

REFERRAL APPROPRIATENESS FOR TRANSTHORACIC ECHOCARDIOGRAPHY (TTE) BY APPLYING AUC CRITERIA

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ABSTRACT

Objectives: To analysis whether the indications for Trans Thoracic Echocardiography (TTE) comply with the AUC criteria, and what factors correlate with deviations from the AUC.

Materials and Methods: This was a prospective data analysis. It was conducted from April 2016 May 2016, in the cardiac investigation department at St. Luke's Hospital, Kilkenny Ireland . Data were recorded in a predesigned structured proforma.

Results: The total number of patient charts reviewed during this period was 122. Out of these 55.7 % were male, 44.2% were female. The percentage of inpatients echo request was more as compared to OPD requests. The percentage requested by cardiology team was 34.4% as compared to non-cardiology teams were 65.5%. During auditing, it is found that 68% of the patients were requested appropriately as compared to 85 % in the UK. The most common reason for inappropriate request was requesting an echo in asymptomatic patients and the most common appropriate indication was heart failure.

Conclusion: By applying the AUC, the burden of unnecessary echoes can be reduced and help to increase the proportion of the request for the echo that originates with cardiologists rather than with primary care physicians which can increase the yield and effectiveness of the echo.

Keywords: Transthoracic Echocardiography, TTE, AUC Criteria.

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INTRODUCTION

Implementing Appropriateness of use criteria (AUC) in echocardiography can have a direct clinical impact and are more likely to result in a patient care intervention.

Echocardiography (echo) was first invented by Swedish physician Inge Edler in 1953¹. The AUC criteria were first established by the American society of echocardiography (ASE) in 2007. British society of echocardiography also published guidelines on appropriateness criteria for echocardiography in 2007². The primary reason for their advent concerns is the unne-

cessary requests for imaging test which are particularly wasteful and relatively common. Very few studies have assessed how the clinic request for ECHO compared to the AUC^{3,4}. Cardiac diagnostic imaging represents a large component of the increase in health care expenditures, and the use of echocardiography, in particular, continues to rise⁵⁻⁸.

Implementing AUC in echocardiography can have a direct clinical impact as appropriate studies are more likely to reveal new and major findings and are more likely to result in a patient care intervention⁹. Unfortunately, 10% of transthoracic echocardiography (TTE) referrals are inappropriate or non-adherent to AUC⁹⁻¹¹. The prevalence of non-adherent referrals tends to be greater in patients,¹¹⁻¹⁴ community settings¹⁵ and non-specialist referrals¹²⁻¹⁶; however, inappropriate referrals have been reported in all clinical settings¹⁰⁻¹⁷. Therefore, adherence to AUC is important for cost containment, effective resource utilization and best practice of clinical medicine. Clinicians usually request echocardiograms by complet-

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ing free-form-text requisitions, whether in an electronic or paper format. Very few studies have assessed how clinical requests for ECHO compare to the AUC^{18,19} and most are single centered efforts from academic institutions in the USA. Concerns about inappropriate use of ECHO are raised periodically in the UK and anecdotal reports, as well as a small single centered audit²⁰. In a recent study at our Institution of 2-month duration, 122 patients were reviewed in which 68% of the patients were requested for echocardiography appropriately as compared to UK 88%. The objective of this study is to appropriately use the criteria for Echocardiography to avoid unnecessary request for imaging to save time and hospital expenditure. In an analysis to test whether the indications for TTE comply with the AUC, and what factors correlate with deviations from the AUC. There was a test to determine whether screening requests for TTE by applying AUC might reduce activity levels and help release some of the pressure on ECHO departments. The objective of this study is to appropriately use the criteria for Echocardiography to avoid unnecessary request for imaging to save time and hospital expenditure

MATERIALS AND METHODS

This was a prospective data analysis. All patients (inpatients & OPD) referred for echocardiographies were included in this audit. It was conducted from April 2016 to May 2016, in the cardiac investigation department at St. Luke’s Hospital, Kilkenny Ireland. All in and out patients request cards during this period were reviewed & data were recorded in a predesigned structured proforma.

RESULTS

The total number of inpatient charts reviewed during this period was 122. Out of these 55.7 % were male, 44.2% were female. The percentage of inpatients echo request was more as compared to OPD requests. The percentage requested by cardiology team was 34.4% as compared to non-cardiology teams were 65.5% as shown in chart 1. The age distribution is shown in Chart 2. During auditing, it is found that 68 % of the patients were requested appropriately as compared to 85 % in the UK. . The diagnostic reasons for the Echo is shown in Chart 3. The most common reason for inappropriate request was requesting an echo in asymptomatic patients and the most common appropriate indication was heart failure as shown in Chart 4. Distribution of ACCF 2011 AUC indication categories in classifiable referrals using a free-form text requisition and the structured referral requisition algorithm is shown in Table 1.

Name of Patient:	Gender
Address:	Phone number:
Study requested:	
Clinical Problem	
Medications	
Diagnostic impression/Diagnostic:	
Patient Ward/Room	
Yes No	
<input type="checkbox"/>	Is the patient asymptomatic?
<input type="checkbox"/>	is this echo for routine surveillance?
<input type="checkbox"/>	Does the patient have a previous echo result?
<input type="checkbox"/>	Is the ordering doctor a cardiologist or cardiac specialist?
<input type="checkbox"/>	Does the patient have a change in clinical status or cardiac exam?
<input type="checkbox"/>	Does the patient have suspicion of pulmonary embolism?
<input type="checkbox"/>	Does the patient have a suspicion of endocarditis?
Please, provide the following information:	
Referring Dr:	
Speciality:	
Phone Number:	
Referral Date	

Fig 1: Sampling Frame for data collection

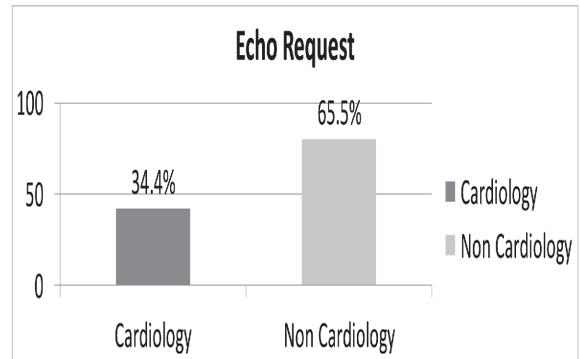


Fig 2: ????????????

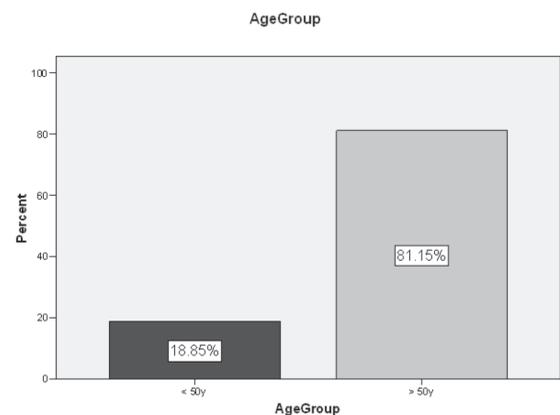


Fig 3: ????????????

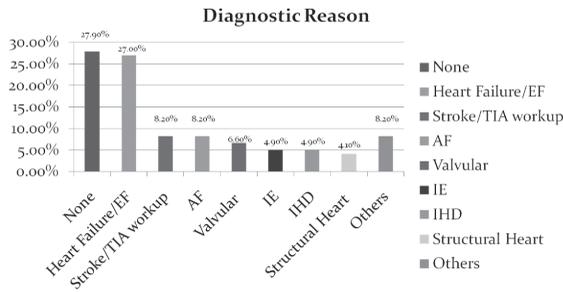


Fig 4: ????????????

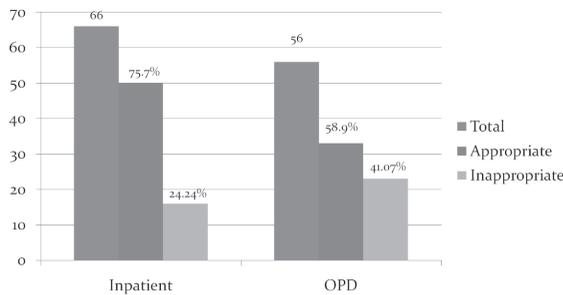


Fig 5: ????????????

Table 1: Distribution of ACCF 2011 AUC indication categories in classifiable referrals using a free-form text requisition and the structured referral requisition algorithm.

AUC Indication Category of Classifiable Requisitions	Free-form-text requisition n = 77 (%)	Structured algorithm requisition n = 253 (%)
General evaluation of cardiac structure and function	34 (44.2)	79 (31.2)
Cardiovascular evaluation in an acute setting	7 (9.1)	0 (0)
Evaluation of valvular function	20 (26.0)	87 (34.4)
Evaluation of intracardiac and extracardiac structures and chambers	1 (1.3)	0 (0)
Evaluation of aortic disease	1 (1.3)	0 (0)
Evaluation of hypertension, heart failure or cardiomyopathy	14 (18.2)	69 (27.3)
Adult congenital heart disease	0 (0)	18 (7.1)

DISCUSSION

The recently published ACCF 2011 AUC for echocardiography is a useful tool for physicians to guide their use of echocardiography, ensuring that echocardiography is used in clinical settings where it can provide the greatest diagnostic and prognostic value while also identifying scenarios where the diagnostic benefit is minimal. AUC has been adopted within the United States and other countries and serves as a quality measure during the accreditation of echocardiography laboratories by the government and international organizations²¹⁻²³.

In a study at the Ottawa Heart Institute (UOHI), of 1303 consecutive TTE referrals, more than 26 % of requisitions did not provide enough information to determine if the referral met AUC²⁴. Further, 41 % of requisitions from cardiologists provided insufficient information Banihashemi and colleagues concluded that structured requisition formats that required referring physicians to provide AUC-relevant information where needed to facilitate the monitoring and application of AUC in the echocardiography Laboratory²⁴.

The first study to assess AUC in a large geographical area with a unified and homogenous healthcare system (Wales, UK), in the District General Hospitals of various sizes, as well as in two tertiary centers. The proportions of appropriate (86%), inappropriate (11%), and uncertain indications (3%) were similar to the findings of previous studies. The only European study that has applied AUC⁴ reported that virtually all (98.8%) indications for TTE in 931 patients in five community hospitals were captured by the revised criteria. Indications were appropriate in 80.3%, inappropriate in 14.7%, and of uncertain appropriateness in 5% of cases. Interestingly, after analyzing an independent sample of 259 patients who had been discharged from the hospital during the same period, the authors reported that 16.2% fulfilled criteria for being offered a TTE, without one having been requested²⁴.

The AUC for echocardiography has been developed to help clinicians to choose testing more appropriately to improve the quality of care²⁵. One of the study in Australia in 2015 adapting the American Appropriate

Use Criteria (AUC) for transthoracic echocardiography to Australian practice matched 90 of 98 AUC with the guidelines (53 appropriate, 12 sometimes appropriate, 25 rarely appropriate), but eight lacked any match. Among the matched criteria, 76 (82%) indications were concordant with the guidelines²⁶.

During an audit it was found that by applying appropriate criteria one can avoid unnecessary burden and 68% compared to the UK 88% were appropriate and the most common cause was found to be heart failure and the most common inappropriate prescription was in asymptomatic patients. During another audit, different team consultants mostly prescribed appropriate prescription seeing the need for diagnostic imaging which is helpful in diagnosis.

Echocardiography represents the first-line cardiovascular imaging (CVI) modality for the assessment of patients with HF. Cardiac magnetic resonance (CMR), single photon emission computed tomography (SPECT), positron emission tomography (PET), and cardiac computed tomography (CCT) complement echocardiography or represent an alternative to it in the case of the suboptimal acoustic window. The demand for CVI in HF is constantly increasing as a result of continuously evolving in technology, diversification of indications, and a rise in HF prevalence, partially due to better life expectancy and higher HF prevalence in the elderly^{27,28}. The increasing demand necessitates appropriate criteria for CVI use in HF to assist decision making²⁹.

Although transthoracic echocardiography (TTE) is an important tool in the diagnosis and management of cardiovascular disease, there are concerns regarding TTE utilization³⁰⁻³². Previous studies report a growth rate in TTE volume of 6–8% annually^{31,33}. (educational intervention reference). One study conducted in Massachusetts from 2011 to 2012 demonstrated the educational intervention to reduce the inappropriateness of echocardiography¹. The use of AUC to guide educational efforts aimed at improving the cardiac imaging services utilization is an example of the AUC actionable application. Although the educational intervention in this study succeeded in reducing the rate of inappropriate TTEs, similar to a statewide quality

improvement initiative for cardiac computed tomography, 16³⁴ not all interventions studied have produced the desired results. Specifically, a study by Willens et al,³⁵ did not reduce inappropriate stress echocardiograms with an educational intervention. The intervention consisted of a grand round lecture attended by only approximately 50% of the target audience and distribution of a list of common inappropriate indications for stress echocardiography. In contrast, the intervention in this study involved a monthly lecture, distribution of a pocket card for ordering providers, and important regular feedback about ordering behavior, there was a 26% reduction in the number of TTEs ordered per day during the intervention (3.9 vs. 2.9 TTEs, $P < 0.001$), but no significant difference between the intervention and post-intervention periods (2.9 vs. 3.1, $P = 0.23$), (36). This audit compares our results to standards set by AUC criteria of American society of Echocardiography.

CONCLUSION

By applying the AUC, the burden of unnecessary echoes can be reduced and help to increase the proportion of the request for the echo that originates with cardiologists rather than with primary care physicians which can increase the 'yield' and effectiveness of the echo.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Jaffri SA: Contributed substantially to the conception and design of the study, the acquisition of data, analysis and interpretation of data.

Zehra SRE: Manuscript writing and final approval of the version to publish.

Sultan S: Manuscript writing and final approval of the version to publish.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.