Extracorporeal Life Support Organization

ELSO Data Request Form for Publication

ELSODataRequest@elso.org

General Principles for using ELSO Registry data for Publication

1. ELSO supports the use of ELSO Registry data for research to improve the care of ECMO patients.
2. Released data must only be used to test the hypotheses included in the study proposal.
3. Investigators are allowed 12 months of exclusive access to the data for the questions articulated in the proposal.
4. I agree to only publish one (1) manuscript from this data request. This does not include abstracts for scientific meetings.
5. For all approved data requests, an approved Data Use Agreement for Publication must be signed before data will be released.

All requests for ELSO Registry data constitute my own work and that of the co-investigators included in this request. I acknowledge and agree to the Data Use Agreement for Publication. Please email the completed data request form to ELSODataRequest@elso.org.

ADMINISTRATIVE INFORMATION ***(Investigator has to complete all fields)***	
PROJECT and corresponding contact	
Principal Investigator(s)	Marc Anders
Organization	Texas Children's Hospital
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Co-Investigator(s) (please include role and ELSO Site)	Erika O'Neil, MD, TCH Emily Naomi, MD, MGH Taylor Olson, MD, NCH Peta Alexander, MD, BCH Ryan Barbaro, MD, UM Jamel Ortoleva, Tufts Medical Center, Boston, MA
Any additional person who will have access to the data?	Not applicable
ELSO CENTER	
Name of Center Director / Coordinator requesting data	Jim Thomas
Email address of Director / Coordinator	jathoma1@texaschildrens.org
Electronic Signature of Center Director / Coordinator	Jim Thomas
Date	10/12/2020
ELSO Center Name	Texas Children's Hospital
ELSO Center Number	102
DATA USE	
Publication in a peer-reviewed journal (yes/no)	Yes
Anticipated journal of submission? (specify)	ATS
I have existing data requests from ELSO? (yes/no) *If yes, provide updates for any released dataset*	Yes: ECMO in Influenza * manuscript prepared

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Overall Study Objective

Describe the characteristics, ECMO-related complications, and outcomes of peripartum patients requiring ECMO support for COVID-19 in comparison to the general COVID-19 population.

Study aims *(we encourage study aims to include a hypothesis)*

Peripartum patients supported with ECMO for COVID-19 have similar outcomes than a propensity matched cohort of non-pregnant females

Background and Significance

The pandemic associated with coronavirus SARS-CoV-2 and related clinical disease (COVID-19) has affected over 37 million people worldwide with over 1 million deaths.WHO The hormonal, cardiovascular physiology, and immunomodulatory changes during pregnancy increase susceptibility to respiratory infections and may predispose to severe presentations of the disease.CDC Additionally, reports of severe COVID-19 infections in pregnant and peripartum women and the fetal effects are emerging.[CDC,Kayem, Fiore, Hou, Knight]

Extracorporeal membrane oxygenation (ECMO) is an invasive support strategy for cardiac, respiratory, or combined cardiorespiratory failure when conventional treatment options have failed. ECMO has been successfully deployed for the management of critical illness in pregnant and postpartum patients, including during the previous pandemic.Nair, Naoum,Ramanathan The use of ECMO during the H1N1 pandemic saved many maternal and fetal lives, however, few studies report the use of pregnant and postpartum ECMO during this pandemic.[Nair,Kayem, Knight, Hou, Fiore, Barbaro]

Against this background, we would like to inverstigate maternal ECMO patients with COVID-19 induced ARDS extracted from ELSO, with maternal data and data on fetuses and neonates as possible.

Sample inclusion criteria *(defined by ICD-9 / ICD-10 codes, procedure codes, age, ECMO support type, e.g. 28 days to 18 years, pulmonary, 2018-2021 who had any mention of P27.1 ICD-10 diagnoses 2018-2021 who had any mention of P27.1 ICD-10 diagnoses)*

• Patients with Pregnancy and COVID-19 suspected or confirmed diagnosis by COVID-ELSO addendum
•ECMO recipients between 1/1/2020 and 12/31/2020

Sample exclusion criteria

• male patients with COVID-19 infections

Sample study years

1/1/2020-12/31/2020

Planned statistical analysis

We will use descriptive statistics for patients' demographics, pre-ECLS factors, comorbid diagnosis as listed in the COVID-19 addendum between the pregnant population and general COVID-19 population available on the webpage at the time of data query. We will calculate

odds ratios to identify ECMO related complications more or less frequent in the pregnant population.

Categorical and dichotomous variables will be expressed as exact numbers with percentages, whereas continuous variables will be expressed as median with 25th-75th interquartile ranges (IQR). Chi square analysis will be used to look for associations between categorical variables, whereas Wilcoxon-Mann-Whitney test will be used to compare non-normally distributed continuous variables. Statistical significance on univariate testing will be determined as $p < 0.05$ with inclusion cutoff for logistic regression analysis set as a probability value of < or = to 0.05. A multivariable logistic regression model will be developed to test patient demographics (age, weight), pre identified comorbidities for severe illness in COVID pregnancy (Age > 35, BMI > 30, preexisting Diabetes, History of pre Eclampsia, chronic Hypertension, gestational pre-Eclampsia or gestational Hypertension), pre-ECMO clinical factors (time from admission to ECLS start, time from intubation to ECLS start), cardiac arrest prior to ECMO (with or without ECPR), ECMO run factors (cannulation site, 24 hour blood gas/lactate), and selected ECLS complications (neurologic, pulmonary, hemorrhagic, thrombotic, renal, cardiovascular) for the primary outcome of hospital discharge. For all significant outcomes, we will report odds ratios (OR) as unit odds ratios with 95% confidence intervals. Pre ECMO variables and continuous variables obtained at 24 hours into the ECMO run will be additionally converted into groups corresponding to various interquartile ranges (0-25%iles, 25-50%iles, 50-75%iles, and 75-100%ile) for Kaplan-Meier survival analysis, which will be analyzed by Peto's log rank and Wilcoxon test. Statistical analyses will be carried out using JMP® (version 14, SAS, Cary, North Carolina, USA).

Relevant ELSO variables *(do not state – 'All Available', do not list dates)*
** for variables not listed in ELSO including addenda, the data request will be rejected:*

1. Add Patient:
a. Age
b. Sex
c. Race
d. Gravida
e. Gestational age
f. ECLS start time
g. Run Number
h. Support type
i. ECLS mode
2. Run Information:
a. Admission weight
b. Admission height
c. Intubation
3. Pre-ECLS Assessment:
a. Pre-ECLS Arterial Blood Gas (all included variables)
b. Pre-ECLS Ventilator Settings (all included variables)
c. Pre-ECLS Hemodynamics (all included variables)
4. Pre-ECLS Support:
b. Time from first intubation to ECLS start
c. Pre-ECLS cardiac arrest
d. Renal, Pulmonary and Other Support Codes
   i. Renal replacement therapy

ii. Inhaled Nitric Oxide
g. Medications (all included variables)
h. Vasoactive infusion (all included variables)
5. ECLS Assessment:
a. 24 hour ECLS Arterial Blood Gas (all included variables)
b. 24 hour ECLS Ventilator Settings (all included variables)
c. 24 hour ECLS Hemodynamics (all included variables)
d. Blood pump flow rates (all included variables)
e. ECLS Care (all included variables)
f. Cannulation site – arterial and venous including cannula size
6. Mode and Equipment:
a. Initial mode (all included variables)
b. Modes and Cannulations (all included variables)
c. Mode Conversion (all included variables)
7. Diagnoses:
a. COVID-19 addendum
8. CPT Procedure Codes: (procedures associated with PE or pregnancy related procedures)
9. ECLS Complications:
a. Mechanical Complications (all included variables)
b. Patient Complications
i. Patient hemorrhagic complications (all included variables)
ii. Patient Neurologic Complications (all included variables)
iii. Patient Renal Complications (all included variables)
iv. Patient Cardiovascular Complications (all included variables)
v. Patient Pulmonary Complications (all included variables)
vi. Patient Metabolic Complications (all included variables)
vii. Patient Limb Complications (all included variables)
10. Infections (all included variables)
11. Outcomes:
a. Discontinuation reason – we are specifically interested in patients receiving Lung Transplant post while on ECMO
b. Extubated
c. Extubation date
d. Discharged Alive
e. Date/Time ICU Discharge
f. Date/Time Hospital Discharge
g. Hospital discharge location
h. Death date/time

References *(please include references for cited works in background, significance, and methods)*

1. World Health Organization (WHO). Coronavirus disease (COVID-19) dashboard. 2020 https://covid19.who.int/
2. Chen YH, Keller J, Wang IT, et al. Pneumonia and pregnancy outcomes: A nationwide population-based study. Am J Obstet Gynecol 2012;207;288. e1-7.
3. Center for Disease Control and Prevention (CDC). Data on COVID-19 during pregnancy. 2020. https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/special-populations/pregnancy-data-on-covid-19.html

4. Kayem G, Lecarpentier E, Deruelle P, Bretelle F, Azria E, Blanc J, Bohec C, Bornes M, Ceccaldi PF, Chalet Y, Chauleur C, Cordier AG, Desbrière R, Doret M, Dreyfus M, Driessen M, Fermaut M, Gallot D, Garabédian C, Huissoud C, Luton D, Morel O, Perrotin F, Picone O, Rozenberg P, Sentilhes L, Sroussi J, Vayssière C, Verspyck E, Vivanti AJ, Winer N, Alessandrini V, Schmitz T. A snapshot of the Covid-19 pandemic among pregnant women in France. J Gynecol Obstet Hum Reprod. 2020 Sep;49(7):101826. doi: 10.1016/j.jogoh.2020.101826. Epub 2020 Jun 4. PMID: 32505805; PMCID: PMC7270811.
5. Fiore A, Piscitelli M, Adodo DK, et al. Successful Use of Extracorporeal Membrane Oxygenation Postpartum as Rescue Therapy in a Woman With COVID-19 [published online ahead of print, 2020 Aug 6]. J Cardiothorac Vasc Anesth. 2020;S1053-0770(20)30793-X. doi:10.1053/j.jvca.2020.07.088
6. Hou L, Li M, Guo K, et al. First successful treatment of a COVID-19 pregnant woman with severe ARDS by combining early mechanical ventilation and ECMO [published online ahead of print, 2020 Aug 21]. Heart Lung. 2020;S0147-9563(20)30359-9. doi:10.1016/j.hrtlng.2020.08.015
7. Knight M, Bunch K, Vousden N, et al. Characteristics and outcomes of pregnant women admitted to hospital with confirmed SARS-CoV-2 infection in the UK: national population-based cohort study. BMJ. 2020;369:m2107. Published 2020 Jun 8. doi:10.1136/bmj.m2107
8. Nair P, Davies AR, Beca J, et al. Extracorporeal membrane oxygenation for severe ARDS in pregnant and postpartum women during the 2009 H1N1 pandemic. Intensive Care Med. 2011;37(4):648-654. doi:10.1007/s00134-011-2138-z
9. Naoum EE, Chalupka A, Haft J, MacEachern M, Vandeven CJM, Easter SR, Maile M, Bateman BT, Bauer ME. Extracorporeal Life Support in Pregnancy: A Systematic Review. J Am Heart Assoc. 2020 Jul 7;9(13):e016072. doi: 10.1161/JAHA.119.016072. Epub 2020 Jun 24. PMID: 32578471.
10. Ramanathan K, Tan CS, Rycus P, et al. Extracorporeal Membrane Oxygenation in Pregnancy: An Analysis of the Extracorporeal Life Support Organization Registry. Crit Care Med. 2020;48(5):696-703. doi:10.1097/CCM.0000000000004269
11. Barbaro RP, MacLaren G, Boonstra PS, Iwashyna TJ, Slutsky AS, Fan E, Bartlett RH, Tonna JE, Hyslop R, Fanning JJ, Rycus PT, Hyer SJ, Anders MM, Agerstrand CL, Hryniewicz K, Diaz R, Lorusso R, Combes A, Brodie D; Extracorporeal Life Support Organization. Extracorporeal membrane oxygenation support in COVID-19: an international cohort study of the Extracorporeal Life Support Organization registry. Lancet. 2020 Oct 10;396(10257):1071-1078. doi: 10.1016/S0140-6736(20)32008-0. Epub 2020 Sep 25. Erratum in: Lancet. 2020 Oct 10;396(10257):1070. PMID: 32987008; PMCID: PMC7518880.

Previous ELSO publication(s) by the study team that support the team's ability to complete the work *(if no previous experience, please write N/A)*

Ramanathan K, Tan CS, Rycus P, Anders M, Lorusso R, Zhang JJY, MacLaren G. Extracorporeal Membrane Oxygenation in Pregnancy: An Analysis of the Extracorporeal Life Support Organization Registry. Crit Care Med. 2020 May; 48(5):696-703. PMID: 32191415.

O'Halloran CP, Thiagarajan RR, Yarlagadda VV, Barbaro RP, Nasr VG, Rycus P, Anders M, Alexander PMA. Outcomes of Infants Supported With Extracorporeal Membrane Oxygenation Using Centrifugal Versus Roller Pumps: An Analysis From the Extracorporeal Life Support Organization Registry. Pediatr Crit Care Med. 2019 12; 20(12):1177-1184. PMID: 31567621.

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Olson TL, O'Neil ER, Ramanathan K, Lorusso R, MacLaren G, Anders MM. Extracorporeal membrane oxygenation in peripartum cardiomyopathy: A review of the ELSO Registry. Int J Cardiol. 2020;311:71-76. doi:10.1016/j.ijcard.2020.03.006

C O'Halloran, V Yarlagadda, RP Barbaro, M Anders, P Rycus et al. Pump Type Does Not Affect Mortality in Children < 10kg Supported With Veno-Arterial ECMO for Cardiac Indications-An ELSO Registry Analysis. Circulation 138 (Suppl_1), A15528-A15528

Have any previous ELSO reviews for this hypothesis been published ? *(if yes, explain how your analysis will contribute to science, if no previous publications, please write N/A)*

N/A