Cardiovascular Examination: A Journey Through Time

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Objectives

1. Describe the history of the development of cardiac examination techniques.
2. Become familiar with available teaching tools: electronic stethoscope, SAM 2, and Harvey simulator
3. Self-assess clinical skills in cardiac examination
Who first described and explored chest & cardiac percussion?
The Father of Percussion

Joseph Leopold Auenbrugger provided the first comprehensive description of percussion of the chest in his 1761 monograph.

Jean Nicholas Corvisart, the prominent French physician, physician to Napoleon Bonaparte, moved percussion into the mainstream of medical practice.
Medical Instruments for Percussion

Flint's Pleximeter made of hard rubber on the left and Flint's percussor with rubber head and hard rubber handle on the right, circa 1880.
Who invented chest & cardiac auscultation?
Father of Auscultation: Rene Laënnec (1781-1826)

French physician
Invented cylinder stethoscope
  ◦ Originally made from paper; later made from hollow wooden tube

Hailed as Father of Thoracic Medicine
The Stethoscope

Rene Laennec, who invented the first stethoscope, commented that "no patient report could suffice to characterize disease, and that for a certain diagnosis, mediate auscultation is required."
Stethoscopes: Then and Now
Importance of PE skills?

- Flegel KM. Does the physical examination have a future? *CMAJ.* 1999;161(9):1117-8.
The Professional Symbols
Study: Most new doctors can't use stethoscope

Only 20 percent 'hear' common heart problems

September 2, 1997
Web posted at: 11:43 p.m. EST (0443 GMT)

ATLANTA (CNN) -- U.S. researchers say many new doctors have trouble using their stethoscopes to listen to the sounds of a person's heart and lungs.

The most recent survey of first-year medical students found that just 20 percent of those tested could correctly identify the murmurs and clicks of normal heart sounds with their ears alone.

In tests, students also struggled with identifying the sounds of heart murmurs and other noises that might correspond to illnesses.

The survey was conducted in September by Dr. David Dillman, a professor of general internal medicine at the University of Colorado in Denver. The study was published in the July issue of the journal Academic Medicine.

"Our findings are completely consistent with the physicians I talk to in medical practice," said Dr. Dillman.
Will Physicians Soon Trade In Their Stethoscopes For Tiny Ultrasound Machines?

May 14th, 2011 by Iltifat Husain, M.D. in News, Opinion

Recently, the Wall Street Journal did a great piece on how mobile technology is being used in medicine. They looked at the major avenues of use — from the hospital to personal to emergency care settings.

They gave an example of how a cardiologist has stopped carrying a stethoscope, and now just uses mobile ultrasound, a modality we have highlighted numerous times in the past.

Dr. Topol, a cardiologist in San Diego, carries with him instead a portable ultrasound device roughly the size of a cellphone. When he puts it to a patient’s chest, the device allows him to peer directly into the heart. The patient looks, too; together, they check out the muscle, the valves, the rhythm, the blood flow.

“Why would I listen to ‘lub dub’ when I can see everything?” Dr. Topol says.
COMPETENCY IN CARDIAC EXAMINATION SKILLS IN MEDICAL STUDENTS, TRAINEES, PHYSICIANS, AND FACULTY

A Multicenter Study

Jasminka M. Vukanovic-Criley, MD; Stuart Criley, MBA; Carole Marie Warde, MD; John R. Boker, PhD; Lempira Guevara-Matheus, MD; Winthrop Hallowell Churchill, MD; William P. Nelson, MD; John Michael Criley, MD
Mean Test Scores for Cardiac Examination by Training Level

Figure 1. Main test scores for cardiac examination competency by training level. The dotted horizontal line indicates the mean score for all participants (53.24). The mean score for full-time faculty (FTC) was not significantly different from that of medical students, internal medicine (IM) residents, family medicine (FM) residents, and other practicing physicians (volunteer clinical faculty VCF and private practice PP). Mean scores were improved in third- and fourth-year students compared with first- and second-year students (P < .05), but they did not improve thereafter. Asterisk indicates P < .05. Error bars represent 95% confidence intervals.
Why physicians have problems with clinical competency now?
Were physicians more clinical competent in the past?
Reduction of Bedside Teaching in the US

- 1960: 75%
- 1978: 16%
- 2002: 10%

Years: 1960, 1978, 2002
Resurgence of PE

Physical examination is still important
Hypothesis based
Evidence based

But skills are inadequate

<table>
<thead>
<tr>
<th>Trainee</th>
<th>Type of Exam</th>
<th>Skills</th>
<th>References</th>
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<tbody>
<tr>
<td>Internal medicine</td>
<td>General PE</td>
<td>↓</td>
<td>Li et al. Academic Medicine. 1994</td>
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<td></td>
<td></td>
<td></td>
<td>Ramani et al. JGME. 2010.</td>
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<tr>
<td>Internal Medicine</td>
<td>Rectal</td>
<td>↓</td>
<td>Wilt et al. JGIM. 1991.</td>
</tr>
<tr>
<td>Internal medicine and Family medicine</td>
<td>Cardiac</td>
<td>↓</td>
<td>Vukanovic-Criley et al. Archives of Internal Medicine. 2006.</td>
</tr>
<tr>
<td>Family medicine</td>
<td>Pelvic</td>
<td>↓</td>
<td>Lang et al. F. Family medicine. 1990.</td>
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### Performing a Physical Examination

<table>
<thead>
<tr>
<th>Task</th>
<th>Milestone</th>
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<tbody>
<tr>
<td>1. Perform an accurate physical examination that is appropriately targeted to the patient’s complaints and medical conditions. Identify pertinent abnormalities using common maneuvers</td>
<td>6</td>
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<td>2. Accurately track important changes in the physical examination over time in the outpatient and inpatient settings</td>
<td>9</td>
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<td>3. Demonstrate and teach how to elicit important physical findings for junior members of the healthcare team</td>
<td>18</td>
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<td>4. Routinely identify subtle or unusual physical findings that may influence clinical decision making, using advanced maneuvers where applicable</td>
<td>30</td>
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**Standardized patient Direct observation Simulation**

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Comparison of Students and Cardiologists in Diagnosing Cardiac Findings

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<th>Students</th>
<th>Cardiologists</th>
<th>P values</th>
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<tr>
<td>Total correct diagnosis</td>
<td>75 %</td>
<td>49 %</td>
<td>P &lt;0.001</td>
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<tr>
<td>Systolic murmurs</td>
<td>93 %</td>
<td>62 %</td>
<td>P &lt;0.001</td>
</tr>
<tr>
<td>Diastolic murmurs</td>
<td>75 %</td>
<td>16 %</td>
<td>P &lt;0.001</td>
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What makes the differences:
Portable Ultrasound Scanners: Handheld Devices

Siemens Acuson P-10
GE Scan
Pocket ultrasound, 1 pounds.
A patient with acute onset of shortness of breath

A 45 y-o patient has had 3 days history of fever and progressive shortness of breath. Patient has unremarkable medical history; and takes no medications.
BP 110/95 mmHg; HR 112; RR 18; T 101F.
Awake, alert X3. JVD 4 cm above clavicle. Lungs are clear to auscultation. Cardiac auscultation
What will you do next?

1. Order Valsalva maneuver
2. Order amyl nitrite inhalation
3. Squatting
4. Observe for Kusmaul’s sign
5. Perform pulsus paradoxus
A patient with respiratory distress

A 23 y-o patient has had fever 102°F and rapidly progressing shortness of breath during the last 5 days. Physical examination is remarkable for skin lesions in both upper and lower extremities. Cardiac auscultation day 5:
What will be the most likely life-saving intervention?

1. Broad spectrum antibiotics
2. Antipseudomonal antibiotics
3. Parenteral antifungal
4. Valve replacement
My students are dismayed when I say to them “Half of what you are taught as medical students will in 10 years have been shown to be wrong. And the trouble is none of your teachers knows which half.”

Dr. Sydney Burwell (1893-1967)
Dean of Harvard Medical School (1935-1949)
Thank You