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# Assessment of nutritional adequacy in patients on extracorporeal membrane oxygenation.

Hitoshi Hirose, MD, PhD

*Thomas Jefferson University, [Hitoshi.Hirose@Jefferson.edu](mailto:Hitoshi.Hirose@Jefferson.edu)*

Joseph Miessau, PA-C

*Thomas Jefferson University*

Evanthia Foliou, RD

*Thomas Jefferson University*

Pawel Karbowski, PA-C, MS

*Thomas Jefferson University*

Melanie K. Sion, MD

*Thomas Jefferson University, [Melanie.Sion@jefferson.edu](mailto:Melanie.Sion@jefferson.edu)*

*See next page for additional authors*

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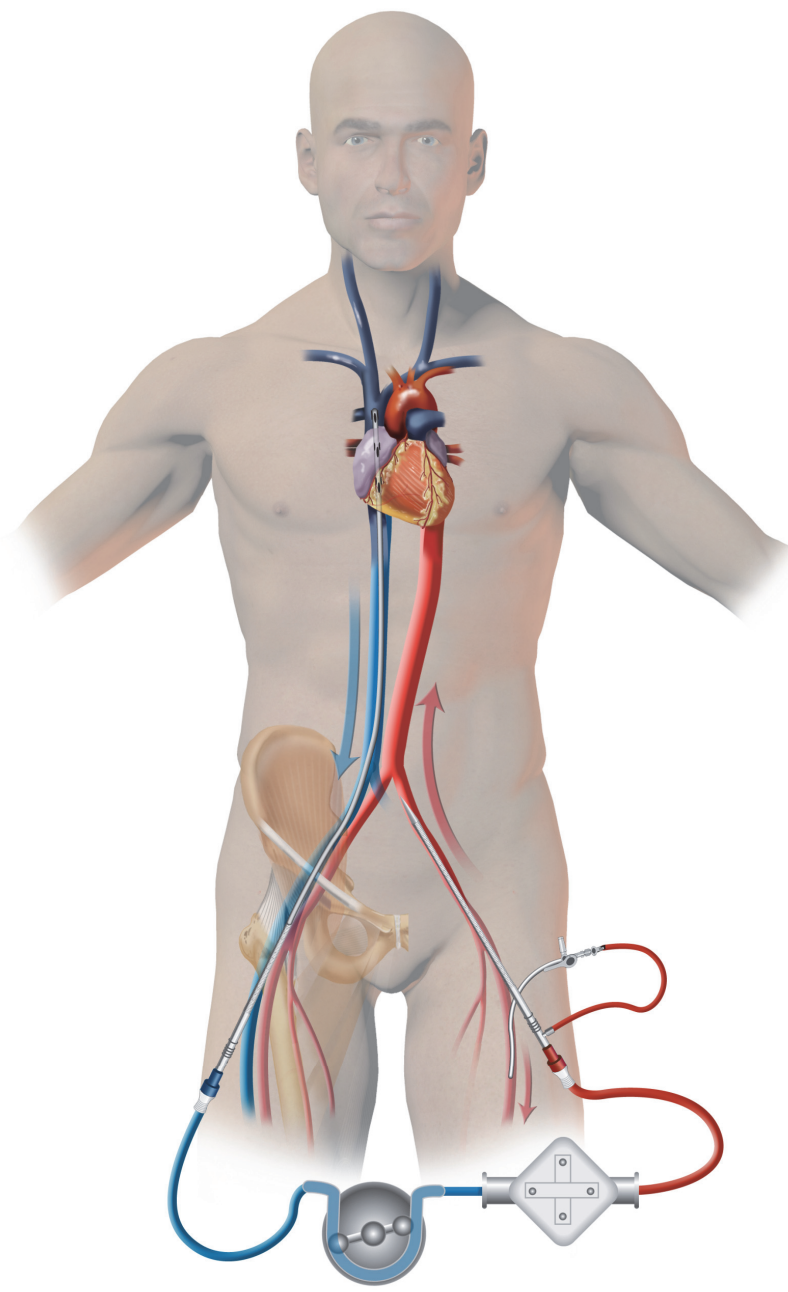
**Authors**

Hitoshi Hirose, MD, PhD; Joseph Miessau, PA-C; Evanthia Foliou, RD; Pawel Karbowski, PA-C, MS; Melanie K. Sion, MD; and Christine Feldmeier, MD

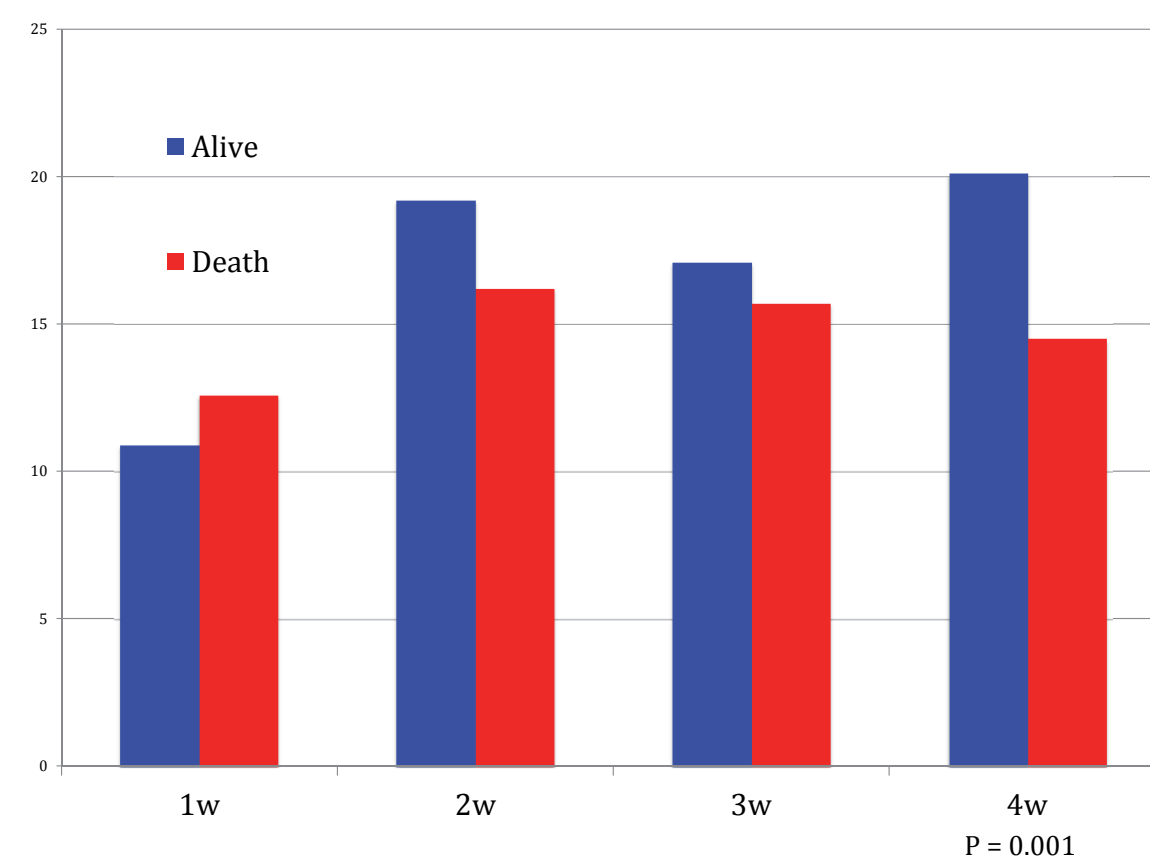
## Introduction

Nutrition is a key element of recovery from the state of critical illness. Little is known about nutritional adequacy in patients supported on extracorporeal membrane oxygenation (ECMO) for severe cardio-respiratory dysfunction. There are theoretical concerns regarding safety, timing and adequacy of calorie feedings in a hyper-metabolic state and the effect on morbidity and mortality.

## Veno-Arterial ECMO



## Serum Pre-Albumin in Survivors vs. Non-Survivors



## Methods

A retrospective review for ECMO patients.  
 Study period: July 2010 and June 2012

2 groups: survivors (16) and non-survivors (29).

Age, sex, preoperative comorbidities, type and duration of ECMO, day to initiation and goal feeding, caloric intake, weekly biomarkers, end-organ recovery and scores were compared between 2 groups.

Biomarkers:

- Pre-albumin
- Albumin
- C-reactive protein

Total Number of ECMO: 45  
 Venoarterial ECMO : 37  
 Venovenous ECMO : 8  
 17 patients with a BMI over 30  
 12 patient required total parenteral nutrition

## Nutritional Adequacy

Determining caloric requirement is difficult. The use of a metabolic cart to perform indirect calorimetry is not possible on ECMO. Patients on ECMO are unable to meet criteria for the best predictive equations.

Energy requirements for patients on ECMO are based on calories per body weight.

Caloric target : 25kcal/kg/day and adjusted accordingly for obese and underweight patients.

Protein requirements : 1.5-2.0g/kg/day per usual weight if normal weight and based on ideal body weight (IBW) if obese (Cresci).

Preferably enteral feedings were provided via post-pyloric tube.

TPN was an option enteral intolerance. Most commonly due to ileus or gastro-intestinal bleeding.

## Results

Age, sex, preoperative co-morbidity, type and duration of ECMO were similar in 2 groups.

Survivors had better preoperative SOFA scores , preoperative SAPS scores , and preoperative creatinine values.

All patients that survived were started on tube feeds within 2 days of ECMO initiation in contrast to 59% of non-survivors (P= 0.004).

88% of survivors versus 59% of non-survivors met adequate caloric feeding goals by day 3 (P= 0.04).

TPN was more frequently utilized in survivors in addition to tube feeds (50% vs 14%, p=0.009).

Pre-albumin values were similar between the 2 groups during the first 3 weeks, however were better in survivors by week 4 from ECMO initiation (20 mg/dl vs 14 mg/dl, p=0.001).

## Results

	Survivors	Non-Survivors	P value
N=45	16	29	
Age	42.5±14	47.9±12.5	0.2054
Male sex	9 (%)	14 (%)	0.6085
Venovenous ECMO	3 (%)	5 (%)	0.8992
BMI	29.2	30.5	0.6089
TPN Requirement	8 (%)	4 (%)	0.0086
Day TF initiated	1.3 ± 0.7	1.7 ± 1.0	0.1243
TF Goal by day 3	14 (%)	17 (%)	0.0452
Serum Albumin Week 4	3.8 ± 0.4	3.3 ± 0.6	0.0017
Serum pre-albumin Week 4	20.1 ± 5.1	14.5 ± 5.4	0.001
Pre-ECMO SOFA	11.2 ± 1.3	12.9 ± 3.0	0.0116
Post-ECMO SOFA	11.2 ± 1.9	13.9 ± 2.8	0.0004
Pre-ECMO SAPS	52.3 ± 11.6	61.7 ± 11.3	0.0119
Post-ECMO SAPS	41.2 ± 11.0	56.1 ± 15.4	0.0005
Pre Creatinine	1.2 ± 0.7	1.8 ± 1.1	0.0310
Post Creatinine	0.8 ± 0.4	1.4 ± 0.8	0.0017
Pre-ECMO SAPS (>50)	6 (%)	14 (%)	0.4862
Post-ECMO SAPS (>50)	2 (%)	12 (%)	0.0452

## Discussion

Previous publications and our observation regarding to nutrition on ECMO lead to similar conclusions;

- 1) enteral feeding is safe
- 2) enteral feeding did not increase the adverse events
- 3) delay of the achievement of nutritional goal was not avoidable
- 4) no standard protocol for nutritional support for ECMO has been determined
- 5) residual gastric volume was handled in the institutional based policy
- 6) ECMO patients were treated differently from other critical ill patients although the nutritional calculation was based on other non-ECMO critically ill patient data

## Conclusion

We found that the patients who were started on feeds earlier and the patients who met calorie goals in the earlier stages after initiation of ECMO had lower mortality, although other factors may contribute to survival as well. Our data underscores the importance of establishing a goal oriented regimen for these patients, early in their course while on ECMO.

## Contact information

Nicholas Cavarocchi, MD.  
 Nicholas.Cavarocchi@Jefferson.edu

Professor of Surgery  
 Division of Cardiothoracic Surgery  
 Thomas Jefferson University