



# THE FLOW



"We're in the business of hope"

-Micheal Heard, RN

*May you all have a safe and joyous holiday season!!*

*Happy Holidays & Seasons Greetings from ELSO!!*



## ELSO / SCCM ECMO Management Workshop

01/20/2017 - 01/21/2017 <http://www.sccm.org/Congress>

Location: Honolulu, Hawaii

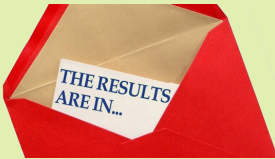


**→→ Please Register Here Now ←←**

Space is limited and filling up quickly



### From the Registry Committee



The registry continues to benefit from the feedback of its members. In September the ELSO registry underwent many changes in how data was inputted. Notably, the registry moved from ICD-9 to ICD-10 diagnostic codes. The ELSO registry also changed how it recorded procedures moving from CPT codes to ICD-10 Procedure Codes.

In the case of procedure codes we received numerous emails about difficulties with ICD 10 procedures codes. In response to this concern we sent out a survey to all ELSO centers and the responses indicated that ELSO centers would like to return to CPT codes for procedures. We hope to continue to be responsive to your feedback so thank you much for helping us make the ELSO registry meet your needs. We will of course stay with ICD 10 for diagnostic codes.

## AWARD UPDATE

**THE ELSO AWARD  
FOR EXCELLENCE  
IN LIFE SUPPORT**

**NEW ONLINE APPLICATION**

**APPLY**

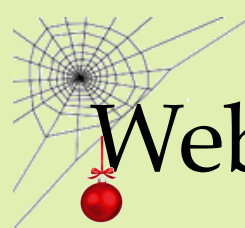
**DECEMBER 1 - APRIL 1, 2017**



### Registry Forms Deadline

All forms must be in the registry by January 14, 2017 in order to be included in the next set of reports.





# Website Corner



## Discussion Board Topics of the Month

These are the hottest topics. Stop by and provide your input!

**13fr VV Cannulas:** What experience do centers have with the Avalon 13fr given the delays in the Origen 13fr double-lumen cannula?

**Routine Surveillance Cultures:** Are folks still doing routine cultures for ECMO?

**Adult Protocols:** A center looking to expand indications for adult ECMO beyond H1N1 is looking for your help in setting inclusion/exclusion criteria.

## Keep those questions coming!

In the past month, we have had **19 new posts** by your fellow ELSO members looking for your input. Log in and find out what folks are talking about and provide your input!



## Discussion Board Contributor of the Month

Congratulations to Gillian Wylie, RGN, RSCN from the Royal Hospital for Children / Queen Elizabeth University Hospital in Glasgow, Scotland. Thanks for your great questions and keep those posts coming!

Please Take My Survey

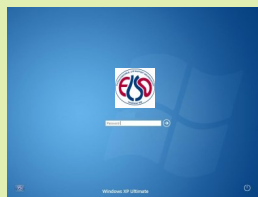
## Fellow Pediatric Critical Care Physicians and Trainees:

We would like to ask for your participation in our research project, which is to identify, characterize, and help to define the ethical considerations associated with withdrawal of a Ventricular Assist Device (VAD) or Extracorporeal Membrane Oxygenation (ECMO) circuits in patients in a Pediatric Intensive Care Unit (PICU) or a Pediatric Cardiothoracic Intensive Care Unit (PCTICU).

Because of your expertise in working with critically ill children in the ICU, we would appreciate no more than 5-10 minutes of your time to complete this survey. Your participation is completely voluntary. Your completion of the survey will serve as your consent to participate in the study.

Click [here](#) to take the survey: Thank you in advance for your help!

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Leanna Huard MD ([lhuard@mednet.ucla.edu](mailto:lhuard@mednet.ucla.edu)),  
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Mattel Children's Hospital  
Division of Critical Care



## Logging On

All ELSO Member institutions have an Administrative Account for your ELSO Registry data entry. This account can create separate accounts for your local physicians and ECMO Specialists. Contact your local ECMO Coordinator to get your accounts set up!



## Communication Committee Update

Preparation for the 5<sup>th</sup> Edition of the Red Book continues and is approaching conclusion. Work has begun on producing an eBook version of the Spanish version of the 4<sup>th</sup> Edition of the Red Book. Gail Annich is leading the charge on producing the 4<sup>th</sup> Edition of the Specialist Manual. We are also beginning work on the ECMO App.



## Get Involved

A standing committee meeting will take place in Keystone, Colorado 2017. All of those interested in becoming more involved in ELSO are welcomed to attend. Details to follow in the next newsletter.



# Management Moments



By Omar Al-Ibrahim, MD, FAAP

Chief, Division of Pediatric Critical Care

Medical Director, Pediatric Intensive Care Unit

UBMD Pediatrics

Medical Director, ECMO and Apheresis Programs

Managing a low volume ECMO center can be very challenging. Maintaining competency of ECMO specialists & physicians is a priority. In our center, we've adopted a philosophy of continuous medical education by providing consistent exposure variety of educational activities throughout the year. These activities range from didactics, to sessions to discuss clinical scenarios, "wet-labs", ECLS simulation, debriefing sessions & monthly ECLS QA meetings.

We have created a schedule that includes monthly meetings that detail & clarify that philosophy. We try to adhere to it as much as possible with the idea of being flexible at times to accommodate.

ECMO meetings happen the first Wednesday of each month at 5 pm.

Attendance to these meetings is crucial. Attendance rate of 80% is required. 100% attendance to wet-labs is required.

| <i>Month</i> | <i>Events</i>  |
|--------------|--|
| January      | PICU RN ECMO class<br>Wet Labs**                               |
| February     | Didactics*<br>Discuss Upcoming ECMO national meetings          |
| March        | Didactics*   |
| April        | Didactics*<br>Wet labs**                                       |
| May          | Simulation session   |
| June         | Didactics*   |
| July         | Annual test<br>Hemochron (i-STAT) competency                   |
| August       | Wet Labs**   |
| September    | Simulation session   |
| October      | Didactics*<br>Wet labs**                                       |
| November     | ESLO meeting review<br>Discuss Upcoming ECMO national meetings |
| December     | Simulation session   |

\*Didactics would include:

Lectures: VA ECMO, VV, anticoagulation, troubleshoot, ECMO circuit parts & design...

Clinical Scenarios & quizzes

New ECLS related publications

Case discussions & debriefing sessions

\*\*Wet-labs: to train ECMO specialist in emergency procedures in case of sudden circuit failure or other events that require immediate discontinuation of ECMO support

This approach has been working well. Our ECMO specialists are very eager to attend, learn, & participate in these discussions. Our program has received the ELSO award of excellence four consecutive times beginning in 2009 (2009, 2011, 2013, and 2016).

Special recognition & thanks to Cathleen Ducato, our program coordinator for more than 15 years. She is a great resource, very dedicated & has been a wonderful asset to the program. She is leading a great team of ECMO specialist who got the recognition by the hospital administration consistently. She also is the Apheresis Program coordinator since its development in 2009. Both programs are growing & have been evolving progressively over the last few years serving well the critically ill children in our community.



# Bedside with Dr. Bartlett

Dr. Bartlett is considered by many to be the “father” of ECMO. He has a vast amount of experience and has faced many critical situations and decisions. In this newsletter series, he will join us on ECMO rounds at the bedside.

A 16 year old 80 kg boy was placed on VV-ECMO for respiratory support 2 days following chest trauma. On the third ECMO day he begins to bleed from the chest tube in his right chest. He is bleeding 500 cc/hr. We stopped the heparin altogether and gave him some platelets but the bleeding is still continuing at 300 cc/hr.

## *What is happening and what should we do?*

At the time of the injury and placement of chest tubes, bleeding from the lung and chest wall stopped when clots formed in the damaged small vessels. Normally, when those clots lyse the fibrin network seals the damaged vessels. But when the patient is anticoagulated new fibrin doesn't form and bleeding starts again. Stopping the heparin helps, but clot in the pleural space is lysing and producing fibrin split products (measured as d-dimers) which act as anticoagulants.

We could slow fibrinolysis with Amicar or tranexamic acid. We could transfuse the freshest platelets the blood bank can provide. If protein clotting factors are depleted (measured after heparin is stopped) we can restore them with fresh frozen plasma or cryoprecipitate. We could enhance fibrin formation by giving recombinant factor 7 (it can clot the circuit, have a primed circuit available).

If these measures do not stop the bleeding, major vessels are open and direct closure (by thoracoscopy or thoracotomy, usually thoracotomy) is needed. When is surgical intervention indicated in major bleeding? My rule of thumb is half a blood volume in 24 hours or less. His blood volume is 5.6 liters (7% of body weight), so transfusion of 2.8 liters or 6 units of blood is the time to go to the OR. If you wait too long the coagulopathy of multiple transfusions complicates the problem.

Clearing clot, ligating bleeding vessels, coagulating bleeding sites and chest tube holes will stop the bleeding, but leave the chest packed and open, because you will need to look again when bleeding starts in a day or two. Close the chest when he is off ECMO and off anticoagulation. You would think that this would lead to infection, but it very rarely does.

**Is there a question or clinical situation that you would like to consult**

**Dr. Bartlett with? Send your question to [newsletter@elso.org](mailto:newsletter@elso.org)**





# The Changing Face of ECMO

By Charlie Nix, RN

Advanced Technologies Specialist, Children's Healthcare of Atlanta

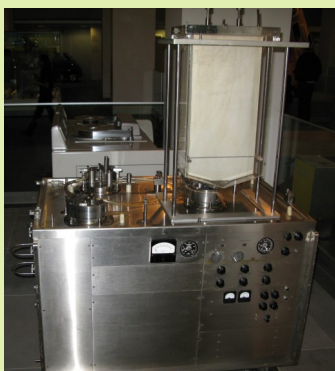


Recent events have me thinking about how the face of ECMO has changed over the years. In the early years, ECMO was primarily used in the neonatal ICU for babies with some form of PPHN, usually Meconium Aspiration Syndrome (MAS). Once ECMO was proven effective in the neonatal population, it began to be used more frequently in the pediatric population for patients with respiratory failure, RSV, and overwhelming sepsis. As ECMO experience continued to evolve, its use moved more towards the cardiac population. In recent years, the use of ECMO for adult patients has literally exploded. It is intriguing to look back at the ELSO registry in 1990 and compare it to today's numbers.

The chart below shows the dramatic shift of ECMO utilization from neonates to the adult population. If you combined all of the neonatal and pediatric cases, the total would equal only a little more than half of the entire adult cases last year. Compare this to 1990 where there were only a total of 21 adult ECMO cases vs 1623 neonate and pediatric. In addition to the trend shifting from neonate to adults, the amount of cardiac vs respiratory cases has also shifted. In 1990 there were 1476 respiratory cases compared to 168 cardiac cases. Looking at 2015, the total number of respiratory cases (neo and ped) is comparable to the number of cardiac cases (2640/2566). Cardiothoracic surgeons are now performing surgeries on patients, who 10 years ago, would never have been candidates. Because of this trend, cardiac ECMO cases have increased in both neonatal and pediatric populations. The adult population has changed as well, following the trend from respiratory to cardiac use.

Roller pumps were used for many years with great success, but as the population of ECMO has changed so has the technology. Both centrifugal and roller pumps were utilized in the early stages of ECMO, but the first generation of centrifugal pumps created too much hemolysis, making roller head systems the pump of choice for many years. Technology has evolved in such a way that hemolysis on the centrifugal pump system is now comparable to the roller. With the benefits offered by centrifugal pump technology, most ECMO programs use centrifugal systems as their primary ECMO pump. Between the years of 2005 and 2015 the use of roller heads has decreased from 75% to 10% of all ELSO registered cases. Circuits are now much more simplistic than ever before, one system combining the pump and oxygenator into one unit. Even in the early 2000's it could take up to 8 units of blood to prime an adult ECMO circuit. Today it can be done with as little as one unit and many initiate with a just crystalloid prime. The face of ECMO has changed since its inception. It is an ever evolving technology and we as caregivers must be open to this change in order to better serve the patients we care for.

|                   | 1990 | 2015 |
|-------------------|------|------|
| Neo Respiratory   | 1348 | 627  |
| Neo Cardiac       | 86   | 336  |
| Ped Respiratory   | 108  | 445  |
| Ped Cardiac       | 81   | 461  |
| Adult Respiratory | 20   | 4568 |
| Adult Cardiac     | 1    | 1769 |



References:  
ECMO Registry of the Extracorporeal Life Support Organization (ELSO), Ann Arbor, Michigan, November, 2016.  
Toomasian, John "Re: Centrifugal vs Roller." Message to Charlie Nix. 11 November 2016. E-mail

# ECMO Center Spotlight: Brigham & Women's Hospital



Working at the Brigham & Women's Hospital in the Respiratory Care Department has always inspired me to achieve higher goals, because we work in an environment that encourages us to reach out past our boundaries to accomplish the best patient care possible. When Dr. Phil Camp, a Thoracic Surgeon, posed the question, how can we start an ECMO program, we relied on those same boundless ideals that have been instilled in us and accepted the challenge. Where do you begin when you start a program? Well, we were very fortunate here at the Brigham & Women's Hospital. We had Respiratory Therapists who had been previously trained in other ECMO programs and we found Gary Oldenburg and the community of ELSO. Gary set up a training program for us, gave us confidence and guidance and was an unwavering champion in our corner. We were also fortunate enough to be neighbors with Peter Betit, along with his team at Boston Children's Hospital, and Dr. Kacmarek from Massachusetts General Hospital who was always willing to provide us with ideas or just let us observe.



**Brenda Graham**

It is now four years later, we have 18 Respiratory Therapists on our team, and added Executive Director, Dr. Hari Mallidi along with a great support system of physicians ranging from Pulmonary, Hematology, Renal, Cardiac, Anesthesia and Thoracic Surgery. We run our program with a multi-disciplinary approach working side by side with nursing, pharmacy, physical therapy and perfusion. Over this time frame, we have achieved a 65% success rate overall, on over 90 patients. We started with 20 patients in the first two years and have expanded to over 50 this year. We have been able to start an ambulation program for our bridge to lung transplant patients, bridged to VAD's for others and answered the call for our respiratory failure patients with ARDS, H1N1 and pneumonia. Our longest ECMO patient was on our service for 6 months until she was able to obtain a lung transplant, she is home with her family now and doing well. Our biggest achievement: offering hope to a population of patient's that otherwise may not have survived without our ECMO program.



**Gina Applegate**

As an ECMO Coordinator, I am probably the most fortunate. I have an outstanding team and they are truly the heart and soul of the program. They saw it, believed it and made it happen and continue to



**Maria Smolynsky putting Dr. Phil Camp in the Iron Lung during RT Week**

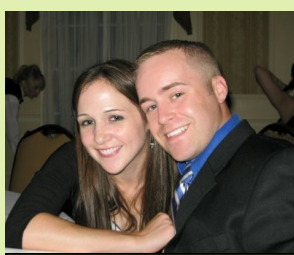
do so every single day with every single patient. We have met our challenges, but throughout them all, ELSO and the community has always been there for us. I sometimes say to the staff, it's like having 60 of the best hospitals caring for the patient when you're a member of ELSO. When we have had questions, Columbia, Michigan and Children's has always answered our call.



**Kevin Vaughan - RT ECMO Specialist**

I am sure it is cliché, but we are a great program and a great team. We offer a decentralized ECMO service. Our specialists go to where the patients are, and don't necessarily need to cohort all our patients in one location throughout the hospital. Although, it does take effort to ensure that the units are capable of caring for these patients, we feel that the non-ECMO aspects of care are better served when patients are managed locally in specialized intensive care units." We have an excellent survival rate, infection control rate and a remarkably small technical error rate. We consistently review our practices, always reflecting on how we can achieve better care and attain the best outcomes. The key to all of this has been the out pouring of support, leadership and education. We get that from our ECMO physicians; you can often find, even after normal business hours, that Dr. Hari Mallidi will help us put "finishing touches" on our patient care plans, or our Medical Director, Dr. Gerald Weinhouse coming to support our staff and ensure we are all doing well.

We want to be an asset to our patients, our hospital and our community. We feel that we have achieved this and we only hope we can pay it forward in our turn as the ELSO community has done for us.



**Adam and Trisha Smith**

Susan LaGambina, RRT  
Assistant Director, Respiratory Care  
ECMO Coordinator  
Brigham & Women's Hospital



**Sarah Mortell, Susan LaGambina, Meagan Muir, Maria Smolynsky**



#### **4th Annual SWACELSO Conference**

02/15/2017 - 02/18/2017

<http://elso-swac2017.org/>

Location: Doha, Qatar

[info@elso-swac2017.org](mailto:info@elso-swac2017.org)

#### **33rd Annual Children's National Symposium: ECMO and the Advanced Therapies for Respiratory Failure**

02/26/2017 - 03/02/2017 <http://www.cvent.com/d/1fqxtc>

Location: Keystone, Colorado USA

**Lisa Williams** 202-476-5919 [LIWILLIA@childrensnational.org](mailto:LIWILLIA@childrensnational.org)



#### **ELSO Adult ECMO Training Course**

04/05/2017 - 04/08/2017

Location: Emory Conference Center, Atlanta GA

Peter Rycus, MPH 734-998-6600 [prycus@elso.org](mailto:prycus@elso.org)

Registration will be opening in early 2017.



#### **Euro-ELSO 2017**

05/04/2017 - 05/07/2017

<http://www.euroelso.net/euroelso-2017.html>

Location: Maastricht, The Netherlands

#### **27th Annual Specialist Education in Extracorporeal Membrane Oxygenation (SEECMO) Conference**

06/02/2017 - 06/04/2017

Location: Children's Hospital Colorado - Aurora, CO

**Alexandria Wilkinson** 720-777-6948 [alexandria.wilkinson@childrenscolorado.org](mailto:alexandria.wilkinson@childrenscolorado.org)



#### **28th Annual ELSO Conference**

09/24/2017 - 09/27/2017

Location: Baltimore, MD

**Peter Rycus, MPH** 734-998-6601 [prycus@elso.org](mailto:prycus@elso.org)

28th Annual ELSO Conference September 25-27, Pre-Conference Symposium September 24-25.

Venue: Hilton Baltimore



## Facebook

If you use Facebook please visit our sites and “like” us! We intend to use Facebook as a way to present information to not only ELSO members but to anyone who is interested in our organization. [www.facebook.com/ELSO.org](http://www.facebook.com/ELSO.org)

Euro-ELSO Facebook page:  
[www.facebook.com/EuroELSO](http://www.facebook.com/EuroELSO)



## Twitter

Follow us on twitter!  
[www.twitter.com/ELSOOrg](http://www.twitter.com/ELSOOrg)



### Revised and updated 12/09/2016 (This replaces previous updates)

*Over the past month, ELSO Centers have reported difficulties obtaining a variety of disposables from Maquet Cardiopulmonary (Pediatric Quadrox ID and CardioHelp ) and have reached out to the ELSO leadership for guidance. ELSO has been able to obtain the following unofficial information:*

Concerns were raised regarding endotoxin testing procedures at the German manufacturer of Maquet disposables, including pediatric Quadrox oxygenators and CARDIOHELP disposables, leading to a product hold by Maquet. <http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfRes/res.cfm?ID=144531>. Also, Maquet is under an ongoing consent decree issued by a federal judge in New Hampshire. The company is encouraged about its progress since these events unfolded however; there are still lingering, intermittent product manufacturing and customs delays that may affect US product availability. Maquet has an updated consent decree progress report that is viewable at <http://www.atriummed.com/consentdecree>

Although this information is not new; lingering affects from the consent decree and backlog from the endotoxin manufacturing line shutdown are still causing intermittent product availability and allocation issues for Maquet.

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The ELSO Newsletter editorial team’s goal is to bring you a newsletter that is entertaining, informational, and educational. If you have any suggestions for improving the newsletter or would like to contribute content, please contact Joel Davis at [jdavis@elso.org](mailto:jdavis@elso.org).

Thank you from the ELSO Newsletter editorial team

Joel Davis, Kennethia Banks-Borden, Teka Siebenaler, Omar Al-Ibrahim, Terri Wells, Nandini Nair, Bruno Claro

