Protagonist: POCUS should be unrestricted for frontline HCW

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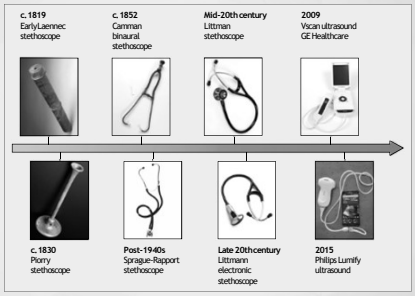
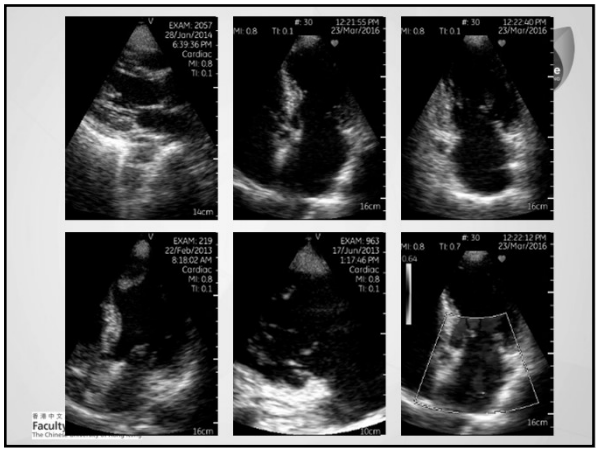
Evolution of stethoscope





Sensitivity and Specificity of Handheld Echocardiography for Evaluating Cardiac Structures and Function

Cardiac Targets	Diagnostic Accuracy (%)	
	Sensitivity	Specificity
Left ventricular dilation[13,16-19]	73-100	64-93
Left ventricular systolic function[13,14,16,20-23]	>90	>90
Left ventricular hypertrophy[24]	70	>90
Inferior vena cava dilation[16,20]	≈70	>80
Left atrial dilation[25]	53-75	72-94
Pericardial effusion[16,17,22]	89-91	≈96
Valvular heart disease[13,17,22,26,27]	≈80	≈80
Right ventricle dilation and function[14,20,22]	Variable among studies	

Chamsi-Pasha et al. Circulation. 2017;136:2178-2188.

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M/65 acute chest pain POCUS by a cardiologist fellow

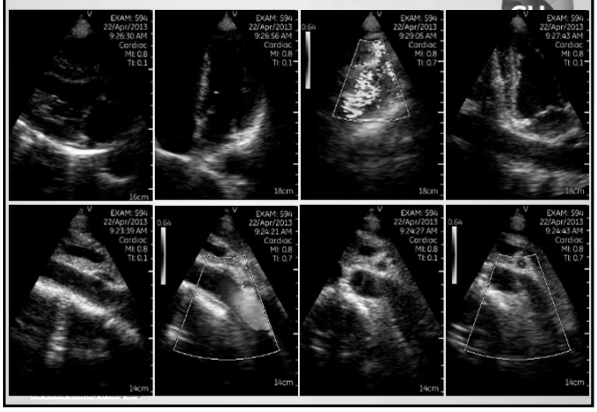


TABLE 3 Correct Diagnoses by HHU and PE With the Standard Echocardiogram as the Reference

Echocardiogram Finding	HHU % Correct	PE % Correct	% Difference (95% CI)	p Value
Normal LV function (n ¼ 196)	89	58	31 (23 to 39)	<0.0001
Abnormal LV function (n ¼ 54)	96	35	61 (45 to 77)	<0.0001
Normal RV function (n ¼ 203)	94	57	37 (30 to 45)	<0.0001
Abnormal RV function (n ¼ 47)	68	21	47 (26 to 67)	0.0001
Pulmonary hypertension absent (n ¼ 191)	92	89	3.1 (−3 to 9.3)	0.36
Pulmonary hypertension present (n ¼ 59)	53	42	10 (−8.3 to 28.6)	0.33
Valve disease, mild or absent (n ¼ 199)	94	91	3.5 (−1.9 to 8.9)	0.23
Valve disease, moderate or severe (n ¼ 51)	71	31	39 (19 to 59)	0.0003
Miscellaneous findings* absent (n ¼ 143)	77	64	13 (1.7 to 23.5)	0.02
Miscellaneous findings* present (n ¼ 107)	47	3	44 (33 to 55)	<0.0001

*Miscellaneous findings include LV, RV, and aortic dilation; LV hypertrophy; hypertrophic cardiomyopathy; atrial and ventricular septal defect and other congenital abnormalities; and pericardial effusion.
CI ¼ confidence interval; HHU ¼ handheld ultrasound; LV ¼ left ventricular; PE ¼ physical examination; RV ¼ right ventricular.

TABLE 4 Accuracy of HHU and PE in Moderate to Severe Cardiac Valve Disease Based on Standard Echocardiogram*

Echocardiogram Finding	HHU % Correct	PE % Correct	% Difference (95% CI)	p Value
Mitral regurgitation absent (n ¼ 230)	99.6	97.0	2.6 (−0.2 to 5.4)	0.07
Mitral regurgitation present (n ¼ 230)	100.0	60.0	40.0 (14.0 to 66.0)	0.008
Tricuspid regurgitation absent (n ¼ 225)	97.0	98.0	−0.9 (−4.1 to 2.3)	0.75
Tricuspid regurgitation present (n ¼ 25)	88.0	28.0	60.0 (31.0 to 89.0)	0.0007
Aortic stenosis absent (n ¼ 234)	97.9	96.6	1.2 (−1.9 to 4.4)	0.55
Aortic stenosis present (n ¼ 16)	93.8	87.5	6.3†	1.0

*There were only 10 patients with moderate or severe aortic regurgitation, tricuspid or mitral stenosis, or pulmonary valve disease. †Small samples prevented the calculation of a reliable CI.
CI ¼ confidence interval; HHU ¼ handheld ultrasound; PE ¼ physical examination.

HHU correctly identified **82%** vs PE correctly identified **47%** ($p < 0.0001$) of abnormalities on TTE.

$63.01 saved per patient HHU vs PE

Mehta M, *JACC. Cardiovascular imaging*. 2014;7:983-990

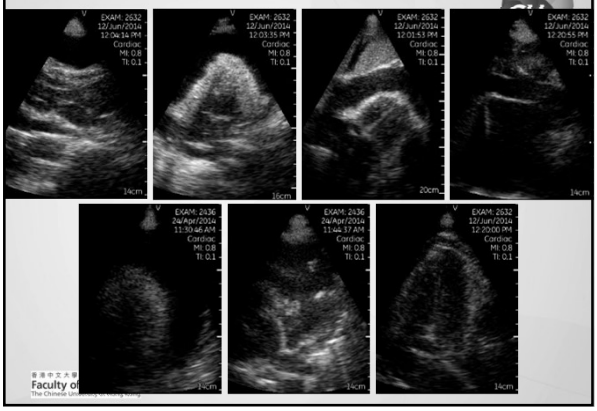
POCUS plus PE vs PE alone by general physicians

		Cardiomegaly[c]				Left Ventricular Function				Pericardial Effusion			
Cases	N	HCU %	PE %	*P* Value	N	HCU %	PE %	*P* Value	N	HCU %	PE %	*P* Value	N
	Matching expert cardiologist exactly												
All	290	90	59	.005	311	59	46	.005	336	79	49	.0001	336
Normal	114	93	59	.0001	271	73	64	.01	219	84	61	.0001	269
Abnormal[d]	176	70	53		40	32	12	.0001	117	60	3	.0001	67
	Matching expert cardiologist within 1 assessment level												
All	290	90	59	.005	311	88	67	.0001	336	96	59	.0001	336
Normal	114	93	59	.0001	271	89	77	.005	219	95	62	.0001	269
Abnormal	176	70	53		40	85	49	.0001	117	99	48	.0001	67

Martin, et al. The American Journal of Medicine (2009) 122, 35-41

Solution is not to restrict HCW from using POCUS
But to provide them with proper training

M/72 CA lung, hypotension, POCUS by an AED physician



Selected Studies Reporting POC Echocardiography Training Curricula for Novice Users

Study	Participants	Prior TTE Training	Training	Imaging Goals	Accuracy
Longjohn et al[46]	Pediatric emergency physicians (n=2)	Minimal	2 hours didactic training; 15 practice POCTTEs	LV function (normal or diminished); IVC collapsibility; pericardial effusion	Agreement with cardiologist: LV function κ=0.87, IVC collapsibility κ=0.73, pericardial effusion κ=0.77
Razi et al[9]	Internal medicine residents (n=3)	None	Image review (DVD with 50 sample TTEs); 20 practice POCTTEs	LV systolic dysfunction (LVEF<40%)	Sensitivity 94%; Specificity 94%;
Lucas et al[4]	Internal medicine hospitalists (n=8)	None	27 hours didactic and hands-on training; 34 practice POCTTEs	LV systolic dysfunction; severe mitral regurgitation; moderate/severe left atrial enlargement; moderate/severe LV-t-pericardial effusion; IVC dilatation	LV systolic dysfunction: sensitivity 84%; specificity 67%; pericardial effusion: sensitivity 100%; specificity 95%
Croft et al[30]	Internal medicine residents (n=9)	None	15 hours didactic training (including image review); 15 hours hands-on training	LV size; global/regional LV systolic function; valvular abnormalities; LV-t-pericardial effusion	Diagnostic images obtained: 94%; Images interpreted correctly: 93%; Correct identification of major TTE findings: 92%, and minor findings: 78%

2h-27h lectures
15-34 hands-on practice POCUS
>90% accuracy for major findings

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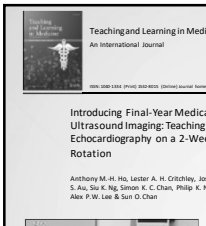
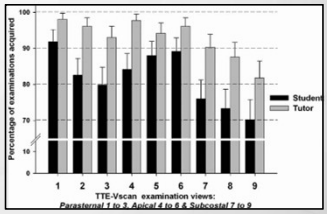


Teaching and Learning in Medicine
An International Journal

Routledge

Introducing Final-Year Medical Students to Pocket- Sized Ultrasound Imaging: Teaching Transthoracic Echocardiography on a 2-Week Anesthesia Rotation

Anthony M.-H. Ho, Lester A. H. Critchley, Joseph Y. C. Leung, Patricia K. Y. Kan, Sylvia S. Au, Siu K. Ng, Simon K. C. Chan, Philip K. N. Lam, Gordon Y. S. Choi, Joey K. M. Wai, Alex P. W. Lee & Sun O. Chan



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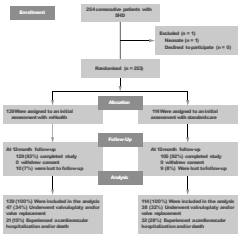
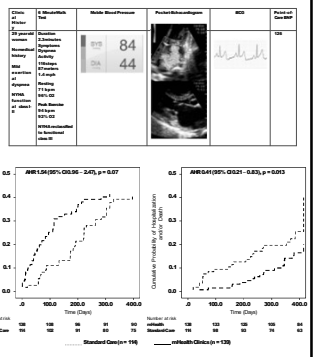
A. M.-H. HO ET AL. Teaching and Learning in Medicine, 27(3),307–313.

A Randomized Trial of Pocket-Echocardiography Integrated Mobile Health Device Assessments in Modern Structural Heart Disease Clinics

INDIA





Bhavnani et al. JACC-CVI. 2018;11:546-557

EXPERT CONSENSUS STATEMENT

Focused Cardiac Ultrasound: Recommendations from the American Society of Echocardiography

Scenarios considered by ASE appropriate for POCUS use:

a. FCU When Echocardiography is Not Promptly Available

i. The need for clinical evaluation is emergent or urgent and echocardiography is not immediately available

ii. Echocardiography not immediately available and the findings from FCU facilitated physical examination would allow more rapid triage and directed clinical management

b. FCU When Echocardiography is Not Practical

i. Frequent serial examinations to follow up an ultrasound finding

ii. Physical examination adjunct in at-risk populations

c. eFCU

i. Adjunct to physical examination

ii. Assessing heart disease in underserved or remote populations in which echocardiographic platforms are not available

iii. Screening of athletes for potential causes of sudden cardiac death

European Heart Journal – Cardiovascular Imaging (2014) 15, 956–960
doi:10.1093/ehjci/jeu081

POSITION PAPER

Focus cardiac ultrasound: the European Association of Cardiovascular Imaging viewpoint

The concept of point-of-care, problem-oriented focus cardiac ultrasound examination (FoCUS) is increasingly applied in the settings of medical emergencies, including cardiac diseases. The European Association of Cardiovascular Imaging (EACVI) recognizes that cardiologists are not the only medical professionals dealing with cardiovascular emergencies. In reality, emergency cardiac diagnostics and treatment are also carried out by a wide range of specialists. For the benefit of the patients, the EACVI encourages any medical professional, sufficiently trained to obtain valuable information from FoCUS, to use it in emergency settings. These medical professionals need to have the necessary knowledge to understand the obtained information entirely, and to use it correctly, thoughtfully and with care. In this document, the EACVI underlines major differences between echocardiography and FoCUS, and underscores the need for specific education and training in order to fully utilize advantages and minimize drawbacks of this type of cardiac ultrasound examination in the critically ill patients.

Focus cardiac ultrasound. European Heart Journal – Cardiovascular Imaging (2014) 15, 956–960

Would you restrict the use of something that:

- Adds critical information for POC decision-making
- Is more accurate than PE alone
- Is cost-effective
- Reduces unnecessary TTEs
- Is effectively learnable by frontline HCW
- Imposes positive impact on survival as shown by RCTs
- Is supported by guidelines?

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Therefore I say POCUS should *NOT* be restricted for use frontline HCW

Instead, we should teach them how to make the best use of it!

Thank You

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Rebuttal….

Inferior diagnostic accuracy
May lead to unnecessary echo
May miss important diagnosis
Lack of training among those who use it
No incentive to use
Limited data on its impact on clinical outcome

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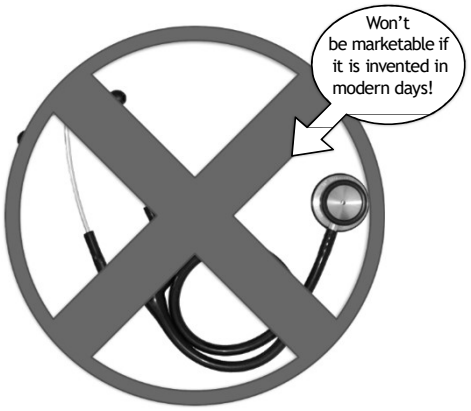

"I have no doubt whatever, from my own experience of its value, that it will be acknowledged to be one of the greatest discoveries in medicine by all those who are of a temper, and in circumstances, that will enable them to give it a fair trial. That it will ever come into general use, notwithstanding its value, I am extremely doubtful; because its beneficial application requires much time, and gives a good deal of trouble both to the patient and the practitioner; and because its whole hue and character is foreign, and opposed to all our habits and associations"

- On stethoscope, 1821

Original Article
PROCEEDINGS OF SINGAPORE HEALTHCARE

A pilot survey on an understanding of point of care bedside ultrasound (POCUS) among medical doctors in internal medicine: Exposure, perceptions, interest and barriers to training

Proceedings of Singapore Healthcare
2018, Vol. 27(2) 85–95

DOI: 10.1177/2010105817731412
journals.sagepub.com/home/psh
SAGE

Wee Ming Peh and Mei Ling Kang

Abstract
Introduction: Clinical bedside point-of-care ultrasonography (POCUS) is an important adjunct to history and physical examination. The objective of this pilot survey is to assess the level of exposure, perceptions, interest levels and possible barriers toward training of POCUS in internal medicine.
Methods: In October 2015, all medical doctors who were working in the Singapore General Hospital Internal Medicine Department were invited to complete a hard-copy printed 27-question Likert-scale survey.
Results: A total of 124 medical doctors participated in the survey (response rate 82.1%). The proportions of participants who have heard, witnessed, and performed POCUS were 65.6% (*N* = 82), 71.2% (*N* = 89) and 41.6% (*N* = 52), respectively. POCUS was rated highly on usefulness in the practice of internal medicine (*M* = 8.74; SD = 1.34). The top three POCUS skills that doctors would like to acquire would be (1) procedural guidance POCUS (70.8%); (2) point-of-care cardiac ultrasound (69%) and (3) lung ultrasound 58.4% (based on percentage ranked first through third). The sample mean of interest in undergoing further training in POCUS is 8.91 (SD = 1.27) (0 = not interested, 10 = very interested). The top three barriers identified were (1) lack of an ultrasound machine (*M* = 7.98 SD = 2.28); (2) cost of an ultrasound machine (*M* = 7.79 SD = 2.19) and (3) lack of a formal training curriculum (*M* = 7.25 SD = 2.08) (0 = not a barrier at all, 10 = severe barrier).
Conclusions: There is a high level of exposure and interest in POCUS. Doctors perceived bedside POCUS as very useful in the practice of internal medicine. A lack of machine and formal curriculum impedes development of a training program. This pilot survey may serve as a basic needs assessment to an implementation of an internal medicine POCUS training curriculum.

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Europace (2011) 13, 883–888
doi:10.1093/europace/eur051
CLINICAL RESEARCH
Electrocardiology and Risk Stratification

Prevalence of hypertrophic cardiomyopathy on an electrocardiogram-based pre-participation screening programme in a young male South-East Asian population: results from the Singapore Armed Forces Electrocardiogram and Echocardiogram screening protocol

Choon Ta Ng[1], Tek Siong Chee[2], Lee Fong Ling[2], Yian Ping Lee[2], Chi Keong Ching[3], Terrance S.J. Chua[3], Christopher Cheok[4], and Hean Yee Ong[2*]

Review Article
Singapore Med J 2017; 58(7): 347-353
doi: 10.11622/smedj.2017063

CME ARTICLE

Basic Cardiac Life Support: 2016 Singapore Guidelines

Swee Han Lim[1], FRCSEd, FRCPEd, *Fong Chi Wee*[2], MSH, MEd, *Tek Siong Chee*[3], MBBS, MMed

ABSTRACT Basic Cardiac Life Support (BCLS) or cardiopulmonary resuscitation (CPR) refers to the skills required (without use of equipment) in the resuscitation of cardiac arrest individuals. On recognising cardiac arrest, chest compressions should be initiated. Good quality compressions are with arms extended, elbows locked, shoulders directly over the casualty's chest and heel of the palm on the lower half of the sternum. The rescuer pushes hard and fast, compressing 4–6 cm deep for adults at 100–120 compressions per minute with complete chest recoil. Two quick mouth-to-mouth ventilations (each 400–600 mL tidal volume) should be delivered after every 30 chest compressions. Chest compression-only CPR is recommended for lay rescuers, dispatcher-assisted CPR and those unable or unwilling to give ventilations. CPR should be stopped when the casualty wakes up, an emergency team takes over casualty care or if an automated external defibrillator prompts for analysis of heart rhythm or delivery of shock.

Keywords: breathing, cardiac arrest, cardiopulmonary resuscitation, mouth-to-mouth ventilations, pulse check

eview Article
Singapore Med J 2017; 58(7): 354-359
doi: 10.11622/smedj.2017068

Singapore Defibrillation Guidelines 2016

Chun Yue Francis Lee[1], MBBS, FRCS, *Venkataraman Anantharaman*[2], MBBS, FRCPEd, *Swee Han Lim*[2], FRCSEd, FRCPEd, *Yih Yng Ng*[3], MBBS, MPH, *Tek Siong Chee*[4], MBBS, MMed, *Chong Meng Seet*[1], MBBS, FRCS, *Marcus Eng Hock Ong*[2,5], MBBS, MPH

ABSTRACT The most common initial rhythm in a sudden cardiac arrest is ventricular fibrillation or pulseless ventricular tachycardia. This is potentially treatable with defibrillation, especially if provided early. However, any delay in defibrillation will result in a decline in survival. Defibrillation requires coordination with the cardiopulmonary resuscitation component for effective resuscitation. These two components, which form the key links in the chain of survival, have to be brought to the cardiac victim in a timely fashion. An effective chain of survival is needed in both the institution and community settings.

Keywords: cardiopulmonary resuscitation, defibrillation, defibrillator, public access defibrillation, ventricular fibrillation

Yeah we know that….

- POCUS is not perfect, but…
- ECG is not perfect
- CXR is not perfect
- TTE is not perfect
- We don't ban everything that is imperfect
- We make use of its strength knowing its limitations to deliver the best patient care

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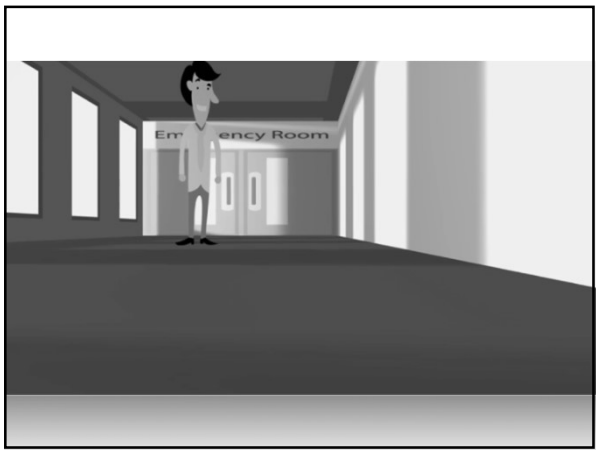

Thank You

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