

NEAT-ECHO



TRICNetwork



National Evaluation of the Use of Critical Care Echocardiography in Shock

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PROJECT DETAILS

PROJECT TITLE	National Evaluation of the Use of Critical Care Echocardiography in Shock (NEAT-ECHO)		
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1. NEAT-ECHO OVERVIEW

1.1 Background

Focused and comprehensive echocardiography in patients admitted to critical care can help to identify significant pathology, alter patient management and improve outcomes.¹⁻⁶ National and international guidelines, including the joint Intensive Care Society (ICS) and British Cardiovascular Society's (BCS) 2022 'Shock to Survival' report, Guidelines for the Provision of Intensive Care Services (GPIC), and the NHS England Seven Day Services Clinical Standards, recommend that echocardiography should be easily accessible (within one hour) for all patients requiring cardiovascular support and should be performed on admission to critical care for patients presenting with shock .¹

Improving 24/7 access to focused echocardiography was one of the key recommendations from the ICS/BCS 'Shock to Survival' report.^{1,7} Despite these recommendations, no national data exists on the frequency with which echocardiography is performed on critical care units across the UK, whether current access to echocardiography is adherent to national guidance, or whether bedside echocardiography is perceived to be useful in identifying the underlying type of shock patients present with. In this service evaluation our objectives are to ascertain the proportion of patients with shock that receive an echocardiograph on admission to critical care, and whether the scan is helpful in determining the type of shock.

1.2 Aims of NEAT-ECHO

1. Identify the availability of accredited echocardiography providers on critical care units in the UK.
2. Evaluate the governance measures surrounding echocardiography in critical care.
3. Identify the proportion of patients admitted to critical care with shock that receive echocardiography within 24 hours of admission and whether echocardiography is perceived to aid shock aetiology differentiation.

1.3 Why this service evaluation is important?

Echocardiography provides clinicians with the ability to rapidly, accurately and non-invasively assess a shocked patient's cardiac status at the bedside. Its use is increasingly recommended by national and international societies. Echocardiography has become a mandatory component of both the Emergency Medicine and Acute Medicine curricula, and it is likely only a matter of time before it becomes a core competency in Intensive Care Medicine training. Although we have anecdotal evidence that critical care echocardiography provision has room for improvement, the next step is to define its current use within UK critical care units, the availability of both accredited scanners and educators, and the governance structures in place.

2. METHODOLOGY

NEAT-ECHO will comprise two components:

- A survey to assess the provision of echocardiography within critical care units and associated governance structures.
- A national service evaluation of echocardiography use in critical care to investigate patients diagnosed with shock.

2.2 Study Setting

All adult ICUs in the UK offering level 2 and/or level 3 care, including but not limited to high-dependency units, intensive care units, specialist intensive care units and post-anaesthesia care units, will be invited to participate in the study.

2.3 Population

All critical care patients admitted within the chosen data collection period will be screen against the following criteria:

Inclusion Criteria

- Adult (≥ 18 years of age)
- Admitted to a critical care setting (ICU/HDU) with shock of any aetiology (e.g., septic shock, cardiogenic shock, haemorrhagic shock, anaphylactic shock etc.).

Shock describes a state of insufficient delivery or utilisation of oxygen leading to tissue hypoperfusion. Clinically, this is identified by a systolic blood pressure $< 90\text{mmHg}$ for ≥ 30 min or the need for vasopressors or inotropes to maintain systolic blood pressure $\geq 90\text{mmHg}$ and evidence of hypoperfusion of the peripheries and vital organs. We appreciate an element of clinical judgement is likely to be required and there may be some instances when a patient has shock despite a SBP of $\geq 90\text{mmHg}$. Some example scenarios include:

- **Should be included** – a patient admitted with presumed urosepsis with signs of organ hypoperfusion requiring noradrenaline to maintain a SBP of $\geq 90\text{mmHg}$.
- **Should be included** – a trauma patient presenting with a SBP $< 90\text{mmHg}$ and clinical signs of organ

hypoperfusion despite fluid resuscitation.

- **Should be included** – a patient with cardiogenic shock post-acute myocardial infarction requiring inotropic support to maintain an SBP of ≥ 90 mmHg.
- **Should be included** – A patient post STEMI with a low ejection fraction and cardiac output, who has a SBP > 90 and is on an inodilator, suffering from end-organ dysfunction such as oliguric kidney injury.
- **Should not be included** – routine post-operative admission who remains intubated and ventilated requiring minimal vasopressor support secondary to sedation with no signs of hypoperfusion.

2.4 Data collection

Data will be collected at study sites during any continuous 10-day period between March 4th and April 3rd. **However**, new patients can only be included during the first 7 days, with the remaining days to facilitate 72 hours of follow up for patients included on day 7. Data will be collected **for all new patients admitted to critical care within the initial seven-day period** who have shock of any aetiology on admission. Each patient will be followed up for a maximum of 72 hours, or until they receive their first echocardiogram, which ever occurs first. New patients should only be included if they are admitted within the first 7 days of the data collection period. The reason for the 10-day data collection period is to allow for a full 72 hour follow up (if required) of patients admitted on day 7.

Survey data

The survey will assess provision of echocardiography within and for critical care units across the UK, governance structures in place for storing, reporting and reviewing scans, and access to regular echocardiography teaching. A copy of the survey can be found in Appendix 2.

Service evaluation data

No patient identifiable data will be collected. You will be provided with a hyperlink that will take you to a blank

CRF. One CRF should be recorded for each patient with shock on decision to admit to critical care. You must ensure you select the correct hospital at the top of the record otherwise we will be unable to identify which site the patient has presented to.

Data will be collected about:

- Timing of echocardiography during a patient's admission.
- Type of echocardiogram performed.
- Reporting, documenting and saving echocardiography images and video loops.
- Perceptions of whether the echocardiograph helped elucidate the aetiology of the patient's shock.

2.5 Data security

This service evaluation has been registered at The Royal London Hospital, Barts Healthcare NHS Foundation Trust. Data collected from individual hospitals will be entered directly into an eCRF using a secure data entry web portal, 'Research Electronic Data Capture' (REDCap, www.project-redcap.org). This platform is secure, password protected, and hosted by the University of Liverpool.

Patient identifiable information will not be collected by this service evaluation and will not be entered to the online database. Submitted data will be analysed centrally by authorised users within the NEAT-ECHO study team. Only authorised users at each participating NHS hospital will have access to the eCRF. User accounts for the service evaluation database will not be issued unless the NEAT-ECHO study team has received evidence of successful registration of NEAT-ECHO via local clinical governance processes.

2.5 Consent

Individual patient consent is not required as this is a service evaluation, with no identifiable patient information recorded. No alterations to routine practice will be made.

2.6 Risks and Patient Safety

There are no risks associated with the collection of data in this service evaluation.

3. DISSEMINATION AND REPORTING

Study findings will be disseminated at the conclusion of data collection and analysis through peer-reviewed academic publications, social media, and through conference papers and presentations.

References

1. Intensive Care Society | Shock to Survival Report. <https://ics.ac.uk/resource/shock-to-survival-report.html>.
2. Vieillard-Baron, A. *et al.* A decade of progress in critical care echocardiography: a narrative review. *Intensive Care Medicine* 2019 45:6 **45**, 770–788 (2019).
3. Levitov, A. *et al.* Guidelines for the appropriate use of bedside general and cardiac ultrasonography in the evaluation of critically ill patients-Part II: cardiac ultrasonography. *Crit Care Med* **44**, 1206–1227 (2016).
4. Hall, D. P., Jordan, H., Alam, S. & Gillies, M. A. The impact of focused echocardiography using the Focused Intensive Care Echo protocol on the management of critically ill patients, and comparison with full echocardiographic studies by BSE-accredited sonographers. *J Intensive Care Soc* **18**, 206–211 (2017).
5. Flower, L., Olusanya, O. & Madhivathanan, P. R. The use of critical care echocardiography in peri-arrest and cardiac arrest scenarios: Pros, cons and what the future holds. *J Intensive Care Soc* **22**, 230 (2021).
6. Flower, L., Olusanya, O. & Madhivathanan, P. R. The Use of Point-of-Care Lung Ultrasound and Echocardiography in the Management of Coronavirus Disease 2019 (COVID-19). *J Cardiothorac Vasc Anesth* **34**, 2861–2863 (2020).
7. NHS England » Seven Day Services Clinical Standards. <https://www.england.nhs.uk/publication/seven-day-services-clinical-standards/>.

Appendix 1: EXEMPLAR CLINICAL GOVERNANCE FORM

Title: National Evaluation of the Use of Echocardiography in Critical Care (NEAT-ECHO) – A national service evaluation	Advisory notes
Division: Critical Care and Anaesthetics	<i>Your local site division or department may have a different name</i>
Specialty: Intensive Care Medicine	
Departmental Audit/Clinical Governance lead: [Consultant in Intensive Care Medicine]	<i>This will be the consultant within your unit who has overall role for audit/clinical governance</i>
Audit/Project Supervisor: [Consultant in Intensive Care Medicine]	<i>In most hospitals, this will require a named consultant to sponsor the project</i>
Project lead: [Your Name]	
Other project team members:	<i>Insert names of other collaborators for data collection</i>
Type of project: <input type="checkbox"/> Local <input type="checkbox"/> National <input type="checkbox"/> NICE <input type="checkbox"/> Quality standard	<i>Select national or equivalent</i>
Site: [Trust/hospital name]	<i>Insert your hospital name or if your trust has intensive care units across multiple sites, list them all</i>
Proposed start date: 04/03/2024	
Proposed completion date: 31/03/2024	

National Patient Data Opt-Out/Information Governance		
Are you using anonymous data (non-identifiable patient data)?	Yes	<i>NEAT-ECHO does not request nor hold data which is identifiable or likely to be identifiable.</i>
Do you have the patient's consent to use their data?	No	
Does this audit have CAG approval under Section 251? <i>(National Audits only)</i>	No	
Do you intend to present the audit findings outside the Trust?	Yes	<i>You must inform your local information governance team this project will have data collected centrally.</i>

Further common aspects of audit/QI/service evaluation registration forms:

1. Standards/Guidelines being reviewed/audited:

Name: Guidelines for the Provision of Intensive Care Services (FICM and ICS) Version 2 - 2022

Standards:

- Cardiothoracic critical care – echocardiography must be immediately available
- In patients requiring cardiovascular support transthoracic echocardiography must be immediately available at the patient's bedside at all times.
- Individuals who scan and report independently must be trained to a level that is appropriate for their clinical practice.
- All images must be securely stored for quality assurance purposes with appropriate data governance.
- Whenever scans are performed to inform clinical decision making, a structured report must be generated and stored in the patient record.
- Quality improvement, audit, and peer review activity must occur regularly.
- All critical care units should be able to ensure the provision of point-of-care ultrasound.

Name: Intensive Care Society and British Cardiovascular Society Shock to Survival Report – 2022

Standards:

- Societies work with NHS commissioners and health educators to increase provision of both FoCUS and accredited echocardiography assessment across a wider range of in-patient services
- There is an urgent, unmet need to develop a cadre of accredited echocardiographers available 24/7 to support CS diagnosis and management. Providing a reliable and resilient 24/7 FoCUS service to support CS diagnosis is essential and will require collaboration between echocardiographers, cardiologists, intensive care, anaesthetics, acute medicine and emergency medicine teams.
- echocardiography should be performed when patient's are admitted with suspected cardiogenic shock or acute heart failure

Name: NHS England Seven Day Services Clinical Standards – 2022

Standard:

- Echocardiography will be available seven days a week within 1 hour for critical patients

2. Aims

The overall aim of this project is to evaluate the current use of echocardiography in critical care within the UK. We will specifically look at the availability of echocardiography in critically ill patients, the governance structures in place and the proportion of patients that receive ability of all UK critical care units to deliver safe and effective emergency ultrasound, with respect to training, governance and service delivery.

3. Audit criteria

Audit Criteria (What should be happening, e.g. Prescriptions should be clearly signed and dated)	Acceptable audit target (% of cases where this should happen)
Echocardiography should be immediately available for all patients requiring cardiovascular support or with cardiogenic shock, and for all critically ill patients within 1 hour.	100%
Individuals who scan and report independently must be trained to a level that is appropriate for their clinical practice.	100%
The service must have a nominated lead consultant with dedicated time in their job plan that is sufficient to reflect the demands of the service and associated governance processes.	100%
All images must be securely stored for quality assurance purposes with appropriate data governance.	100%
Whenever scans are performed to inform clinical decision making, a structured report must be generated and stored in the patient record.	100%
All critical care units should be able to ensure the provision of point-of-care ultrasound	100%

4. Methodology

Refer to the Methodology section of the protocol.

Appendix 2: Example Survey

Which NHS hospital do you currently work at?

Please select your hospital from the list below.

* must provide value

Royal Albert Edward Infirmary

Does your hospital receive Intensive Care Medicine trainees from the Faculty of Intensive Care Medicine?

Yes

No

reset

Does your hospital have an Emergency Department?

* must provide value

Yes

No

reset

How many level 2 funded beds does your critical care unit have?

* must provide value

43

How many level 3 funded beds does your critical care unit have?

* must provide value

21

What is the combined total number of doctors, ACCPs and PAs that work on your critical care unit?

This includes doctors of all grades. ACCP - Advanced Critical Care Practitioner; PA - Physicians Associate.

56

How many accredited *focused* echocardiography providers are there within your critical care team?

This should include all people who are accredited to this level working on your critical care unit at the time of completing the questionnaire, including rotational trainees. Please put the total number of providers with each accreditation in the relevant boxes that appear.

If you have a critical care echocardiography lead they will be well placed to help you answer this question. If not, then you may need to use unit based trainee and consultant groups to help confirm this number.

FUSIC Heart (formally known as FICE) - Focused Ultrasound in Intensive Care Heart Module; FEEL - Focused Echocardiography in Emergency Life Support; BSE L1 - British Society of Echocardiography Level 1; fTOE - Focused TOE

* must provide value

- FUSIC Heart (formerly FICE)
- FEEL
- BSE L1
- fTOE
- Other

How many *advanced/comprehensive* echocardiography providers are there within your critical care team?

This should include all people who are accredited to this level working on your critical care unit at the time of completing the questionnaire, including rotational trainees. Please put the total number of providers with each accreditation in the relevant boxes that appear.

If you have a critical care echocardiography lead they will be well placed to help you answer this question. If not, then you may need to use unit based trainee and consultant groups to help confirm this number.

ACCE - Adult Critical Care Echocardiography; BSE - British Society of Echocardiography; EACVI TOE - European Association of Cardiovascular Imaging TOE; EACVI TTE - European Association of Cardiovascular Imaging TOE; EDEC - European Diploma in Advanced Critical Care Echocardiography; BSE TOE - British Society of Echocardiography TOE

* must provide value

- ACCE
- BSE Level 2
- EDEC
- EACVI TTE
- BSE TOE
- EACVI TOE
- Other

How many approved echocardiography trainers do you currently have within your critical care team?

* must provide value

How many of these trainers are rotational trainees?

This includes foundation doctors, locally employed doctors (e.g., clinical fellows) and specialty trainees from any background.

Which best describes your routine access to any form of echocardiography by an accredited scanner within your hospital?

This refers to anyone accredited in performing any form of either focused (e.g., FUSIC) or comprehensive (e.g., BSE level 2) echocardiography.

* must provide value

24/7

Monday - Friday in hours only

Monday - Friday all hours but not weekends

None

Other

reset

Is there regular, formal echocardiography teaching available at your critical care unit?

* must provide value

Yes - Weekly

Yes - Fortnightly

Yes - Monthly

Yes - Ad hoc

No

reset

Do you routinely upload echocardiography images performed on your critical care unit to an electronic storage system?

This refers to a defined pathway for secure storage of both focused and comprehensive echos performed on the unit.

* must provide value

+ Yes - radiology based storage system

Yes - cardiology based storage system

+ Yes - third party programme

+ Not at all

Is there an established pathway in place for secondary review of echocardiography images performed on your critical care unit?

This refers to a defined pathway available for all focused and comprehensive echos performed on the unit. The review may be by any suitably experienced member of the critical care or cardiology team.

* must provide value

Yes

No

reset

Do you have an identified local critical care echocardiography lead?

* must provide value

Yes

No

reset

If you have a critical care echocardiography lead, how many PAs do they have recognised for this in their job plan?

What are your personal views about the incorporation of echocardiography into routine critical care practice?

Expand

Submit

Save & Return Later

Appendix 3: Example CRF

Which hospital is this patient currently admitted to? <i>* must provide value</i>	<input type="text"/>
When was the patient accepted for admission to critical care? <i>This is the time of decision to admit to critical care, not necessarily when they were first physically on the critical care unit.</i> <i>* must provide value</i>	<input type="button" value="Monday to Friday, in hours"/> <input type="button" value="Monday to Friday, out of hours"/> <input type="button" value="Saturday, Sunday, or a bank holiday"/> reset
Was urgent echocardiography recommended as part of their initial admission management plan? <i>Up to, and including, the point of first review by a critical care consultant.</i> <i>* must provide value</i>	<input type="button" value="Yes"/> <input type="button" value="No"/> <input type="button" value="Don't know / not specified"/> reset
Was any kind of echocardiography performed within 72 hours of acceptance to critical care? <i>This refers to any form of echocardiography including focused or comprehensive within the first 72 hours only.</i> <i>This may include scans performed after the decision to admit to critical care but before the patient physically entered the critical care unit (e.g. whilst being reviewed on a ward or in ED).</i> <i>* must provide value</i>	<input checked="" type="button" value="Yes"/> <input type="button" value="No"/> reset
How many hours after decision to admit to critical care did the patient receive any kind of echocardiograph? <i>This refers to any form of echocardiography including focused or comprehensive within the first 72 hours only. Please round this to the nearest half hour.</i> <i>This may include scans performed after the decision to admit to critical care was made but before the patient physically entered the critical care unit (e.g. whilst being reviewed on a ward or in ED).</i> <i>* must provide value</i>	<input type="text"/>

What time period was this echocardiogram performed in?

This refers to the first scan the patient received after being accepted to critical care.

* must provide value

Monday to Friday, in hours

Monday to Friday, out of hours

Saturday, Sunday, or a bank holiday

No scan performed

reset

What type of echocardiographic assessment was performed?

Focused includes: Focused Ultrasound in Intensive Care (FUSIC) - formerly FICE; British Society of Echocardiography (BSE) L1; fTOE

Comprehensive includes: British Society of Echocardiography (BSE) L2; Adult Critical Care Echocardiography (ACCE); European Diploma in Advanced Critical Care Echocardiography (EDEC); BSE TOE

* must provide value

Focused

Comprehensive

No scan performed

reset

Where were the images stored?

* must provide value

+ On the ultrasound machine

+ Uploaded to an imaging system

+ Not stored

+ No scan performed

Was the location of image storage documented?

Yes

No

reset

How was the echocardiogram documented in the notes?

+ Freetext

+ Structured report

+ Not documented

What level of accreditation did the person performing the scan hold?

Adult Critical Care Echocardiography (ACCE); British Society of Echocardiography (BSE) L1; British Society of Echocardiography (BSE) L2; European Diploma in Advanced Critical Care Echocardiography (EDEC); British Society of Echocardiography (BSE) TOE; European Association of Cardiovascular Imaging (EACVI) TOE; European Association of Cardiovascular Imaging (EACVI) TTE; focused TOE (fTOE); Focused Ultrasound in Intensive Care - HEART (FUSIC - formally known as FICE);

* must provide value

- + FUSIC Heart
- + BSE Level 1
- + fTOE
- + BSE Level 2 / ACCE
- + BSE TOE
- + EDEC
- + EACVI TTE
- + EACVI TOE
- + Accreditation not listed
- + Unaccredited
- + Don't know

Was the accreditation level of the person performing the scan documented in the notes?

- Yes
- No

reset

Who was the initial echocardiogram performed by?

This refers to the first scan performed following the patient being accepted to intensive care.

That scan may have taken place on the ward, the ICU or in ED.

* must provide value

- Critical care doctor (trainee)
- Critical care doctor (locally employed doctor)
- Critical care doctor (SAS doctor)
- Critical care doctor (consultant)
- Anaesthetist not working in critical care
- Non-cardiology medical doctor not working in critical care
- Surgical doctor not working in critical care

	<p>Cardiology doctor</p> <p>Cardiac physiologist</p> <p>Advanced critical care practitioner</p> <p>Advanced nurse practitioner</p> <p>Allied healthcare professional</p> <p>Don't know / not stated</p> <p>Other (please specify)</p> <p>No scan performed</p> <p>reset</p>
<p>Did the initial echocardiogram help differentiate the aetiology of shock?</p> <p>* must provide value</p>	<p>Yes</p> <p>No</p> <p>No scan performed</p> <p>reset</p>
<p>Did the findings of the initial echocardiogram change the management of the patient?</p>	<p>Yes</p> <p>No</p> <p>No scan performed</p> <p>reset</p>
<p>What type of shock did the patient have?</p>	<p>+ Cardiogenic shock</p> <p>+ Obstructive shock</p> <p>+ Hypovolaemic shock</p> <p>+ Distributive shock</p>