Ultrasound and the Evolution of the Physical Examination

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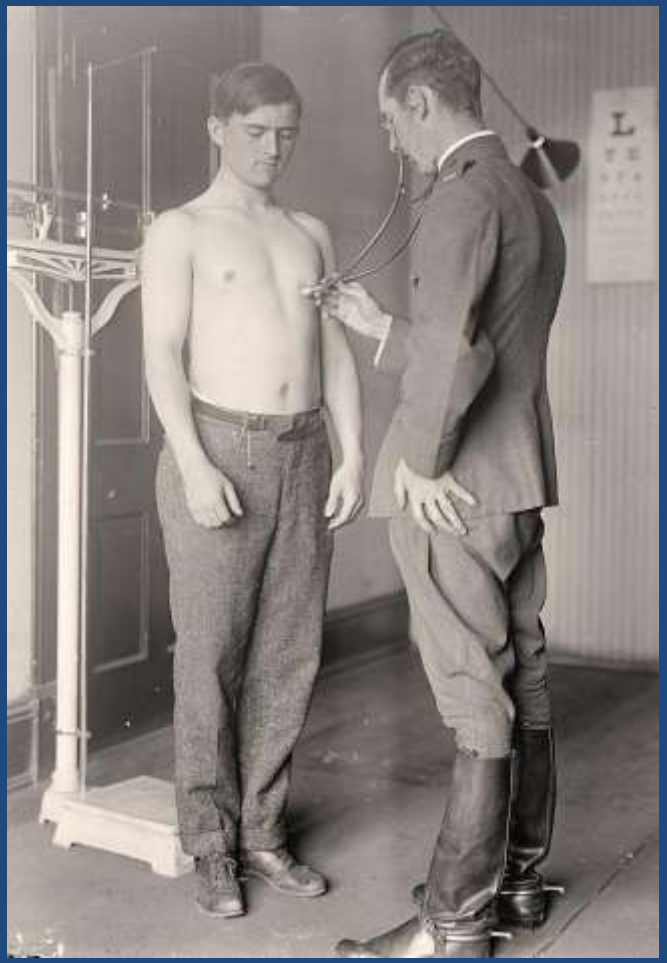
The Physical Examination

- Was the center of medical practice for centuries if not millennia
- Physicians and healers could examine patients and diagnose disease processes untrained persons could not
- An art form as well as science

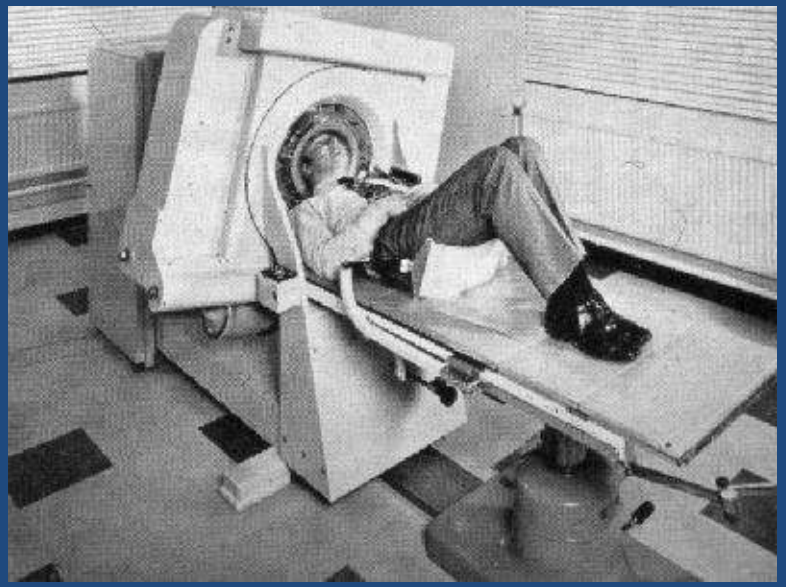


The Physical Examination

- Over the last 100 years there has been increasing tension between the art of physical examination and usurpers of diagnosis
- X-rays were perhaps the first great challenge of the physical examination and a major one

The Physical Examination Rivals

- Fortunately and unfortunately, plain x-rays left much to be desired
- With the arrival of computed tomography and MRI the physical examination was truly challenged



The Physical Examination Rivals

- A detailed neurological examination would now be followed by a CT or MRI
- The abdominal examination for right lower quadrant pain was no longer acceptable as a pathway to the operating room for appendicitis

The Physical Examination Rivals

- Lab tests also challenged the physical examination
- “What is the white count?”
- “This patient cannot have appendicitis, his/her white count is normal”
- Did not work all that well in many cases

The Physical Examination

- How did we get here from there?
- Why did this happen?
- Is the physical examination
  - bad? Wrong?
  - Inadequate?
  - Too limited?
  - Too hard to master?

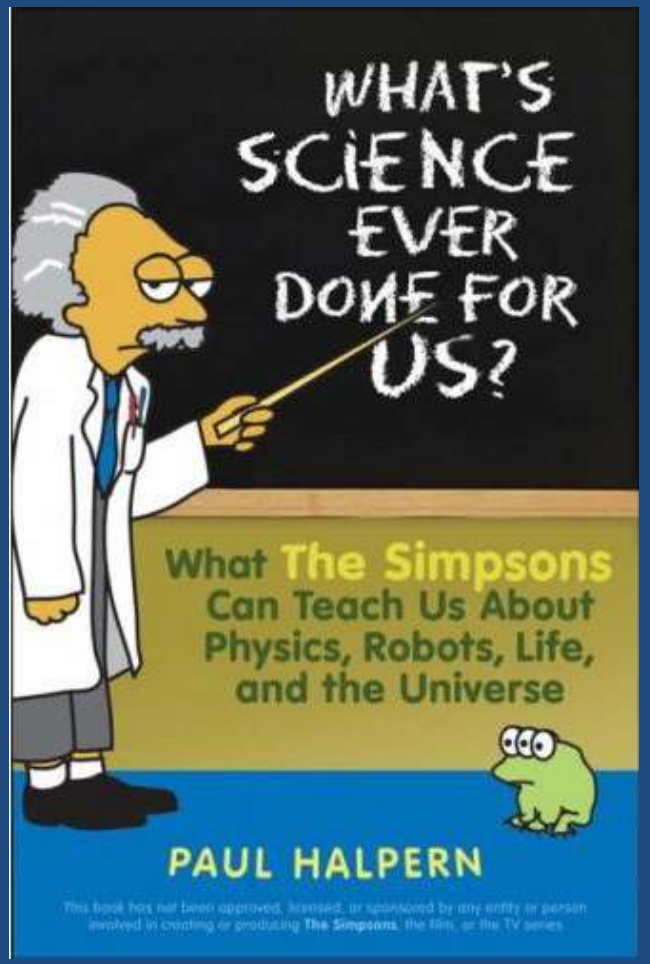
The Physical Examination

- We have been worried about it for a long time
- It is no secret that physical examination skills are thought to have declined or perhaps are being replaced
- Why have they not improved with years of discover and correlation to final diagnosis and imaging results?

- Jauhar S. The demise of the physical exam. *N Engl J* Med. 2006; 354:548-51.
- Fraser K et al. Simulation training improves diagnostic performance on a real patient with similar clinical findings. *Chest*. 2011; 139:376-81.
- Conn RD et al. Cardiac physical diagnosis in the digital age: an important but increasingly neglected skill (from stethoscopes to microchips). *Am J Cardiol.* 2009; 104:590-5.

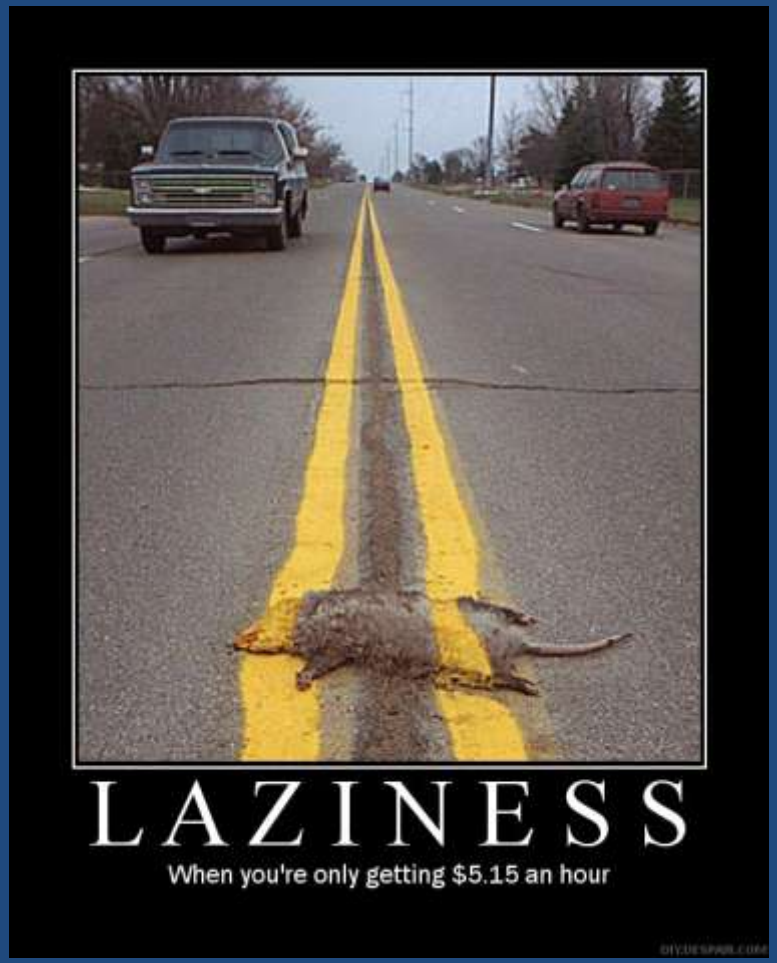
The Physical Examination

- Its just that we are human
- Both the best and worst things about humans have caused the changes we have seen
- The best:
  - Innovation
  - Invention
  - Creativity
  - Science



The Physical Examination

- The worst:
  - Laziness
  - Apathy
  - Taking the easy way out
  - Hiding not exploring
  - Not dreaming

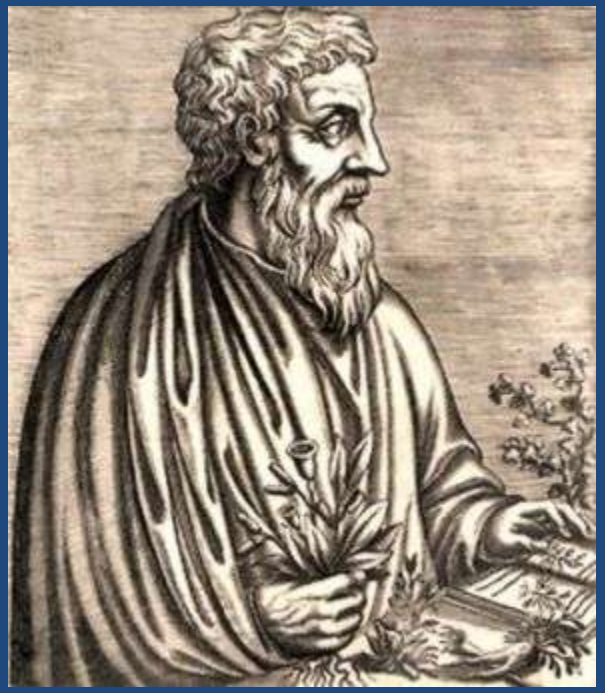


The Physical Examination

- It is simply easier to push a button or check a box
- “Why do I have to risk my license when I can get a CT scan?”
- “I can see the patient after the CT scan is done?”
- “Just get an MRI and then call me”
- “I never saw the patient, but they told me the CT was normal”

The Physical Examination

- Shouldn't everyone have great physical examination skills?
- Isn't that a physicians job?
- Remember who was the best physical examination guru at your school?
- How long did it take him or her to become so good?
- Ever wonder how accurate he or she really was?
  - Hopefully you never questioned it

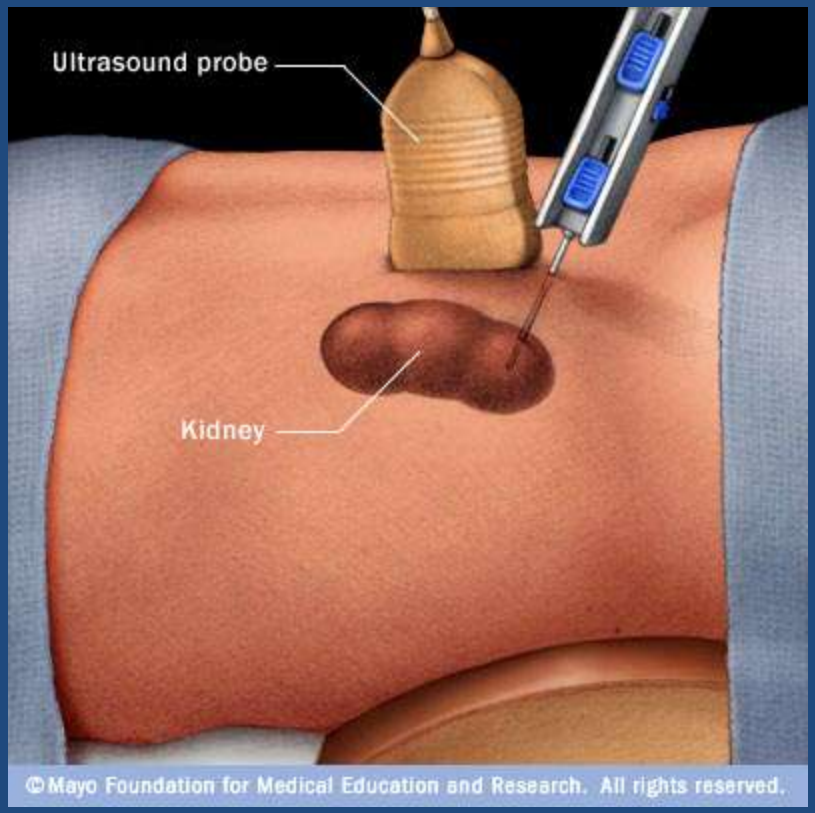


The Physical Examination needs Ultrasound

- Because it is great in the hands of great physical examiners
- Most of us are not
- Why?
  - Reality, painful reality
- Should we all be better
  - Yes, but at what price
- Look at the patients perspective
  - Just get the right diagnosis
  - Just do the procedure accurately and correctly
- The physical examination can never be so cozy with an MRI or CT
- Ultrasound can be right there with you
  - Costs less
  - No radiation
- But why stoop so low?
  - Some of us just have to cheat to get the same results
  - But what if we get better results when we cheat?

Impact of Point-of-Care Ultrasound on The Physical Examination

- Interesting conversation with a senior nephrologist about his experiences years ago
- Ultrasound and impact on his practice and entire section
- Shift of an entire service line secondary to the impact of ultrasound on the physical examination and procedure



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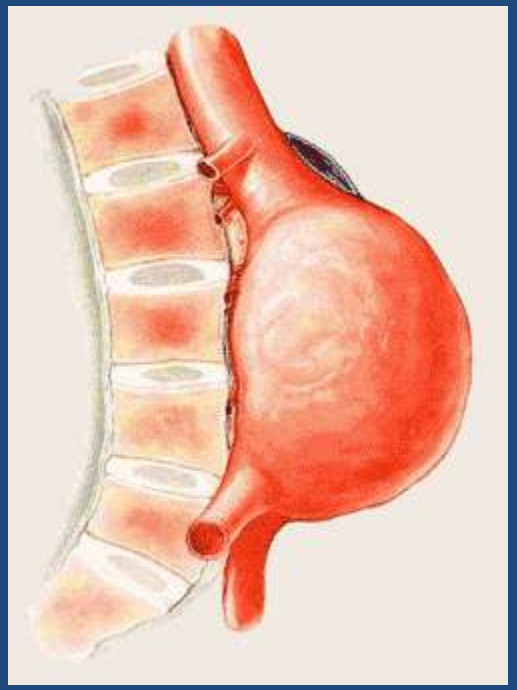
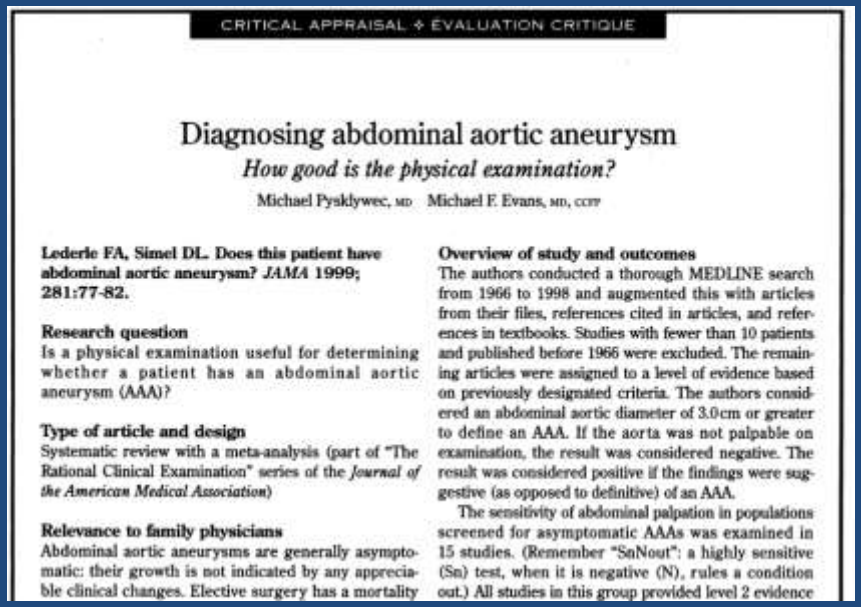
Impact of Point-of-Care Ultrasound on The Physical Examination

- Appropriate to ask if this is really true
- Careful when listening to ultrasound zealots!
- They are a slippery bunch
- Lets start with an oldie but goody
- We can all pick up a AAA right?
  - They said so in medical school
  - List of things to look for
  - Classical presentation



AAA and Physical Examination Performance

- Physical examination versus ultrasound
- Physical examination succeeded in picking less than 50% of AAA
- Ultrasound succeeds in visualizing abdominal aorta in 92 to 98% of patients
- A report of an AAA missed by US is hard to find
- Accuracy numbers approaching 98%



CRITICAL APPRAISAL ✦ ÉVALUATION CRITIQUE

Diagnosing abdominal aortic aneurysm

How good is the physical examination?

Michael Pysklywec, MD Michael F. Evans, MD, CCFP

Lederle FA, Simel DL. Does this patient have abdominal aortic aneurysm? *JAMA* 1999; 281:77-82.

Research question
Is a physical examination useful for determining whether a patient has an abdominal aortic aneurysm (AAA)?

Type of article and design
Systematic review with a meta-analysis (part of "The Rational Clinical Examination" series of the *Journal of the American Medical Association*)

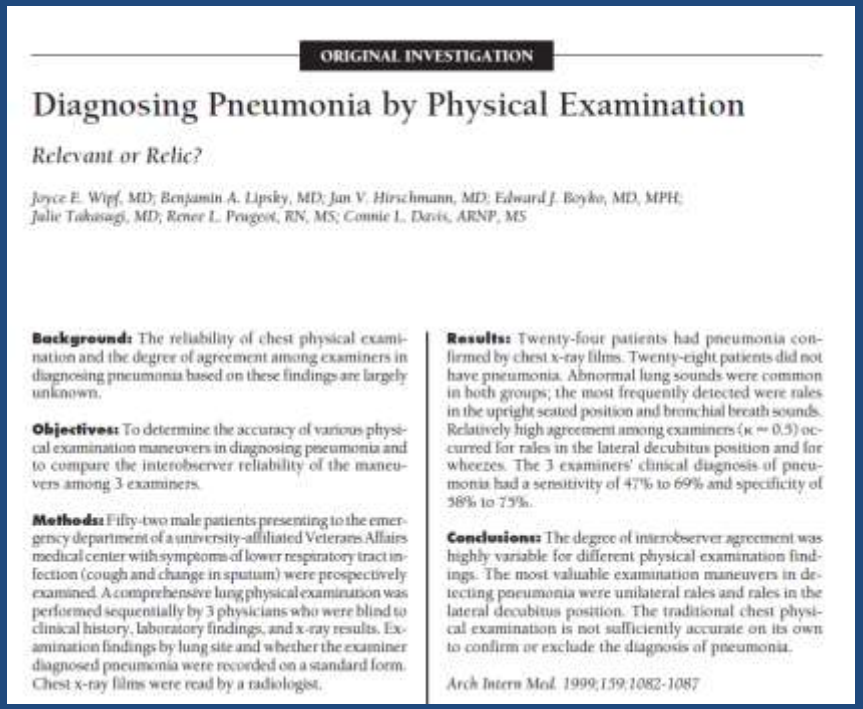
Relevance to family physicians
Abdominal aortic aneurysms are generally asymptomatic: their growth is not indicated by any appreciable clinical changes. Elective surgery has a mortality

Overview of study and outcomes
The authors conducted a thorough MEDLINE search from 1966 to 1998 and augmented this with articles from their files, references cited in articles, and references in textbooks. Studies with fewer than 10 patients and published before 1966 were excluded. The remaining articles were assigned to a level of evidence based on previously designated criteria. The authors considered an abdominal aortic diameter of 3.0 cm or greater to define an AAA. If the aorta was not palpable on examination, the result was considered negative. The result was considered positive if the findings were suggestive (as opposed to definitive) of an AAA.

The sensitivity of abdominal palpation in populations screened for asymptomatic AAAs was examined in 15 studies. (Remember "SnNout": a highly sensitive (Sn) test, when it is negative (N), rules a condition out.) All studies in this group provided level 2 evidence

Pneumonia and Physical Examination Performance

- What about auscultation for pneumonia
- A treasured skill relied upon for over a hundred years
- Normal lung sounds = no pneumonia, no bronchospasm no CHF etc
- Comparison between CXR and auscultation with stethoscope
- Head to head comparison
  - No US this time



ORIGINAL INVESTIGATION

Diagnosing Pneumonia by Physical Examination

Relevant or Relic?

Joyce E. Wipf, MD; Benjamin A. Lipsky, MD; Jan V. Hirschmann, MD; Edward J. Boyko, MD, MPH; Julie Takasugi, MD; Renee L. Peugeot, RN, MS; Connie L. Davis, ARNP, MS

Background: The reliability of chest physical examination and the degree of agreement among examiners in diagnosing pneumonia based on these findings are largely unknown.

Objectives: To determine the accuracy of various physical examination maneuvers in diagnosing pneumonia and to compare the interobserver reliability of the maneuvers among 3 examiners.

Methods: Fifty-two male patients presenting to the emergency department of a university-affiliated Veterans Affairs medical center with symptoms of lower respiratory tract infection (cough and change in sputum) were prospectively examined. A comprehensive lung physical examination was performed sequentially by 3 physicians who were blind to clinical history, laboratory findings, and x-ray results. Examination findings by lung site and whether the examiner diagnosed pneumonia were recorded on a standard form. Chest x-ray films were read by a radiologist.

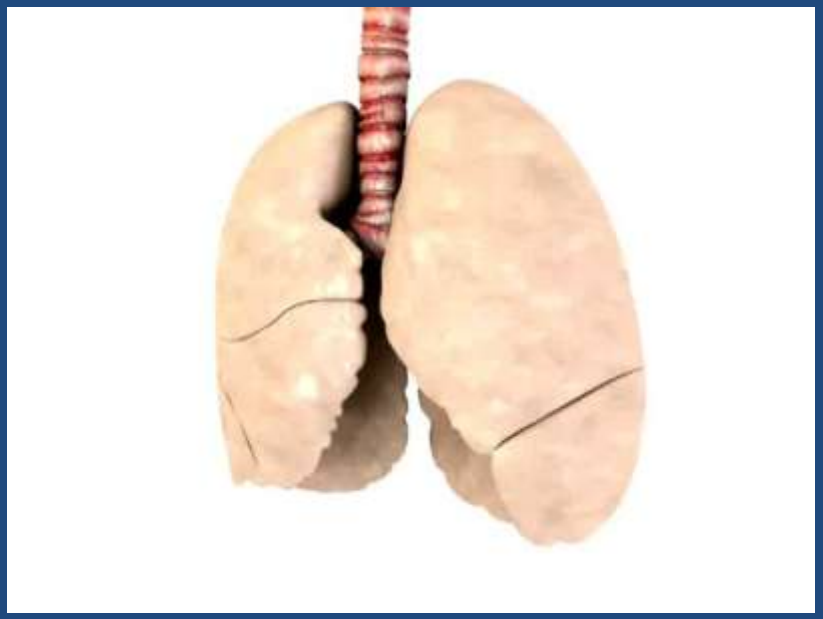
Results: Twenty-four patients had pneumonia confirmed by chest x-ray films. Twenty-eight patients did not have pneumonia. Abnormal lung sounds were common in both groups; the most frequently detected were rales in the upright seated position and bronchial breath sounds. Relatively high agreement among examiners ($\kappa = 0.5$) occurred for rales in the lateral decubitus position and for wheezes. The 3 examiners' clinical diagnosis of pneumonia had a sensitivity of 47% to 69% and specificity of 58% to 75%.

Conclusions: The degree of interobserver agreement was highly variable for different physical examination findings. The most valuable examination maneuvers in detecting pneumonia were unilateral rales and rales in the lateral decubitus position. The traditional chest physical examination is not sufficiently accurate on its own to confirm or exclude the diagnosis of pneumonia.

Arch Intern Med. 1999;159:1082-1087

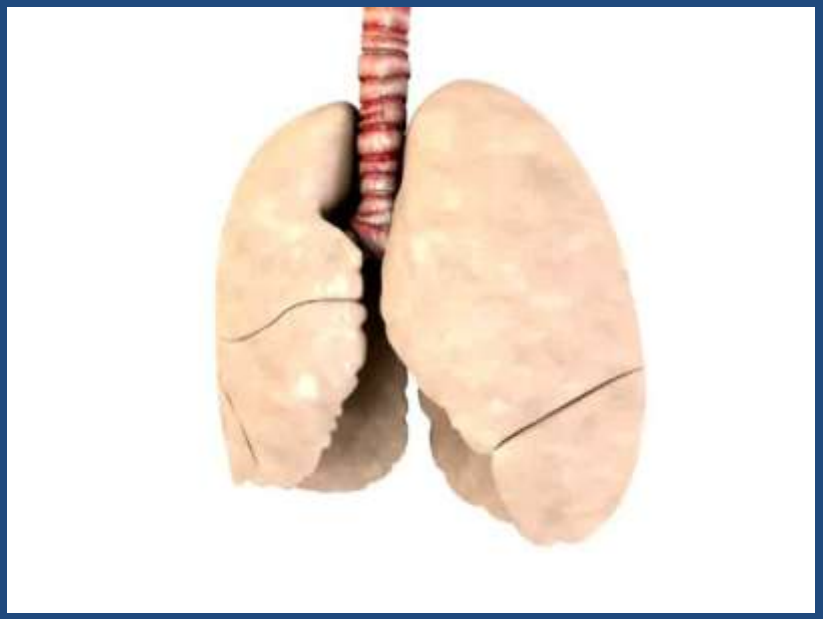
Pneumonia and Physical Examination Performance

- 52 patients presenting to ED with lower respiratory tract infection
- A comprehensive lung physical examination was performed sequentially by 3 physicians blind to clinical history, laboratory findings, and x-ray
- Findings by lung site and whether the examiner diagnosed pneumonia were recorded on a standard form
- Chest x-ray films were read by a radiologist



Pneumonia and Physical Examination Performance

- 24 had pneumonia by x-ray
- 28 did not have pneumonia
- Abnormal lung sounds were common in both groups; the most frequently detected were rales in the upright seated position and bronchial breath sounds
- Relatively high agreement among examiners ($k<0.5$) occurred for rales in the lateral decubitus position and for wheezes



Pneumonia and Physical Examination Performance

- The 3 examiners' clinical diagnosis of pneumonia had a sensitivity of 47% to 69% and specificity of 58% to 75%
- Conclusions:
  - *The degree of interobserver agreement was highly variable*
  - *The traditional chest physical examination is not sufficiently accurate on its own to confirm or exclude the diagnosis of pneumonia*

Pneumonia and Lung Ultrasound Performance

- Cortellaro F, Colombo S, Coen D, Duca PG. Lung ultrasound is an accurate diagnostic tool for the diagnosis of pneumonia in the emergency department. *Emerg Med J*. 2010 Oct 28.
- Lung US and CXR were performed in ED patients
- A chest CT scan was performed during hospital stay when clinically indicated
- 120 patients entered the study

Pneumonia and Lung Ultrasound Performance

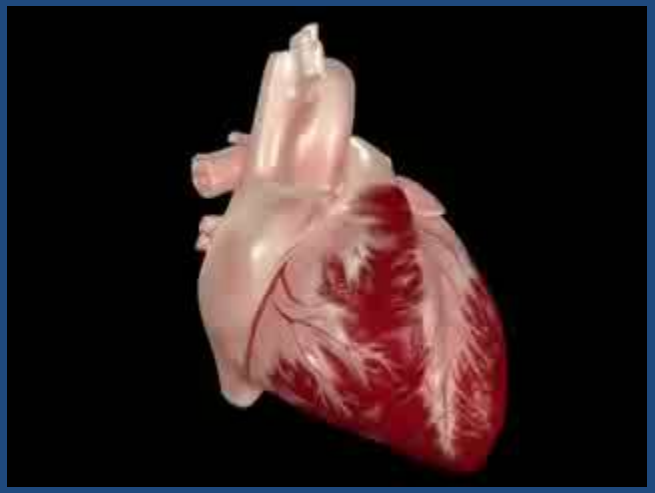
- 81 patients DX with pneumonia was confirmed in 81 (67.5%)
- The first CXR was positive in 54/81 patients (sensitivity 67%; 95% CI 56.4% to 76.9%) and negative in 33/39 (specificity 85%; 95% CI 73.3% to 95.9%)
- Lung US was positive in 80/81 (sensitivity 98%; 95% CI 93.3% to 99.9%) and negative in 37/39 (specificity 95%; 95% CI 82.7% to 99.4%)

Pneumonia and Lung Ultrasound Performance

- A CT scan was performed in 30 patients (26 of which were positive for pneumonia)
- In CT subgroup the first CXR was diagnostic for pneumonia in 18/26 cases (sensitivity 69%)
- US was positive in 25/26 (sensitivity 96%)

Cardiac Abnormalities and Physical Examination Performance

- This is as dear as auscultation gets
- The heart is meant to be heard
- Kobal SL, Trento L, Baharami S, Tolstrup K, Naqvi TZ, Cercek B, Neuman Y, Mirocha J, Kar S, Forrester JS, Siegel RJ. Comparison of effectiveness of hand-carried ultrasound to bedside cardiovascular physical examination. Am J Cardiol. 2005; 96:1002–1006



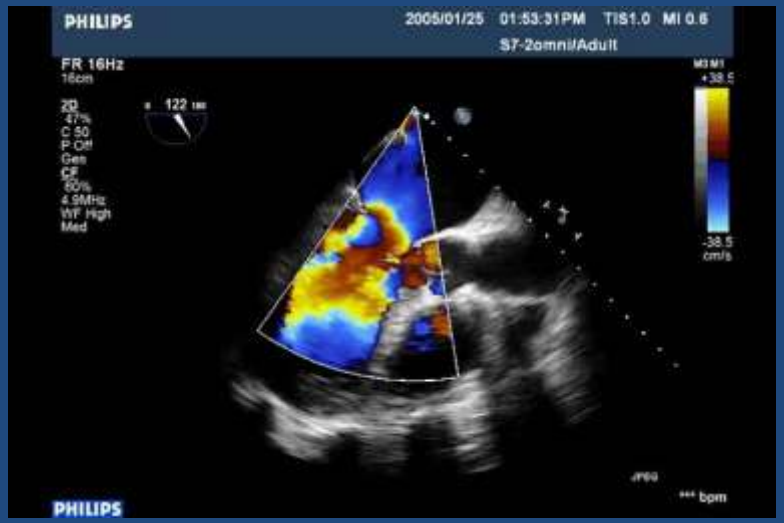
Cardiac Abnormalities and Physical Examination Performance

- Two first-year medical students with four hours of didactic training
- Fourteen hours of hand-on bedside ultrasound training
- Compared to five board-certified cardiologists using only stethoscopes and their physical examination skills in diagnosing cardiac pathology
- Sixty-one cardiac patients

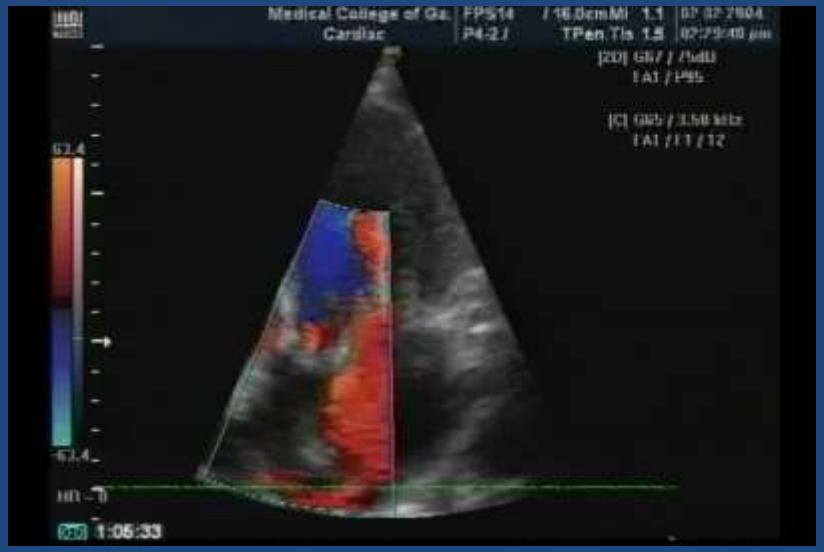
Cardiac Abnormalities and Physical Examination Performance

- Overall the cardiologists identified 49% of the pathology and the first year students identified 75%
- How can this be?
- Does not seem rational, or does it?

Hearing and Feeling are not always the same as seeing



Hearing and Feeling are not always the same as seeing



There are less contested advantages to US over physical examination

- Acute Scrotal Pain
- Should be easy to rule in torsion on physical examination, or rule it out
- Turns out accuracy is very poor and this is one of the leading causes of litigation in emergency medicine for diagnostic errors
- Physical examination findings over lap wildly between mild and severe pathology
- Labs typically not helpful

There are less contested advantages to US over physical examination

- Whole host of reasons the physical examination fails in some patients
- Some a patient related some are related to variation in anatomy and some in physical examination skill level and experience
- Yet point of care ultrasound seems to regain that accuracy for me
  - Adhikari S, Blaivas M. Point-of-care emergency ultrasound evaluation of acute scrotal pain in the ED. *Am J Emerg Med*. 2011 Mar 28.

There are less contested advantages to US over physical examination

- Peritonsillar abscess
- Classic descriptions
- Accuracy in experienced ENT hands about 80 to 85%
- Point of care ultrasound nearly 100%
- Ultrasound at the patients bedside revolutionized what I felt comfortable doing and my diagnostic capability
  - Lyon M, Blaivas M. Intraoral ultrasound in the diagnosis and treatment of suspected peritonsillar abscess in the emergency department. *Acad Emerg Med*. 2005; 12:85-8.

There are less contested advantages to US over physical examination

- The diagnosis of peritonsillar abscess alone turns out to be difficult
- Overlap with tonsillitis and peritonsillar abscess
- Confirmation of diagnosis often required blind needle or scalpel incision in the back of the throat
- Nerve racking at best
- Low accuracy
- Often skipped if possible

There are less contested advantages to US over physical examination

- Ultrasound has revolutionized both the diagnosis of peritonsillar abscess and then treatment (in my practice)
- No more blind sticks
- No more incisions or aspirations just to confirm or refute diagnosis

There are less contested advantages to US over physical examination

- Can extend the process to some interesting lengths and were not considered before ultrasound joined the clinician at the patients bedside

There are less contested advantages to US over physical examination

- Ocular examinations
- Performed daily
- Limits exist
- Ultrasound helps again
- How easy is it to evaluate this eye?
  - Blaivas M, Theodoro D, Sierzenski PR. A study of bedside ocular ultrasonography in the emergency department. *Acad Emerg Med*. 2002; 9:791-9.

There are less contested advantages to US over physical examination

- The eye is still touched, but only barely
- In fact, no pressure is transferred to the globe so penetrating injuries are not worsened
- A critical examination of a vulnerable and important organ can be completed in less than a minute
- May not be possible outside of an operating suite

There are less contested advantages to US over physical examination

- The amount of information obtained far exceeds that which can be obtained from a physical examination alone (at least mine)
- Ultrasound of the eye, when performed properly, at the point of care is safe and more efficient

Ultrasound and the Physical Examination

- Six case series submitted on accidental finds on point-of-care US prior to would be disastrous incision and drainage of obvious abscess
- Neat cases
- Showed utility of ultrasound in academic setting where physical examination skills are still being honed by some, but should have been perfected by others
- Response from reviewer:
  - *"My only real criticism is that in many cases, a careful physical examination would have probably been about as good as an US. In particular…"*
  - *"I worry about suggesting that US should entirely replace a physical exam and would consider removing..."*

Ultrasound and the Physical Examination

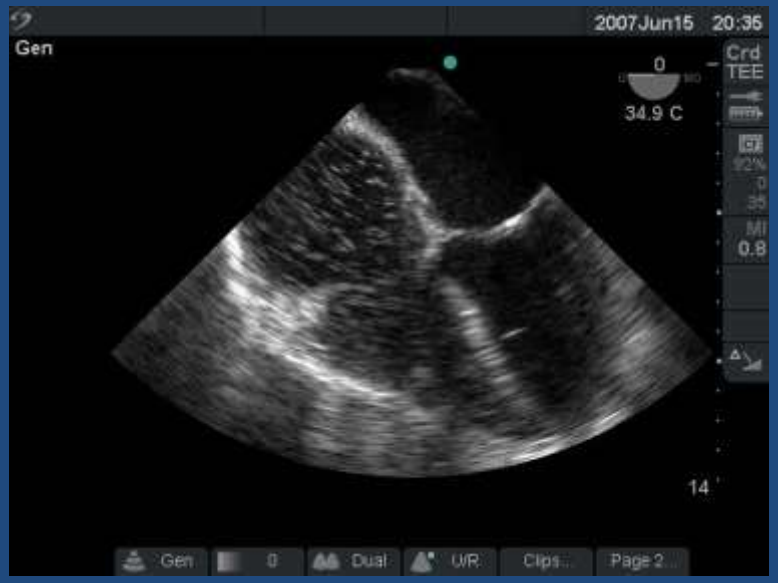
- The reviewer is right
- These pathology described in all of the cases should have been accurately diagnosed on physical examination
  - But were not
- So the patients dilemma is:
  - I want the correct diagnosis made
- Two pathways are available:
- First option:
  - Bring everyone up to a good physical examination standard
  - Price: years to decades
- Regardless of what should be, good physical examination skills are lacking
- Second option:
  - Cheat, with ultrasound
  - Price: days to learn, months to gain proficiency
  - Other benefit, translates to different body areas and examinations

Ultrasound and the Physical Examination

- Just like for an ancient warrior a sword was a lethal extension and great amplifier of the hand
- So for a healer, ultrasound is a great extension of the hand
- The hand examining the patient
- No other technology allows for this
  - CT, MRI, PET
  - All too large and expensive
- Only ultrasound comes to the patients bedside and physicians coat pocket

Ultrasound and the Physical Examination

- There is a natural synergy between ultrasound and the physical examination
- Ultrasound is becoming part of and an incredible but readily available extension of the physical examination
- They are not enemies but rather allies
- The allegiance between the two is only now being explored



Questions?