

FREQUENCY OF INDICATIONS FOR TRANSTHORACIC ECHOCARDIOGRAPHY (TTE) IN NON-CARDIAC PATIENTS IN PESHAWAR, PAKISTAN

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ABSTRACT **OBJECTIVES**

This study aimed to find the frequency of indications for Transthoracic echocardiography and its impact on non-cardiac patient management in Peshawar, Pakistan.

METHODOLOGY

A cross-sectional study was conducted in Medical B Ward, Department of Internal Medicine at Hayatabad Medical Complex, Peshawar, Pakistan, over six months from July to 31st December 2020. A non-consecutive probability sampling technique was used. The sample size was calculated using an Openepi calculator, keeping 25.9 % as the frequency of requesting heart failure as an indication of echocardiography, 6.15 % as the confidence limit, and 95 % as a confidence interval.

RESULTS

A total of 195 patients were included in the study. The mean age of the patients was 48.3 years, with 59% females and 41% males. The major indication for TTE was assessing left ventricular systolic function in 146 (75%) patients and then finding the cause of the observed arrhythmias in 15 (7.5%) patients. A major proportion (95%) of the evaluated patients had no major change in the ongoing management plan following TTE. The working diagnosis in evaluated patients was changed by 12.7%, whereas new management plans were devised in only 4.9% of the cases.

CONCLUSION

Designing a randomized study to fully elaborate on the utility of TTE in patients admitted to acute medical wards while trying to address all confounding variables is an extremely difficult task.

KEYWORDS: Echocardiography, Transthoracic, Medical Ward; LV Systolic Function

INTRODUCTION

The appropriate use of echocardiography remains ever-important, seeing the increasing workload on the hospital and the need for human resources, equipment, and infrastructure. The cost of this investigation further swells up the medical bills of the patients attending the health care facility. The ever-advancing innovations in echocardiography require clinicians to make the best possible, efficient, and cost-effective use in patient care.^{1,2} Transthoracic Echocardiography (TTE) has been in clinical practice since the latter part of the seventies. The noninvasive and ready availability makes it stand out as an investigation of choice, especially for the moribund and critically ill.³ Transesophageal Echocardiography (TOE) is another useful and valuable tool but remains invasive and not readily available.⁴ The Appropriate Use Criteria (AUC) for echocardiography is a physician-derived quality enhancement tool to ensure that echocardiography is streamlined for better patient outcomes.⁵ Transthoracic echocardiography has

evolved into a comprehensive assessment of complex cardiac anatomy, function, and hemodynamics.⁶ Several studies have been done to evaluate the usefulness of requesting TTE in acutely ill patients admitted to medical wards. The overall yield of transthoracic echocardiography (TTE) in acute ischemic stroke (AIS) is low, with 38% of patients demonstrating clinically relevant findings and leading to additional workup in 8.5%.⁷ The overall yield of transthoracic echocardiography in acute ischemic stroke is low, and stratifying patients based on their likelihood of benefiting from it can improve resource utilization. Routine echocardiography significantly impacts decision-making and treatment in almost half of patients admitted to an internal medicine ward due to significant heart abnormalities detected.⁸ Most echocardiography requests for diagnosis of infective endocarditis were inappropriate, especially TTE requests, with no significant impact of the 2017 international guidelines on appropriateness for cardiac imaging in valvular heart disease.⁹ TTE is often useful and appropriate for patients in internal medicine

departments, but its use should be based on clinical indications and not on a cardiologist's preference.¹⁰ A careful review of the available literature showed that no local study was undertaken to evaluate this important tool's usefulness in clinical practice. We wanted to conduct this observational study to document the usefulness of requesting echocardiography in acutely ill patients admitted to General Internal Medicine wards. We wanted to study the indications for echocardiography and its impact on change in diagnosis and management of non-cardiac patients in Peshawar, Pakistan.

METHODOLOGY

After obtaining formal approval from the ethical review board (Ref No: 306 /HEC/B&PSC / 2020 , 04-06-2020) of Hayatabad Medical Complex, Peshawar, this Cross-Sectional study was conducted in Medical B Ward, Department of Internal Medicine at Hayatabad Medical Complex, Peshawar, Pakistan. It was spread over six months, from July to December 2020. A total of 195 patients were included in the study population. A non-consecutive probability sampling technique was used. The sample size was calculated using an Openepi calculator, keeping 25.9 % as the frequency of requesting heart failure as an indication of echocardiography, 6.15 % as a confidence limit, and 95 % as a confidence interval.¹¹ All patients of either sex between 18 to 75 years of age, whether admitted through emergency or outpatient, were included in the study. All those patients who were admitted with a cardiac illness, whether acute or sub-acute, had an echocardiogram done in the last 06 months, or were poor candidates for TTE based on technical difficulty in the form of extreme obesity or structured abnormalities in the chest were excluded from the study. All those patients who underwent TTE examination without being examined prior by the consultants were also excluded. A structured proforma was used to document all the details about the patient, including the age, sex, primary admitting diagnosis, reasons for requesting TTE, and the resultant changes in the diagnosis and the management plan. No formal informed consent from the patient was required for the study. All the included patients were examined in the grand ward rounds by the respective consultants (Rank of Assistant Professor and above), followed by requesting TTE. The residents were asked to fill in the request proforma mentioning the reasons for TTE. The results of the TTE were then documented in the proforma. The data was analyzed using SPSS version 22. Mean± standard deviation was calculated for quantitative variables like age, while frequency/ percentages were calculated for categorical variables like gender and indications for echocardiography. Nonparametric sample tests,

including binominal tests, were applied to calculate confidence intervals for different proportions of indication of TTE. One sample t-test was used to calculate a confidence interval for changes in diagnosis and management. The results were presented in the form of tables and graphs.

RESULTS

A total of 196 patients who met the inclusion criteria during the study period were included. The mean age of the patients was 48±3 years, with 59% females and 41% males. The major indication for requesting TTE in patients admitted for non-cardiac causes in 146 (75%) patients was to assess LV systolic function, followed by finding the cause of the observed arrhythmias in 15 (7.5%) patients. TTE was also requested in 14 (7%) patients suspected to be suffering from infective endocarditis and in 5 (2.5%) of the patients for the evaluation of suspected valvular heart disease on bedside examination. About 4 (2%) of the included patients had TTE performed as part of the workup for pulmonary embolism, while 12 (6%) patients had TTE done for other nonspecific indications. The working diagnosis in evaluated patients was changed for only 25 (12.7%). The major changes in the management plan were observed in only 10 (4.9%) patients, with the remaining 185 (95%) having no major change in the ongoing management plan following TTE.

Table 1: Percentage of Indication for TTE

Indication for requesting TTE	Numbers	%age	Confidence interval		P-Value
			Lower	upper	
LV dysfunction	146	74.5	0.678	0.804	0.000
Observed arrhythmias	15	7.7	0.043	0.123	0.000
Infective endocarditis	14	7.1	0.040	0.177	0.000
Valvular heart diseases	05	2.6	0.008	0.59	0.000
Pulmonary embolism	04	02	0.006	0.51	0.000
Non specific	12	6.1	0.032	0.105	0.000
Total	196	100	1.4849	1.8825	0.000

Table 2: Impact of Requesting TTE on Management

Major changes	Numbers	%ages	Confidence interval		P-Value
			Lower	upper	
Working diagnosis	25	12.7	0.804	1.747	0.000
Management plan	10	4.9	0.0199	0.0821	0.001

DISCUSSION

The study project and its results remain extremely important because the study population was recruited

from the medical ward where the patients were admitted for primarily non-cardiac causes. All of the previous similar studies available have been conducted in intensive care.^{12,13} While critically ill patients need sophisticated investigative tools for clear diagnosis and management, All emergency physicians can learn to perform focused transesophageal echocardiography (F-TEE), enhancing their ability to provide critical care for critically ill or cardiac arrest patients.¹² 40% of COVID-19 patients admitted to ICU had abnormal echocardiography findings, with 85% having raised pulmonary artery pressures, making trans-thoracic echocardiography a useful prognostication tool.¹³ The transthoracic echocardiographic studies were appropriately ordered for 533 patients (74%). Symptoms of potential cardiac origin (e.g., dyspnea) were the most common reason for TTE (n = 156, 21.8%). The most common inappropriate use was routine repeat evaluation of patients with heart failure and no change in clinical status (n = 74, 10.3%).¹⁴ In our study, working diagnosis was changed in only 12.7% of cases. This implies that keeping dyspnea as the most common reason for requesting TTE would make it more appropriate. No such local study has been steered to estimate the practicality of doing TTE in our local setup with meager resources, especially when healthcare delivery is not free. Our results showed that the working diagnosis was altered in 12.7%, whereas new management plans were devised in only 4.9% of the cases. Most (95%) evaluated patients had no major changes following TTE. The development of AUC for echocardiography is a physician-derived quality enhancement tool enacted to rationalize using this important investigation tool for better patient outcomes. The requests for TTE examination were evaluated in an Australian regional center by Al-Kaisey et al. and reported 77% appropriate while 20.3% inappropriate, and 2.7% uncertain TTE indications, whereas early similar findings were reported by Patil et al. with 82% (appropriate), 12.3% (inappropriate) and 5.3% (uncertain).¹⁵ In a Philippine study, Most echocardiography requests have appropriate indications (87.9%).¹¹ AI-empowered echocardiography systems can standardize measurements, aid in diagnosing cardiac diseases, optimize clinical workflow, and reduce healthcare costs.^{16,17,18} So we should recommend such systems to improve health care delivery and reduce unnecessary burden on our health system.

LIMITATIONS

The observational, non-randomized nature of our study is a major limitation. We cannot conclude that the management changes observed following TTE would have happened anyhow over time, and using TTE has only led to prompter changes. The institution of such an

audit may inculcate fear amongst the practicing clinicians about the changes in the management plan based on their clinical skills and would depend more on hard core evidence in the form of TTE with a potential to escalate the treatment costs and mitigate any medico-legal concerns. We strongly believe that designing a randomized study to fully elaborate the utility of TTE in patients admitted to acute medical wards with diverse co-morbidities while trying to address all confounding variables is an extremely difficult task.

CONCLUSIONS

Despite the limitations of the research project, including the small sample size, it is clear that the request for TTE in the admitted patient for non-cardiac causes must be made only with strict compliance with the appropriate use criteria for echocardiography. This should ensure that the facility's workload is reduced and that the cost burden on the patient is reduced, resulting in a performance improvement.

CONFLICT OF INTEREST: None

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