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SAINT JOSEPH MERCY HEALTH SYSTEM

Traditional Stethoscope & the Innovative Ultrasound

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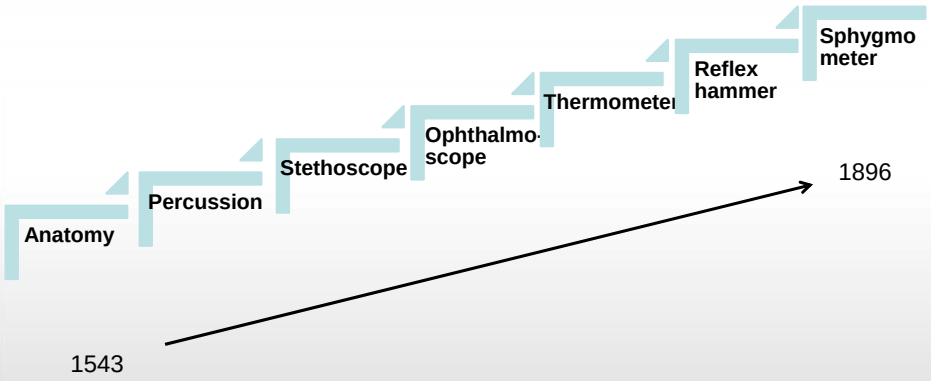
Goals for this Workshop

- Define physical exam techniques that correlate with evidence based diagnosis
- Identify physical exam techniques that are commonly done incorrectly or not performed
- Utilize the ultrasound to confirm findings of a physical exam
- Utilize the ultrasound to teach the physical exam with visual confirmation of findings

The Physical Exam History

Modern physical exam



The Stethoscope for the 21st century- History & Benefits

- Brief History:
  - Bedside ultrasound tools available as early as 1998
  - Medical school ultrasound curriculum integration
  - Emergency medicine 2001 first set of guidelines
    - ACGME requirement for ED residencies
    - 2008 consensus guidelines
- Benefits:
  - US guided placement of central lines **preferred safety practice**-evidence-based guidelines: AHRQ,CDC, UK National Institute for Health and Care Excellence (NICE)
  - augment the history and physical exam
  - help narrow differential diagnoses
  - arrive at a correct diagnosis earlier with less ancillary testing.

Positive and Negative Likelihood Ratios

Examination Quality	Poor to Fair	Good	Excellent
Positive Likelihood Ratio	2 to 5	5 to 10	> 10
Negative Likelihood Ratio	0.5 to 0.3	0.3-0.1	< 0.1

- Disclaimer: I am not a statistician, so please do not ask me questions above and beyond this slide. Thank you ☺

The Stethoscope for the 21st century- Diagnosis & Management

- Diagnosis of Community Acquired Pneumonia [1]:
  - confirmed in 229 patients (63.3%)
  - sensitivity of 93.4% (95% CI, 89.2%-96.3%)
  - specificity of 97.7% (95% CI, 93.4%-99.6%)
  - likelihood ratios (LRs) of 40.5
- Diagnosis of Cardiac etiology [2]
  - decreased time to diagnosis
  - improved survival and neurologic outcomes

1.Chest. 2012 Oct;142(4):965-72
2. Annals of Emergency Medicine 17(2):150-4 · February 1988

The Stethoscope for the 21st century- Diagnosis & Management

- Diagnosis of full thickness rotator cuff tears & subacromial bursitis :
  - Accuracy of 87% (same as MRI)
- Management of Musculoskeletal diagnosis:
  - Improved planning for procedures and ultrasound guided procedures
  - Improved cost effectivity- 5-20% <MRI

Novice vs. Expert

- Initiation of ultrasound curriculum in medical school is most effective
- Novice can identify sonographic B-lines (distinguish pulmonary edema, acute heart failure) with similar accuracy to an expert sonographer. [1]
- Kobal et al demonstrated that 2 first-year med students w/ 18 hrs of ultrasound training were able to outperform 5 board certified cardiologists using standard physical exam in detecting cardiac abnormalities. [2]

1. Chiem AT[1], Chan CH[2], Ander DS[3], Kobylivker AN[4], Manson WC[5] Acad Emerg Med. 2015 May;22(5):564-73. doi: 10.1111/acem.12651. Epub 2015 Apr 22.
2. *Am J Cardiol* 2005;96[7]:1002.

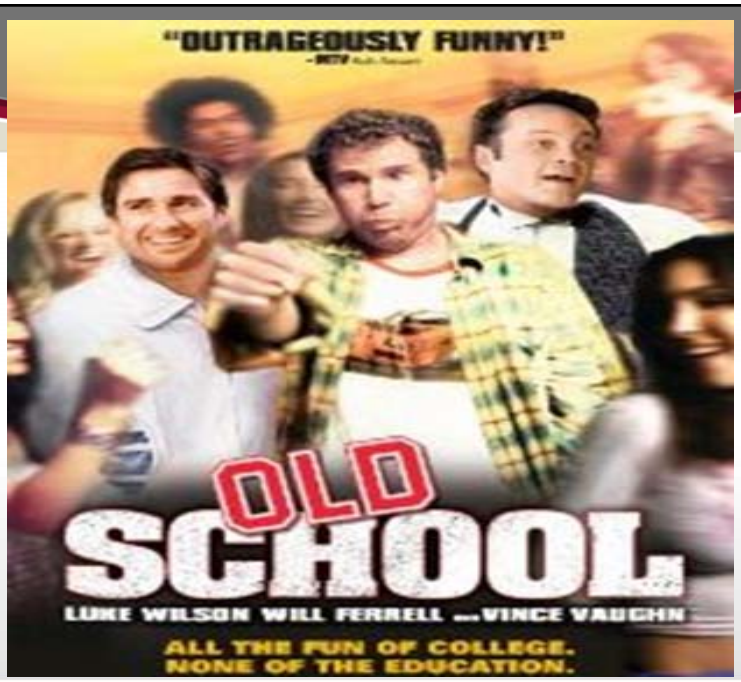
The Cumulative Effect
Exam & Ultrasound

- Cumulative effect of exam
  - concept that combining specific portions of an exam result in higher likelihood of an accurate diagnosis
- Ultrasound-physical exam extender
  - not a replacement for formal imaging studies or the physical exam
- Improvement in diagnosis utilizing physical exam and the ultrasound
  - A combination of auscultation and LUS increased the positive LR to 42.9 (95% CI, 10.8-170.0) for the diagnosis of CAP.

Next….

- Focus on Musculoskeletal exam
- Focus on Cardiopulmonary exam
- Small group sessions

Musculoskeletal Exam



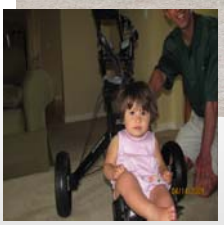
Key components of Musculoskeletal Physical Exam-Stanford 25

1. Inspection
2. Palpation
3. ROM
4. Strength
5. Neurovascular
6. Special Tests

Clinical Questions

- Does my patient with shoulder pain have a rotator cuff injury or subacromial bursitis/impingement?
- Does my patient with knee pain have a ligamentous injury or meniscal tear?

Yeah! I'm ready for the evidence…



Shoulder pain-Rotator Cuff Injury

Finding	Positive LR	Negative LR
Age < 39 40-59 years > 60 years	0.1 NS 3.2	
Neer Impingement	1.5	0.3
Hawkins Impingement	1.7	0.3
Empty Can (Jobe's)	2.1-3.9	0.6
Dropped arm test	2.9-5.0	NS
Painful Arc	2.8	0.3

Journal of Clinical Rheumatology, 2010, Apr; 16(3): 105-8.

Shoulder Pain-Subacromial Impingement (or Bursitis)

Finding	Positive LR	Negative LR
Neer Impingement	1.7	0.35
Hawkins Impingement	1.7-2.1	0.51
Painful arc	2.25	0.38
Empty Can (Jobe's)	1.14	0.85
External ROM Resistance (Patte's)	2.3	0.50
Yergason's sign (biceps tendonitis/Impingement)	2.8	0.7

Arch Phys Med Rehabilitation, 2009, Nov; 90(11); 1898-1903.

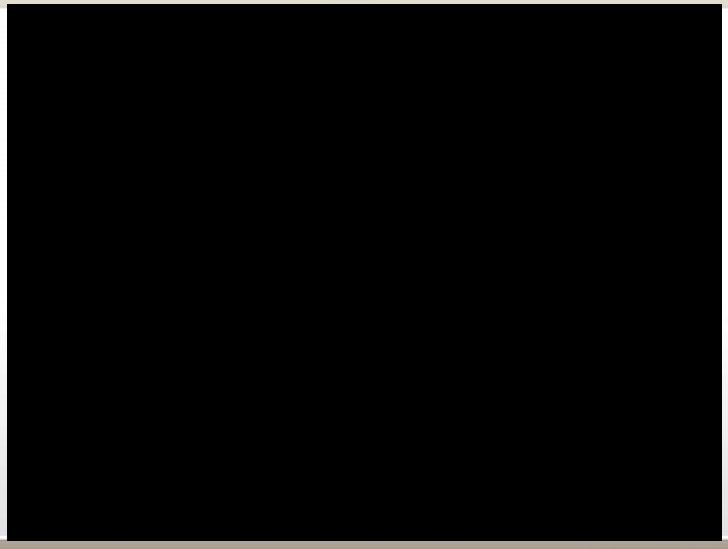
Rotator Cuff Tear Physical Exam Cumulative effect

Finding	Positive LR	Negative LR
Palpable Tear	10.2	0.1
Murrell Findings: Hawkins or Neer impingement + Empty Can (supraspinatus) + Patte's (infraspinatus weakness)	48	0.02
Park Findings: Hawkins + Painful Arc + Patte's (infraspinatus weakness)	15.9	0.2

Hawkins and Neer Impingement

Empty Can (Jobe's) Test and External ROM Resistance (Patte's)

Dropped Arm Test & Painful Arc



Knee pain-ACL & PCL Injuries

Finding	Positive LR	Negative LR
Acute Effusion	1.6	0.8
“Popping” sensation	2.3	0.5
Giving way	1.6	0.6
Anterior Drawer	11.5	0.5
Lachman	17.0	0.2
Posterior Drawer	97.8	0.1

Arch of Phys Med Rehabilitation, 2010, Sep; 91(9); 1452-9.

Knee pain-MCL injuries

Finding	Positive LR	Negative LR
Trauma by external force to leg	2.0	0.9
Rotational trauma	1.7	0.6
Pain on Valgus stress test (30°)	2.3	0.3
Laxity on Valgus stress test (30°)	1.8	0.2

Am J Med, 2008, Nov; 121(11); 982-988.

Knee pain-Meniscal Injury

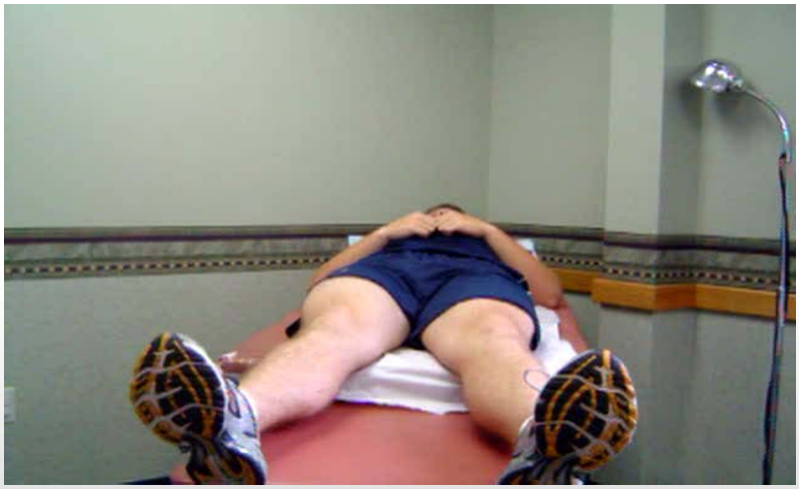
Finding	Positive LR	Negative LR
Chronic Joint Effusion	5.7	0.7
Joint Line tenderness	1.5	0.5
Positive McMurray test	4.5	0.8
Deep Squat test	1.29	0.60
Thessaly Test 5 and 20 degrees flexion	1.07-16	0.5-0.9

1. Journal of Ortho and Sports Physical Therapy. September 2015, (42), 693-702.
2. Clin J Sport Med, 2008, Jan; 18(1); 24-30
3. JAMA, 2001 Oct 3; 286(13); 1610-20.

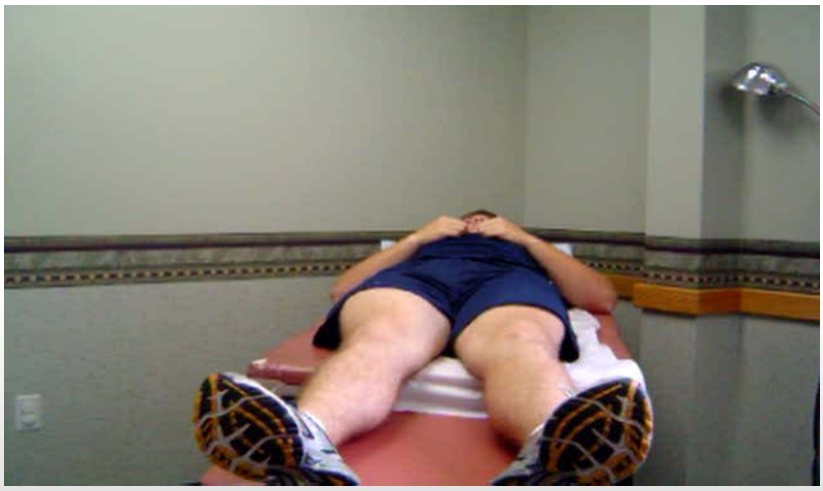
Knee physical exam cumulative effect

Finding	Positive LR	Negative LR
ACL=Effusion, Popping & Giving way +Anterior Drawer	15.4	0.8
MCL=External or Rotational Trauma and laxity on Valgus stress	6.4	0.5
Meniscus = Combining Age>40, continuation of activity impossible, weight bearing during trauma, and pain on passive flexion	5.8	NS

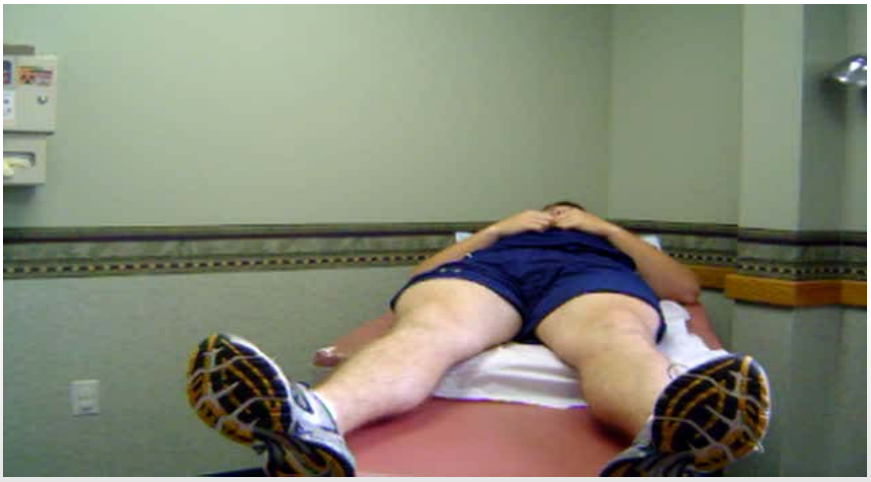
Anterior Drawer and Lachman's



Valgus and Varus Stress Tests



McMurray Test and Joint Line Tenderness



Thessaly Test

[redacted]

Cardiopulmonary Exam

Cardiopulmonary Exam-The Stanford 25

- 1. Inspection
- 2. Palpation
- 3. Percussion
- 4. Auscultation

Clinical Questions

- What is the cause of my patient's shortness of breath?
  - Pneumonia?
  - COPD?
  - Pleural Effusion?
  - Cardiac Tamponade?

Pneumonia

- **Asymmetric chest expansion**
  - hands placed underneath the 10th rib
- Evidence
  - 1819 pt Brooke Army Medical Center with cough in 1984
  - 48 w CXR proven PNA
  - Best finding*
    - Sensitivity = 5%
    - Specificity = 100%
    - **LR (+) = 44.1**
  - No other studies done on this examination

Pneumonia

Physical Finding	Likelihood ratios
Asymmetric chest expansion	**(+) 44.1**
Egophony	(+) 4.1
Bronchial breath sounds	(+) 3.3
Percussion dullness	(+) 3.0
Unilateral Crackles	(+) 3.2
Diminished breath sounds	(+) 2.3
Absence of abnormal VS	(-) 0.3
Heckerling score 4-5 (1990) T >37.8; HR > 100;Crackles; Diminished BS; absence of asthma	(+) 8.2
Heckerling score 0-1	(-) 0.3

Bottom line…

- Not that many studies
- Cumulative effect of exam:
  - Chest expansion
  - Egophony and bronchophony
  - Percussion
  - 99 and 66 have no EBM!
- Algorithms complicated

COPD: Physical Exam

	Physical Finding	LR (+)
THE GOOD	Early inspiratory crackles	14.6
	Absent cardiac dullness	11.8
	Subxiphoid cardiac impulse	7.4
NOT SO GOOD	Reduced Breath Sounds	3.2
	Hoover's sign	4.2
	Forced exp. Time > 9 sec	4.1

COPD

- Best is clinical rule: Combination of history and exam
  - JAMA 1995 Hollerman and Sinel
- **2/3 = LR (+) of 25.7**
  - 1. 70 pack year smoking
  - 2. Self-reported hx or chronic bronchitis or emphysema
  - 3. Diminished breath sounds

Pleural effusions

Physical Findings	Likelihood ratios	
Percussion dullness	(+) 4.8	
Chest expansion	(+) 8.1	
Reduced tactile fremitus	(+) 5.7	(-) 0.1
Diminished breath sounds	(+) 5.2	(-) 0.1
Diminished vocal resonance	(+) 6.5	

CHF

Physical Finding	Likelihood ratio (+)
JVP elevation for EF < 50%	6.3
Apical impulse displaced for EF < 50%	10.3
AJR for 15 seconds	8.0
Hx of MI and apex displaced	39!

Cardiac tamponade

Physical finding	Frequency (%)
Elevated Neck Veins	100
SBP < 100	58-100
Diminished Heart Tones	36-84
Tachycardia	81-100
Pericardial Rub	27

Stethoscope or Bedside Ultrasound?

Small Group Sessions

- Rotate through 4 stations:
  - Physical Exam 10 min
  - Cardiopulmonary US 10 min
  - MSK US and exam 10 min
  - Curriculum/Cost of US 10 min

GOAL:

- To understand benefits of integration and our process and focus

Discussion

- 10 min
  - What are some of your best practices in building a better bedside clinician?
  - What are some resources or tools for ultrasound at your program?
  - What barriers have you overcome in creating an ultrasound program?

Feedback/Questions?

- 5-10min
- Did this workshop change your perception of the value of integrating physical exam and bedside US?
- What was value-added with regard to our workshop?

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