Management of surge and escalation in critical care services: standard operating procedure for adult respiratory extra corporeal membrane oxygenation
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Introduction and context

The focus of this document is to set out the background, principles and processes for the management of surges in demand for adult respiratory extra corporeal membrane oxygenation (ECMO). The nature of adult respiratory ECMO services is such that this is a national surge and escalation process rather than a regional process that escalates to a national level.

Respiratory ECMO is indicated for acute severe but potentially reversible respiratory failure. Aetiologies include, but are not limited to, pneumonia, acute respiratory distress syndrome, pulmonary aspiration, air leak syndrome and large airway disease or disruption.

This Standard Operating Procedure (SOP) forms part of a suite of NHS England published SOPs that cover the following services:

- Adult critical care
- Adult respiratory extra corporeal membrane oxygenation
- Adult intensive care
- Burns services

(https://www.england.nhs.uk/commissioning/ccs/)

It is recognised that:

- There are mutual interdependencies between these services and the critical care and intensive care resource they each use; and
- Surge pressures are not solely linked to winter and can occur at any time of year.

In the context of this SOP, the term surge is used to describe pressure on the whole adult respiratory ECMO system rather than referring to surge pressure experiences within an individual Adult Respiratory ECMO Centre.

All capacity reporting and bed management will use, as its basis, the NHS Pathways Directory of Services (Pathways DoS) system to monitor the bed availability for adult and adult respiratory ECMO services in England and Scotland. Wales and Northern Ireland utilise the respiratory ECMO beds in England and Scotland but are not involved in the surge and escalation processes.

Each of the commissioned Adult Respiratory ECMO Centres are routinely commissioned to provide capacity for up to 3 patients under normal conditions which can be increased under surge conditions. It should be noted that capacity can be flexible depending on activity within other interdependent services and should be considered as a guide.
1. Purpose

The SOP sets out:

A consistent national approach for England and Scotland by which providers of the services covered by this document can escalate capacity pressures to their commissioners and NHS England (Scotland commissions adult respiratory ECMO under a service agreement with NHS England);

• How organisations, the services covered by this document and the stakeholders should act;
• The process for the identification of current and potential capacity for the services covered by this document; and
• The anticipated escalation process nationally across the NHS in England, in support of the services covered by this document (including the NHS Strategic Command arrangements to be implemented by NHS England should they be required).
• The approach to supporting NHS England Emergency Preparedness, Resilience and Response (EPRR) planning in relation to any incident, event or outbreak of disease that may result in the need for treatment by a specialist adult respiratory ECMO Centre.

All processes described take account of the specific commissioning arrangements for the services covered.

In the event of a surge in demand identified via the NHS Pathways Directory of Services (Pathways DoS) system daily monitoring system or via alerts from the adult respiratory ECMO centres, the Adult Respiratory ECMO Lead (the ARE Lead) coordinates NHS England’s response. All surge issues should be referred to the ARE Lead in-hours.
2. Strategic aim

The strategic aims of this document are for the services covered by this document to:

- Prevent avoidable mortality and morbidity due to patients requiring care and not being able to access this in a timely manner;
- Maximise capacity in the health and social care system in a range of scenarios through a coordinated escalation and de-escalation approach across geographical footprints; and
- Support national coordination of triage and prioritisation during periods of escalation.

Support for repatriation of patients able to be discharged is at the centre of arrangements. This is to ensure that the maximum use is made of the highly specialised adult respiratory ECMO services.

**Appendix 2** gives detail about adult respiratory ECMO, the indications for its use, criteria for referral and contraindications.
3. Target audience

The primary audiences for this document are:

- Those involved in planning adult respiratory ECMO services;
- Others involved in the oversight of specialised services in NHS England;
- Those involved in strategic command arrangements out-of-hours in NHS England (i.e. EPRR staff);
- Providers of adult respiratory ECMO services; and
- Communications staff.

Given the small number of providers of adult respiratory ECMO services, surge demand is managed on a national (rather than regional or local) basis.
4. Surge and escalation management arrangements

This section sets out the roles and responsibilities to be undertaken at times of surge pressure. The information in this section is incorporated into a series of action cards shown at Appendix 1.

The following sections describe actions in pre-surge (heightened risk of surge), surge (need for extra capacity to be deployed), escalation (all surge capacity deployed) and recovery (surge and escalation phases passed and pre-surge arrangements reinstated).

This SOP would apply for any surge situation, not just pandemic influenza, for example, mass casualty events. In a mass casualty event, there may need to be a specific urgent call. This will be organised by the Adult Respiratory ECMO (ARE) Lead as necessary.

4.1 Pre-surge phase

During periods when there are likely to be bed capacity issues (for example, between 1 November and 31 March and/or when there are pandemics but accepting that surge can happen at any time of the year), the ARE Lead in-hours convenes a weekly teleconference to discuss bed availability and potential issues. The calls take place every Monday at 15.00 and the individuals taking part include:

- A representative from each of the six centres (the five Adult Respiratory ECMO Centres and the surge Adult Respiratory ECMO Centre in Scotland)
- The ARE Lead in-hours or their deputy (Chair)
- A representative from National Services Division, Scotland (who supports the designated surge centre for adult respiratory ECMO in Scotland)
- A member of the NHS England Emergency Preparedness and Rapid Response (EPRR) Team (as required)
- Public Health England representative (as required)
- A member of the NHS England Winter Operations Team (as required)

The weekly teleconference covers:

- An update of bed capacity from each of the six centres; and
- Potential issues and a discussion of possible solutions
When an Adult Respiratory ECMO Centre is unable to take part in a teleconference, they will e-mail the ARE Lead information to supplement the posted bed status in the NHS Pathways Directory of Services (Pathways DoS) system. This ensures that a complete national picture can be determined at the teleconferences.

The ARE Lead in-hours circulates a brief note of the meeting to all adult ECMO centres and others taking part in the teleconference. The ARE Lead may liaise with NHS England regional staff if, for example, there is an indication that adult respiratory ECMO capacity issues may impact on other services, or if there are specific repatriation issues highlighted.

All centres will be advised of the teleconference dial details.

The ARE Lead in-hours sends an e-mail to the ARE Lead out-of-hours every Thursday at 16.00 (or before any bank holiday period) and the ARE Lead out-of-hours sends an e-mail to the ARE Lead in-hours every Monday at 08.00 (or following any bank holiday period). The e-mail either:
  a) confirms that there are no known issues; or
  b) details potential issues and what has been discussed in terms of possible solutions; or
  c) details known issues and what has been put in place as a consequence.

4.2 Surge phase

The surge point is defined as the point at which patient numbers exceed 12 nationally and centres are required to respond to an increase in demand. During this period of moderate demand, centres may need to flex capacity and staff within ICU to manage additional ECMO patients. This position is confirmed by the ARE Lead in-hours.

Should the surge point be reached in-hours, the ARE Lead in-hours:
- Reviews the bed status information from the NHS Pathways Directory of Services (Pathways DoS)
- Convenes a teleconference with the six centres (and the other attendees of the weekly teleconferences where feasible)
- Confirms that the surge point has been reached
- Agrees which surge capacity should be made available
- Agrees how the surge point will be monitored, for example, through frequent teleconferences
- Ensures that the EPRR Team is aware of the situation
- Communicates information to NHS England staff as appropriate
- Agrees a communications plan as appropriate
- Follows up any repatriation issues with staff in NHS England, once local escalation between the Adult Respiratory ECMO Centre and the hospital to which a patient who no longer needs adult respiratory ECMO could be repatriated
• Confirms (in conjunction with EPRR and Operations Second on call) when a surge episode is reached and what ‘next steps’ are required, including the decision to formally contact the Chief Executives of the Adult Respiratory ECMO Centres to inform them that the surge point has been reached and that there may be a need to identify additional adult respiratory ECMO capacity.

The ARE Lead in-hours is responsible for liaising with other NHS England staff to ensure that the agreed actions are implemented alongside the agreed communications plan.

The ARE Lead in-hours decides either:
   a) The surge point has passed and pre-surge arrangements can be reinstated; or
   b) surge arrangements have been exhausted and the escalation point has been reached.

Should the surge point be reached out-of-hours, the centres follow the pathway in line with the agreed flow chart and communicate the position to the ARE Lead in-hours so that any further actions can be followed up.

4.3 Escalation phase

The escalation phase is defined as more than 21 patients receiving ECMO across the network. During this period of high demand Centres will need to flex capacity and staff within ICU to manage additional ECMO patients. Enhanced monitoring is likely to be required. Increased levels of activity may start to impact on other services delivered by the Trusts. This position is confirmed by the ARE Lead.

Centres are commissioned to take 5 patients during surge periods. Where demand and service pressures are such that this needs to be exceeded it will be discussed at the teleconferences and plans will be agreed to ensure continued access to the service for patients requiring ECMO.

Once the escalation point is reached, the ARE Lead:
   • Reviews the bed status information from the NHS Pathways Directory of Services (Pathways DoS)
   • Convenes a teleconference (with the option to be chaired by the EPRR Clinical Advisor) with the six centres (and other NHS England and NHS Scotland staff as appropriate)
   • Confirms that the escalation point has been reached
   • Agrees what other actions should be instigated, for example, temporary suspension of elective activity
   • Agrees how the escalation point will be monitored, for example, through frequent teleconferences
   • Ensures that the EPRR Team is aware of the situation
   • Communicates information to NHS England staff as appropriate
   • Agrees a communications plan as appropriate
• Formally contacts the Chief Executives of the Adult Respiratory ECMO Centres to inform them of the arrangements that have been put in place to manage and indicate that there will be a need to identify additional adult respiratory ECMO capacity. As part of this communication any issues relating to the need for the temporary suspension of elective surgical targets will be addressed.

The ARE Lead, in conjunction with the EPRR and Operations Second on call, is responsible for liaising with other NHS England staff to ensure that the agreed actions are implemented alongside the agreed communications plan.

The ARE Lead, in conjunction with the EPRR and Operations Second on call, decides when the escalation point has passed and surge arrangements can be reinstated.

4.4 Recovery phase

The recovery phase is defined as the point at which surge and escalation phases have passed and pre-surge arrangements can be reinstated. This position is confirmed by the ARE Lead in-hours.

Once the recovery point is reached, the ARE Lead in-hours:
• Prepares (in conjunction with EPRR), a debrief following any escalation phases, including recommendations for improvement in the SOP
• Discusses post-escalation debriefs at the weekly teleconferences
• Implements any changes agreed as a result of post-escalation debrief

Phase Summary

<table>
<thead>
<tr>
<th>Phase</th>
<th>Beds Occupied</th>
<th>Service Demand</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-surge</td>
<td>Up to 12</td>
<td>Low</td>
<td>Green</td>
</tr>
<tr>
<td>Surge</td>
<td>13 - 21</td>
<td>Moderate</td>
<td>Amber</td>
</tr>
<tr>
<td>Escalation</td>
<td>22 – 27</td>
<td>High</td>
<td>Red</td>
</tr>
<tr>
<td>Critical</td>
<td>28+</td>
<td>Very high</td>
<td>Black</td>
</tr>
</tbody>
</table>

- Green: Low service demand
- Amber: Moderate service demand. Centres may need to flex capacity and staff within ICU to manage additional ECMO patients
- Red: High service demand. Centres will need to flex capacity and staff within ICU to manage additional ECMO patients. Enhanced monitoring likely to be required. Increased level of activity may start to impact on other services delivered by the Trusts.
- Black: Very high service demands. Enhanced monitoring and contingency will be required to manage national service demands. Highly likely that there will be an impact on other services delivered by the Trusts. Workforce and capacity pressures likely.
5. Interdependencies/links with other services

Critical Care Networks should prioritise repatriation of all patients to create capacity in Adult Respiratory ECMO Centres. Regional leads should support the repatriation of patients during surge and escalation, accepting that repatriation may not be to the originating Trust. If repatriation is delayed for more than 24 hours, and the Adult Respiratory ECMO Centre has escalated locally the ARE will formally communicate with the Chief Executive of the Trust to which the patient is being repatriated to facilitate repatriation.
5.1 Appendix 1: action cards

<table>
<thead>
<tr>
<th>Role</th>
<th>ADULT RESPIRATORY ECMO SERVICES STANDARD OPERATING PROCEDURE ACTION CARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>The role of the Adult Respiratory ECMO Centre is to:</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Complete/update the NHS Pathways Directory of Services (Pathways DOS) system at least twice a day.</td>
</tr>
<tr>
<td>2</td>
<td>Ensure the safety of adults at all times escalating concerns about clinical safety arising from capacity constraints to NHS England.</td>
</tr>
<tr>
<td>3</td>
<td>e-mail bed availability status to the Adult Respiratory ECMO Lead when unable to take part in teleconferences</td>
</tr>
<tr>
<td>4</td>
<td>Take part in the weekly teleconferences during periods of potential bed capacity issues, reporting bed availability and any known issues.</td>
</tr>
<tr>
<td>5</td>
<td>Take part in surge teleconferences, reporting bed availability; make available surge capacity according the agreed protocol.</td>
</tr>
<tr>
<td>6</td>
<td>Take part in escalation teleconferences, reporting bed availability; instigate other actions, in line with the agreed protocol.</td>
</tr>
<tr>
<td>7</td>
<td>Follow up any repatriation issues through local governance routes and escalate to NHS England if local governance routes are not successful</td>
</tr>
</tbody>
</table>
ADULT RESPIRATORY ECMO SERVICES
STANDARD OPERATING PROCEDURE
ACTION CARD

1.2 NHS ENGLAND ADULT RESPIRATORY
ECMO LEAD IN- HOURS – PRE-SURGE

Pre-surge is defined as: the period during which there are likely to
be bed capacity issues (for example, between 1 November and 31
March and/or when there are pandemics but accepting that surge
can happen at any time of the year).

In-hours is defined as: between the hours of 09.00 and 17.00 from
Monday to Friday (except bank holidays).

The role of the Adult Respiratory ECMO (ARE) Lead in-hours during
pre-surge is to:

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Be responsible for the day-to-day management of the Standard Operating Procedure</td>
</tr>
<tr>
<td>2</td>
<td>Review the standard operating procedure as necessary</td>
</tr>
<tr>
<td>3</td>
<td>Ensure that appropriate payments are made for activity in line with contracts</td>
</tr>
<tr>
<td>4</td>
<td>Convene and chair the weekly national teleconferences during periods when there are likely to be capacity issues. The calls take place every Monday at 15.00 and the participants include:</td>
</tr>
<tr>
<td></td>
<td>• A representative from each of the six Adult Respiratory ECMO Centres</td>
</tr>
<tr>
<td></td>
<td>• A representative from National Services Division, Scotland (who supports the designated surge centre for adult respiratory ECMO in Aberdeen)</td>
</tr>
<tr>
<td></td>
<td>• A member of the NHS England EPRR Team (as required)</td>
</tr>
<tr>
<td></td>
<td>The weekly teleconference covers:</td>
</tr>
<tr>
<td></td>
<td>• An update of bed capacity from each of the six centres</td>
</tr>
<tr>
<td></td>
<td>• Potential issues and a discussion of possible solutions</td>
</tr>
<tr>
<td></td>
<td>Circulate a brief note of the meeting.</td>
</tr>
<tr>
<td></td>
<td>The ARE Lead in-hours is responsible for liaising with NHS England regional staff if, for example, there is an indication that adult respiratory ECMO capacity issues may impact on other services.</td>
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</tr>
<tr>
<td>5</td>
<td>Send an e-mail to the ARE Lead out-of-hours every Thursday at 16.00 (or before any bank holiday period) to identify any support required out of hours.</td>
</tr>
<tr>
<td>6</td>
<td>Confirm (in conjunction EPRR) when a surge episode is reached and what ‘next steps’ are required, by whom and the timescales for completion.</td>
</tr>
<tr>
<td>7</td>
<td>Provide support to the ARE Lead out-of-hours during surge and escalation phases.</td>
</tr>
</tbody>
</table>
### 1.3 NHS ENGLAND ADULT RESPIRATORY ECMO LEAD IN-HOURS – SURGE

Surge is defined as: the point at which patient numbers exceed 12 nationally and centres are required to respond to an increase in demand. This position is confirmed by the Adult Respiratory ECMO Lead (ARE Lead) in-hours.

In-hours is defined as: between the hours of 09.00 and 17.00 from Monday to Friday (except bank holidays).

The role of the ARE Lead in-hours during surge is to:

<table>
<thead>
<tr>
<th>1</th>
<th>Be responsible for the day-to-day management of the Standard Operating Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Review the standard operating procedure as necessary</td>
</tr>
<tr>
<td>3</td>
<td>Ensure that appropriate payments are made for surge activity in line with contracts</td>
</tr>
</tbody>
</table>
| 4 | In the event that the surge point is reached in-hours:  
  - Review the bed status information from NHS Pathways Directory of Services (Pathways DOS)  
  - Convene a teleconference with the six centres (and the other attendees of the weekly teleconferences where feasible)  
  - Confirm that the surge point has been reached  
  - Agree which surge capacity should be made available  
  - Ensures that the EPRR Team is aware of the situation  
  - Agree how the surge point will be monitored, for example, through frequent teleconferences  
  - Communicate information to NHS England staff as appropriate  
  - Agree a communications plan as appropriate  
  - Follow up any repatriation issues with colleagues in NHS England, once local escalation between the Adult Respiratory ECMO Centre and the hospital to which a patient who no longer needs adult respiratory ECMO could be repatriated  
  - Formally contacts the Chief Executives of the Adult Respiratory ECMO Centres to inform them that the surge point has been reached and that there may be a need to identify additional adult respiratory ECMO capacity. |
The ARE Lead in-hours is responsible for liaising with other NHS England staff to ensure that the agreed actions are implemented alongside the agreed communications plan.

The ARE Lead in-hours decides either:
   a) The surge point has passed and pre-surge arrangements can be reinstated; or
   b) surge arrangements have been exhausted and the escalation point has been reached.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Send an update e-mail to the ARE Lead out-of-hours every Thursday at 16.00 (or before any bank holiday period) and more frequently as required.</td>
</tr>
<tr>
<td>6</td>
<td>Confirm (in conjunction with EPRR) when a surge episode is reached and what ‘next steps’ are required, by whom and the timescales for completion.</td>
</tr>
<tr>
<td>7</td>
<td>Monitor bed capacity on a daily basis when a surge episode is reached.</td>
</tr>
<tr>
<td>8</td>
<td>Confirm when a surge episode has passed and pre-surge arrangements and monitoring can be reinstated.</td>
</tr>
<tr>
<td>9</td>
<td>Provide support to the ARE Lead out-of-hours during surge phases.</td>
</tr>
<tr>
<td>Role</td>
<td>1.4 NHS ENGLAND ADULT RESPIRATORY ECMO LEAD OUT-OF-HOURS – PRE-SURGE</td>
</tr>
<tr>
<td>------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>Pre-surge is defined as: the period during which there are likely to be bed capacity issues (for example, between 1 November and 31 March and/or when there are pandemics but accepting that surge can happen at any time of the year).</td>
<td></td>
</tr>
<tr>
<td>Out-of-hours is defined as: between the hours of 17.00 and 09.00 from Monday to Friday, weekends and bank holidays.</td>
<td></td>
</tr>
<tr>
<td>The Adult Respiratory ECMO (ARE) Lead out-of-hours is the NHS England on-call EPRR Officer supported by the NHS England on-call Operations Director and working in collaboration with the EPRR and Operations Second on call.</td>
<td></td>
</tr>
<tr>
<td>The role of the ARE Lead out-of-hours is to:</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Convene and chair the weekly teleconferences during pre-surge phases when the weekly teleconference falls on a bank holiday.</td>
</tr>
<tr>
<td>The calls take place every Monday at 15.00 and the individuals taking part include:</td>
<td></td>
</tr>
<tr>
<td>• A representative from each of the six centres</td>
<td></td>
</tr>
<tr>
<td>• A representative from National Services Division, Scotland (who supports the designated surge centre for adult respiratory ECMO in Aberdeen)</td>
<td></td>
</tr>
<tr>
<td>• Other members of the NHS England EPRR Team (as required)</td>
<td></td>
</tr>
<tr>
<td>The weekly teleconference covers:</td>
<td></td>
</tr>
<tr>
<td>• An update of bed capacity from each of the six centres</td>
<td></td>
</tr>
<tr>
<td>• Potential issues and a discussion of possible solutions</td>
<td></td>
</tr>
<tr>
<td>The ARE Lead out-of-hours circulates a brief note of the meeting. The ARE Lead out-of-hours may liaise with NHS England regional staff if, for example, there is an indication that adult respiratory ECMO capacity issues may impact on other services.</td>
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</tr>
<tr>
<td>2</td>
<td>Ensure that any actions following the teleconferences are implemented when the weekly teleconference falls on a bank holiday.</td>
</tr>
<tr>
<td>3</td>
<td>Send an update email to the ARE Lead in-hours every Monday at 08.00 (or after a bank holiday).</td>
</tr>
<tr>
<td>4</td>
<td>Confirm (in conjunction with EPRR) when a surge episode is reached out of hours and what ‘next steps’ are required, by whom and the timescales for completion.</td>
</tr>
<tr>
<td></td>
<td><strong>EPRR and Operations Second on call</strong></td>
</tr>
<tr>
<td>5</td>
<td>Confirm (in conjunction with the ARE Lead out-of-hours) when an escalation point is reached.</td>
</tr>
</tbody>
</table>
### 1.5 NHS ENGLAND ADULT RESPIRATORY ECMO LEAD OUT-OF-HOURS – SURGE

Surge is defined as: the point at which patient numbers exceed 12 nationally and centres are required to respond to an increase in demand. This position is confirmed by the Adult Respiratory ECMO Lead (ARE Lead) out-of-hours.

Out-of-hours is defined as: between the hours of 17.00 and 09.00 from Monday to Friday, weekends and bank holidays.

The ARE Lead out-of-hours is the NHS England on-call EPRR Officer supported by the NHS England on-call Operations Director and working in collaboration with EPRR and Operations Second on call.

The role of the ARE Lead out-of-hours is to:

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Confirm (in conjunction with EPRR) when a surge episode is reached out of hours and what ‘next steps’ are required, by whom and the timescales for completion.</td>
</tr>
</tbody>
</table>
| 2    | In the event that the surge point be reached out-of-hours:  
|      | • ensure that the Adult Respiratory ECMO Centres follow the pathway shown at Appendix 2 in line with the agreed flow chart; and  
|      | • communicate the position to the ARE Lead in-hours so that any further action can be followed up.  
|      | Communicate status and agree a communications plan as necessary. |
| 4    | Monitor bed capacity on a daily basis when a surge episode is reached |
| 5    | Liaise with the ARE Lead in-hours to enable comprehensive handover in normal working hours (as outlined above) and confirm key actions arising during the on call period in writing (via email). |
| **EPRR and Operations Second on call** |  |
| 6    | Confirm (in conjunction with the ARE Lead out-of-hours) when an escalation point is reached. |
### 1.6 NHS ENGLAND ADULT RESPIRATORY ECMO LEAD IN-HOURS AND OUT-OF-HOURS – ESCALATION

Escalation is defined as: more than 21 patients receiving ECMO across the network. During this period of high demand Centres will need to flex capacity and staff within ICU to manage additional ECMO patients. Enhanced monitoring is likely to be required. Increased levels of activity may start to impact on other services delivered by the Trusts. The position is confirmed by the Adult Respiratory ECMO (ARE) Lead in conjunction with EPRR.

The role of the ARE Lead is to:

<table>
<thead>
<tr>
<th>1</th>
<th>Confirm (in conjunction with EPRR) when the escalation phase is reached and what ‘next steps’ are required, by whom and the timescales for completion.</th>
</tr>
</thead>
</table>
| 2 | In the event that escalation point is reached:  
  - Review the bed status information from the NHS Pathways Directory of Services (Pathways DOS)  
  - Convene a teleconference (which may be chaired by EPRR Clinical Advisor) with the six centres (and other NHS England and NHS Scotland staff as appropriate)  
  - Confirm that the escalation point has been reached  
  - Agree what other actions should be instigated, for example, temporary suspension of elective activity  
  - Ensures that the EPRR Team is aware of the situation  
  - Agree how the escalation point will be monitored, for example, through frequent teleconferences  
  - Communicate information to NHS England staff as appropriate  
  - Agree a communications plan as appropriate |

The ARE Lead, in conjunction with EPRR, is responsible for:  
- liaising with other NHS England staff to ensure that the agreed actions are implemented alongside the agreed communications plan  
- agreeing how services will be monitored during the escalation period  
- agreeing a communications plan as appropriate  
- deciding when the escalation point has passed and surge arrangements can be reinstated.
<table>
<thead>
<tr>
<th></th>
<th>EPRR and Operations Second on call</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Confirm (in conjunction with the ARE Lead) when an escalation point is reached.</td>
</tr>
<tr>
<td>5</td>
<td>Chair teleconferences during escalation phases</td>
</tr>
<tr>
<td>6</td>
<td>Ensure (in conjunction with the ARE Lead) that any actions following escalation teleconferences are implemented.</td>
</tr>
<tr>
<td>7</td>
<td>Act as the NHS England lead in the event of any media communications.</td>
</tr>
<tr>
<td>8</td>
<td>Confirm (in conjunction with the ARE Lead) when an escalation point has passed and surge arrangements can be reinstated.</td>
</tr>
<tr>
<td>Role</td>
<td>1.7 NHS ENGLAND ADULT RESPIRATORY ECMO LEAD IN-HOURS AND OUT-OF-HOURS – RECOVERY</td>
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<td>Recovery is defined as: the point at which surge and escalation phases have passed and pre-surge arrangements can be reinstated. This position is confirmed by the Adult Respiratory ECMO (ARE) Lead in-hours.</td>
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<td>The role of the ARE Lead is to:</td>
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<td>Once the recovery point is reached:</td>
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<td>• Prepare (in conjunction with EPRR), a debrief following any escalation phases, including recommendations for improvement</td>
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<td>• Discuss post-escalation debriefs at the weekly teleconferences</td>
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<td>• Implement any changes agreed as a result of post-escalation debrief</td>
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5.2 Appendix 2: background to adult respiratory ECMO including indications for its use, the location of ECMO centres and criteria for referral

Respiratory ECMO is indicated for acute severe but potentially reversible respiratory failure. Aetiologies include, but are not limited to, pneumonia, acute respiratory distress syndrome, pulmonary aspiration, air leak syndrome and large airway disease or disruption. Referrals to the service should only be made by adult intensive care units for patients who are critically ill and already receiving lung protective mechanical ventilation or for patients in whom lung protective ventilation is not possible due to the severity of hypoxaemia/hypercapnea. Eligibility criteria are based on those of the CESAR study.

Inclusion criteria are:
- Adult patients > 16 years old
- Potentially reversible respiratory failure
- Lung injury score (LIS) >3 or arterial pH <7.20 due to hypercapnea despite optimal conventional treatment. A LIS>2.5 is acceptable in the context of a rapidly declining patient.

Contraindications for ECMO are:
- High pressure (peak inspiratory pressure > 30 cmH\textsubscript{2}O) and/or high FiO\textsubscript{2} (> 0.8) ventilation for more than 7 days (relative contraindication)
- Signs of intracranial bleeding (relative contradiction)
- Other contraindications to limited heparinisation (relative contraindication);
- A contraindication to continuation of active treatment

The LIS or Murray score uses four variables to assess the acuity of lung injury
- Oxygenation
- Findings on a plain chest radiograph
- Level of positive end expiratory pressure (PEEP) required in mechanical ventilation
- Respiratory system compliance

The service commissioned by NHS England includes:
- Patient retrieval by air or road, including mobile ECMO if necessary
- Assessment for respiratory ECMO
- Respiratory ECMO treatment
- Post ECMO trialling off and stabilisation
- End of life care on ECMO if necessary, including family support

NHS England does not commission bridge to transplantation.

ECMO Centres
There are five designated centres in England that provide this service and with whom NHS England has standard contracting arrangements, with an additional ‘satellite centre’ in Scotland. Aberdeen acts as a ‘satellite centre’ for Leicester, however, all Scottish referrals should be made to Leicester in the first instance. If
following assessment, it is deemed appropriate, a Scottish patient may be directed to Aberdeen for Treatment.

- St. Thomas' Hospital, Guy’s & St Thomas’ NHS Foundation Trust
- Royal Papworth Hospital NHS Foundation Trust
- Royal Brompton Hospital, Royal Brompton & Harefield NHS Foundation Trust
- Wythenshawe Hospital, Manchester University NHS Foundation Trust
- Glenfield Hospital, University Hospitals of Leicester NHS Trust
- Aberdeen Royal Infirmary [Satellite]

Referral

Once a referral has been made to one of the designated centres, it is the responsibility of that designated centre to source an ECMO bed at one of the five designated centres, or a Scottish patient may be directed to the 'satellite centre' in Aberdeen for treatment.

The five designated centres may be able to provide additional capacity at times of 'surge'. There are no additional designated surge centres in England that provide capacity when there is pressure on the five designated centres, however, Scottish patients may be directed to the 'surge centre' in Aberdeen.

NHS England also works very occasionally with the centre in Stockholm, Sweden.

If there are no beds available within the designated and surge capacity in the UK, a bed may be sourced internationally, for example, from the Karolinska Institute, Sweden (under a reciprocal arrangement).

Any exceptional requests for funding to meet surge and escalation requirements should be addressed to the Adult Respiratory ECMO Lead in-hours.
5.3 Appendix 3: contact details

**Adult Respiratory ECMO Lead in-hours**

Nicola Symes  
nicola.symes@nhs.net  
Tel: As advised to ECMO Centres

Fiona Marley  
fiona.marley@nhs.net  
Tel: As advised to ECMO Centres

**Paediatric Respiratory ECMO Lead in-hours:**

Nicola Symes  
nicola.symes@nhs.net  
Tel: As advised to ECMO Centres

Fiona Marley  
fiona.marley@nhs.net  
Tel: As advised to ECMO Centres

**Adult (and Paediatric) Respiratory ECMO Lead out-of-hours**

NHS England EPRR Team  
England.eprr@nhs.net  
0844 822 2888 ask for ‘NHS 05’

In the event that either of the two in-hours leads are unavailable (for example, because of annual leave), the role will usually be undertaken by the other in-hours lead. An out-of-office message will be left in response to e-mails and a voicemail message will be left in response to phone calls.