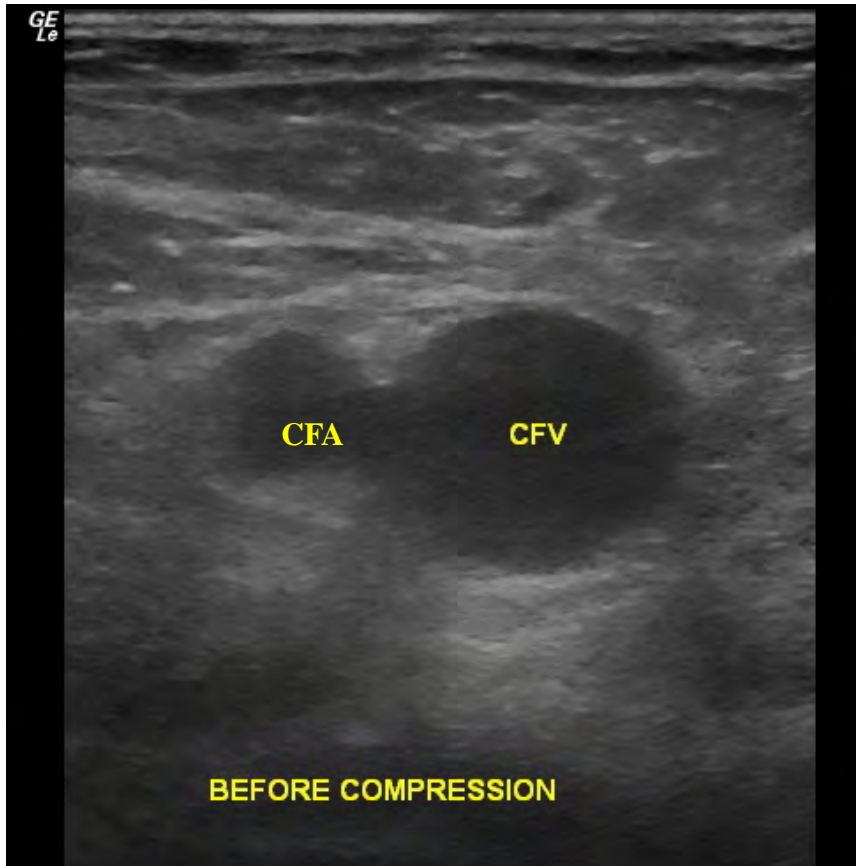
Case: 52 yr old male is being seen in the office on Friday afternoon with some pain and slight swelling of the left leg of two days duration. He has just returned from visiting his parents in California.

Cause of leg swelling?





Compressibility Test for DVT

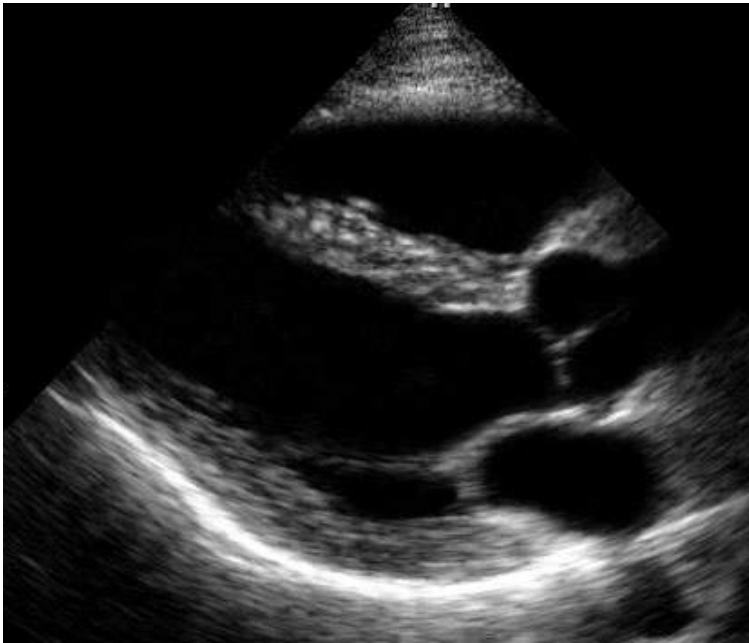


Case: 55 yr old male with a history of chronic poorly controlled HTN that you are seeing for the first time.

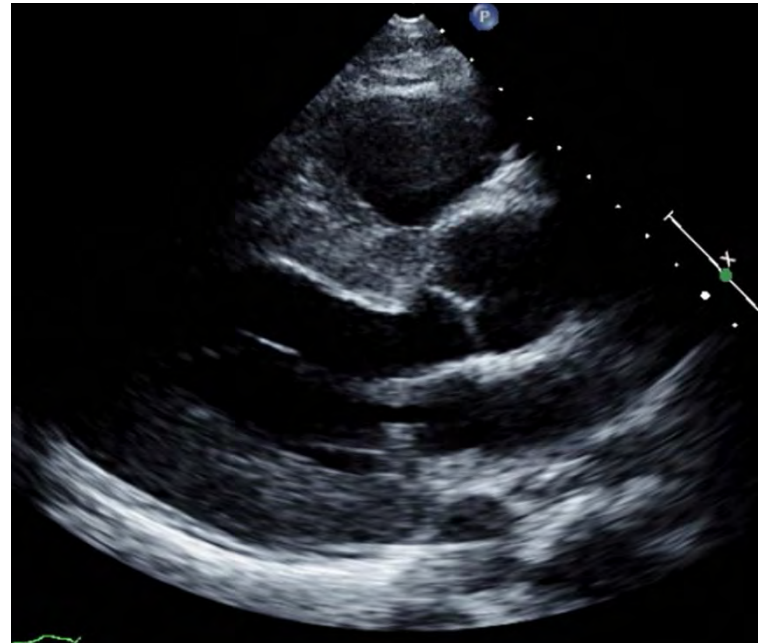
Has he developed end organ heart damage?

Parasternal Long Axis View

NORMAL



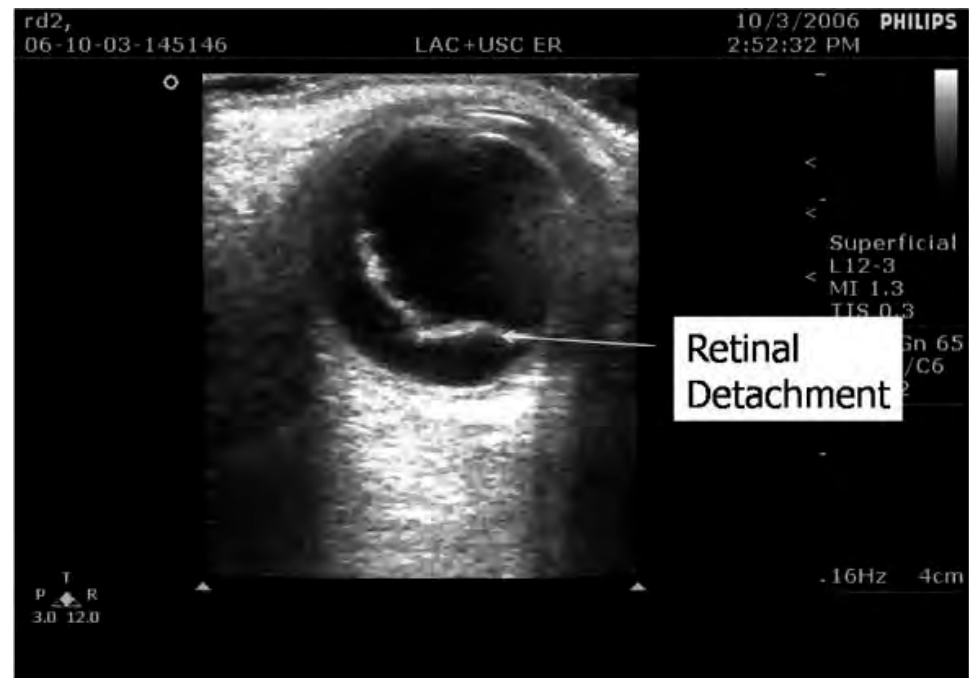
Concentric LVH



Case: 48 yr female reports she woke up this AM and could not see out of the left eye. She was in a MVA earlier in the week and had some trauma to her head but was seen in the ER and released.

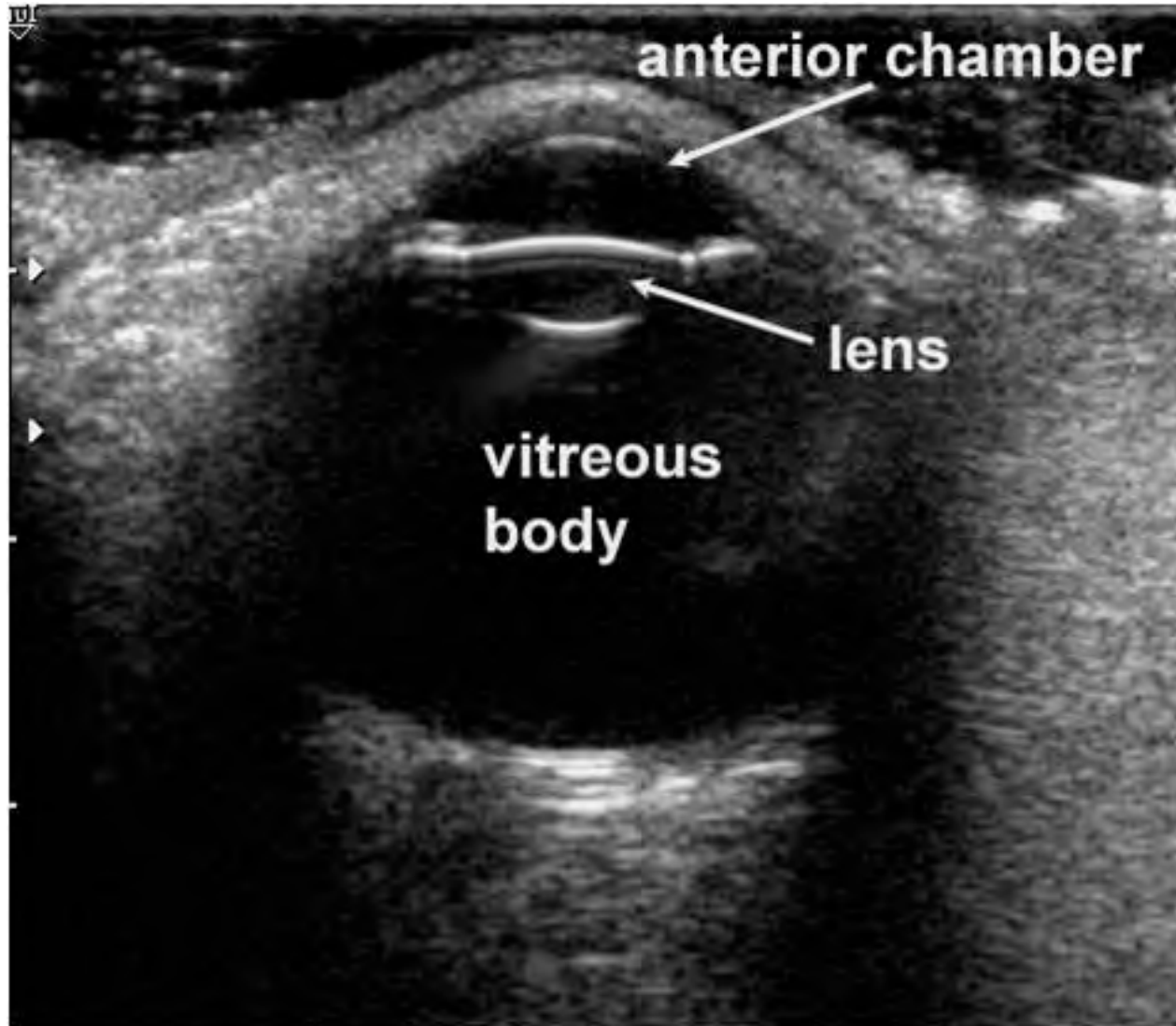
Cause of blindness?

Ultrasound Examination of the Eye



A

Normal US Eye Examination



Student Satisfaction – M1

(scale: strongly agree, agree, undecided, disagree, strongly disagree)

- The use of ultrasound enhanced my ability to learn basic anatomy.
 - *Agree or strongly agree = 81%*
- The use of ultrasound enhanced my ability to learn basic physiology.
 - *Agree or strongly agree = 70%*
- I found the overall educational experience in ultrasound enhanced my medical education.
 - *Agree or strongly agree = 95%*

M1 Comments

- Ultrasound was a great way to reinforce the information we learned in anatomy.
- Very helpful to understand physiology.
- It was nice to be able to see how our knowledge from class can be used with real skill and equipment.
- Probably my favorite part of the semester.
- I enjoyed interacting with the patients.
- It's the reason I choose to come here and I have not been disappointed.

Student Satisfaction – M2

(scale: strongly agree, agree, undecided, disagree, strongly disagree)

- Use of ultrasound in Introduction to Clinical Medicine has allowed for increased clinical correlation with basic science instruction.
 - *Agree or strongly agree = 91%*
- Ultrasound has enhanced my understanding of the physical exam.
 - *Agree or strongly agree = 92%*
- I found the overall educational experience in ultrasound enhanced my medical education.
 - *Agree or strongly agree = 94%*

Student Satisfaction – M3

- Ultrasound enhanced my overall educational experience during my clinical clerkship.
 - *Agree or strongly agree = 91%*
- Ultrasound is an important clinical skill that will enhance my ability to care for my patients.
 - *Agree or strongly agree = 96%*
- I would like to see more ultrasound training in the third year curriculum.
 - *Agree or strongly agree = 92%*

PGY 1 Survey: Class of 2010

- Rating of the ultrasound curriculum: 4.54 out of 5.0
- Do you feel the ultrasound curriculum has been beneficial during your first year of residency? 88% Yes
- In what ways have you used ultrasound:
 - Supplement physical examination 67%
 - Assist with procedures 79%
 - Confirmation of diagnosis 58%
- Should ultrasound be standard in medical student education? 92% Yes

Future of Ultrasound Education

- Competency – based education
- Ultrasound simulation for learning and assessment
- Interactive on-line learning
- Need more faculty trained to teach ultrasound – basic science and clinical
- Expansion of ultrasound education to university and college level – anatomy, physiology, engineering, etc
- Research on effectiveness of teaching with ultrasound
- Broader base of practitioners – non-physicians
- Core Global Curriculum



The mission of the Society of Ultrasound in Medical Education (SUSME) is to promote the use of ultrasound in medical education through development of educational experiences, research on outcomes, and distribution of results.

The purpose of the SUSME web site is to:

- provide a forum for the exchange of information about the use of ultrasound in medical education
- facilitate communication and collaboration between educators who are using ultrasound in medical education
- develop a database of information about the use of ultrasound in medical school curricula, and
- provide links to resources, events, and associations related to ultrasound in medicine



1st World Congress on Ultrasound in Medical Education:
in 3 days

News

[New Learning Modules Added](#)

[2009 Annual Meeting](#)

[2008 Annual Meeting](#)

[World Congress](#)

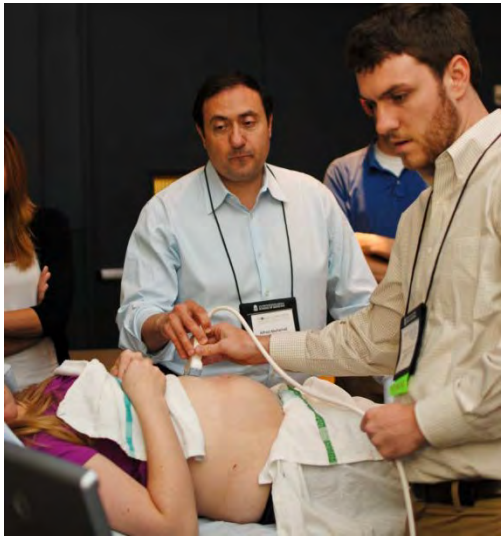
[Follow Us on Twitter](#)

Contact the Society of Ultrasound in Medical Education – info@susme.org



www.wcume.org/





SECOND WORLD CONGRESS

ULTRASOUND IN MEDICAL EDUCATION

SEPTEMBER 27 - 29, 2013





Ultrasound can be fun!

year
of
2013
Ultrasound



