Safer Care Victoria

February 2020

Implementing the Victorian ECMO Service

Part one: Response to the evidence review

ABBREVIATIONS

AHPEQS	Australian Hospital Patient Experience Question Set
ANZICS	Australian and New Zealand Intensive Care Society
ARV	Adult Retrieval Victoria
AV	Ambulance Victoria
ECMO	Extracorporeal membrane oxygenation
ECPR	Extracorporeal cardiopulmonary resuscitation
ELSO	Extracorporeal Life Support Organization
ICU	Intensive care unit
MTDM	Medical Treatment Decision Maker
REACH	Retrieval and Critical Health
SCV	Safer Care Victoria
VA	Venoarterial
VAED	Victorian Admitted Episodes Dataset
VV	Venovenous

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About this report

Safer Care Victoria (SCV) is working with the Department of Health and Human Services (the department) to refine and implement a new delivery model for extracorporeal membrane oxygenation (ECMO) in Victoria. This report outlines how the new model, known as the Victorian ECMO Service, should be implemented.

In late 2017, SCV was asked by the department to review the evidence for and the outcomes of adult patients who received ECMO within Victoria. The review, published in May 2019, produced 13 recommendations for the optimal delivery of ECMO. In response to the evidence review, SCV established the Victorian ECMO Service working group to develop a plan to implement a tiered, networked and accredited statewide ECMO service. For more background read the Adult extracorporeal membrane oxygenation (ECMO) in Victoria: Centralisation and retrieval model evidence review (ECMO evidence review).

The recommendations in thie report are for patients aged 18 years and older, treated in an acute health service environment.

HOW TO READ THIS REPORT

This report should be read together with *Part two: appendices* which provide clinical and operational detail, information on policy development and service implementation.

The report is divided into eight sections:

1. **Snapshot of responses**
   includes responses to each of the 13 recommendations from the ECMO evidence review.
2. **Guiding principles**
   covers the principles that will guide the establishment and operation of the Victorian ECMO Service.
3. **Structure and governance**
   outlines proposed operational and governance structures for the Victorian ECMO Service.
4. **Consultation and coordination**
   details coordination and communication structures and pathways for ECMO referrals, decision making, and retrievals.
5. **Clinical criteria for ECMO**
   covers the agreed criteria clinicians will use to make decisions for individual patients about ECMO.
6. **Hospital accreditation**
   details hospital accreditation requirements for services to participate
7. **Clinical credentialing**
   outlines requirements for credentialing clinicians to care for ECMO patients in Victoria.

WHAT IS ECMO?

ECMO gives temporary life support for critically ill patients with reversible acute respiratory and cardiac failure and/or patients requiring a 'bridge' to transplantation.

It is a high-risk procedure but can be lifesaving. It is not a common procedure.

8. Statewide training program

presents a statewide training program to support credentialing of clinicians.

ABOUT THE WORKING GROUP

In 2019 we established an expert working group of 35 clinical experts to outline what is required to provide a safe and effective statewide ECMO service for adults in Victoria.

The group was tasked with responding to the recommendations from the evidence review and envisioning how the statewide ECMO service could be implemented in Victoria.

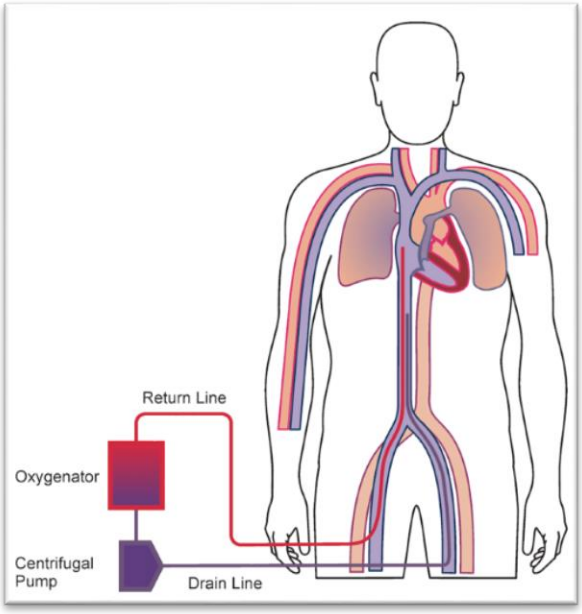
Our working group was supported by consumers including those with lived ECMO experience. Their input will ensure the proposed plan to set up the service meets the community's expectations for delivering outstanding care to the sickest Victorians.

The working group has developed clinical criteria, protocols, service design and monitoring processes to address the recommendations from the evidence review.

HOW DOES ECMO WORK?

An ECMO circuit pumps blood from a patient into an oxygenator that removes carbon dioxide and adds oxygen then returns blood to the patient.

Diagram 1: Venovenous ECMO circuit



ECMO is typically classified into three types:

- Venovenous (VV) ECMO for patients with acute respiratory failure

- Venoarterial (VA) ECMO for patients with heart failure, with or without respiratory failure
- Extracorporeal cardiopulmonary resuscitation (ECPR), a time-critical subset of VA ECMO for patients in cardiac arrest

Each type of ECMO requires specific timing and treatment pathways. VV ECMO patients are generally treated for longer periods. VA ECMO patients require shorter periods of ECMO but have lower survival rates. ECPR patients require immediate intervention and have the lowest survival rate.

Snapshot of responses

Under the proposed Victorian ECMO Service, health services will be eligible to become a comprehensive, intermediate or initiation ECMO centre. This tiered system will enable collaboration between services. Below, we have provided a snapshot of how the statewide service will meet each of the recommendations from the evidence review.

Recommendation 1

A single Victorian ECMO Service responsible for 24-hour consultation, retrieval and transfer; and ECMO bed management should be formed.

We recommend a 24-hour consultation, coordination, retrieval,transfer and bed management service should be created with:

- on-call ECMO experts to provide consultation on decisions around eligibility, initiation, ongoing management and weaning for all patients considered for, or already on ECMO
- credentialed ECMO retrievalists, who can initiate ECMO support at referring hospitals and/or retrieve patients to Comprehensive and Intermediate ECMO centres
- resources and transport platforms to retrieve eligible patients and transfer to a comprehensive or intermediate ECMO centre
- modified IT platforms to manage patient flow and ECMO bed capacity.

See appendix 3 for more details.

Recommendation 2

The Victorian ECMO Service must be consulted on decisions regarding: initiation, ongoing management and weaning of all patients considered for or already on ECMO.

All advice, referral and retrieval requests should be managed via a centralised 24-hour consultation and coordination service.

In response, we have developed clinical criteria for decisions about all patients considered for, or already on ECMO – including initiation, ongoing management and weaning.

See appendix 3 and 4 for more details.

Recommendation 3

All hospitals providing any ECMO service should be accredited and participate in the Victorian ECMO Service.

We are proposing specific requirements for accrediting hospitals to participate in the Victorian ECMO Service at all tiers (comprehensive, intermediate and initiation).

We have outlined roles and responsibilities for each hospital tier, including governance and reporting expectations.

 See appendix 2 and 5 for more details.

Recommendation 4

Systems and processes should be developed to monitor performance and standards of ECMO services, with oversight of workforce and health service training, accreditation, performance management and future planning of ECMO services.

We are proposing operational and governance structures which include performance and quality and safety measures.

We are proposing training and accreditation requirements, processes and monitoring for all hospital tiers and the clinical workforce.

While the future planning of ECMO services remains the responsibility of the department, our proposed monitoring measures and governance structure should inform planning.

 See appendix 2, 5, 6 and 7 for more details.

Recommendation 5

A single patient eligibility criteria protocol will be developed with clear, evidence-based indications for the initiation of ECMO.

We have established criteria and developed tools to support clinical decision making about ECMO for individual patients. These cover the benefit of ECMO for a patient, stages of ECMO: referral, initiation, withdrawal and weaning. The criteria are evidence-informed and reflect international best practice.

 See appendix 4 for more details.

Recommendation 6

The Alfred Hospital should be a designated comprehensive ECMO centre. This hospital should initiate and maintain at least 30 ECMO procedures each year, participate in the retrieval and support service as part of the Victorian ECMO Service, offer all forms of ECMO support, and offer heart and lung transplantation and mechanical ventricular assist devices.

Additionally, they will be responsible for training and supporting other health services to become accredited ECMO sites.

We are proposing requirements for health services to be accredited as a comprehensive ECMO centre, including minimum patient numbers.

We have established roles and responsibilities for comprehensive ECMO centres, including participation in the consultation and retrieval services.

Our operational and governance structures for the Victorian ECMO Service include performance and quality and safety measures to monitor comprehensive ECMO centres

We have outlined a statewide training program and proposed training requirements for clinicians who participate in the service.

Recommendation 7

In the first instance, a maximum of two sites should be designated as Intermediate ECMO Centres. These services should:

- maintain a minimum of 20 ECMO procedures each year
- participate in the retrieval and support service as part of the Victorian ECMO Service
- offer all forms of ECMO support.

The department will be responsible for designating the two intermediate ECMO centres.

We are proposing requirements for accreditation as an intermediate ECMO centre, including minimum patient numbers. Intermediate sites will need to have cardiac surgery capability.

We have outlined roles and responsibilities for intermediate ECMO centres, including participation in the consultation and retrieval services.

Our operational and governance structures for the Victorian ECMO Service include performance and quality and safety measures to monitor intermediate ECMO centres.

See appendix 2, 3, 4 and 5 for more details.

Recommendation 8

Where pre-operative consultation is feasible, patients who are likely to require peri-procedural ECMO (e.g. complex cardiac surgery) should be transferred, prior to the commencement of the procedure, to a comprehensive ECMO Centre or intermediate ECMO Centre that has the appropriate capability level.

Pre-operative consultation and advice will be provided via the centralised 24-hour consultation and coordination service.

Our proposed referral and retrieval pathway includes transfer of patients requiring peri-procedural ECMO prior to commencing the procedure.

See appendix 3 for more details.

Recommendation 9

All services providing cardiac surgery which are not a Comprehensive or Intermediate ECMO Centre must be able to initiate ECMO, with the following conditions:

(i) The service is accredited to provide ECMO.

(ii) ECMO is only initiated with the intention of stabilisation and transfer to a Comprehensive or Intermediate ECMO Centre.

Recommendation 10

Services that have vascular surgery and a high-volume interventional cardiology service, who do not also offer cardiac surgery, should be able to initiate ECMO, with the following conditions:

(i) The service is accredited to provide ECMO.

(ii) ECMO is only initiated with the intention of stabilisation and transfer to a Comprehensive or Intermediate ECMO Centre.

We are proposing accreditation requirements for health services to become an initiation site.

Our proposed referral and retrieval pathway includes details of initiation and retrieval at initiation sites.

All advice, referral and retrieval requests should be managed via a centralised 24-hour consultation and coordination service.

All patients started on ECMO at initiation sites should be transported to an intermediate or comprehensive ECMO centre within 48 hours. Patients not appropriate for ongoing care will not be transferred.

We have outlined roles and responsibilities for ECMO initiation.

Our operational and governance structures for the Victorian ECMO Service include performance and quality and safety measures to monitor ECMO initiation sites.

For quality assurance and improvement ECMO retrieval teams should supervise cannulation by the local team at initiation sites whenever possible.

See appendix 2, 3, 4 and 5 for more details.

Recommendation 11

The Victorian ECMO Service will support all services not included in recommendations 6-10 by providing advice for patients who may be eligible for ECMO and, where appropriate, facilitate retrieval.

The 24-hour consultation, coordination, retrieval and transfer service will provide prompt expert advice and support to all acute health services not accredited as comprehensive, intermediate or initiation sites

Teams with credentialed ECMO retrievalists, who can initiate ECMO at referring hospitals, will transfer patients to comprehensive or intermediate centres.

See appendix 3 and 6 for more details.

Recommendation 12

Patients with out-of-hospital cardiac arrest who are eligible for ECPR should be transferred directly to a site which provides a dedicated, trained and resourced ECPR service, if accessible within 60 minutes of the arrest.

The proposed implementation model for the Victorian ECMO Service will allow intermediate and initiation sites to develop extracorporeal cardiopulmonary resuscitation (ECPR) capabilities over time.

See appendix 5, 6 and 7 for more details.

Recommendation 13

All sites performing ECMO must submit data on all patients and ECMO procedures to the Australia New Zealand Intensive Care Society (ANZICS) ECMO registry for public reporting. All comprehensive and intermediate ECMO centres will be encouraged to report to ELSO.

Our proposed operational and governance structures for the Victorian ECMO Service include data collection and reporting from all sites and retrieval services performing ECMO.

Data sources for these measures should include:

- Victorian Admitted Episodes Dataset (VAED)
- Ambulance Victoria
- ANZICS Intensive Care Clinical Quality Registries (ECMO Dataset).

See appendix 1 and 2 for more details.

Guiding principles

These guiding principles set out the expectations of clinicians and consumers for how the Victorian ECMO Service should be implemented and should operate.

All patients receive high quality person-centred care

Patients and families are central to decision making and communication

Equity of care should overcome barriers such as geography

Service operates 24 hours a day, seven days a week

Aim for early referral to avoid late retrieval

Decision to retrieve or initiate ECMO is made within 30 minutes

Patients should be cannulated as soon as safely possible

Patients are transferred to the right place the first time.

Support clinicians to deliver best practice care

Processes are standardised and public and private hospitals meet the same requirements

Each hospital has a single identified point of contact for communication with the single, central coordination point

The bedside clinician has load minimised and support maximised

Resources are hosted online and are easy to find and to use

Debriefing and feedback is standard following every case.

Collaboration and cooperation ensure care is safe, high quality and sustainable

Aim to achieve best practice rather than minimum standard

Technology is used to close distances, support clinicians and families, and maximise efficiency

Data is centralised, complete and transparent, with quality and timeliness of service benchmarked against best practice

Current resources are used and optimised, equipment aligned for safety and consumable stock coordinated centrally to limit waste.

Structure and governance

This section outlines the recommended systems and processes to deliver, monitor and provide oversight of the Victorian ECMO Service. This includes the structure of the service, data collection, monitoring and reporting processes and responsibilities. The potential for statewide management of equipment is also outlined.

STRUCTURE

The Victorian ECMO Service should be a collaboration between the participating hospitals and Ambulance Victoria. Participating hospitals form a tiered network, with complex cases managed by designated centres while still providing access to timely care across the state.

Tiered hospital network

Tier one: comprehensive ECMO centre

A comprehensive ECMO centre should:

- manage more than 30 ECMO patients per year
- provide all forms of ECMO
- manage patients throughout the course of their illness
- initiate ECMO, manage complications and wean patients from ECMO
- provide long term supports or destination therapies such as ventricular assist devices and organ transplantation
- accept patients transferred from other hospitals
- maintain facilities and staffing resources to manage up to ten patients on ECMO simultaneously
- provide staff training and support other health services towards accreditation within the VES.

Tier two: intermediate ECMO centres

An intermediate ECMO centre should:

- manage more than 20 ECMO patients per year
- provide all forms of ECMO
- manage patients throughout the course of their illness
- initiate ECMO, manage complications and wean patients from ECMO
- transfer complex patients and those who require assessment for long term supports or destination therapies to a comprehensive centre
- accept patients transferred from other hospitals
- maintain facilities and staffing resources to manage up to three patients on ECMO simultaneously
- support staff training and support other health services towards accreditation with the VES.

Tier three: initiation sites

In order to offer equity across the state for patients that require time-critical access to ECMO support, a number of hospitals should be designated by the department to develop the skills, processes and facilities to initiate patients on ECMO.

These sites will be established at hospitals that offer either high-volume interventional cardiac services available 24 hours a day seven days a week, or cardiothoracic services and be accredited as part of the Victorian ECMO Service.

An initiation site should:

- be able to initiate ECMO in less than 60 minutes
- refer all patients who meet the referral criteria to the Victorian ECMO Service coordination service for discussion, decision support and retrieval planning
- transfer ECMO patients and potential ECMO patients to comprehensive or intermediate centres
- maintain facilities and staffing resources to manage a patient on ECMO for up to 48 hours while awaiting retrieval

Patients not appropriate for ongoing ECMO care will not be retrieved and would continue to be cared for at the initiation site.

All other hospitals

Most hospitals across the state will not provide ECMO services. These hospitals still form an important part of the Victorian ECMO Service.

All hospitals not accredited to initiate or manage ECMO should:

- refer all patients who meet the referral criteria to the Victorian ECMO Service coordination service for discussion, decision support and retrieval planning
- transfer ECMO patients and potential ECMO patients to comprehensive or intermediate centres.

Eligible patients will either have ECMO initiated at the hospital by an ECMO retrieval team or will be transported to an intermediate or comprehensive centre for consideration of ECMO initiation there. Patients not appropriate for ECMO care will not be retrieved and would continue to be cared for at the initiation site.

GOVERNANCE

There does not appear to be an existing structure in which the governance of the Victorian ECMO Service could sit. Our working group proposes a Victorian ECMO Service governance committee be established to provide statewide oversight of the clinical and operational maintenance and performance of the service (Table 1).

We recommend the committee include staff from all participating health services across all tiers of the service, consumers, representatives from hospitals not accredited to participate in the service, as well as representatives from the department and Safer Care Victoria (Table 1). Coordination of the committee could be the role of the comprehensive ECMO centre, Ambulance Victoria or the department. All of these options are likely to require some additional resources. Additional resource would be required to extract and analyse data and prepare reports on a regular basis.

The committee should meet two to three times per year to monitor the service, review referred cases and coordinate ongoing education. Identified performance issues or system vulnerabilities should be escalated to the department. The committee should also be responsible for reviewing and updating guidelines, training programs and accreditation standards in line with new evidence and international best practice (Table 1).

At a health service level, Ambulance Victoria and accredited hospitals should remain responsible for maintaining their ECMO service to the accreditation standards including staff credentialing, equipment management and reviewing local outcomes and performance.

Table 1: Governance structure of the Victorian ECMO Service

Level of governance	Responsibilities	Data sources	Key personnel	Frequency
Health service, hospital or Ambulance Victoria	• Credential staff • Meet and maintain accreditation standards • Manage equipment • Review clinical and service outcomes including mortality and morbidity reviews and consumer and clinicians experience • Report feedback, clinical registry and administrative data	Local hospital data including consumer and clinician experience	• ECMO Program Director • ECMO Coordinator • Consumer	As required
Statewide governance committee	• Review comparative outcome and service performance including consumer and clinician experience • Undertake case and service reviews • Identify and escalate outliers and system vulnerabilities • Maintain consumer information resources, guidelines, protocols and accreditation criteria	• ANZICS clinical registries • Ambulance Victoria • Victorian Admitted Episode Dataset • Consumer and clinician experience surveys • VAHI	Clinician and executive representatives from: • comprehensive and intermediate sites • initiation sites • non-accredited hospitals • Ambulance Victoria	2-3 times per year

			• consumers • the department • SCV • VAHI	
Department of Health and Human Services	• Designate and accredit hospitals • Manage outliers and performance issues	• Health services • Victorian ECMO Service governance committee • VAHI • SCV	• Health services policy and commissioning • Consumers	As required

MONITORING AND PERFORMANCE

Clinical and operational data collection

Data should be collected to monitor ECMO activities across the state and:

- ensure high-quality care is being provided
- identify areas of concern or vulnerability
- identify areas for improvement.

Clinical and operational data should be drawn from the following sources:

- Ambulance Victoria's Adult Retrieval Victoria Information System and quality assurance reports
- Australia and New Zealand Intensive Care Society registries' (ANZICS) ECMO dataset
- the department's administrative datasets including Victorian Admitted Episodes Dataset (VAED)

This data will capture all patients referred for ECMO and ideally patients considered for ECMO. All patients who are established on ECMO will be captured in the VAED.

Our working group recommends that all comprehensive, intermediate and initiation sites and those hospitals with an ICU submit data to the ANZICS ECMO dataset, even if the patient is not admitted to the ICU. For sites without an ICU this data would be submitted by the retrieval team. Comprehensive and intermediate ECMO centres will also be expected to contribute to the international Extracorporeal Life Support Organisation (ELSO) registry.

Resources will be required to extract, analyse, report and interpret this data. This process should involve clinicians and consumers with expertise in data as well as representatives from the department, SCV and VAHI.

We recommend that identified vulnerabilities and outliers be escalated to the department for further investigation and response (Table 1). SCV and the VAHI may have roles in supporting these functions.

Details of the proposed data collection and reporting requirements are included in appendix 1.

Feedback and consumer experience surveys

A formal feedback process should be established as part of the Victorian ECMO Service (Diagram 1).This will measure consumer and clinician experience of the service, and support continuous improvement. Feedback should be collected from:

- consumers including patients, patient's family, carers and medical treatment decision makers (MTDM)
- clinicians including nursing, medical, perfusion and allied health staff from referring units including initiation sites
- clinicians from the Victorian ECMO Service coordination and retrieval teams and comprehensive and intermediate centres.

Diagram 1: Feedback process

The consumer experience surveys designed for the Victorian ECMO Service are drawn from the Australian Hospital Patient Experience Question Set and are similar to the Victorian Healthcare Experience Survey (VHES).

The current delivery methods of the VHES do not allow for surveys to target individual patients who receive specific treatments at the level desired by our working group. Future developments may allow for targeted feedback via the VHES.

Feedback and consumer experience surveys will be coordinated by the ECMO coordinator at comprehensive and intermediate centres. Results will be collated and reviewed within the Victorian ECMO Service governance structure (Appendix 2 and 5).

Details of the feedback processes including drafts of surveys can be found in appendix 2.

STATEWIDE EQUIPMENT MANAGEMENT

ECMO requires a specific set of equipment to be available and maintained ready for immediate use.

Managing equipment

Managing equipment, both consumable and non-consumable, should remain the responsibility of individual hospitals. The ECMO coordinator or perfusion department at each hospital will be responsible for ensuring adequate equipment is available and maintained according to manufacturer requirements.

Our working group recommends initiation sites with smaller numbers of ECMO patients should be able to exchange short-expiry stock with longer expiry stock from comprehensive and intermediate ECMO centres. The larger ECMO programs are likely to use significantly more consumables and this process should reduce waste. Resources to manage this process may be required.

Procuring equipment

To maximise patient safety, all hospitals participating in the Victorian ECMO Service should use the same types of ECMO equipment and consumables. This will also have economic benefits.

Our working group recommends procurement of ECMO equipment and consumables should be coordinated by the comprehensive ECMO centre. Health Purchasing Victoria advise a model similar to the Victorian Respiratory Support Service is preferred.

Consultation and coordination

This section outlines how clinical advice, referral and retrieval should operate within the Victorian ECMO Service.

PATIENT REFERRAL AND CLINICAL ADVICE

A single point of contact is needed for clinicians to discuss and refer patients to the Victorian ECMO Service. The establishment of a 24-hour consultation, coordination, retrieval and transfer service to support clinical staff and manage ECMO beds across the state would meet this need.

Our working group recommends that the Victorian ECMO Service use the established teleconference and coordination staff in the Adult Retrieval Service at Ambulance Victoria. In addition to the established team, this service will require immediate access to an ECMO advice specialist, probably by an on-call arrangement.

The Victorian ECMO Service coordination service should:

- operate 24 hours a day on every day of the year
- receive referrals from clinicians across Victoria 24 hours a day, seven days per week
- provide management and decision support
- involve other clinical experts when required, for example transplant physicians, toxicologists
- determine eligibility of the patient for ECMO and retrieval
- determine retrieval requirements and destination centre
- maintain and use a statewide ECMO bed management system (an update to the current software platform, REACH, would be required)
- arrange and coordinate the retrieval of patients to comprehensive or intermediate centres.

ECMO advice specialists should:

- be a College of Intensive Care Medicine fellow
- have greater than five years continuous ECMO experience
- work in either a comprehensive or intermediate centre
- be exclusively rostered to the Victorian ECMO Service coordination service. When rostered, ECMO Advice Specialists need to be available immediately which means they cannot be rostered on for other duties.

PATIENT RETRIEVAL

Our working group recommends ECMO retrievals be incorporated as part of the current systems and platforms operated by Ambulance Victoria. In addition, two credentialed ECMO retrievalists will be required for transfer of a patient on ECMO. Like the ECMO advice specialists, an on-call arrangement would probably be needed.

An ECMO retrievalist should:

- work with the retrieval team to safely transfer patients to comprehensive or intermediate centres
- be credentialed to participate in ECMO retrievals
- be credentialed as an ECMO cannulator
- work in a comprehensive, intermediate or initiation centre/site
- be exclusively rostered to the Victorian ECMO Service for retrievals. When rostered the ECMO retrievalists need to be available immediately 24 hours a day, which means they cannot be rostered on for other duties.

Detailed descriptions of the referral and retrieval pathways can be found in appendix 3. Pathways have undergone logic testing for content and flow of information (appendix 8).

Details of credentialing requirements including credentialing checklists can be found in appendix 6.

Clinical criteria for ECMO

This section outlines the patient eligibility criteria and tools developed to support clinical decision making about patients considered for ECMO across Victoria.

We have developed a patient eligibility criteria protocol which considers the benefit of ECMO, referral, initiation, withdrawing and weaning criteria. These criteria have been developed using the best available evidence, published guidelines from around the world and expert opinion.

Our clinical criteria cover the following areas of the service:

Referral

- Includes clinical triggers for referring patients for ECMO
- Includes pre-procedural referral for planning of high-risk cardiac surgery and interventional cardiology patients.

Eligibility

Includes decision-making tools for determining eligibility based on diagnostic groups, comorbidities and physiological derangements.

Initiation

Focuses on preventing delayed support.

Weaning

Provides guidance on when and how to assess patients are ready to wean support.

Withdrawing support

Offers guidance to help you asses if a patient can be withdrawn from ECMO.

A detailed description of each criteria can be found in appendix 4. The protocol was tested during routine ECMO referrals to the Alfred (appendix 8).

Hospital accreditation

This section outlines the proposed facility, capability and staffing expectations public and private hospitals will need to meet to be accredited to participate in the Victorian ECMO Service at any tier.

Hospitals should be accredited to participate in the Victorian ECMO Service as comprehensive or intermediate centres or initiation sites.

We have developed an accreditation checklist which centres and sites can use to develop their program and self-assess on a regular basis, for example annually (appendix 5.7).

Under our current proposal accreditation of hospitals for the Victorian ECMO Service will be standalone. However, the capability requirements for accreditation also align with the cardiac clinical capability framework and the critical care core capability framework being developed by the department.

While the requirements for accreditation are outlined here; the service designation and accreditation process will be determined by the department. Our working group recommends this accreditation process involve ECMO experts and consumers and that hospital accreditation is reviewed every three years.

ACCREDITATION REQUIREMENTS

Accreditation requirements for each tier should reflect the increasing complexity of service delivery:

Initiation sites

Need to be able to safely commence ECMO and manage a patient for up to 48 hours.

Intermediate centres

Need to be able to provide care to patients for the entire treatment duration but not provide destination or definitive treatments, for example ventricular assist devices and transplantation.

Comprehensive centre

Need to be able to provide destination or definitive treatments, in addition to all requirements expected of intermediate centres and initiation sites.

Criteria for accreditation

- Hospital capability including operating theatres, cardiac catheter laboratory and intensive care units
- Clinical staff including essential roles:
  - ECMO program director
  - ECMO coordinator
  - ECMO specialist roles – responsible for bedside management of the patient and ECMO
  - ECMO lead – to oversee management of patients
  - ECMO cannulators

- Perfusionists (comprehensive and intermediate centres only)
- Cardiac surgery staff (comprehensive and intermediate centres only).

- Bedside care model
- Equipment
- Activation and escalation process
- Quality assurance and improvement
- ECMO program

More detail on the accreditation requirements for each tier of service can be found in appendix 5. We have also developed and tested individual accreditation checklists (see appendix 5.7 and 8.3).

Clinician credentialing

This section outlines the methods and expectations for credentialing of clinicians providing care for patients on ECMO.

All clinicians who care directly for patients receiving ECMO should be credentialed. We have outlined credentialing requirements for specific roles defined in the Victorian ECMO Service at both the hospital level and the coordination and retrieval service level.

Individual health services should be responsible for credentialing clinicians to participate in their local ECMO program. To assist health services, the Victorian ECMO Service will be responsible for developing and maintaining guidelines and checklists.

We recommend re-credentialing occurs every two years and be tailored to a clinician's recent experience of ECMO practice. Our plan is to use a traffic light system for re-credentialing. If a staff member does not achieve the required re-credentialing components over a given time frame, the initial credentialing requirements will need to be met.

Our working group recommends a state register or passport of ECMO credentialing be developed to facilitate mutual recognition between health services. Resource would be required to support and maintain credentialing functions which may be incorporated into the same role identified to support the governance of the Victorian ECMO Service.

More details on credentialing requirements including credentialing checklists can be found in appendix 6.

Statewide training program

This section proposes a model to provide a statewide training program for all clinicians involved in the care of patients on ECMO.

As part of the Victorian ECMO Service a statewide training program should be designed. In line with the recommendations from the ECMO evidence review, the comprehensive centre will be responsible for training and supporting other health services to become accredited ECMO sites.

Staff members will be expected to complete components for credentialing purposes. Experienced members of teams from all comprehensive and intermediate ECMO centres should assist in providing ECMO education as part of credentialing and re-credentialing cycles.

The training program will involve multiple components to equip staff members with the skills to manage patients on ECMO:

Introductory ECMO course

- Basics of physiology and ECMO modalities
- Equipment orientation
- Patient selection
- Complications and emergency procedures

Hospital-based training program

Overseen by ECMO program director including:

- Theoretical components
    - Equipment
    - patient management
    - circuit management
    - complications
    - weaning
- Practical components (wet-lab training)
    - ECMO procedures
    - circuit procedures
- Simulation training
    - Troubleshooting
    - emergency scenarios

Cannulation course

For all clinicians participating in percutaneous cannulation techniques.

More details on the planned training program can be found in appendix 7.

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References

Abrams et al. (2018)

Position paper for the organization of ECMO programs for cardiac failure in adults. Intensive Care Med. 2018 Jun;44(6):717-729

Adult Retrieval Victoria (2017)

ARV Reference Manual.https://www.ambulance.vic.gov.au/about-us/our-services/adult-retrieval-victoria/#resources

Australian Commission on Safety and Quality in Health Care:

Australian Hospital Patient Experience Question Set. https://www.safetyandquality.gov.au/our-work/indicators-measurement-and-reporting/australian-hospital-patient-experience-question-set

BMJ best practice (2019)

Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria: https://bestpractice.bmj.com/topics/en-us/7/criteria

Brechot et al. (2013)

Venoarterial extracorporeal membrane oxygenation support for refractory cardiovascular dysfunction during severe bacterial septic shock. Crit Care Med 41, 1616-1626

Broman et al. (2019)

The ELSO Maastricht Treaty for ECLS Nomenclature: abbreviations for cannulation configuration in extracorporeal life support - a position paper of the Extracorporeal Life Support Organization. Crit Care. 2019 Feb 8;23(1):36. doi: 10.1186/s13054-019-2334-8

Cardiac Society of Australia and New Zealand (2016)

Guidelines on support facilities for coronary angiography and percutaneous coronary intervention. https://www.csanz.edu.au/resources/

Combes et al. (2014)

A Position paper for the organization of extracorporeal membrane oxygenation programs for acute respiratory failure in adult patients. Am J Respir Crit Care Med. 2014 Sep 1;190(5):488-96

Combes et al. (2018)

Extracorporeal Membrane Oxygenation for Severe Acute Respiratory Distress Syndrome. N Engl J Med. 2018 May 24;378(21):1965-1975

Extracorporeal Life Support Organization (ELSO)

(2010): ELSO guidelines for training and continuing education of ECMO specialists

(2013): Guidelines for ECPR Cases

(2013): Guidelines for Adult Cardiac Failure.

(2014): ELSO guidelines for ECMO Centres

(2017): General Guidelines for all ECLS Cases

(2017): Guidelines for Adult Respiratory Failure. https://www.elso.org/Resources/Guidelines.aspx

Falk et al. (2019)

Extracorporeal Membrane Oxygenation for Septic Shock. Crit Care Med. 2019 Aug;47(8):1097-1105

New Zealand Ministry of Health: Service model Extra Corporeal Membrane Oxygenation (ECMO) (2017)

https://nsfl.health.govt.nz/national-services/service-models-consultation

Ortuno et al. (2019)

Weaning from veno-arterial extra-corporeal membrane oxygenation: which strategy to use? Ann Cardiothorac Surg. 2019;8(1):E1–E8

Peek et al. (2009)

Efficacy and economic assessment of conventional ventilatory support versus extracorporeal membrane oxygenation for severe adult respiratory failure (CESAR): a multicentre randomised controlled trial. Lancet. 2009 Oct 17;374(9698):1351-63

Riera et al. (2018)

Extracorporeal Membrane Oxygenation for Adults With Refractory Septic Shock. ASAIO J. 2018 Oct 10. doi: 10.1097/MAT.0000000000000905

Schmidt et al.

(2014): Predicting survival after extracorporeal membrane oxygenation for severe acute respiratory failure. The Respiratory Extracorporeal Membrane Oxygenation Survival Prediction (RESP) score. Am J Respir Crit Care Med. 2014 Jun 1;189(11):1374-82

(2015): Predicting survival after ECMO for refractory cardiogenic shock: the survival after veno-arterial-ECMO (SAVE)-score. Eur Heart J. 2015 Sep 1;36(33):2246-56

Shaukat et al. (2018)

Outcomes of ECMO support for complex high-risk elective PCI: a single-center experience and review of the literature. J invasive cardiology 2018;30(12):456-460

University of Wisconsin Hospitals and Clinics authority (2018)

Extracorporeal Membrane Oxygenation (ECMO): Initiation and Management– Adult – Inpatient – Clinical Practice Guideline. https://www.uwhealth.org/cckm/cpg/respiratory/related/

Vogel et al. (2018)

Veno-arterio-venous ECMO for septic cardiomyopathy: a single-centre experience. Perfusion. 2018 May;33(1_suppl):57-64

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