National Evaluation of the Use of Critical Care Echocardiography in Shock

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⁴ British Society Echocardiography
⁵ Faculty of Intensive Care Medicine
⁶ Barts Health NHS Trust

Version 4.0
02 March 2024
## PROJECT DETAILS

<table>
<thead>
<tr>
<th>PROJECT TITLE</th>
<th>National Evaluation of the Use of Critical Care Echocardiography in Shock (NEAT-ECHO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT TYPE</td>
<td>Service Evaluation</td>
</tr>
<tr>
<td>EMAIL</td>
<td><a href="mailto:neatecho@gmail.com">neatecho@gmail.com</a></td>
</tr>
<tr>
<td>PROJECTED START DATE</td>
<td>4 March 2024</td>
</tr>
<tr>
<td>PROJECTED COMPLETION DATE</td>
<td>31 July 2024</td>
</tr>
</tbody>
</table>
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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.\textsuperscript{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.\textsuperscript{1}

Improving 24/7 access to focused echocardiography was one of the key recommendations from the ICS/BCS ‘Shock to Survival’ report.\textsuperscript{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 < 90mmHg for ≥30 min or the need for vasopressors or inotropes to maintain systolic blood pressure ≥90mmHg 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 ≥90mmHg. 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 ≥90mmHg.
- **Should be included** – a trauma patient presenting with a SBP <90mmHg 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

### Appendix 1: EXEMPLAR CLINICAL GOVERNANCE FORM

<table>
<thead>
<tr>
<th>Title:</th>
<th>National Evaluation of the Use of Echocardiography in Critical Care (NEAT-ECHO) – A national service evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advisory notes</td>
<td>Your local site division or department may have a different name</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Division:</th>
<th>Critical Care and Anaesthetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialty:</td>
<td>Intensive Care Medicine</td>
</tr>
<tr>
<td>Departmental Audit/Clinical Governance lead:</td>
<td>[Consultant in Intensive Care Medicine]</td>
</tr>
<tr>
<td>Audit/Project Supervisor:</td>
<td>[Consultant in Intensive Care Medicine]</td>
</tr>
<tr>
<td>Project lead:</td>
<td>[Your Name]</td>
</tr>
<tr>
<td>Other project team members:</td>
<td>Insert names of other collaborators for data collection</td>
</tr>
</tbody>
</table>

| Type of project: | □ Local  
□ National  
□ NICE  
□ Quality standard |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Select national or equivalent</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site:</th>
<th>[Trust/hospital name]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert your hospital name or if your trust has intensive care units across multiple sites, list them all</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proposed start date:</th>
<th>04/03/2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed completion date:</td>
<td>31/03/2024</td>
</tr>
</tbody>
</table>

### National Patient Data Opt-Out/Information Governance

<table>
<thead>
<tr>
<th>Are you using anonymous data (non-identifiable patient data)?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEAT-ECHO does not request nor hold data which is identifiable or likely to be identifiable.</td>
<td></td>
</tr>
</tbody>
</table>

| Do you have the patient’s consent to use their data? | No |

| Does this audit have CAG approval under Section 251?  
(National Audits only) | No |

<table>
<thead>
<tr>
<th>Do you intend to present the audit findings outside the Trust?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>You must inform your local information governance team this project will have data collected centrally.</td>
<td></td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Audit Criteria</th>
<th>Acceptable audit target (% of cases where this should happen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(What should be happening, e.g. Prescriptions should be clearly signed and dated)</td>
<td></td>
</tr>
<tr>
<td>Echocardiography should be immediately available for all patients requiring cardiovascular support or with cardiogenic shock, and for all critically ill patients within 1 hour.</td>
<td>100%</td>
</tr>
<tr>
<td>Individuals who scan and report independently must be trained to a level that is appropriate for their clinical practice.</td>
<td>100%</td>
</tr>
<tr>
<td>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.</td>
<td>100%</td>
</tr>
<tr>
<td>All images must be securely stored for quality assurance purposes with appropriate data governance.</td>
<td>100%</td>
</tr>
<tr>
<td>Whenever scans are performed to inform clinical decision making, a structured report must be generated and stored in the patient record.</td>
<td>100%</td>
</tr>
<tr>
<td>All critical care units should be able to ensure the provision of point-of-care ultrasound</td>
<td>100%</td>
</tr>
</tbody>
</table>

4. **Methodology**

  *Refer to the Methodology section of the protocol.*
Appendix 2: Example Survey

Which NHS hospital do you currently work at?

* must provide value

Royal Albert Edward Infirmary

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

Yes  No

Does your hospital have an Emergency Department?

* must provide value

Yes  No

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.

* must provide value

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 TTE; 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

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

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

Do you have an identified local critical care echocardiography lead?

* must provide value

Yes

No

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?

Submit

Save & Return Later
### Appendix 3: Example CRF

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which hospital is this patient currently admitted to?</td>
<td>* must provide value</td>
</tr>
<tr>
<td>When was the patient accepted for admission to critical care?</td>
<td>Monday to Friday, in hours</td>
</tr>
<tr>
<td></td>
<td>Monday to Friday, out of hours</td>
</tr>
<tr>
<td></td>
<td>Saturday, Sunday, or a bank holiday</td>
</tr>
<tr>
<td>Was urgent echocardiography recommended as part of their initial admission management plan?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Don't know / not specified</td>
</tr>
<tr>
<td>Was any kind of echocardiography performed within 72 hours of acceptance to critical care?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td>How many hours after decision to admit to critical care did the patient receive any kind of echocardiograph?</td>
<td>* must provide value</td>
</tr>
</tbody>
</table>

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.

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).
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What time period was this echocardiogram performed in?</strong></td>
<td>Monday to Friday, in hours</td>
</tr>
<tr>
<td></td>
<td>Monday to Friday, out of hours</td>
</tr>
<tr>
<td></td>
<td>Saturday, Sunday, or a bank holiday</td>
</tr>
<tr>
<td></td>
<td>No scan performed</td>
</tr>
<tr>
<td><strong>What type of echocardiographic assessment was performed?</strong></td>
<td>Focused</td>
</tr>
<tr>
<td></td>
<td>Comprehensive</td>
</tr>
<tr>
<td></td>
<td>No scan performed</td>
</tr>
<tr>
<td><strong>Where were the images stored?</strong></td>
<td>On the ultrasound machine</td>
</tr>
<tr>
<td></td>
<td>Uploaded to an imaging system</td>
</tr>
<tr>
<td></td>
<td>Not stored</td>
</tr>
<tr>
<td></td>
<td>No scan performed</td>
</tr>
<tr>
<td><strong>Was the location of image storage documented?</strong></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td><strong>How was the echocardiogram documented in the notes?</strong></td>
<td>Freetext</td>
</tr>
<tr>
<td></td>
<td>Structured report</td>
</tr>
<tr>
<td></td>
<td>Not documented</td>
</tr>
</tbody>
</table>
### What level of accreditation did the person performing the scan hold?

- [FUSIC Heart](#)
- [BSE Level 1](#)
- [fTOE](#)
- [BSE Level 2 / ACCE](#)
- [BSE TOE](#)
- [EDEC](#)
- [EACVI TTE](#)
- [EACVI TOE](#)
- [Accreditation not listed](#)
- [Unaccredited](#)
- [Don’t know](#)

- *must provide value*

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

- [Yes](#)
- [No](#)

### 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.*

- [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](#)

- *must provide value*
### Did the initial echocardiogram help differentiate the aetiology of shock?

* must provide value

- Yes
- No
- No scan performed

### Did the findings of the initial echocardiogram change the management of the patient?

- Yes
- No
- No scan performed

### What type of shock did the patient have?

- Cardiogenic shock
- Obstructive shock
- Hypovolaemic shock
- Distributive shock