# “MINIATURE ECHO MACHINE SHOULD REPLACE STETHOSCOPE IN CARDIOLOGY PRACTICE”

Vs

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"As a matter of fact, stethoscope is a misnomer," The "scope" part of the word implies that the device is used for looking at something.

"Now that we have ultrasound, we have a real 'stethoscope' in our hand,

- Dr. Jagat Narula, professor of cardiology at Mount Sinai School of Medicine

Tell me one clinical cardiac condition where you rely more on a stethoscope than an echo?

# Problems with a stethscope

* No diagnosis
* Doubtful diagnosis
* Wrong diagnosis
* Incomplete diagnosis
* Delayed diagnosis

# No diagnosis

* Soft murmurs
* RWMA
* Hypertrophy
* Diastolic dysfunction
* Mild/Mod Effusion
* Mild Constriction
* Mild Restriction

**All these can be diagnosed by miniature echo**

# Doubtful diagnosis

* COPD vs LVF
* Aortic Stenosis vs HOCM
* S4 vs Ejection Clicks

# Wrong diagnosis

* Physiologic murmurs

* Physiologic S3

# Incomplete diagnosis

* Chamber sizes and anomalies
* Valve morphology
* IVC status
* Aortic arch
* PA size
* RA / RV collapse

# Delayed diagnosis

* Pulmonary embolism
* Aortic dissection
* Pericardial Tamponade

# I have evidence

* Last year, a study was performed to test both the accuracy of handheld ultrasound vs. traditional physical examination and also the impact of the devices on downstream testing and costs.
* A total of 250 patients
* Referred for a standard echocardiogram for common indications such as murmur, stroke, cardiac function or arrhythmia.
* Patients underwent examination using a handheld ultrasound and also a physical exam from trained cardiologists, academic cardiologists

J Am Coll Cardiol Img 2014;7:983–990

* 142 abnormal findings identified on the standard echocardiogram
* Handheld ultrasound was able to correctly identify 82%,
* Physical exam identified only 47%.
* Handheld ultrasound was superior to physical exam for both normal and abnormal cardiac function

## Correct Diagnoses by HHU and PE With the Standard Echocardiogram as the Reference

| Echocardiogram Finding | HHU % Correct | PE % Correct | % Difference (95% CI) | p Value |
|---|---|---|---|---|
| Normal LV function (n = 196) | 89 | 58 | 31 (23 to 39) | <0.0001 |
| Abnormal LV function (n = 54) | 96 | 35 | 61 (45 to 77) | <0.0001 |
| Normal RV function (n = 203) | 94 | 57 | 37 (30 to 45) | <0.0001 |
| Abnormal RV function (n = 47) | 68 | 21 | 47 (26 to 67) | 0.0001 |
| Pulmonary hypertension absent (n = 191) | 92 | 89 | 3.1 (−3 to 9.3) | 0.36 |
| Pulmonary hypertension present (n = 59) | 53 | 42 | 10 (−8.3 to 28.6) | 0.33 |
| Valve disease, mild or absent (n = 199) | 94 | 91 | 3.5 (−1.9 to 8.9) | 0.23 |
| Valve disease, moderate or severe (n = 51) | 71 | 31 | 39 (19 to 59) | 0.0003 |
| Miscellaneous findings* absent (n = 143) | 77 | 64 | 13 (1.7 to 23.5) | 0.02 |
| Miscellaneous findings* present (n = 107) | 47 | 3 | 44 (33 to 55) | <0.0001 |

* Of the 108 patients without any abnormalities on standard echocardiography
* 82% were referred to further testing on the basis of physical exam
* only 56% were referred for additional tests after examination with handheld ultrasound.
* Once additional testing was factored in, cost modeling was used to show that handheld ultrasound had an average overall cost of $644.43,compared with $707.44 for physical exam

* **Savings of $63.01 per patient when handheld ultrasound was used.**

Frequency of Missed Overall and Major Cardiovascular Findings by PE and Echocardiography

| | MD 1 | MD 2 | MD 3 | MD 4 | Overall |
|---|---|---|---|---|---|
| Overall | | | | | |
| PE | 60% | 56% | 65% | 57% | 59% |
| Echo | 31%* | 26%* | 23%* | 37%* | 29%* |
| Major | | | | | |
| PE | 39% | 31% | 58% | 46% | 43% |
| Echo | 23% | 13% | 23%* | 29% | 21%* |

* $p < 0.05$ vs. PE.

*Journal of the American College of Cardiology, Volume 37, Issue 8, 15 June 2001, Pages 2023-2024*

# You need more evidence?


* Greaves K, Jeetley P, Hickman M, Dwivedi G, Sabharwal N, Lim T, Janardhanan R & Senior R 2005 The use of hand-carried ultrasound in the hospital setting – a cost-effective analysis. Journal of the American Society of Echocardiography Volume 18, Issue 6, Pages 620–625

* Spencer KT, Anderson AS, Bhargava A, Bales AC, Sorrentino M, Furlong K & Lang RM 2001 Physician-performed point-of-care echocardio-graphy using a laptop platform compared with physical examination in the cardiovascular patient. Journal of the American College of Cardiology vol:37 page 2013–2018

* Panoulas VF, Daigeler AL, Malaweera AS, Lota AS, Baskaran D, Rahman S & Nihoyannopoulos P 2013 Pocket-size hand-held cardiac ultrasound as an adjunct to clinical examination in the hands of medical students and junior doctors. European Heart Journal Cardiovascular Imaging vol:4 pages 323–330.

# In all these studies

* Ultrasound devices were found to be significantly superior
* The time taken for the performance of the ultrasound examination was only a few minutes more than the physical examination
* If no abnormality was found on ultrasound examination, physicians were less likely to order additional tests than when no abnormality was found on physical examination
* Suggest a greater confidence in making the diagnosis with the ultrasound device.

# Let us be true

* How accurate and confident  are we at auscultation
* How good is our auscultation training
* Do we have the time and the patience
* If we skip auscultation how much do we lose
* How often we decide Rx based on auscultation only
* Is the value of ausculatory diagnosis anything more than satisfaction

Perhaps, it is just time
to acknowledge failure
and
just move on
to something worthwhile

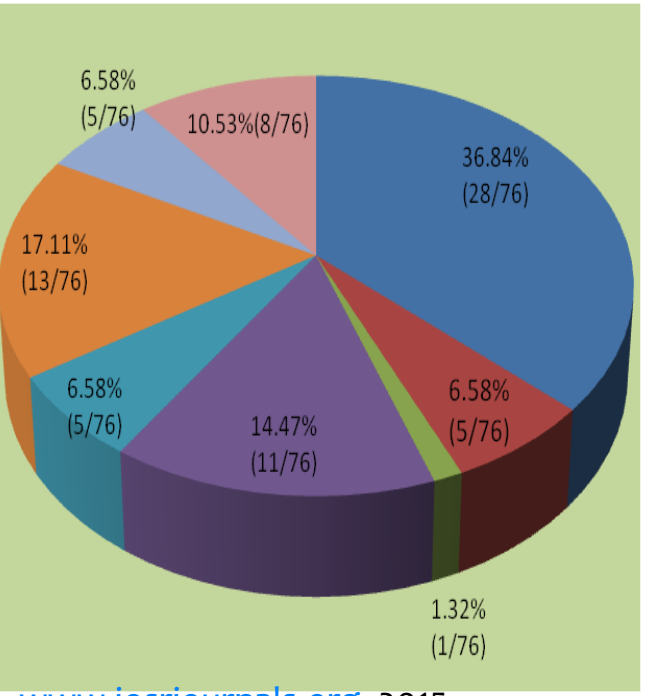
# Topol : 2011 Health Summit

* For the last 2 years he had not used his stethoscope for examining patients

"Why would you listen to a heart when you have an ultrasound in your pocket?"

# More nosocomial infection with Stethoscope

* Bacteriological analysis of stethoscopes used by the HCP of this hospital revealed that more than 50% of stethoscopes were colonized by the various groups of bacteria including MRSA and multidrug resistant strains.




| Isolated organisms | Visiting doctors n=40(%) | Resident n=28(%) | MBBS student n=32(%) | Total n=100(%) |
|---|---|---|---|---|
| Bacillus subtilis | 4(10) | 12(42.8) | 12(63.1) | 28(36.84) |
| S.aureus | 4(10) | 1(3.57) | 0 | 5(6.58) |
| E.coli | 1(2.5) | 0 | 0 | 1(1.32) |
| CONS | 5(12.5) | 5(17.8) | 1(3.1) | 11(14.47) |
| Pseudomonas sp | 0 | 3(10.8) | 2(6.2) | 5(6.58) |
| Acinetobacter sp | 7(17.5) | 5(17.8) | 1(3.1) | 13(17.11) |
| Diphtheroids | 4(10) | 0 | 1(3.1) | 5(6.58) |
| Micrococcus | 0 | 6(21.4) | 2(6.2) | 8(10.53) |
| Total isolates | 25 | 32 | 19 | 76 |
| Growth found | 18(45) | 17(60.7) | 17(53.1) | 52 |
| Sterile | 22(55) | 11(39.2) | 15(46.8) | 48 |

www.iosrjournals.org, 2015

| Echo machines | Capabilities |
| --- | --- |
| Stationary high-end systems | Full range of standard echo modalities and measurements (MM, 2D, PW, CW, Colour, TVI, TEE), and advances modalities (3D, contrast) |
| Mobile (smaller machines on wheels, middle range technology) | Full range of standard echo modalities and measurements (MM, 2D, PW, CW, Colour, TVI, TEE) |
| Portable (small machines that can be carried by a person) | Basic, standard echo modalities and measurements (MM, 2D, PW, CW, Colour) |
| Hand-held or pocket-size imaging devices | Limited functions (2D, Colour) and measurement package |

# Hand-held Echo

* 2-d and doppler
* Broad bandwith, phase array probe (1.7- 3.8 MHz)
* Images and videos can be stored and transferred to PC or USB
* The little machines (Vscan, by GE) retail for over $8,000, though you can buy them cheaper used or overseas.

* This can be used in an emergency room in the middle of the night, in a critical care unit, in an ambulance,

* In remote areas with limited medical access or even on the battlefield.

* Can be used as a screening tool in mass screening programs.

# Pocket Mobile Echocardiography (PME) and Transthoracic Echocardiography (TTE) interpretation

| Transthoracic echo parameter (% abnormal) | Visualized (%) | | | True Positive + True Negative (% of visualized/% of total scanned) | | | Variability (κ) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Overall | Attendings | Fellows | Overall | Attendings | Fellows | Overall (4 raters) | Attendings (2 raters) | Fellows (2 raters) |
| **EF** Low – 14 % | 95 | 93 | 97 | 95/91 | 97/91 | 93/91 | 0.71 | 0.95 | 0.68 |
| **WMA*** Abnormal – 13 % | 83 | 85 | 81 | 89/74 | 90/77 | 87/71 | 0.72 | 0.90 | 0.47 |
| **LVEDD** Enlarged – 15 % | 95 | 95 | 94 | 92/87 | 94/90 | 91/85 | 0.67 | 0.82 | 0.55 |
| **Pericardial effusion** Significant – 0 % | 94 | 94 | 94 | n/a | n/a | n/a | n/a | n/a | n/a |
| **Mitral valve** Abnormal – 7 % | 90 | 90 | 90 | 85/77 | 88/79 | 82/74 | 0.35 | 0.59 | 0.29 |
| **Aortic valve** Abnormal – 6 % | 82 | 86 | 80 | 96/79 | 97/83 | 95/76 | 0.76 | 0.84 | 0.75 |
| **IVC size** Dilated – 12 % | 75 | 73 | 77 | 78/58 | 81/59 | 74/57 | 0.42 | 0.84 | 0.39 |

Ann Intern Med. 2011 Jul 5; 155(1): 33–38.

Fair to moderate agreement for mitral valve abnormality and IVC size, and substantial agreement for LVEDD, EF, WMA, and the aortic valve

# Hand held echo-
# Is it worse than standard echo?

* Comparison of HE(Hand held echo) and SE(Standard echo) showed modest intra- and interobserver variation and good agreement in diagnosing LVSD and other changes in cardiac function and morphology (significant valvular disease), corresponding to a low inter-method variation and a good safety; thus, HE can be used to screen for LVSD and other cardiac abnormalities.

Dan Med J 2015;62(7):A5100

# Can it be performed by Primary Care Physicians(PCP)

* Fourteen PCPs underwent training in HHE, which included 28 hours of lecture and 4 days of hands-on scanning.

* Of the 1,312 HHEs, image quality was considered good in 35.4%, acceptable in 45.4%, and poor in 19.2% by the expert interpreter, and inconclusive in 115 cases (8.7%).

* Overall diagnosis by PCP and EE(Expert Echocardiographer) was concorded in 761 patients (58%). Two hundred seventy-four studies were considered normal by PCPs, only two of which were noted to have significant disease by the expert reader.

Hand-Held Cardiac Ultrasound Screening by Family Doctors
**ACC: Feb 10, 2016**

# Am Ht J 2006

* **Effect of training and type of stethoscope on cardiac auscultatory performance.**

* ***Iversen K*, *Søgaard Teisner A*, *Dalsgaard M*, *Greibe R*, *Timm HB*, *Skovgaard LT*, *Hróbjartsson A*, *Copenhagen O*, *Copenhagen S*, *Copenhagen K*.**

* Randomized trial with a 2 x 2 factorial design.

* 72 house officers simple or advanced stethoscope
  4-hour course in auscultation or no course.

- Heart auscultation findings were in poor accordance with echocardiography

- High interobserver variation.

- Outcome did not improve with either advanced stethoscope or attending of a course in heart auscultation.


GE Healthcare
Vscan

# THANK YOU