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ECHOCARDIOGRAPHY BY THE NON-CARDIOLOGIST
A Curriculum for the Fast Track Strategy

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SUMMARY

A formal echocardiographic approach in a general intensive care unit requires a 24 hour availability of an expert in echocardiography, who could not be easily found. Therefore, a goal-directed echocardiogram strategy specifically tailored to the intensivist should be created. The concept of goal-directed echocardiography (GDE) has been incompletely evaluated and it is necessary to find a curriculum program to grant proficiency.
We propose the Fast-Track Echocardiographic Strategy (FTES) program to accomplish both objectives. All medical associations of echocardiography agree that extensive training and experience are needed to acquire and interpret a formal echocardiogram, however, to answer the five questions of FTES a simpler curriculum program would be enough. The aim of this review study was to propose a curriculum to teach non-cardiologist physicians intensivist (NCPI) to use a GDE such as FTES.
A search for published literature, from 1999 until June 2008, in English and French languages in Medline was undertaken in order to find out the most relevant and contemporary studies in this area. Strength of evidence of the articles found was based on five strengths of evidence. A framework for published medical research's critical appraisal and a checklist for sources of bias were used for assessment of studies quality. In overall, all studies showed it was possible to teach NCPI to use a GDE examination.
After a critical appraisal of the literature, we proposed FTES program to grant proficiency to NCPI in a GDE, to be used in hemodynamic unstable critically ill patients (hypotension with or without hypoxemia), to answer five simple questions, in order to define an hemodynamic profile and consequently be able to optimize their treatments. In conclusion, probably FTES program should at least be considered.

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RESUMO

ECOCARDIOGRAFIA REALIZADA PELO NÃO CARDIOLOGISTA
Um Curriculum para o Fast Track Strategy

O exame ecocardiográfico formal numa unidade de cuidados intensivos polivalente exige uma disponibilidade de um perito em ecocardiografia todas as 24h, o que raramente é conseguido. Assim, um exame ecocardiográfico focado por objectivos, especificamente dirigido ao intensivista não cardiologista deveria ser criado. O conceito de exame ecocardiográfico focado por objectivos tem sido parcialmente avaliado e é necessário encontrar um curriculum de modo a garantir a competência.
Propõe-se o curriculum para aprendizagem do Fast-Track Echocardiographic Strategy (FTES) para atingir estes fins. Todas as associações médicas de ecocardiografia estão de acordo que é necessário um treino e experiencia extensos para obter e interpretar um exame ecocardiográfico formal porém, para responder às cinco perguntas do FTES apenas um curriculum simples seria necessário. O objectivo deste estudo de revisão foi de propor um curriculum para ensinar intensivistas não cardiologistas a usar um exame ecocardiográfico focado por objectivos como o FTES.

Realizou-se uma pesquisa da literatura de 1999 até Junho de 2008 na Medline do modo a encontrar os estudos contemporâneos mais relevantes nesta área. A força de evidência dos artigos seleccionados foi baseada em cinco níveis de força de evidência. Foi utilizada uma estrutura para a avaliação crítica da literatura publicada e uma lista de tarefas para reconhecer enviesamentos de modo a avaliar a qualidade dos estudos escolhidos. Globalmente, todos os estudos mostraram ser possível ensinar intensivistas não cardiologistas a usar um exame ecocardiográfico focado por objectivos.

Após una análise crítica da literatura é proposto um curriculum para ensinar o Fast-Track Echocardiographic Strategy (FTES) para garantir a devida competência mínima a usar esta estratégia no doente hemodinamicamente instável (hipotenso com ou sem hipoxémia) e responder às cinco simples perguntas do FTES de modo a definir o perfil hemodinâmico e consequentemente ser capaz de optimizar a terapêutica. Em conclusão o programa do FTES deveria pelo menos ser considerado.

INTRODUCTION

Despite the huge qualities and significant data supporting its use in general intensive care units (GICU), many clinicians are not exploiting the potential of bedside echocardiography.

As it is well known, a formal echocardiographic approach in GICU requires a 24 hour availability of an expert in echocardiography, who could not be easily found. In addition, the formal echocardiographic examination requires approximately 1 hour to be performed, with additional time needed for complex cases [1]. Therefore, a goal-directed echocardiogram (GDE) strategy to approach the hemodynamic unstable patient (hypotension with or without hypoxemia), specifically tailored to the non-cardiologist physician intensivist (NCPI) should be created [2].

The concept of "limited," "focused," or "goal-directed" echocardiography (GDE) has been introduced but incompletely evaluated. Nevertheless, we have been assisting to a growing body of literature demonstrating that the NCPI can be trained to acquired and interpret transthoracic echocardiography in a goal-directed manner [1-5]. All medical associations of echocardiography agree that extensive training and experience are needed to acquire and interpret a complete and comprehensive echocardiographic examination [6], however, to answer the FTES' five questions it may not be necessary to undergo such kind of training.

There is lack of agreement in what should be the best formal didactic and practical training program in GDE for intensivist. On the one hand, it remains uncertain whether physicians with limited formal training in echocardiography can learn adequately to use this device properly to answer simple clinical questions and use it as a strategy to approach the critically ill patient. On the other hand, there is no clear harmony on what echocardiographic windows view and quantity of lectures and hands-on examinations should be taught, what should be the most appropriate curriculum to ensure competency, and what should be the best simple strategy to assess the hemodynamic unstable critically ill patient.

In this review study, after a critical appraisal of the literature, we proposed Fast-Track Echocardiographic Strategy (FTES) program to grant proficiency to NCPI in a GDE, to be used in hemodynamic unstable critically ill patients, to answer five simple questions, in order to define an hemodynamic profile and consequently be able to optimize their treatments.

AIM

To propose a curriculum program to teach NCPI to use a GDE examination such as the FTES in critically ill patients to answer five simple questions, how is the volume status, how are the left and right ventricle systolic functions, how are the chambers, how is the pericardium (cardiac tamponade) and are there any other abnormalities (mobile mass on valves or in chambers).

METHODOLOGY

A search for published literature, from 1999 until June 2008, in Medline was undertaken in order to find out the most relevant and contemporary studies in this area. Strength of evidence of the articles found was based on five strengths of evidence outlined by Mayer (2004)[7]. A framework for published medical research's critical appraisal and a checklist for sources of bias were used for assessment of studies quality. Given the word restriction all included literature were only the ones judged to be the most able to answer the raised question. Excluded published literatures evaluated different questions or were not useful for day-to-day clinical practice.

From more than 500 published articles identified, 29 studies were selected. Almost all were prospective studies, one of the strongest research tools able to show that the cause is associated with the effect more often than

by chance alone which used methodologies able to offer strengths of evidence type 1b. The rest were review and opinion studies offering strength of evidence 3a and 5, respectively. Randomized control trials were not found.

DISCUSSION

Many good prospective studies, with strengths of evidence type 1b, (nearly 2000 patients, more than 1000 examinations, only a few didactic and hand-on-practice lessons) have addressed this issue in several clinical environments. In overall, all studies showed it was possible to teach NCPI to use a GDE examination (see table 1).

Mandavia *et al* (2001)[8] showed that NCPI, taught with 1 hour of instruction and 4 hours of practical training, were able to perform a GDE examination and interpret it correctly, to assess pericardial effusion, compared with standard echocardiography performed by an expert. From a total of 515 GDE, 478 (93%) examinations were considered technically adequate. The overall sensitivity was 96% (95% CI 90.4% to 98.9%), and specificity was 98% (95% CI 95.8% to 99.1%). Positive predictive value was 92.5% (95% CI 85.8% to 96.7%), and negative predictive value was 98.9% (95% CI 97.3% to 99.7%). Overall accuracy was excellent at 97.5% (95% CI 95.7% to 98.7%). All results were closer to the high limit of the confident interval which confers more accuracy to end-results. This study was carried out with a reasonably rigorous methodology that could support the accuracy of outcome. However, some flaws should be mentioned which could influence end-results namely a selected bias was present, only patient at high risk to have a pericardial effusion were included. Probably these excellent results would not be so good whether other kinds of patients were present.

In DeCara et al (2003)'s study [9] NCPI had 20 hours of didactic lessons and hands-one instruction on image acquisition and performed 20 supervised transthoracic echocardiograms prior to scanning 300 inpatients and outpatients included in study. NCPI examinations, compared with the expert, obtained similar overall sensitivity and specificity for the detection of echocardiographic abnormalities 63% vs 65%; p was non-significant, and 92% vs 95%, respectively. However, regional wall motion abnormalities (45% vs 21%), right ventricular dysfunction (56% vs 26%) and non-trivial pericardial effusions (57% vs 22%) were most often missed by NCPI. The authors found that a GDE program could be easily taught to NCPI but possibly the approach must remain focused in basic findings due to the fact that more complex diagnoses were sometimes missed.

However, the type of included patients could give some difficulties to extrapolation of end-results to GICU. I.e, the GDE applicability to intensive care patients has to deal with the negative influence of ventilation, chest tubes, surgical dressings and the difficulty to have optimal patient position which could decrease echocardiographic images quality. Despite this limitation, this study suggested that a GDE could be taught to NCPI. Yet, the exact degree of training required to achieve a good performance and the best way to teach a GDE in GICU remain uncertain.

Hellmann et al (2005) [11] evaluated the rate at which NCPI learn a GDE strategy. The study enrolled thirty NCPI who underwent a training of 15-30 minutes of didactic instruction and one-on-one practice. NCPI performed a total of 231 GDE studies in medically stable inpatients using two-dimensional echo mode images from the parasternal short and long axes and apical four-chamber views, and colour-flow Doppler images across the mitral and aortic valves. The authors concluded that NCP could learn how to perform a GDE strategy. NCP's overall technical proficiency skills improved at the rate of 0.79 (95% confidence interval [CI] 0.53-1.04) points on an overall assessment index (0-3 scale) per 10 scans completed. Interpretation accuracy improved at a rate of 1.01 (95% CI 0.69-1.39) points per 10 scans as measured by an interpretation accuracy index (0-3 scale). However, and despite of the continuous teaching both rate of improvement were not very enthusiastic insofar as both numbers are closer to the inferior limit of the confidence interval. This probably means that a GDE program should have at least more than 10 hands-on practice scans to assure a minimum of proficiency skill and interpretation accuracy. In addition, extrapolation of end-results to intensive care patients persists difficult.

Recently other studies showed that a GDE strategy could be a reality, used as a reliable and clinical useful monitoring tool and haemodynamic evaluation of intensive care patients. Jensen et al (2004) [12] proposed the Focus Assessed TTE (FATE) examination, performed by NCPI. Four scanning positions were of particular interest, subxiphoid view, parasternal short and long axis views, apical four and two-chambers views. The FATE was performed from the positions listed above in a rapid sequence with the following objectives: 1- exclude obvious pathology; 2- assess wall thickness and dimensions of chambers; 3. Assess contractility; 4- visualize pleura on both sides and 5- relate the information to the clinical context. Appropriate Doppler modalities were applied as necessary, e.g. for pressure measurement, evaluation of valvular pathology, myocardial defects and assessment of cardiac output. This protocol was applied in 210 medical and surgical intensive care patients and 233 GDE were performed. The protocol provided usable images of the heart in 97% of the critically ill patients, 58% subcostal,

Table 1- Summary of some published studies addressing this issue

Study	Study's Environment	Trainees	Diddactic lesson	Hand-on practice	Conclusions
Duvall et al (2003),[10] prospective study (strength of evidence type 1b)	Emergency department, intensive care, outpatient department	Students and residents	2h to 30h		Assessment of LV and pericardium
DeCara et al (2003),[9] prospective study (strength of evidence type 1b)	300 patients, ward and outpatient department	Residents	20h	20 exams	Sensitivity 63% and specificity 92%
Croft et al (2006), [6] prospective study (strength of evidence type 1b)	72 outpatients	Residents	3h/day x 5 days	1h/day x5 days	4.45 min ± 0.97 min (3–7 min) to perform the exam in 94%; 93% for accuracy; 80% for changes in therapy according to the echocardiographic findings
Hellmann et al (2005), [11] prospective study (strength of evidence type 1b)	231 exams, ward	Residents	15 to 30 minutes	Continuous training	Improvement of performance in each 10 exams; assessment of LV and pericardium
Jensen et al (2004), [12] prospective study (strength of evidence type 1b)	210 patients, intensive care (ventilated and non-ventilated)	Specialists			Useful images in 97%
Manasia et al (2005), [1] prospective study (strength of evidence type 1b)	90 patients, surgical intensive care	Residents	10h		Examinations performed with sucess in 99%, sucess in diagnosis in 94%, success in interpretation in 84%
Carr et al (2007), [13] prospective study (strength of evidence type 1b)	56 patients, surgical intensive care	Residents	3h	25 exams	Assessment of Inferior vena cava in 65%
Randazzo et al (2003), [14] prospective study (strength of evidence type 1b)	115 patients, emergency department	Physicians with some knowledge in ultrasounds	3h		Agreement in the assessment of LV in 92.3% when EF>50%, 70.4% when EF<30% and 47.8% with EF 30-50%
Alexander et al (2004), [15] prospective study (strength of evidence type 1b)	533 patients, ward, intensive care and high dependency unit	Residents	3h		Agreement in the assessment of LV function in 75%, pericardial effusion in 98%; exam performed in an average of 8.5min
Mandavia et al (2001), [8] prospective study (strength of evidence type 1b)	515 exams, emergency department	Physicians with some knowledge in ultrasounds	1h	4h	Sensitivity 96% and specificity 98% in the assessment of pericardial effusion
Guillorya & Gunterb (2008), [16] review study (strength of evidence type 3b)	Surgical intensive care		<8h		Ability to evaluate volume status, LV function and pericardium
Vignon (2007), [17] prospective study (strength of evidence type 1b)	61 surgical/medical patients (ventilated/non-ventilated)	Residents	3h	5h	Very good ability to assess LV and RV function and dimension and pericardium

80% apical and 69% parasternal. Images through one window were obtainable in 23%, through two windows in 41% and through three windows in 34%. Usable images were achieved in 58.4% with subcostal transducer position, in 79.8% with apical position and in 69.1% with a left parasternal transducer position. Almost all the examinations were performed while the patient was supine, and 66% of the patients were mechanically ventilated during the examination.

Manasia et al (2005) [1] assessed the feasibility and clinical utility of GDE on 90 intensive care surgical patients using two-dimensional mode, two to four standard views (parasternal long, parasternal short, apical four, apical two,

and subcostal views), performed by NCPI. NCPI had 10 hours of didactic and practice training and were asked to evaluate the volume status, left ventricular function, regional wall motion abnormalities and the presence of pericardial effusion. This study was carried out with a reasonably rigorous methodology that could support the accuracy of outcome. Each study was immediately reviewed and repeated by an echocardiographer to determine the technical quality of the transthoracic echocardiography (TTE) and the accuracy of the NCPI's interpretation and NCPI were unaware of patient's diagnosis which allowed that GDE studies were done in unobtrusively and objective manner. NCPI successfully performed a GDE on 89 of 90 (99%) patients. Also, they effectively performed a diagnostic GDE in 94% of patients and interpreted their studies correctly in 84%. GDE provided new cardiac information and changed management of therapy with fluids, inotropes, and vasopressors in 37% of patients. The mean GDE acquisition time was 10.5 +- 4.2 minutes. In 40% of the cases, GDE was technically difficult but good-quality images were obtained.

Carr et al (2007) [13] demonstrated in severe surgical critically ill patients, that, after a limited training program, NCPI could detect poor volume status. In this study 9 NCPI had 3 hours of didactic and practical hands-on training and more 25 supervised GDE previously to start the study. A total of 70 examinations in 54 to 56 patients, (59% were ventilated), were performed. Despite the type of included study's population, possible many with abdominal dressings which created difficulties to obtain the subxiphoid four chamber view (only obtained in 35% of the studies), the inferior vena cava could be evaluated. The concordance rate between expert clinical judgment and central venous pressure and inferior vena cava distensibility index were 62% and 65%, respectively.

Alexander et al (2004) [15], in 533 medical patients, showed, that 20 NCPI could, after a 3 hours of didactic and hands-on practice training, assess LV systolic dysfunction and pericardial effusion with an average time required to complete the GDE of 8.5 minutes (77% of the examinations done in intermediate and critical care units). They used the parasternal short and long-axis and apical four-chamber views. Agreement (k) between GDE and standard echocardiography was very good, 75% (0.51) for LV dysfunction showing that visual estimation of LVEF could accurately be done by NCPI. Also, there was an agreement (k) between GDE and standard echocardiography of 98% (0.51) for moderate or large pericardial effusion. However, ability to assess mitral regurgitation and aortic valve disease was less good. It might imply these kinds of pathologies are outside of the GDE examination field and a FEE is required for these complex diagnoses. This fact argue against Beaulieu et al (2007)'s study [2] who mentioned acute valvular dysfunction, aortic dissection and rupture and a source of embolus as possible indications to be approached by a GDE, as well.

Vignon et al (2007) [17] evaluated the efficacy of a GDE program, using two-dimensional images, offered to NCPI. Sixty-one consecutive medical and surgical critically ill patients, (41 ventilated) were enrolled in the study. NCPI had 3 hours of didactic lessons and 5h of hands-on practice training, and were asked to perform the GDE assessing, in a "rule in, rule out" manner, left ventricle (LV) ejection fraction ≤ 50% by subjective visual estimation, LV and right ventricle (RV) chambers, pericardial effusion and pleural effusion. Each patient was screened using the subxiphoid, parasternal long and short axis and apical four-chamber views. This study was carried out with a very good rigorous methodology that could increase the accuracy of the end-results such as GDE examinations were performed with a maximum delay of 1 hour from the ones executed by the expert. On the contrary, the small number of patients, with the possibility to occur type I error, claiming differences where in fact they did not exist, could be a limitation to generalization of end-results. Nevertheless, in overall, clinical questions were adequately assessed by NCPI with an agreement (k) in the middle/upper part of the confident interval: left ventricular systolic dysfunction [K: 0.76± 0.09 (95% CI: 0.59–0.93)], left ventricular dilatation [K: 0.66± 0.12 (95% CI: 0.43–0.90)], right ventricular dilatation [K: 0.71± 0.12 (95% CI: 0.46–0.95)], pericardial effusion [K: 0.68± 0.18 (95 CI: 0.33–1.03)]. Therefore, end-results can be extrapolated to the majority of critically ill patients and GICUs.

THE FTES PROGRAM

Similarly to the majority of GDE examination described in published studies FTES program (see table 2) involves the use of three echocardiographic windows views, parasternal short-axis, apical four chamber and subxiphoid, views on two-dimensional mode. The aim of FTES is to answer five simple questions in order to obtain basic hemodynamic information and consequently be able to optimize treatment. The questions are answered in a qualitatively manner in order to persist a strategy simple to be performed: how is the volume status assessed by the evaluation of the respiratory diameter variation of the inferior vena cava (no significant variation, variation <50% or >50% meaning high, moderate and small volume status, respectively), how is the left and right ventricle systolic functions (decreased or good function), how is the chambers (dilated or non-dilated), is there a pericardium effusion (No, Yes, large pericardial effusion, cardiac tamponade) and is there any other gross abnormalities (mobile mass on valves or in chambers) (yes or no). Careful should be taken to ask for a standard echocardiogram always when doubts emerge.

In the near future portable ultrasound machine

will become a pocket tool, used during every physical examination [16]. In addition, we predict that a GDE such as FTES will be apply to all critically ill patients to answer the five questions. All of this will be done in a few minutes, with a non-invasive technique, without side-effects, at the bedside of the patient.

To independently perform and interpret a comprehensive clinical echocardiographic examination such as a GDE examination with a hand-carried-ultrasound the ASE, the American College of Cardiology and the American Heart Association recommend Level 2 training (a total of 150 personally performed exams and 300 interpreted studies). Nevertheless, to do FTES and answering its basic questions it may not be necessary to go to these extremes. It should be another philosophy. A lower degree of training is feasible when the goal is to perform a focused examination used only as an extension to the physical examination and never to replace a formal echocardiogram examination [16] . When using FTES all its imaging positions, parasternal short axis, apical four-chamber echocardiographic and the subxiphoid views, should be always and systematically performed in order to confirm previous findings and not miss further disorders, which would otherwise be ignored. The FTES can provide

Table 2: The FTES'program

Formal didactics on two-dimensional mode echocardiogram (10 h)
– Basic principle of echocardiography:
o Physics and Instrumentation
o Principle of image acquisition
– Standard transthoracic echocardiographic views:
o subxiphoid, parasternal short axis and apical four-chamber.
– Normal cardiac anatomy:
o chambers; valves; pericardium; inferior vena cava
– Overview on the use of echocardiography in the ICU environment
– Assessment of inferior vena cava:
o volume status: normal and case reviews
– Left ventricular systolic function (global and regional):
o visual estimation; normal and case reviews
– Right ventricular systolic function (global and regional):
o visual estimation; normal and case reviews
– Left ventricular cavity enlargement:
o visual estimation; echocardiographic features; normal and case reviews
– Right ventricular dilatation:
o definition; etiology; visual estimation; echocardiographic features; normal and case reviews
– Pericardial fluid:
o etiology; echocardiographic features; tamponade; normal and case reviews
– Gross abnormalities:
o vegetations, thrombus, masses
Hands-on training in the intensive care unit (10h): Continuous education and evaluation in intensive care environment of ventilated and non-ventilated patients (almost certainly, as everything, performance skill will improve with clinical practice and formal continuous education). In addition, a pathology-based approach to competency assessment allowing to acquire cognitive and technical skills in echocardiography should be supplemented to the training curriculum.
– Hand-held device:
o operating and setting information
– Supervised application of FTES:
o the critically ill patient; the patient in shock.
– Supervised 50 examinations:
o image quality, interpretation and report

a rapid way of acquiring clinical information. However, NCPI performing FTES should understand the limitations of this approach. Inappropriate interpretation or application of data gained by a poorly skilled user may have adverse consequences. As a result, a complete and comprehensive study such as a formal transthoracic echocardiography or transoesophageal echocardiography should be always asked immediately after the goal-directed examination when any doubt emerges to the NCPI. To avoid misusing the FTES a minimum and adequate training is essential.

Mazraeshahi et al (2007) [18] suggested a good curriculum in echocardiography for critical care involving the use of TTE and TEE approaches and color Doppler and pulsed- or continuous wave Doppler imaging. We agree with the authors when they mentioned that the proficiency acquired should be based not only in the number of examinations performed but also on the number of successful echocardiographic interrogations of specific cardiac pathologic conditions, particularly those relevant to the intensivist. However, we think their curriculum is more the application of the medium/advance standard curriculum in echocardiography to the intensive care environment than a GDE like FTES which should be able to be taught to the majority of intensivist.

Other author, Beaulieu (2007) [19] proposed a good curriculum for a GDE examination tailored to NCPI, the FOCUS program (strength of evidence type 5). This program would have 3 levels before the expert level 4, offering the ability to perform transesophageal echocardiogram. Again, FTES curriculum should be different in many aspects from Beaulieu's FOCUS program. We propose another philosophy. The FTES curriculum should be easier, simpler and very basic.

This curriculum should be at the base of an Escalating skills and training levels immediately after a physical examination and as its complement. A focused training in echocardiography like FTES should aspire only to achieve competence and skill to independently interpret examinations in a very basic platform. However, like the suggested curriculum of Mazraeshahi et al (2007) [18], a pathology-based approach to competency assessment allowing NCPI to acquire cognitive and technical skills in echocardiography should be part of our training curriculum. This basic platform only should offer to NCPI the knowledge and skill on two-dimensional mode echocardiography to facilitate that new echocardiographic method persist straightforward to learn and to be easily applied to all critical ill patients and clinical scenarios, effortless to perform and to answer five questions. Therefore, FTES program can accomplish it. The GDE is a kind of examination strategy, which could take less than 6 minutes to be performed in some studies, to answer only a few questions [2]. We propose Fast-Track Echocardiographic Strategy (FTES) to become a goal-directed approach only as an extension to the physical examination and never to replace a formal echocardiogram examination, to be used in hemodynamic unstable critically ill patients (hypotension with or without hypoxemia), to answer five simple questions, in order to define an hemodynamic profile and consequently be able to optimize their treatments: how is the volume status, how are the left and right ventricle functions, how are the chambers, how is the pericardium (cardiac tamponade) and are there any other gross abnormalities (mobile mass on valves or in chambers). FTES approach is possible and could be applied to the majority of critical ill patients and clinical scenarios[20-26]. We believe that a goal-directed echocardiographic examination such as FTES should be part at least of emergency medical and intensive cares training programs.

CONCLUSION

This review study showed that is possible to teach NCPI to use FTES as an extension of the physical examination, creating a tremendous advantage for bedside assessement and treatment of the critically ill patient. A focused training in echocardiography should aspire only to achieve competence and skill to independently interpret examinations in a very basic platform. The goal is to training all NCPI with a minimum skill to perform a GDE examination and not to replace a complete comprehensive study. This approach is possible and could help to spread this technology to all critical ill patients and clinical scenarios such as in ambulance, battle field and streets. With these facts in mind there is absolutely no reason or valued argument against why an echocardiogram program is not created. Therefore, we recommend the conception of a GDE program like FTES program which should be part of the critical care and emergency care fellowship. In conclusion, probably FTES program should at least be considered.

Conflict of interests:
The Authors who have taken part in this study declared that they do not have anything to disclose regarding funding or conflict of interest with respect to this manuscript.

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