Clinical Commissioning Policy Proposition

Extracorporeal membrane oxygenation (ECMO) for bridge to lung transplant (all ages) [1803]

Version control

For the purpose of consultation NHS England invites views on the evidence and other information that has been taken into account as described in this policy proposition.

A final decision as to whether the clinical commissioning policy will be funded will be made by NHS England following a decision by the Clinical Priorities Advisory Group.

Version number	Summary of amends	Initials	Date

Clinical Commissioning Policy
Extracorporeal membrane oxygenation (ECMO) for bridge to lung transplant (all ages) [1803]

Commissioning Position

Summary

A final decision as to whether Extracorporeal membrane oxygenation (ECMO) for bridge to lung transplant (all ages) will be routinely commissioned/not for routine commissioning will made by NHS England following a recommendation from the Clinical Priorities Advisory Group. The proposal is that ECMO is recommended to be available as a treatment option through routine commissioning as a bridge to lung transplantation within the criteria set out in this document.

Executive Summary

Equality statement

Promoting equality and addressing health inequalities are at the heart of NHS England's values. Throughout the development of the policies and processes cited in this document, we have:

- Given due regard to the need to eliminate discrimination, harassment and victimisation, to advance equality of opportunity, and to foster good relations between people who share a relevant protected characteristic (as cited under the Equality Act 2010) and those who do not share it; and
- Given regard to the need to reduce inequalities between patients in access to, and outcomes from healthcare services and to ensure services are provided in an integrated way where this might reduce health inequalities

Plain language summary

About bridge to lung transplant

Lung transplantation is routinely performed for selected patients with respiratory failure in whom there are no other options for treatment. Due to the scarcity of organ donors patients are put on a waiting list until suitable lungs for transplantation become available. Approximately 25% of patients on the waiting list die from respiratory failure before a suitable donor becomes available or are removed from the waiting list because they become too ill. Some of these patients can be given respiratory support to keep them alive till a transplant organ becomes available. This is known as Bridge to Transplant (BTT).

About current treatment

In the past mechanical ventilation has been used for BTT but it has been associated with severe complications and poor post-transplant outcomes. Lung transplants are now rarely performed in mechanically ventilated patients. Therefore, there are currently no treatments available for deteriorating patients with terminal respiratory failure. Such patients are removed from the lung transplant waiting list and given end-of life care.

About the new treatment

Extracorporeal membrane oxygenation (ECMO) is a technique for providing respiratory support for those people whose lungs are no longer able to function effectively despite all other therapeutic and supportive interventions. Blood is removed from the patient's circulation and passes through a gas exchange device which puts oxygen into the blood and removes carbon dioxide before being returned to the circulation. ECMO can only be used to treat patients for a relatively short period of time. Traditionally patients have been sedated and bedbound while on ECMO but now all patients are encouraged to exercise and take part in physiotherapy.

What we have decided

NHS England has carefully reviewed the evidence to treat critically ill patients awaiting lung transplant with BTT with ECMO. We have concluded that there is enough evidence to make the treatment available at this time.

Committee discussion

The Clinical Priorities Advisory Group are asked to consider the evidence and the policy proposition. See the committee papers (link) for full details of the evidence.

The condition

Several types of lung disease can result in respiratory failure where a person's lungs can no longer get enough oxygen into their blood and clear enough carbon dioxide out. Symptoms of respiratory failure include worsening shortness of breath, rapid breathing, fatigue, anxiety, confusion and then death. These tend to be in patients with cystic fibrosis (CF), pulmonary hypertension (PH), chronic obstructive pulmonary disease (COPD), and idiopathic pulmonary fibrosis (IPF).

Current treatments

Lung transplantation is routinely performed for selected patients with respiratory failure in whom there are no other options for treatment. Due to the scarcity of organ donors patients are put on a waiting list until suitable lungs for transplantation become available. However, approximately 25% of patients on the waiting list are critically ill and die from respiratory failure before a suitable donor becomes available or are removed from the waiting list due to deteriorating health rendering lung transplantation futile and inappropriate (NHSBT, 2017). In the past, mechanical ventilation has been used to 'bridge' [support] these patients to transplant but it is not sufficient for all patients and has been associated with serious complications and poor post-transplant outcomes. This means that lung transplants are now rarely performed in invasively ventilated patients. Bridging support can alternatively be provided with ECMO.

Proposed treatments

NHS Blood and Transplant (NHS BT) are responsible for organ allocation. In May 2017 NHS BT introduced a Super Urgent Lung Allocation Scheme (SULAS) which gives priority to critically ill patients awaiting transplants. The average waiting time to lung transplant for this group of critically ill patients is on average 8 days. The introduction of this change to the national waiting list gives this group of patients a realistic chance of a transplant within a short time. SULAS listing is only available to patients on ECMO or equivalent treatment. At present some lung transplant centres offer ECMO in the absence of national commissioning by NHS England, but other centres do not.

ECMO is a treatment provided for critically ill people in a level 3 critical care area. Blood is removed from the patient's circulation and passes through a gas exchange device before being returned to the circulation. ECMO removes blood from the venous circulation which is then pumped through a gas exchange device and is returned to either the arterial circulation (veno-arterial (VA) ECMO) or the venous circulation (veno-venous (VV) ECMO). VV ECMO provides respiratory support only whereas VA ECMO can provide full cardiorespiratory support.

The rationale for the use of ECMO in these critically ill patients who are refractory to maximal respiratory support is that it is the only treatment available that will allow them a chance to survive to transplant. Without ECMO these patients will inevitably die within hours.

Developments in ECMO technology combined with improvements in patient selection have made it possible to successfully bridge to transplant a group of carefully selected extremely sick patients (Hoetzenecker et al, 2018) and have resulted in 1-year survival post-transplant nearly equivalent to that seen in patients not receiving any bridging support, and a near doubling of the 5-year post-transplant survival over this time (Hayanga et al, 2015). Traditionally, patients on ECMO have been sedated and bedbound to prevent inadvertent cannula dislodgement and to deal with agitation but it can also be performed on patients who are awake and ambulating (Cypel and Keshavjee, 2012).

Epidemiology and Needs Assessment

In 2016-17 there were 341 patients on the waiting list for lung transplant. The underlying conditions of these patients were: Cystic Fibrosis and bronchiectasis (94 patients, 28%), fibrosing lung disease (90 patients, 26%), COPD and emphysema (89 patients, 26%), primary pulmonary hypertension (10 patients, 3%), and other pathologies (57 patients, 17%) (NHSBT Annual report on cardiothoracic organ transplantation, 2017). The epidemiology of the underlying lung conditions is not changing.

A review of the utilisation of the SULAS from May 2017 [when it was introduced] to February 2019 (20 months) showed there have been 19 adult registrations and no paediatric registrations onto this list (NHSBT Cardiothoracic Advisory Group, 2019)

Between April 1st 2017 and March 31st 2018 there were 214 lung transplants carried out in England. Based on activity at Harefield Hospital over the last seven years it has been estimated that up to 10% of lung transplant patients might utilise ECMO BTT. This would result in approximately 21 patients receiving ECMO BTT annually in England.

Currently up to 15 children of all ages are listed for lung transplant each year in England. Ambulatory ECMO could be considered in a select group of paediatric patients (adolescents with height >140cm) so it may be anticipated that there would be up to 1 ECMO episode per year in paediatric patients.

Evidence summary

NHS England has concluded that there is sufficient evidence to support a proposal for the routine commissioning of this treatment for the indication.

Eight studies were used in this review: one systematic review and seven cohort studies containing between 12 and 68 patients on ECMO BTT. All the cohort studies included comparison of post-transplant outcomes in an ECMO BTT cohort and a non-bridged cohort of patients.

Survival

All studies reported 1-year survival, two reported 3-year survival and three reported 5-year survival (in all cases 'survival' means survival after transplant). Results suggest that 70-90% of patients who receive ECMO BTT are still alive at 1 year, around 60-80% are alive at 3 years, and around a 65% are alive at 5 years post-transplant. The rate of survival is no worse in critically ill patients requiring ECMO compared with less ill patients who survive to transplant without ECMO bridging support.

Quality of life and functional status

Health-related quality of life (HRQL) was reported by one study. Patients on ECMO BTT achieved similar improvements in HRQL and depressive symptoms as those who did not require ECMO bridging, these improvements were greatest in the first six months post-transplant and then remained stable at 12 months. Functional status was also assessed in only one study and showed that the 1-year post-transplant functional status of patients on ECMO BTT was equivalent to that of non-bridged patients and could be described as excellent.

Complications

General complications were reported in five studies, acute graft rejection in four studies, long-term graft survival in one study and post-operative ventilation in four studies. Acute graft rejection is not clearly worse in ECMO BTT than non-bridged patients and long-term follow up suggests that overall graft survival is equal. The impact of ECMO BTT on post-transplant ventilation requirements is unclear but the higher rates seen in ECMO BTT patients in some studies may be explained by concurrent MV use. ECMO BTT is associated with higher rates of some serious complications such as bleeding, delirium, myopathy and vascular and thrombotic events, although the exact magnitude of these risks is difficult to determine due to heterogeneity in the post-transplant outcomes and indicators used in different studies. ECMO BTT is associated with a risk of mortality in patients on this treatment, based on five studies around 20% - 30% of patients die on ECMO before transplantation.

Duration of pre-transplant ECMO and length of stay

Duration of ECMO was reported by five studies and ranged from a mean of 3.2 to 15 days. There is little certainty about the exact duration of potential BTT as the ranges are wide within studies, it appears that duration of treatment does not tend to exceed around 16 days in the majority of patients. There is a general trend towards the reporting of longer hospital and ITU stays in patients receiving ECMO BTT but variability within and between studies makes it difficult to identify the exact magnitude of difference or indeed be clear about whether any differences are statistically significant.

Awake versus sedated ECMO

One study includes additional data that provides a comparison of post-transplant outcomes in awake and sedated ECMO strategies. There is a suggestion that an awake ECMO strategy offers a survival advantage over sedated strategies which use concurrent MV. However, the distinction between awake and sedated care is not relevant to the non-bridged patients so this is a comparison that is made between patients in the ECMO BTT intervention group only.

Cost effectiveness

None of the studies provided any data on cost or cost effectiveness of ECMO BTT.

Interventional Lung Assist (iLA)

None of the studies provided data on iLA.

Limitations

No studies provided data on cost effectiveness of ECMO BTT. As randomized control trials are neither practical nor ethical this review included observational studies and a systematic review. Some of the studies had small sample sizes, particularly in the ECMO BTT group, and included patients recruited over long periods of time when ECMO technology and practice may have changed.

Implementation

Criteria

Patients eligible for Lung Transplantation, consistent with The International Society of Heart and Lung Transplant Guidelines described in NHS BT policy who subsequently suffer unexpected and sustained acute deterioration [where their own lungs are no longer able to sustain life despite all other therapeutic interventions] can be considered for ECMO support.

This pathway begins once the patient is on the waiting list for a lung transplant (registered on the non-urgent or urgent scheme) under the care of a cardiothoracic transplant centre.

The decision to commence ECMO support will be subject to an MDT review consisting of the on-call surgeon, transplant respiratory physician and duty intensive care consultant. ECMO support should be considered in patients if there is a reasonable expectation that they:

- Will have good rehabilitation potential which usually means a relatively short duration of severe illness to minimise the risks of prolonged ITU stay and post-operative complications
- are likely to remain free from extrapulmonary organ failure and clinically stable on ECMO without severe infection
- will not clinically deteriorate to the point of becoming dependent on IPPV in an intensive care unit.

Eligible patients placed on ECMO should be registered for the Super Urgent Lung Allocation Scheme (as per NHSBT Policy 231/3).

Patients receiving ECMO support while conscious and self-ventilating (which can include having a tracheostomy with intermittent support) have the highest expectation of a good outcome following lung transplantation and can be supported to lung transplantation with ECMO BTT.

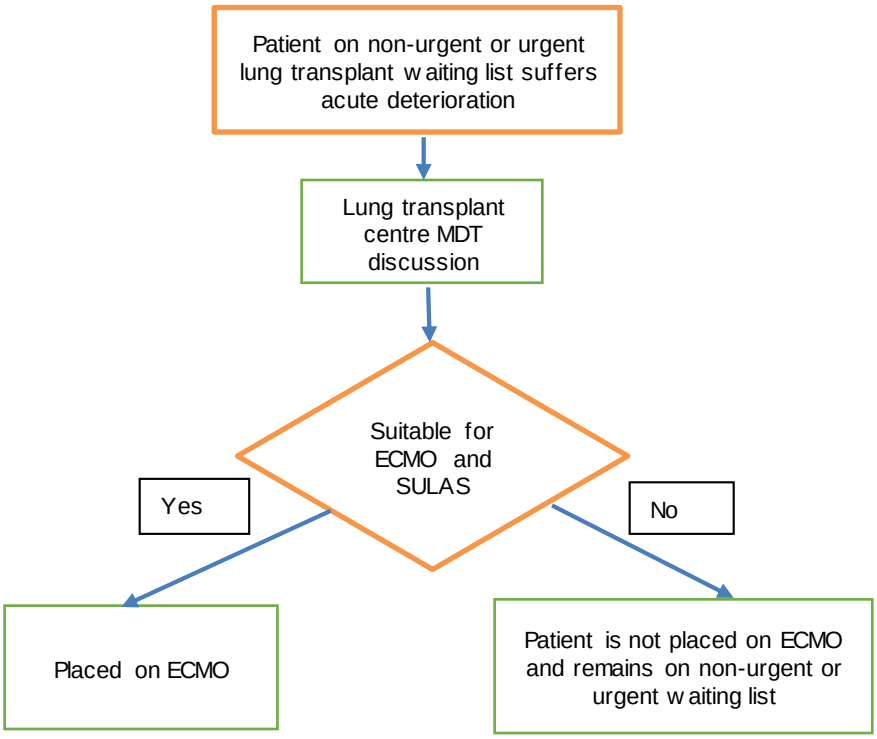
Patients will not be eligible for ECMO when the local MDT concludes the patient does not have a reasonable chance of intermediate survival; for example, is felt to be <50% probability of surviving 3-5 years post-transplant.

Patients requiring re-transplantation will not have access to ECMO BTT.

Paediatric patients will fulfil the criteria above but may be sedated throughout ECMO BTT.

Patient Pathway

This pathway begins once the patient is on the waiting list for a lung transplant (registered on the non-urgent or urgent scheme) under the care of a cardiothoracic transplant centre.



Governance Arrangements

ECMO for BTT will only be commissioned from Highly Specialised lung transplant providers.

Mechanism for funding

The funding and commissioning will be managed through the relevant local NHS England Specialised Commissioning Team from xx/xxxx

Audit requirements

The following information will be collected for all patients treated with ECMO for BTT and uploaded to the NHS England QSIS portal:

- Time per patient on ECMO
- Mortality rate on ECMO
- Complications on ECMO
- Period of dialysis if required
- Quality of Life at 3-months and 1-year post-transplant
- Patient survival post-transplant (collected by NHS BT)

Information on age of patient and clinical history will be recorded and presented to the Cardiothoracic Transplant annual clinical meeting.

Policy review date

This document will lapse upon publication by NHS England of a clinical commissioning policy for the proposed intervention that confirms whether it is routinely or non-routinely commissioned.

Definitions

Extracorporeal membrane oxygenation (ECMO)	A technique for providing respiratory support for those people whose lungs are no longer able to sustain life despite all other therapeutic and supportive interventions. Blood is removed from the patient's circulation and passes through a gas exchanged device before being returned to the circulation.
Bridge to lung transplant (BTT)	Patients with end stage lung disease waiting for a lung transplant who have acutely worsening respiratory failure may need respiratory support to keep them alive until a transplant is available, i.e. to bridge them to transplant.
Mechanical ventilation (MV)	A type of artificial ventilation where a ventilator assists or replaces breathing, often with a tube placed down the trachea under sedation. It is used when a patient's own breathing cannot support them.
Super Urgent Lung Allocation Scheme (SULAS)	This was introduced in 2017 with the aim of improving access to transplants for the sickest patients on the transplant list. Previously, patients were prioritised by individual transplant centres when a suitable donor became available. Patients who are rapidly deteriorating on waiting lists can now be registered for a super urgent transplant.
Level 3 Critical Care	Patients requiring advanced respiratory support alone or monitoring and support for two or more organ systems. This level includes all complex patients requiring support for multi-organ failure.)
Interventional Lung Assist (iLA)	A pumpless system used in patients with acute respiratory distress syndrome (ARDS) aimed at improving extracorporeal gas exchange with a membrane integrated in a passive arteriovenous shunt.
IPPV	intermittent positive-pressure ventilation, the provision of mechanical ventilation by a machine designed to deliver breathing gas until equilibrium is established between the patient's lungs and the ventilator.

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