

Effectiveness of Focus Echo-Cardiography in Deciding Clinical Management of Various Cardio-Pulmonary Ailments at Intensive Care Unit of A Tertiary Care Hospital

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Abstract

Introduction: FOCUS (Focused Cardiac Ultrasound) is a simplified application of echocardiography that is rapidly expanding in use in emergency and critical care medicine. It is limited, point of care cardiac ultrasound diagnostic test with goal directed approach conforming to standardized, targeted, scanning protocols.

Materials and methods: The present study was carried out in the department of Medicine in medical ICU of tertiary care teaching hospital from August 2019 to August 2021. We performed FOCUS on patients presenting to the intensive care unit having chest pain, breathlessness who fulfilled our inclusion criteria prior to which clinical and laboratory assessment was done of patients. Focused echocardiography was performed by the trained medicine faculty /cardiologists using portable ultrasound machine LOGIQ V2 with 3SC-RS Adult cardiac probe in MICU in the patients as early as possible in the patients. On basis of the FOCUS diagnosis, treatment plan was decided like drug therapy, fluid therapy or intervention with the help of medical team consisting of physicians, intensivists, cardiologists and other superspecialists. Patients were reassessed and monitoring done for all for response to treatment as per the case. Those patients were clinically followed up for the outcome, either recovery or death.

Result: The data scrutinized from 151 patients it was studied that maximum patients had reported IHD (58.94 %) and 17.22% patients with pulmonary thromboembolism, 10.60% had DCMP, 2.65% had LV clot, 0.66 had Infective endocarditis, 1.99% had Hypertensive heart Disease, 4.64% had Pericardial Effusion, 2.65% had valvular heart disease, 0.66 % had Aortic Dissection.

In the finding maximum patients were treated with Antiplatelet drug (148), thrombolysis (86), Diuretic (89), Anticoagulation (76), Inotropic drugs (27), Anti-arrhythmic drugs (23), Fluid resuscitation (21). In intervention study 76 patients were treated with percutaneous

transluminal coronary angioplasty, 9 patients were treated with coronary artery bypass grafting & 3 patients with pericardiocentesis. The study reported significant recovery in 88 patients. The P value reported was 0.4999 which is statistically insignificant. The observation makes clear that initial FOCUS study is beneficial for early clinical decision making at intensive care unit and to line up proper treatment to patient for quick recovery.

Conclusion: The present study shows that Focused Echocardiography is clinically potential and is sensitive in the detection of different cardiovascular diseases and also for early clinical decision making in the management of patient in intensive care unit.

Keywords: Focus, focused echocardiography, ischemic heart disease.

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Introduction

A FOCUS (Focused Cardiac Ultrasound) of the heart has been referred to by a number of different names. The acknowledgement that these techniques are separate from the practice of echocardiography necessitates the definition of the nomenclature. The American Society of Echocardiography (ASE) advises using the phrase "focused cardiac ultrasound". The terms "full" or "comprehensive" echocardiogram and "limited" echocardiography have already been established in the field of echocardiography.[1-2]

FOCUS (Focused Cardiac Ultrasound) is a simplified application of echocardiography that is rapidly expanding in use in emergency and critical care medicine. It is limited, point of care cardiac ultrasound diagnostic test conforming to standardized, targeted, scanning protocols.[1] Application of Focused echocardiography in ICU setting is quite distinct from typical comprehensive echocardiography, because the urgent critical care setting mandates a goal-directed approach. Comprehensive echocardiograms are performed by fully trained, experienced, and certified cardiac sonographers, cardiologist echocardiographers, and advanced critical care echocardiographers. Focused echocardiography is performed by physicians, intensivists, cardiac surgeons, emergency practitioners who have limited

training of echocardiography and will use only a few echocardiographic views.[2] Advanced practitioners are capable of measuring many more parameters designed to assess many additional aspects of cardiac structure and function and require more time, additional views, additional tools, and a higher level of qualifications and training in the acquisition and interpretation of images. Focused Echocardiography is a procedure done with portable ultrasound machine which is convenient for non-ambulatory patient and can be used for quick diagnostic and therapeutic decisions for the better outcome of patient in critical care unit and emergency setup. Effective management of critically ill patients requires rapid assessment and clear goals. Focused echocardiography most frequently aims to rapidly identify and differentiate the causes of hemodynamic instability and/or the causes of shock, other cardiac emergencies.

The most frequent indications for goal-directed echocardiography include

- 1) The spectrum of hemodynamic instability.
- 2) Cardiac emergency like Acute Myocardial Infarction (AMI) and its complications.

The differential diagnostic categories for hemodynamic instability [3]

- Septic shock
- Hypovolemic shock
- Cardiogenic shock.

The differential diagnostic categories for cardiac emergencies:

- ST changes associated with cardiac or pericardial disease
- Pericardial tamponade
- Pulmonary Embolism

The goals of FOCUS echocardiography in an unstable patient are: [4]

- Assessing global ventricular systolic function
- Identifying marked right ventricular and left ventricular enlargement
- Assessing intravascular volume
- Presence of a pericardial effusion.

In an emergency setting, it is recommended to go directly to the best view, which is frequently the subcostal or apical view.

Interpretation of Focused echocardiographic findings should be done in the context of clinically available hemodynamic information. When Focused echocardiography is insufficient or when additional abnormalities are appreciated, a comprehensive echocardiogram should be done. This study will be about finding the indications of focused echocardiography in intensive care unit, studying those echocardiography findings and their usefulness in clinical decision making which will improve the outcome in critically ill patients.

Uses [5]

- Valvular abnormalities such as mitral valve prolapse can be detected because the test can visualize the movement of heart valves.
- Doppler can be used during the test to measure the velocity (speed) of blood flow in various areas within the heart. This is helpful in measuring impaired

blood flow in conditions such as aortic stenosis.

- An echo is often used to measure the left ventricular ejection fraction to evaluate the effectiveness of various cardiac treatments in conditions such as heart failure. Also in cardiac arrhythmia it can assess heart movement, which may help in determining the exact cause and best treatment.

Echocardiograms are also sometimes used in conjunction with stress tests for cardiac evaluations. An echo test is done at rest and then repeated during exercise to look for changes in the function of the heart muscle during periods of exertion. Deterioration in muscle function during exercise can be a sign of coronary artery disease.

While the echocardiogram provides a lot of information about cardiac anatomy, it does not visualize the coronary arteries or blockages in coronary arteries. If imaging the coronary arteries is necessary, a cardiac catheterization is commonly performed.[6]

Certain physical variations, such as a thick chest wall or emphysema, can interfere with visualization of heart during an echocardiogram. If you have one of these conditions and need an echo, you might need an invasive ultrasound of your heart known as a transesophageal echocardiogram (TEE).

We performed FOCUS using LOGIQ V2 ultrasound machine with 3SC RS Adult cardiac probe. FOCUS was indicated in patients who required urgent echocardiography for prompt diagnosis. FOCUS is a handy and non-invasive diagnostic tool for correct diagnosis of the patient. Resident students need to learn the basic and focused echocardiographic views as they are the first to come in contact with the patients and do the

continuous monitoring of the patients in the ICCU and Intensive care unit.

Aims and Objectives

Primary Aim:

- To study the indications of focused echocardiography in patients admitted at medical intensive care unit.
- To study the findings of focused echocardiography in these patients.
- To study the usefulness of these findings in deciding clinical management in these patients.

To study the impact of the focused echocardiography on the clinical outcome in the patients.

Eligibility Criteria:

Inclusion Criteria:

- Adult Patients of age group 18-60 yrs, belonging to both the genders were included in the study.
- Patients in MICU in whom echocardiography was clinically indicated*.

Exclusion Criteria:

- Patients who are not willing to give consent.

***Clinical Indications of FOCUS:**

- **Basic Indications**
- Evaluation for pericardial effusion
- Evaluation of left ventricular systolic function
- Evaluation for pulmonary embolism
- Management for cardiac arrest
- **Advanced Indications**
- Evaluation for cardiac tamponade
- Evaluation valvular abnormalities
- Evaluation for aortic dissection

Evaluation for myocardial ischemia

Methodology:

The present study was carried out in the department of Medicine in medical ICU of

tertiary care teaching hospital from August 2019 TO August 2021

- Patients were selected for FOCUS according to inclusion and exclusion criteria of this study.
- The patients were enrolled in the study after the informed consent was taken from either the patient or the legal guardian according to the case.
- Complete history of Patients was obtained and recorded in the study proforma. (annexure)
- General examination and clinical examination were carried out.
- Provisional diagnosis was made on the basis of history and clinical examination.
- Routine and other Lab investigations were sent accordingly and Basic investigations like ECG and chest Xray was done. Some special investigations were done according to the diagnosis.
- Focused echocardiography was performed by the trained medicine faculty /cardiologists using portable ultrasound machine LOGIQ V2 with 3SC-RS Adult cardiac Probe in MICU in the patients as early as possible in the patients.
- Views for FOCUS which were obtained were Parasternal long axis, Parasternal short axis, Subxiphoid 4 chamber, Apical 4 chamber.
- Following cardiac parameters were recorded: Dimensions of heart chambers, any regional wall motion abnormality, status of IVC, any clots or vegetations on the valves or chambers, status of valves, left ventricular ejection fraction, diastolic dysfunction, abnormal collection in pericardium and pulmonary arterial hypertension.
- On basis of the FOCUS diagnosis, treatment plan was decided like drug therapy, fluid therapy or intervention with the help of medical team consisting of physicians, intensivists,

cardiologists and other superspecialists.

- Patients were reassessed and monitoring done for all for response to treatment as per the case. Treatment plan was formulated accordingly as for the fluid therapy, IVC was continuously monitored with CVP or for pericardial effusion, tapping was done ultrasound guided and it was repeated again.
- FOCUS was repeated as per merit of patient case or at the time of shifting the patient to wards.
- These all findings were noted down in proforma sheet and was entered into EXCEL spreadsheet.
- Those patients were clinically followed up for the outcome, either recovery or death.
- Finally conclusion was drawn for role of focused echocardiography in clinical decision making.

Data Analysis Procedure:

Data was analyzed by EXCEL spread sheet; results are documented in proportions and percentages with appropriate statistical tests by using appropriate statistical

Results:

The Observational study is done to emphasize the use of focused Echocardiography in making proper clinical decision making at Intensive care unit.

After acquiring the complete set of data and preparing the master chart, statistician working in another facility was approached in study of Focused Echocardiography. Data was analyzed by studying different parameters like age, gender, Co-morbidities in which patients were observed for different illness like hypertension, diabetes, hypothyroidism, Cerebrovascular Accidents, Post covid incidence, deep vein thrombosis, pregnancy related heart disease, Obesity, Chronic kidney disease, Tuberculosis, Chronic obstructive pulmonary disease (COPD) and other diseases.

2 D Echo was the main observation which was done at initial stage and also after 7 days of treatment to study the recovery condition. A T-test was used to analyse the probability of differences between the groups and $p < 0.05$ was taken to be statistically significant in all calculations. Graphs were prepared using MS excel software.

Table 1: Age

Age Range	No of Cases	Percentage
15 – 25	8	5.30
25 – 35	14	9.27
35 -45	29	19.21
45 -55	54	35.76
55 – 65	45	29.80
65 -75	1	0.66
Total	151	
MEAN	25.166	

In our study, there were total 151 cases that were observed from the age group from 18 years to 62 years. 35 % of the patients from the age group 45 -55 years followed by 29 % from the age group of 55 – 65 years and 19 % of patients from age group of 35 – 45 were observed. The mean age observed was 25.

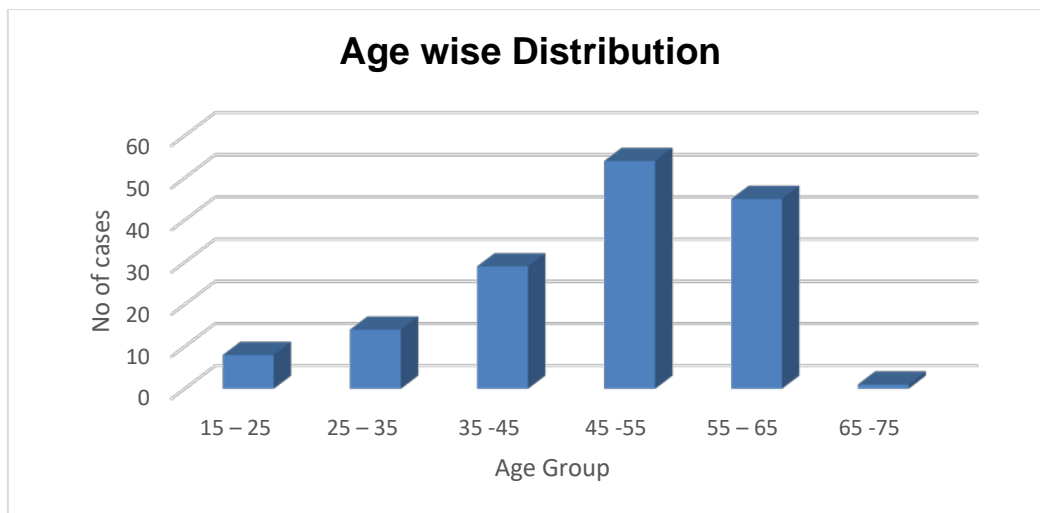
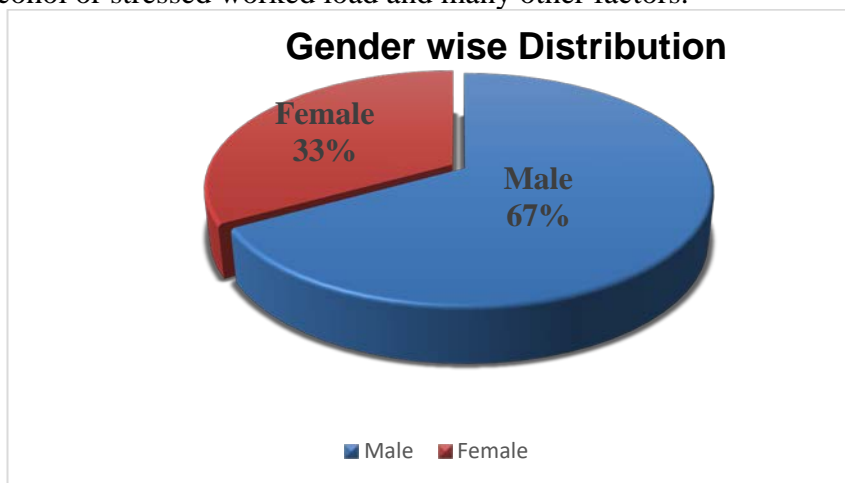


Table 2: Gender Distribution

Gender	No of cases	Percentage
Male	101	66.89
Female	50	33.11
Total	151	

In our study out of 151 cases 66 % were male and 33 % were female. Male preponderance was seen which can be due to many factors like age, sedentary lifestyle, consumption of tobacco or alcohol or stressed worked load and many other factors.



Before the treatment the patient was studied for different Co-morbidities in which BP, blood sugar level, thyroid level, cerebrovascular accident, post covid observation, deep vein thrombosis, pregnancy, Obesity, Chronic kidney disease, tuberculosis, pulmonary disease and other different illness were studied. It was reported that among the 151 cases hypertension (49 %), diabetes (45%)

Obesity (39 %) were the common reasons for the illness. According to Mishra et al consensus statement for diagnosis of obesity, Obesity is a major driver for the widely prevalent metabolic syndrome and diabetes mellitus & hypertension. It is important to note that 49 % of patients had inadequate control of Blood Pressure (defined as SBP \geq 140 mmHg and/or DBP \geq 90 mmHg).

Table 3: Co-morbidities Distribution

Co morbidities	No of Cases	Percentage %
Hypertension	74	49.01
Diabetes	68	45.03
Hypothyroidism	37	24.50
Cerebrovascular Accident	13	8.61
Post Covid status	33	21.85
Deep Vein Thrombosis	19	12.58
Ischemic Heart Disease	24	18.00
Tuberculosis	09	5.96
Pregnancy related heart disease	6	3.97
Obesity	59	39.07
Chronic kidney disease	30	19.87
COPD	13	8.61
Miscellaneous	3	1.98
Mean	31.92	
SD	22.92	

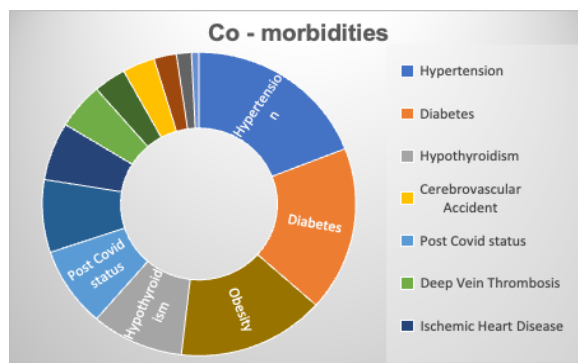


Table 4: Examination at Initial stage by FOCUS

Sr No	FOCUS Report	No of Patients	Percentage
1	DCMP	16	10.60
2	LV clot	4	2.65
3	Infective endocarditis	1	0.66
4	Hypertension heart Disease	3	1.99
5	IHD(RWMA)	89	58.94
6	Pericardial Effusion	7	4.64
7	Valvular Heart Disease	4	2.65
8	Pulmonary Thromboembolism	26	17.22
9	Aortic Dissection	1	0.66
10	Normal	1	0.66
Total		151	
Mean		16.778	

Std Deviation	28.310
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In our study, the cases having co-morbidities had then examined by

FOCUS. A FOCUS is capable of displaying a cross-sectional “slice” of the beating heart, including the chambers, valves and the major blood vessels that exit from the left and right ventricle. By FOCUS patients had being studied for different cardiovascular diseases like dilated cardiomyopathy, left ventricular clot, Infective endocarditis, hypertension, IHD, pericardial effusion, valvular heart

disease, pulmonary thromboembolism and patient having no such abnormality (Normal) .The data scrutinized from 151 patients it was studied that maximum patients had reported IHD (59 %) and 17% patients with pulmonary thromboembolism .Only 1 patients had reported normal from 151 cases .The mean studied was 16.778 and Sd 28.310.

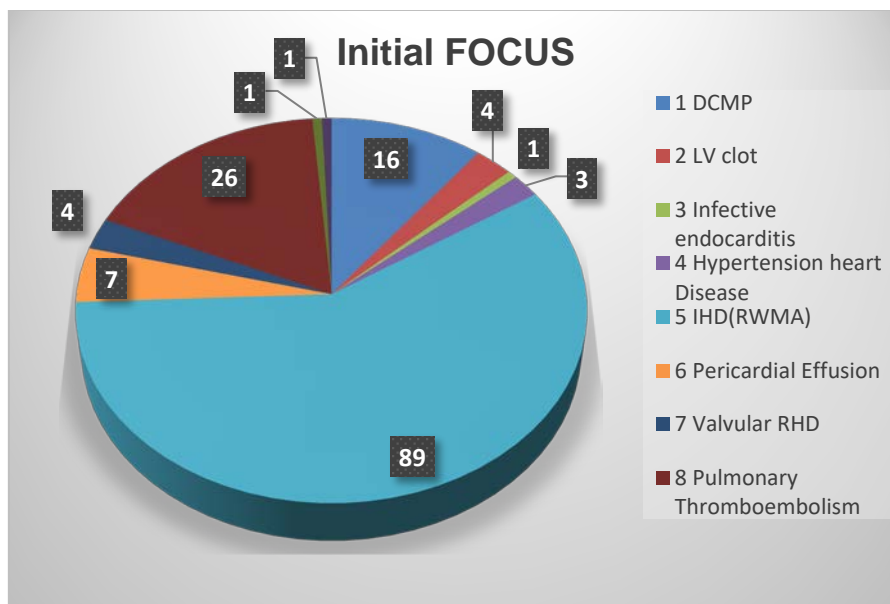


Table 5: FOCUS and Age

Age Range	DC MP	L V clot	Infective endocarditis	Hypertension heart Disease	IHD	Pericardial Effusion	Valvular HD	PT	Aortic Dissection	Normal
15 – 25	2	0	0	0	0	0	1	2	0	0
25 – 35	2	2	1	0	7	1	0	5	0	1
35 - 45	1	0	0	0	22	0	0	2	0	0
45 - 55	5	1	0	2	37	0	1	6	0	0
55 – 65	6	1	0	1	22	5	2	11	1	0
65 - 75	0	0	0	0	1	1	0	0	0	0
Mean	2.67	0.67	0.17	0.50	14.83	1.17	0.67	4.33	0.17	0.17

FOCUS was studied with respect to age. In which it was noted that number of patients suffering Ischemic heart disease was high in the age group of 45-55 years (37) , in age group of 55-65 years (22) and 35-45

years (22) .That is patients suffers from narrowed heart arteries due to which less blood and oxygen reached the heart muscles .Pulmonary Thromboembolism was high in the age group of 55-65 years .

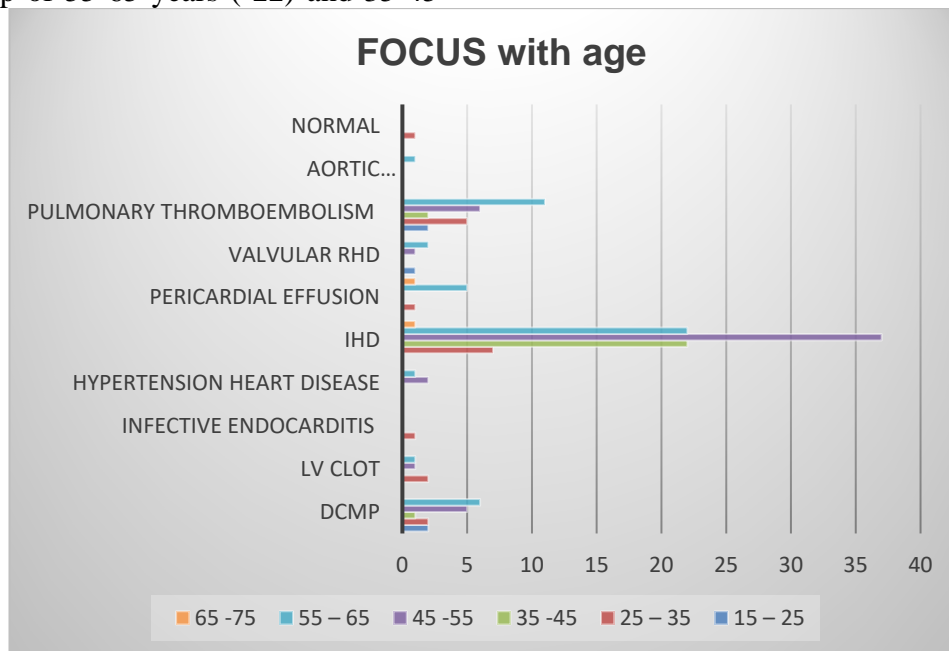


Table 6: FOCUS and Gender

Gender	DCMP	LV clot	Infective endo carditis	Hyper Tensive heart Disease	IHD	Peri cardial Effusion	Valvular HD	PT	Aortic Dissection	Normal
Male	7	2	0	2	74	4	0	15	1	1
Female	9	2	1	1	15	3	4	11	0	0

FOCUS was studied with respect to gender, in which it was observed that maximum male patients reported cardiovascular diseases compared to female, in which out of 151 case 74 male cases has reported for ischemic heart disease.

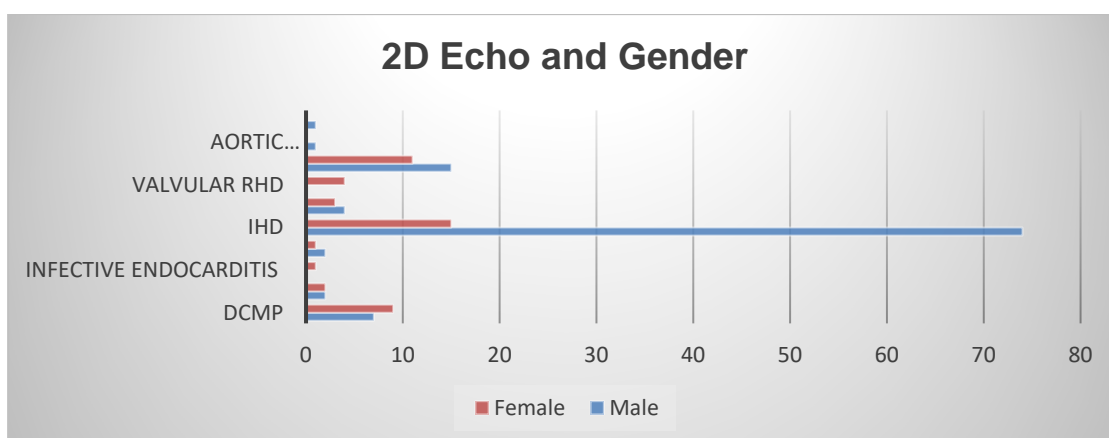


Table 7.1: Study with Drug Therapy

Treatment	No of cases	Percentage
Ionotropic	27	17.88
Fluid resuscitation	21	13.91
Diuretics	89	58.94
Anticoagulation	76	50.33
Antiplatelet	148	98.01
Thrombolysis	86	56.95
Anti-Arrhythmic Drug	23	15.23
Mean	67.143	
SD	46.795	

After the FOCUS study at initial stage the treatment according to the finding was given to the patient for fast recovery. Different drug therapy like Ionotropic, Fluid resuscitation, diuretics, Anticoagulant Antiplatelet, thrombolysis, pericardiocentesis, Anti-arrhythmic drug

were given to patients. In the finding maximum patients were treated with Antiplatelet drug (148), thrombolysis (86), Diuretic (89), Anticoagulation (76), Ionotropic drugs (27), Anti-arrhythmic drugs (23), Fluid resuscitation (21).

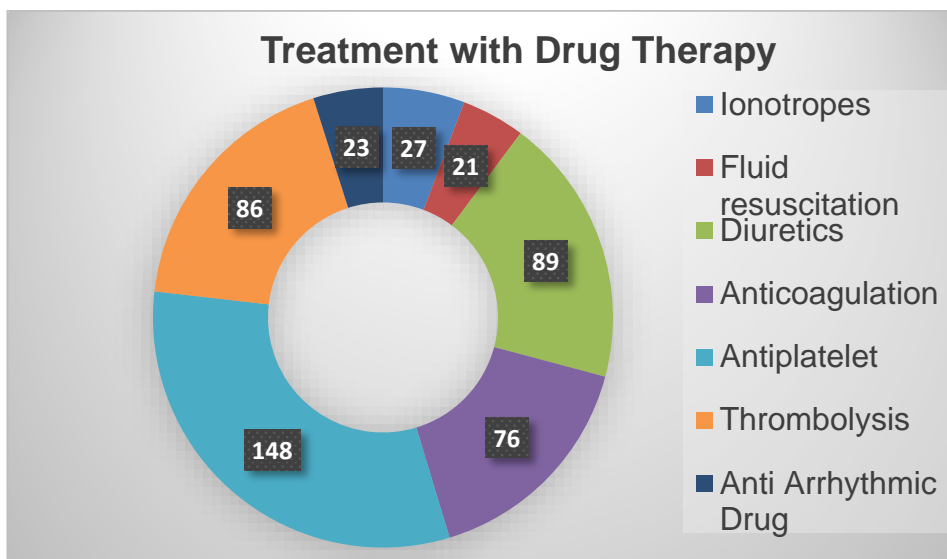


Table 7.1: Treatment with Interventions

Interventions	No of cases	Percentage
Percutaneous transluminal coronary angioplasty	76	50.33
Coronary artery bypass grafting	9	5.96
Pericardiocentesis	3	1.99
Mean	29.333	
SD	40.526	

In intervention study 76 patients were treated with percutaneous transluminal coronary angioplasty, 9 patients were treated with coronary artery bypass grafting & 3 patients with pericardiocentesis.

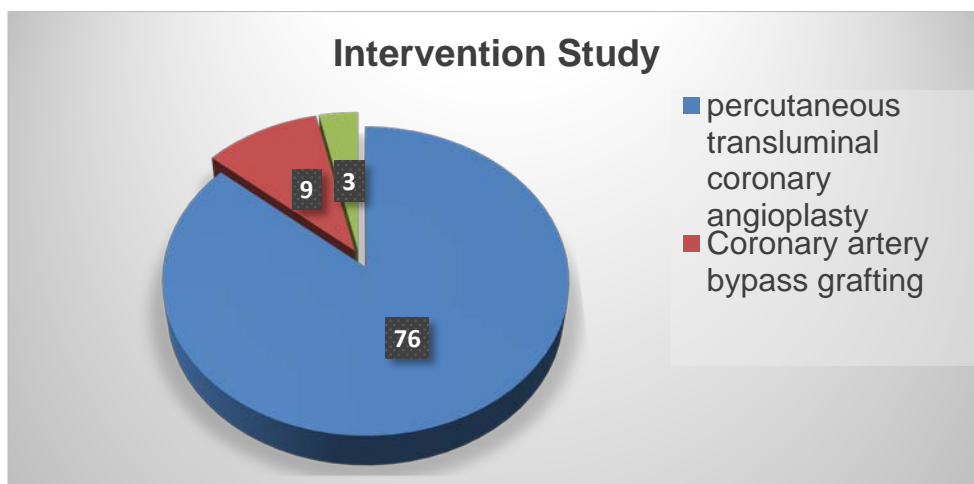
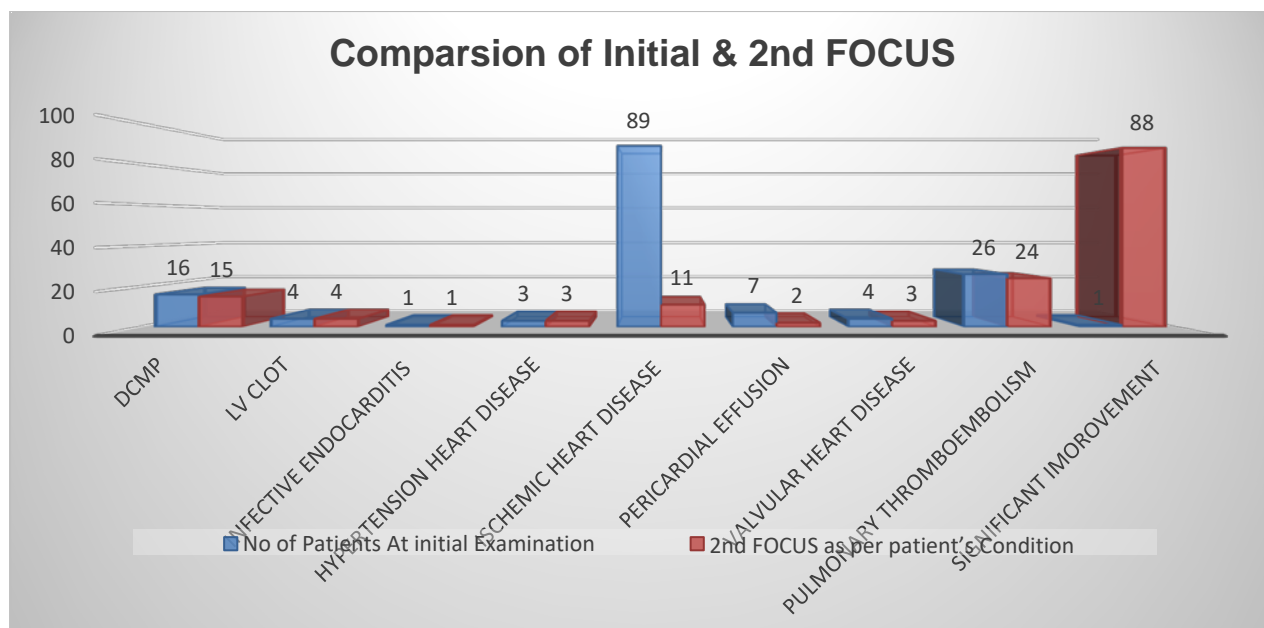


Table 8: Comparative study of Initial FOCUS with 2nd FOCUS as per patient's Condition

Sr No	FOCUS finding	Findings during Initial FOCUS (No. of patients)	2 nd FOCUS as per patient's Condition
1	DCMP	16	15
2	LV clot	4	4
3	Infective endocarditis	1	1
4	Hypertension heart Disease	3	3
5	IHD	89	11
6	Pericardial Effusion	7	2
7	Valvular Heart Disease	4	3
8	Pulmonary Thromboembolism	26	24
9	Significant Improvement	1	88
10	Mean	16.778	
11	SD	28.310	
12	P-value	0.4999 (Insignificant)	

In our study, with the findings of initial FOCUS the patient was treated with different drug therapy and interventions. After giving the drug therapy and interventions according to the condition the 2nd FOCUS was done. From the 2nd FOCUS it was studied that there was a significant improvement in patients health. The study reported significant recovery in

88 patients. The P value reported was 0.4999 which is statistically in-significant. The observation makes clear that initial FOCUS study is beneficial for early clinical decision making at intensive care unit and to line up proper treatment to patient for quick recovery. From the study it was revealed that the significant recovery rate is phenomenal.



Discussion:

All studies that included patients in this thesis have been carried out following ethical approval, obtained from the local ethics committee. The study was carried out in the Medicine Intensive care unit at tertiary care center.

Age & Gender:

The participants were in the age group from 18 years to 60 years. 29.80 % of patients were from the age group 53 -58 years followed by 15.89 % from the age group of 43 - 48 years and 14 .570 % of patients from the age group of 58 -62 were observed. The mean age observed was 16.77.

In our study out of 151 cases, 66 % were male and 33 % were female. Male preponderance was seen which can be due to many factors like age, sedentary lifestyle, consumption of tobacco or alcohol or stressed worked load and many different reasons. **Cowburn PJ et al** 1998 [7], **Cowie MR et al.** [8]in 2000 in Heart (British Cardiac Society) journal stated the factors associated with a poorer prognosis include Male sex, old age, severe symptoms of Heart Failure, Hypotension, Acute coronary syndrome, elevated plasma

BNP concentration, hyponatremia, and renal function impairment.

Co – morbidities in study population undergoing FOCUS:

In our study consisting of 151 patients, we found maximum patients suffering from hypertension (74), diabetes (68), obesity (59), hypothyroidism (37). Other co-morbidities like ischemic heart disease (24), Cerebrovascular accident (13), Postcovid (33), Deep vein thrombosis (19), pregnancy related heart disease (6), chronic kidney disease (30), Tuberculosis (9), Chronic obstructive pulmonary disease (13). There were many patients who had more than one comorbidity as the cardiovascular diseases are mainly multifactorial so many patients had hypertension and diabetes both and some had hypothyroidism too. Longstanding hypertension and diabetes lead to chronic kidney disease.

Association of diseases with co-morbidities:

Hypertension:

The present study reported maximum patients with Hypertension (49.01 %). Hypertensive heart disease who presented in hypertensive failure they mainly had

LVH with pleothoric IVC on FOCUS and were mainly treated with diuretics, antihypertensives. Many IHD patients were suffering from hypertension and diabetes (45.03 %) both. On repeat FOCUS we looked for IVC which gave us further idea of volume status. grades of LVH were taken into consideration with systolic function. From the data received from **Vasan RS et al.[9] in 2000** derived from Framingham Heart Study have shown that BP between 130–139/85–89 mmHg is associated with greater than twofold increased risk of cardiovascular disease (CVD) when compared with persons with BP levels lower than 120/80 mmHg.[8] Greater the BP, higher the risk of myocardial infarction, heart failure, chronic kidney disease and stroke.

Obesity

The present study reported Obesity (39.07 %)- According to **Mishra et al[10]2009** consensus statement for diagnosis of obesity, Obesity is a major driver for the widely prevalent metabolic syndrome and diabetes mellitus & hypertension. **Tsang TS 2002 et al.[11] 2002** in their study stated that the resultant hypertensive heart disease is characterized by LV hypertrophy (LVH), increasing vascular and ventricular systolic dysfunction, impaired relaxation, and increased diastolic stiffness, all factors linked to the pathogenesis of HF_rEF. We calculated BMI, waist hip ratio, skin fold thickness of patients to take obesity into consideration. Based on that we divided the patients into mild, moderate, obese, morbid obesity.

Hypothyroidism

The present study reported Hypothyroidism (24.50 %), patients suffering from hypothyroidism were found to have pericardial effusion on focus. **Vikas Reddy Maddali et al[12] 2020** in European Heart Journal studied on Cardiac tamponade due to primary

hypothyroidism: acute management and approach to prevent recurrence stated that, The clinical resolution of pericardial effusion is satisfactory in majority of the hypothyroid patients with thyroxine replacement therapy, but it takes as long as months after the patient reach the euthyroid state.

Ischemic heart disease

There were patients who had previous history of IHD (18.0 %) were optimized on conservative medical management or intervention but presented to us with reinfarction or ischemic dilated cardiomyopathy.

Cerebrovascular Accident

The present study reported Cerebrovascular accident (8.61 %), patients presented to us with CVA had LV CLOT which resulted in embolic stroke. they were treated with anticoagulation and surgical intervention after stabilization of patient.

Postcovid status

The present study reported Postcovid (21.85%), COVID lead to many thromboembolic complications like CVA, IHD, Pulmonary thromboembolism **Luis Ortega-Paz et al[13]. 2021 J Am Heart Assoc** in his studies related to covid thrombosis and coagulopathy stated that Thrombosis and coagulopathy are frequent complications in patients with COVID-19. The extent of these manifestations is correlated with the severity of COVID-19. The interaction of SARS-CoV-2 with the ACE2 receptor and subsequent endothelial activation and inflammation can trigger an intense thromboinflammatory state.

Deep vein thrombosis

The present study reported Deep vein thrombosis (12.58 %), it was contributing factor for pulmonary thromboembolism. Pregnancy related heart disease was reported (3.97 %), patients in peripartum

and postpartum period presented in heart failure with dilated cardiomyopathy.

Chronic Kidney disease

Chronic Kidney disease in our study was reported (19.87), we found to have hypertensive heart disease, pericardial effusion, IHD, DCMP, infective endocarditis, Calcific mitral valves in patients suffering from CKD.

Tuberculosis

In present study Tuberculosis was reported (5.96%), pericardial effusion with adhesions was one of the main findings in patients with TB. Pericardiocentesis was done usg guided in these patients and patients was started on anti-tubercular drugs. repeat FOCUS for repeated after few hours to look for any collection.

Chronic obstructive pulmonary disease

In Chronic obstructive pulmonary disease- We observed that patients had IHD, Pulmonary thromboembolism, DCMP in these patients.

The findings and outcome in the study population according to the final diagnosis:

DCMP:

From the study, it was noticed 10.60 % of patients had dilated cardiomyopathy. Dilated cardiomyopathy was observed in the age group 45-55 & 55-65 with a mean of 2.67.

Patients with DCMP had following findings on FOCUS:

Reduced LVEF, IVC plethoric, diastolic dysfunction of grades I to III and RWMA.

Causes of DCMP were Ischemic, peripartum, postpartum idiopathic. One of the causes of Pregnancy related heart disease is valvular heart disease but, in our study, we didn't observe valvular heart disease during pregnancy.

Patients with DCMP were mainly treated with diuretics, antiplatelets, inotropic support.

The FOCUS for dilated cardiomyopathy patients is done after 12 hours and 2, 3 days after the initial Echo to check the IVC, improvement in diastolic dysfunction and left ventricular ejection fraction which reported significant improvement in 1 patient from our study.

LV clot:

Left ventricle clot was observed in 2.65 % of patients. 2nd FOCUS for LV clot was done after 2-3 days to study the size of clot but our observation showed no improvement in the patient as we treated the patients conservatively and they were further planned for clot removal surgery after stabilisation. Comprehensive 2D echo was performed in the patients who were later stabilized to study all the parameters. Our study had reported 4 patients with LV clots in the first FOCUS and 2nd FOCUS also reported 4 patients.

Infective endocarditis:

1 patient was diagnosed to have infective endocarditis. Large vegetation was seen on tricuspid valve and the LVEF of the patient was also decreased and IVC plethoric. Infective endocarditis patient suffered from chronic kidney disease and had central line inserted and that was the focus of infection. The patient with Infective Endocarditis and the 2nd FOCUS was done on the 5th day showed no significant change in our findings except IVC was collapsing as the patients were treated with long term antibiotics, diuretics and were planned for surgery after stabilisation.

Hypertension heart Disease:

1.99 % patients with hypertensive heart disease. Following findings were seen on FOCUS:

Left ventricular hypertrophy of grades mild to severe, IVC pleothoric as patients were in hypertensive failure. The hypertension heart disease was monitored for pulmonary oedema and was treated with a diuretic, fluid overloaded state. IVC monitoring was done regularly at interval of 6 hours to see the response of diuretics. 3 patients had reported hypertension heart disease in the initial FOCUS and the 2nd FOCUS also the number of patients was the same.

IHD:

Maximum patients i.e. 58.94 % reported ischemic heart disease which is mostly caused by narrowing of coronary arteries and so there is an inadequate supply of blood and oxygen to a portion of the myocardium; it typically occurs when there is an imbalance between myocardial oxygen supply and demand.

It was noted from our observation that with increasing age the complication of cardiac disease increased. In our study, the FOCUS finding was compared concerning age. In which it was observed that ischemic heart disease patients were maximum in the age group of 45-55 and 55-65 years with a mean of 14.83.

One of the important implications of our study was the influence of sex on cardiovascular disease. FOCUS was compared with respect to sex, and it was studied that male patients with ischemic heart disease had reported high in our study. The overall finding concerning gender was reported that maximum i.e. 105 male patients and 46 female patients reported for cardiovascular disease. Ischemic heart disease had a maximum no of patients. i.e. 89 in the initial FOCUS. Patients had definitive changes on ECG with raised cardiac markers like CPKMB, TROP I. To confirm our findings, we further performed FOCUS to look for heart chamber size, RWMA, LVEF, Diastolic Dysfunction, IVC, any clots in

the patients of IHD. The 2nd FOCUS was done after 5 days and on discharge to check the Echocardiographic regional wall motion, Diastolic Dysfunction and IVC. In the 2nd Echo reported for ischemic heart disease, there was a significant improvement. Comprehensive ECHO was also performed in some patients. Patients of IHD were treated with thrombolysis, antiplatelets and other drug therapy. Most of them further underwent interventional treatment like PTCA AND CABG on basis of findings in CAG.

Our initial FOCUS findings had reported only 1 patient normal. We further evaluated the patient with CAG and patient was found to have double vessel ischaemic heart disease later on intervened with PTCA.

Pericardial Effusion:

Pericardial Effusion was seen in 4.64 % of patients. Patients with tuberculosis, CKD, hypothyroidism were found to have pericardial effusion. FOCUS findings were:

Mild to Massive pericardial effusion, IVC pleothoric, low LVEF, global LV hypokinesia. pericardiocentesis for pericardial effusion was done USG guided and 2nd FOCUS was repeated 1 day after pericardiocentesis and pericardial effusion, IVC, LVEF were mainly seen on repeat FOCUS and on stabilization comprehensive Echo was done.

Valvular heart disease:

Valvular heart disease was seen in 2.65 % patients. We observed mitral stenosis in our patients on FOCUS and their LVEF was noted. Valvular heart disease is most common incidental findings in pregnancy related heart disease were obstetric patients present with symptoms of heart failure. In valvular heart disease, Comprehensive 2 DECHO was done after shifting the patient to the ward.

Pulmonary Thromboembolism:

Maximum patients of pulmonary Thromboembolism. i.e.17.22 % having a clot in pulmonary arteries. Pulmonary thromboembolism was noticed in the age group of 55-65 years with a mean of 4.33. **Dwyer KH 2018[14]** Acad Emerg Med Journal, in his study among 146 patients who presented to the emergency department and were clinically suspected of having a PE, researchers found that RV dysfunction on FoCUS had a specificity of 98% for diagnosing PE and a positive predictive value of 88% – when FoCUS images were reviewed by an expert echocardiographer there was a 96% agreement between interpretations.

Our 2nd FOCUS reported that there was an improvement in 1 patient. In pulmonary Thromboembolism the FOCUS was done after the 2nd or 3rd day, IVC, RA -RV, and pulmonary arterial hypertension were taken into consideration. From our study, 2 patients had shown gradual improvement.

Treatment:

According to the findings noted in the initial FOCUS, the patients underwent treatment .27 patients had treated with ionotropes to treat hypotension, which increase the force of heart muscles contractions. Fluid resuscitation was given to 21 patients in hypotensive with IVC collapsed due to an abnormality in heart rate or less systolic blood pressure .89 patients were treated with diuretic treatment in which the extra fluid and salts were removed out of the body. patients who presented in heart failure or pulmonary edema were mainly resuscitated and treated with diuretics. To prevent blood clotting, 76 patients were treated by administration of anticoagulants .148 patients were treated with antiplatelet treatment.86 were immediately treated with thrombolysis which are fibrinolytics used in the management and treatment of dissolving intravascular clots which is lifesaving in patients with acute myocardial infarction and acute pulmonary

thromboembolism. Percutaneous transluminal coronary angioplasty was done in 76 patients of IHD according to the coronaries involved after performing coronary angiography. Coronary Artery by-pass surgery was done on 9 patients out of 151 who had triple vessel disease diagnosed on coronary angiography. Pericardiocentesis was done on 3 patients for removing fluid from the pericardium. Antiarrhythmic treatment was given to 23 patients for tachycardia and arrhythmias.1 patient with Aortic Dissection was also examined in the initial Focus study. As this treatment and other investigation were done on urgent basis after the FOCUS findings so the patient was able to recover fast.

Fluid Resuscitation

In the present study 21 patients were given fluid resuscitation. In the study done by **Moses M. Kitakule. et al** in 2010 on Use of Ultrasound to Assess Fluid Responsiveness in the Intensive Care Unit Determining the appropriate amount of fluid resuscitation to administer to a critically ill patient is a complex decision. Traditional tools for the assessment of preload sensitivity such as central venous pressure (CVP) and pulmonary artery occlusion pressure (PAOP) are inaccurate in predicting whether a patient requires volume resuscitation. Diagnostic ultrasonography in the form of echocardiography offers an alternative means of determining whether a patient is preload sensitive.

Repetition of Focus to study the improvement

After the treatment was administered, again the FOCUS was carried out to study the rate of recovery. The 2nd FOCUS was repeated as per the treatment and diagnosis reported.

DeCara et al[15] 2012 in assessing the diagnostic accuracy of FoCUS with a portable ultrasound in the hands of

echocardiographers and internal medicine residents. The frequency of missing clinically important findings was 14% among echocardiographers and 23% among medicine residents ($p=0.02$). However, when evaluating just three parameters – atrial dilation, congenital heart defects, regional wall motion abnormalities – the frequency increased to 24% and 47% for echocardiographers and residents, respectively. Based on concerns that expanding the role of FoCUS beyond left ventricular/right ventricular systolic function, relative chamber size, pericardial effusion, and intravascular volume assessment will increase the risk of errors.

The proper diagnosis of illness and accurate treatment given from the study of initial 2D -Echo the success rate of treatment noted was high .88 patients were reported significant improvement. Our study reiterates that initial findings of focused Echocardiography are very much beneficial for proper treatment and fast recovery of the patient.

In a similar study done by **Gabriele Via. et al** 2014 in Journal of the American Society of Echocardiography submitted International Evidence-Based Recommendations for Focused Cardiac Ultrasound (FoCUS) is a simplified, clinician-performed application of echocardiography that is rapidly expanding in use, especially in emergency and critical care medicine. In another similar study done by **J. Heiberg. et al 2016** on Focused echocardiography: a systematic review of diagnostic and clinical decision-making in anesthesia and critical care. He stated that Focused echocardiography is becoming a widely used tool to aid clinical assessment by anesthesiologists and critical care physicians.

Pelikka PA. et al[16] 2013 in his study stated that We agree that FoCUS falls under the mission statement of the American Society of Echocardiography for “commitment to excellence in

cardiovascular ultrasound and its application to patient care through education, advocacy, research, innovation, and service to our members and the public.”

Thus our study also concludes FoCUS will continue to proliferate, and it is in the best interest of patient care providers, maintain the quality of scans and interpretation through standardization and collaboration. Its findings can be one of the most useful and practical for clinical decision-making in patients

Conclusion

- The present study has proved that Focused Echocardiography is clinical potential and are sensitive in the detection of different cardiovascular diseases.
- FOCUS establishes significant interventions in patient management.
- FOCUS can be performed with portable device at the by diagnosing different diseases with active management of patient and offers the potential for timely, repeatable diagnostic information and procedural guidance.
- It helps in timely intervention for better outcome of patient.
- Our study justifies our objective of usefulness of these findings in clinical decision making in these patients and the impact of the focused echocardiography on the outcome in the study population.

More residents, physicians should be trained and well versed with FOCUS by seniors which will help them in proper diagnosis in emergency situation and every ICU should have FOCUS for evidence-based management rather than empirical treatment in emergency patients

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