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| **ECMO Orders** |
| **Purpose** | This process describes how to provide specific blood product requirements for patients undergoing extracorporeal membrane oxygenation (ECMO). |
| **Policy Statements** | * A minimum of 4-Mpls (2 STP) O Neg Leukocyte Reduced RBC (additive solution) units ≤ 7 days will be maintained on “Reserve” in inventory at all times for emergency ECMO initiation.
* Leukocyte Reduced red cells (AS-1/AS-3) used for ECMO prime or re-prime must be no more than 7 days old.
* Spin and remove additive solution just prior to issue on red cells units used for initial ECMO prime for patients <4 months of age
* One < 7 day old, O Neg Leukocyte Reduced CPDA-1 will be on reserve for emergency release for patients on ECMO.
* Irradiated red cells and platelets for all infants less than 4 months old throughout that admission period. (Red cells irradiate just prior to issue.)
* Leukocyte reduced red cells for infants less than 4 months old must lack Hgb S while the infant is on ECMO.
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| **Definitions** | RBC (additive solution)-red blood cells with additive solution of AS-1, AS-3, or AS-5.SDP-Single Donor Platelets (apheresis platelet, pheresed platelet) |
| **Related Documents** | [TSja 03.15.1 ECMO Transfusion Protocol](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/Res/JobA/199769.pdf) |
| **Process** |  |
|  | Activity | Key Considerations | Related Document |
| Initiation of ECMO | 1 | Fresh RBCs that are ≤ 7 days old |

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| **If** | **Then** |
| Patient is < 4 months old | Spin two units group O Neg  |
| Patient ≥ 4 months old and blood type has not been determined on a current sample | Allocate the number O negative units ordered \*\*See below for switching to group specific RBCs |
| Patient ≥ 4 months old and blood type has been determined on a current sample | Allocate the number of group specific/Rh compatible red cells units ordered |

* Spin additional fresh units per physician or
* ECMO Coordinator’s order for patients <4 months of age.
* Leukocyte Reduced CPDA-1 may be used in an emergency if time does not allow the spinning and removal of additive solution.
* Notify the physician and transfusion medicine specialist on call if units < 7 days old are not available.
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|  | 2 | Remove additive solution  | infants <4 months old or per provider’s orders | [TS 10.20 Removing Additive Solution](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/BCP/202357.pdf) |
|  | 3 | Irradiate red cell units as needed  | Infants < 4 months old or per provider’s orders. |  |
|  | 4 | Test RBCs for Hgb S  | Infants < 4 months old or per provider’s orders. | [TS 7.16 Sickle (Hgb S) Testing Red Cell Products](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/BPOrd/202476.pdf) |
|  | 5 | Allocate and tag units for issue.  | Follow Emergency Release Process if issue of units requested prior to completion of required pre-transfusion testing. | [TS 12.1 Allocating of Red Cell Products Under a UXM-SQ](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/Alloc/202511.pdf)[TS 4.20 Compatibility Testing-Electronic Crossmatch](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/PatTest/202236.pdf)[TS 13.3 Allocating and Issuing of Blood Products for Emergency Release](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/EmRel/202813.pdf) |
|  | 6 | Assess platelet inventory. |

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| **If** | **Then** |
| Full ABO compatible SDP available. | Place label on plt rotator to reserve unit for patient. |
|  Platelets not available. | Order unit STAT from blood center. |

 | [TS 7.3 Ordering Blood Products-MBC](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/BPOrd/202330.pdf)[TS 7.4 Ordering Blood Products-ARC](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/BPOrd/202915.pdf) |
|  | 7 | Thaw and allocate FFP and cryoprecipitate per orders. |  | [TS 3.13 Plasma Orders](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/OrdProc/202201.pdf)[TS 3.14 Cryoprecipitate Orders](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/OrdProc/202202.pdf) |
|  | 8 | Prepare and allocate platelets per orders.  |  | [TS 3.8 Platelet Orders](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/OrdProc/202196.pdf) |
|  | 9 | Assess inventory and place order with blood center as needed. | * Replace the 2 “Reserve” ≤ 7 day old O Neg RBC units.
* Order fresh < 7 day RBC as needed for standby prime:
1. Infants < 4 months old: 2 group O, Rh compatible RBCs.
2. Patient’s > 4 months old: 2-4 ABO/Rh compatible RBCs.
3. Patient > 25Kg order 4 units.
* Order SDP platelets as need to maintain a minimum of 1 transfusion dose on standby.
 | [TS 7.3 Ordering Blood Products-MBC](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/BPOrd/202330.pdf)[TS 7.4 Ordering Blood Products-ARC](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/BPOrd/202915.pdf) |
|  | 10 | Issue products in cooler or pneumatic tube as requested. |  | [TS 12.5 Issue of Products](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/Alloc/202493.pdf) |
|  | 11 | Prepare RBC products for standing orders. |  |  |
|  | 12 | Post ECMO case on BB Refrig |  | [TSf 3.15.1 NECMO](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/Res/Mplsf/200100.pdf)[TSf 3.15.2 PECMO](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/Res/Mplsf/200101.pdf) |
| **\*\*Note: Switching patients from group O Red Cells to group specific (A, B, AB)**

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| **If** | **Then** |
| Patients 4- 12 months | Crossmatch one unit of group specific red cells by IS tube technique using a fresh, post-transfusion specimen.* If compatible, group specific units may be issued following standard crossmatch protocol. [TS 3.4 Crossmatch-RBC Orders for Patients over 4 months](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/OrdProc/202193.pdf)
* If incompatible, continue to issue group O red cells
 |
| Patients > 1 year old | Switch to group specific once the recipient’s ABO/Rh has been determined on a current specimen |

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| **Standing orders while patient is on ECMO up to 12 hours post-decannulation.** |
|  | Infant < 4 months old  | RBCs criteria for re-prime or massive blood loss. | RBCs criteria for routine transfusion.  |
| 2 units RBCs (additive solution)* Group O, Rh compatible
* ≤ 7 day old
* Hgb S negative
* Pre-spin units see a
* Remove additive just prior to issue
* Irradiate just prior to issue
 | Select a fresh CPDA-1 RBC* Group O, Rh compatible
* Continue to use from unit regardless of age
* Hgb S negative
* Irradiate aliquots just prior to issue
 |
| Patient > 4 months old | RBCs criteria for re-prime or massive blood loss. | RBCs criteria for routine transfusion.  |
| 2-4 units RBCs (additive solution) (Number of units to be determined by ECMO coordinator)* Group specific/Rh compatible. see b
* Crossmatch compatible
* ≤7 days old
* Irradiate prior to issue per provider order
 | 1 to 2 units RBCs (additive solution) * Group specific/Rh compatible see b
* Crossmatch compatible
* No unit age requirements unless specified by ECMO coordinator
* Irradiate prior to issue per provider order
 |
| * 1. *Additive red cell units may sit spun for up to 5 days. After 5 days, resuspend units. Do NOT re-spin the same unit. Designate spun units as Prime or Routine transfusion.* [TSja 03.0.2 Priming Unit Tag](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/Res/JobA/199765.pdf)

 [TSja 03.0.4 Routine Transfusion Tag](http://khan.childrensmn.org/Manuals/Lab/SOP/TS/Res/JobA/199766.pdf)* 1. *If the group O red cells were used for the initial prime, the patient may be switched to group specific (e.g. A, B, or AB) red cells immediately if patient > 1 year old. If recipient is 4-12 month old, then group specific (E.g. A, B, or AB) red cells must be crossmatched through IS with a* ***new*** *post-group O transfusion specimen.*
 |
|  | Platelets | 1-1/2 Group specific SDP* Patients < 4 months: pre-irradiated
* Patients > 4 months; Pre-irradiate per physician order
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| **Approval****Workflow** | Transfusion Service/Medical Director |
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| **Historical Record** | **Version** | **Written/Revised by:** | **Effective Date:** | **Summary of Revisions** |
| 1 | J Wenzel | 3/11/1998 | Initial Version |
| 2 | J Wenzel | 11/2000 | Reserved O Neg RBC |
| 3 | J Wenzel | 6/28/2002 | Hgb S requirements |
| 4 | J Wenzel | 5/16/2003 |  |
| 5 | J Wenzel | 12/17/2009 | Online format |
| 6 | J Wenzel | 4/10/2012 | Link to jobaid vs appendixAdded information to switch to type specific. |
|  | 7 | S Cassidy | 11/06/15 | Change ≤ 5 days to ≤7 days |
|  | 8 | S Cassidy | 06/01/2022 | Change requirements on RBCs for patient >4 months of age. |