

La decisione di candidare un paziente all' ECMO. Elementi clinici, dati di laboratorio, ecocardiografia e RM per richiedere l'intervento dello shock team.

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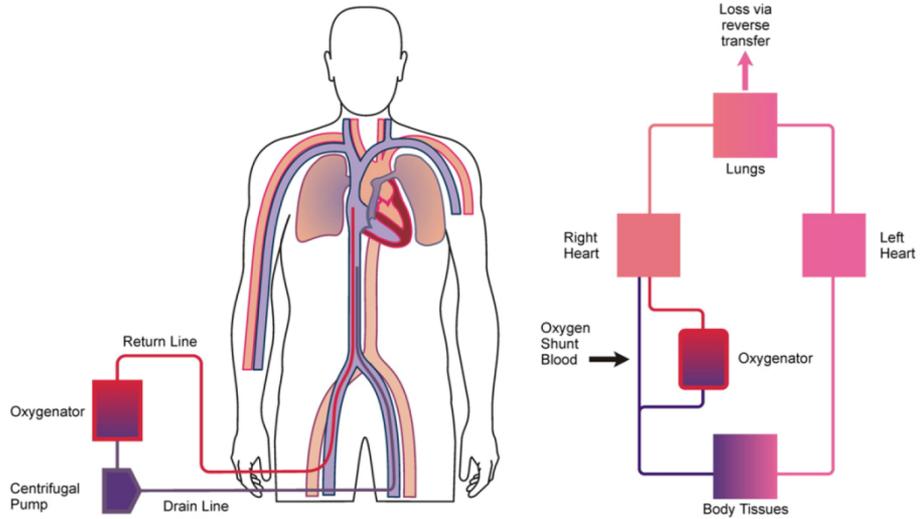
2017



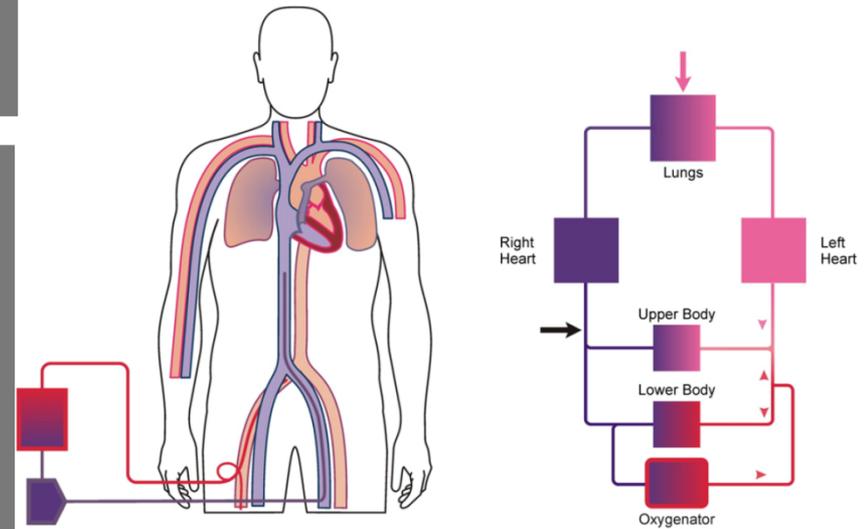
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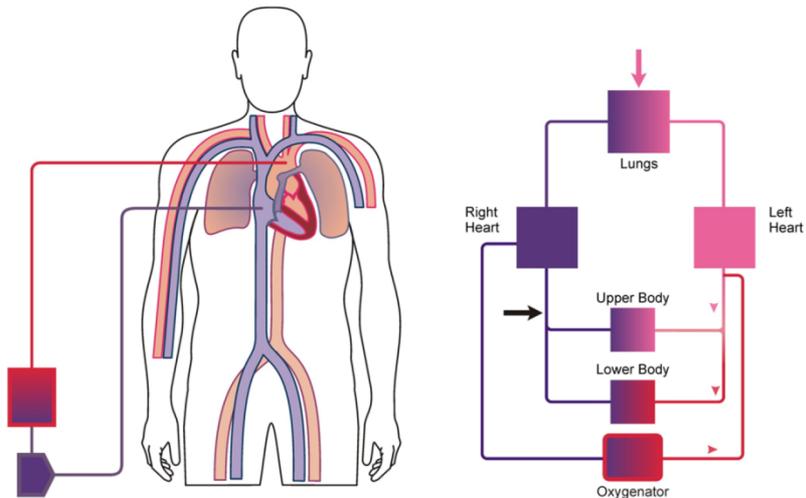
VENO-VENOUS ECMO



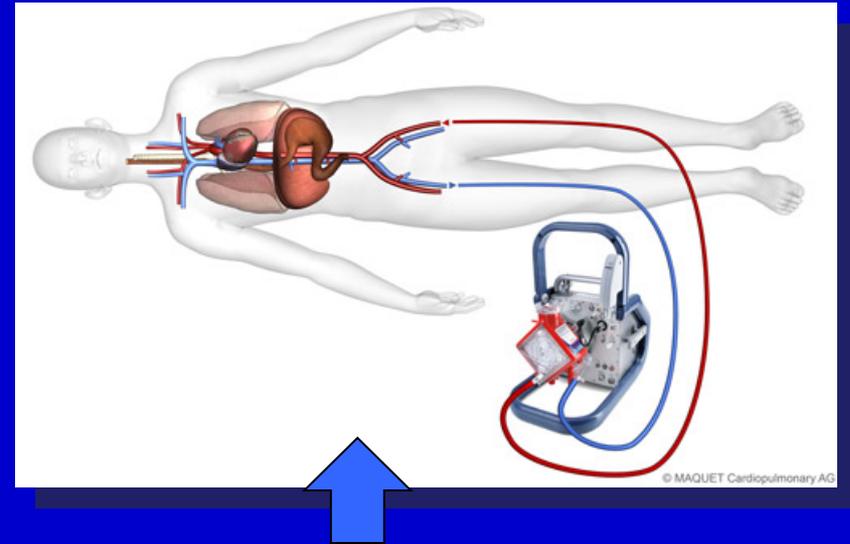
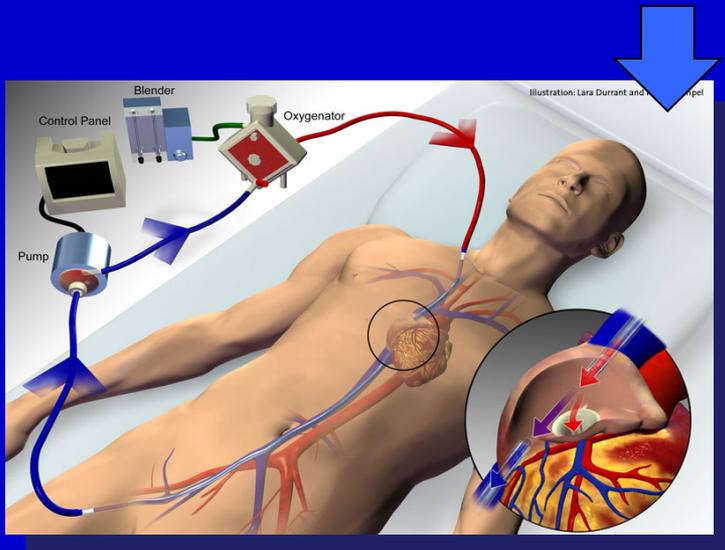
VENO-ARTERIAL ECMO



VENO-ARTERIAL ECMO



VV ECMO is currently indicated for potentially reversible, life threatening respiratory failure where conventional ventilatory strategies are failing and where native cardiac function is adequate (VV ECMO provides no direct circulatory support)

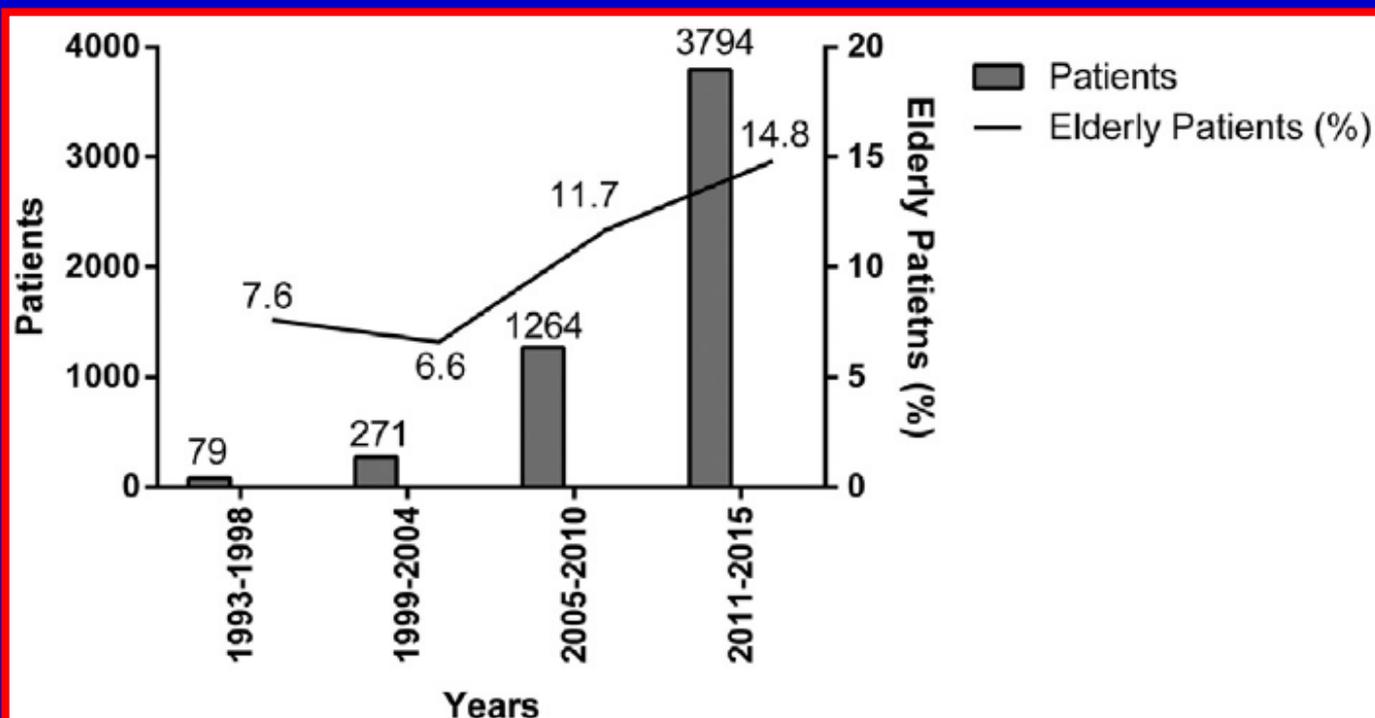


Venoarterial ECMO is currently indicated for potentially reversible cardiogenic shock (bridge to recovery), or as a bridge to more definitive long-term cardiovascular support in patients who are suitable for ventricular assist device (VAD) or heart transplantation.

Venoarterial Extracorporeal Membrane Oxygenation for Refractory Cardiogenic Shock in Elderly Patients: Trends in Application and Outcome From the Extracorporeal Life Support Organization (ELSO) Registry

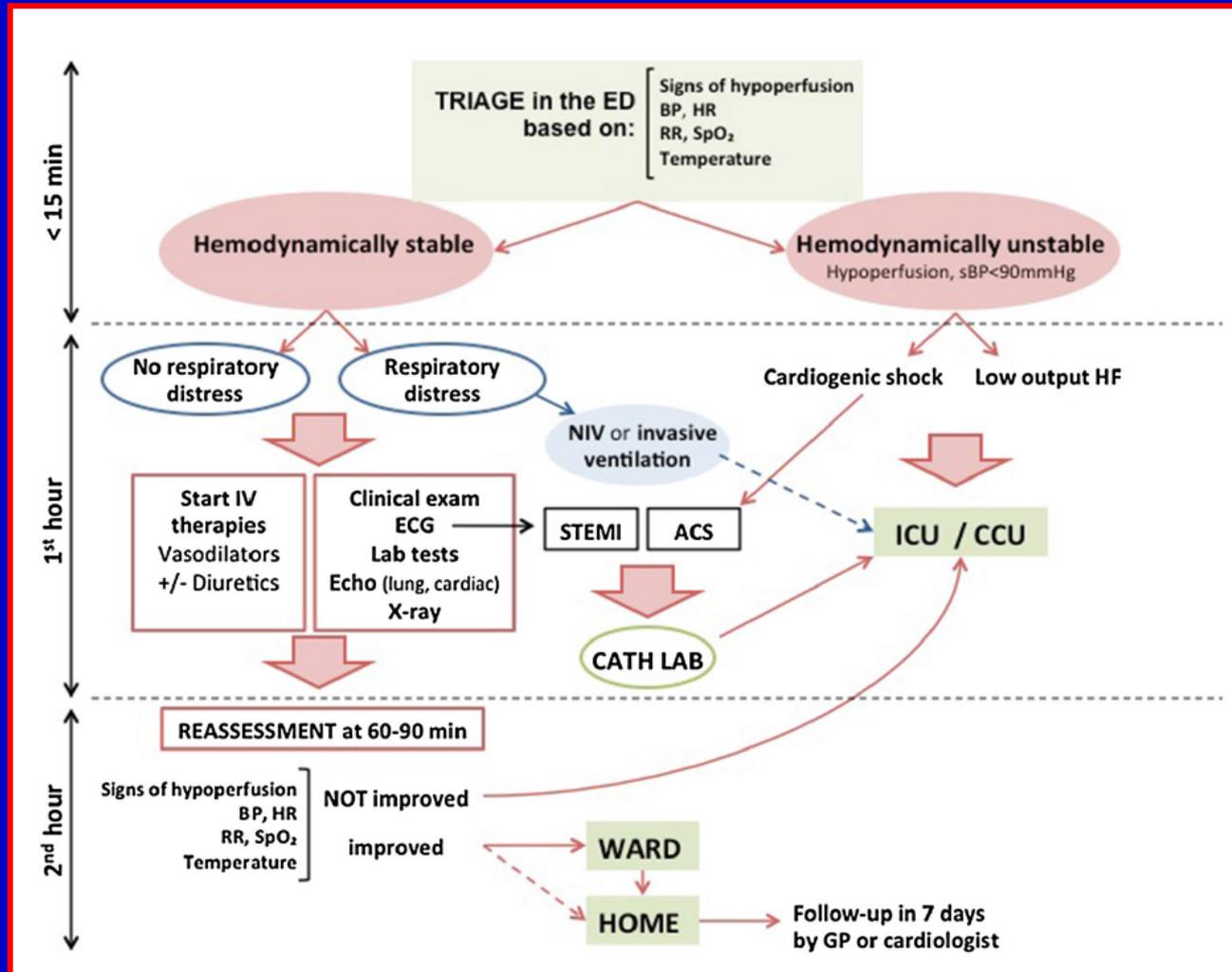
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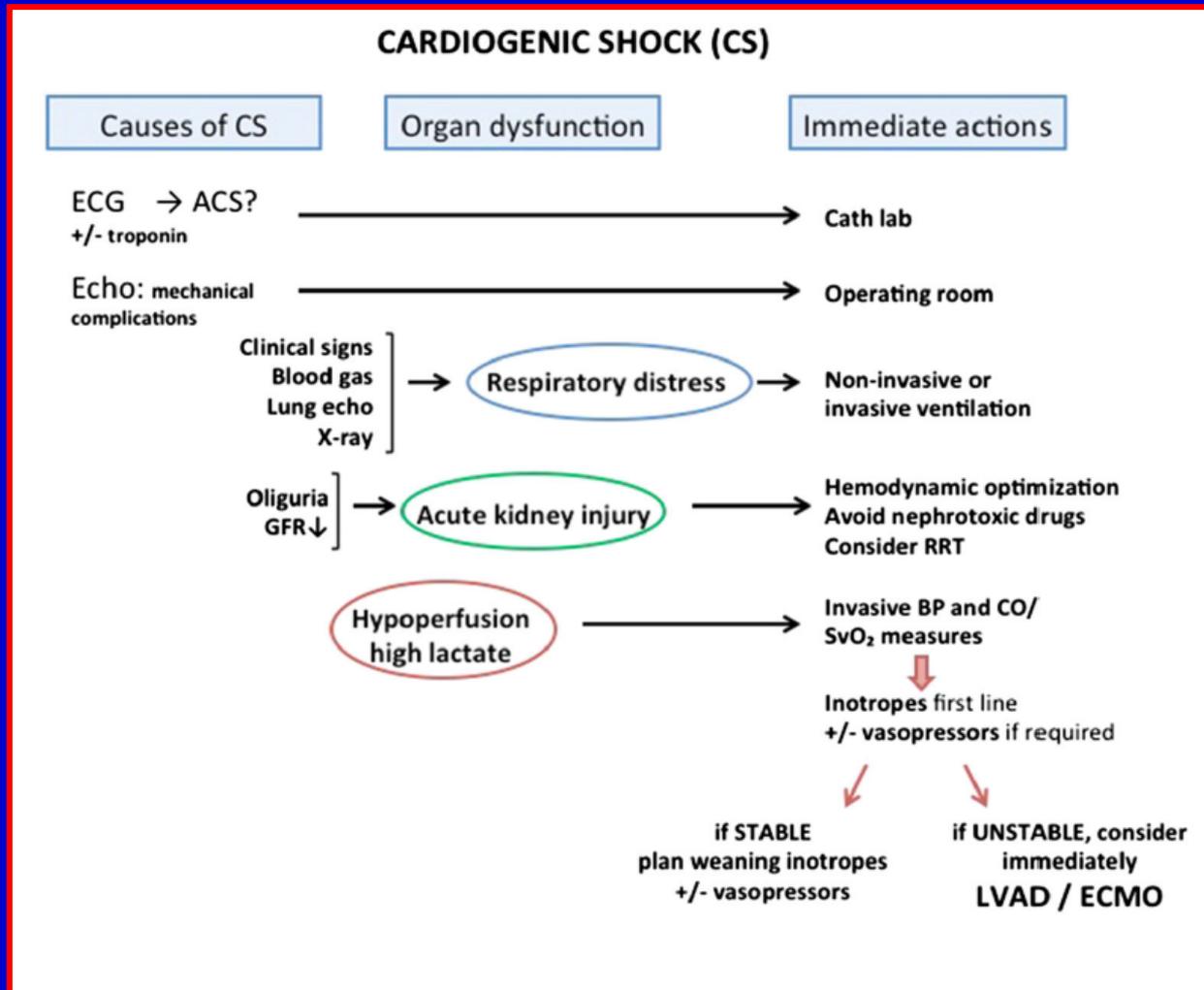
Acute heart failure and cardiogenic shock: a multidisciplinary practical guidance

A. Mebazaa Intensive Care Med (2016)



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Pazienti candidabili al supporto cardiocircolatorio con ECMO v-a

Pazienti di età compresa tra i 18 e i 65 anni con quadro di shock cardiogeno refrattario (evidenza di ipossia tissutale pur in presenza di un adeguato volume intravascolare, ipotensione arteriosa prolungata, ridotto indice cardiaco (< 2.2 L/min/m²), nonostante infusione di catecolamine ad alte dosi, dovuto a:

- 1. Disfunzione miocardica acuta secondaria ad infarto miocardico acuto e/o su complicanze*
- 2. Miocardite acuta/fulminante*
- 3. Overdose di farmaci con marcata depressione sistolica*
- 4. Embolia polmonare severa*
- 5. Cardiomiopatia del periparto*

Nell'insufficienza cardiaca

Indicazioni:

- *Shock cardiogeno refrattario*
- *IMA*
- *Intossicazione farmacologica*
- *Miocardite*
- *Ipotermia accidentale*

Nell'insufficienza cardiaca

Indicazioni

- *arresto cardiocircolatorio intraospedaliero:*
- *testimoniato (inizio manovre ALS entro 5 minuti dall'ACC)*
- *refrattario (mancata ripresa di emodinamica soddisfacente dopo 20 min di manovre rianimatorie correttamente condotte e nonostante la correzione di eventuali fattori concomitanti, come tamponamento cardiaco, PNX, ipovolemia)*
- *da causa potenzialmente reversibile o in paziente già in lista per trapianto cardiaco*
- *con quadro neurologico potenzialmente recuperabile o in alternativa eleggibilità a “codice alba”*
- *età \leq 65 anni*

Nell'insufficienza cardiaca

Indicazioni:

- *Arresto cardiocircolatorio extra-odpedaliero refrattario, primitivo con i seguenti*

Criteri di esclusione:

- *Età \leq 65 anni*
- *Arresto non testimoniato*
- *Comorbidità gravi*
- *Tempo di no-flow (ACC-BLS) $>$ 5 minuti*
- *Tempo di low-flow (ACC-cannulazione) $>$ 100 minuti*

Venoarterial Extracorporeal Membrane Oxygenation for Refractory Cardiogenic Shock in Elderly Patients: Trends in Application and Outcome From the Extracorporeal Life Support Organization (ELSO) Registry

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Variable	Elderly Patients (≥70 Years of Age) n = 735	No Elderly Patients (<70 Years of Age) n = 4,673	p Value
Age, years	75.3 ± 4.5	49.5 ± 13.8	<0.001
70–79	611		
≥80	124		
Gender			
Male	464 (63.9)	3111 (67.5)	0.053
Female	262 (36.1)	1495 (32.5)	
Weight, kg	78.5 ± 18.8	80.5 ± 22.1	0.011
Diagnostic groups			
Cardiogenic shock	130 (17.7)	888 (19.0)	0.416
Cardiac arrest (prior to ECMO application)	35 (4.8)	252 (5.4)	0.536
Coronary atherosclerosis	71 (9.7)	177 (3.8)	<0.001
Heart failure, unspecified	20 (2.7)	190 (4.1)	0.081
Acute myocardial infarction	26 (3.5)	152 (3.3)	0.657
Acute myocardial infarction	25 (3.4)	150 (3.2)	0.738
Vasopressor/inotropic drugs	397 (54.0)	2751 (58.9)	0.014

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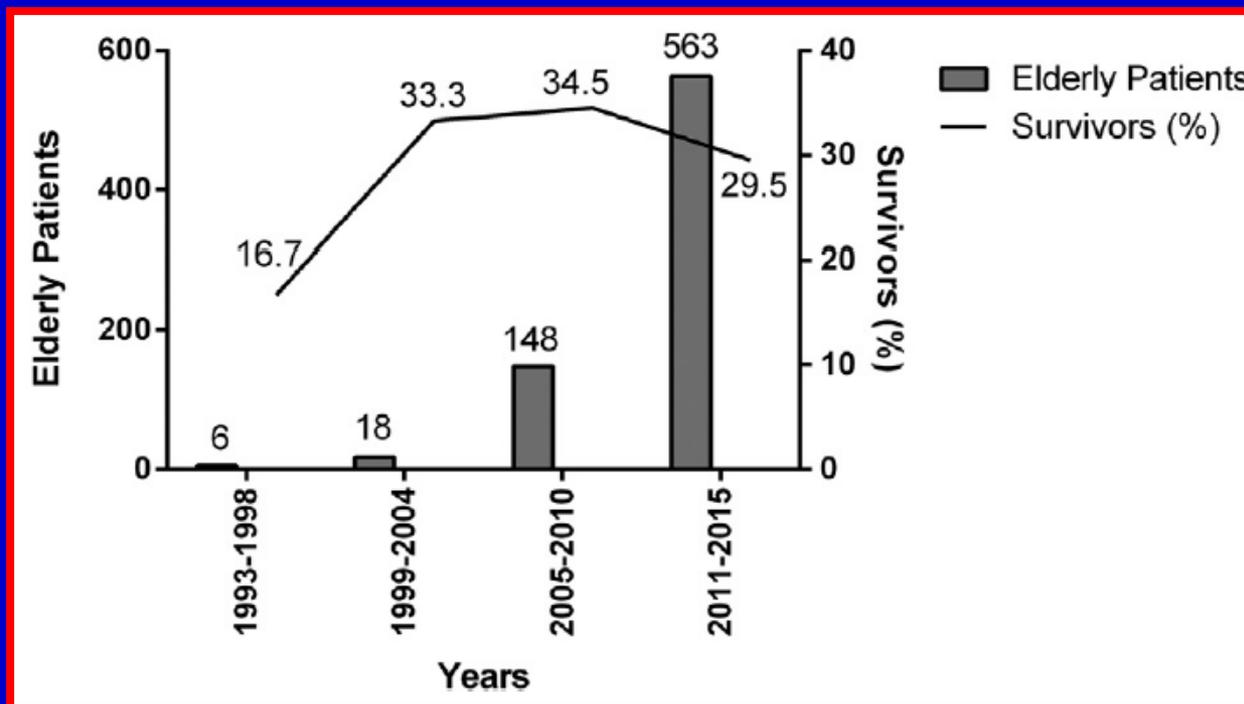
Ann Thorac Surg 2017;

Variable	Elderly Patients (≥70 Years of Age) n = 735	No Elderly Patients (<70 Years of Age) n = 4,673	p Value
Discharged alive	224 (30.5)	2,016 (43.1)	<0.001
Hours on ECMO	100.8 ± 97.9	137.7 ± 146.4	<0.001
0-48	243 (34.1)	1,074 (23.7)	
49-97	188 (26.4)	1,115 (24.6)	<0.001
98-168	167 (23.5)	1,176 (26.0)	
>168	114 (16.0)	1,162 (25.7)	

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Variable	Odds Ratio	95% CI		p Value
		Lower	Upper	
Age	1.043	1.023	1.064	<0.001
Pre-ECMO support: cardiopulmonary bypass (201)	0.279	0.127	0.611	0.001
SBP	0.977	0.965	0.990	<0.001
MPAP	1.031	1.005	1.057	0.017
On ECMO \leq 48 h	3.641	1.255	10.565	0.017
PIP24	1.064	1.018	1.112	0.006
MAP24	0.975	0.958	0.992	0.004
Mechanical: clots: oxygenator (111)	0.369	0.163	0.837	0.017
Hemorrhagic: hemolysis (hemoglobin >50 mg/dL) (211)	10.077	2.626	38.670	0.001

Clinical outcome of mechanical circulatory support for refractory cardiogenic shock in the current era

Takayama et al. The Journal of Heart and Lung Transplantation 2013

Vasopressors (Dopamine, Norepinephrine, Epinephrine)

Inotropes (Dobutamine, Milrinone)

IABP

RCS:

- Systolic blood pressure < 90 mmHg
- Cardiac Index < 2.0 L/min/m²
- Organ failure

Clinical outcome of mechanical circulatory support for refractory cardiogenic shock in the current era

Takayama et al. The Journal of Heart and Lung Transplantation 2013

Refractory Cardiogenic Shock (n=90)



BRIDGE TO DECISION DEVICE

•Short-term VAD (n=44)

preferred choice

•VA ECMO (n=46)

for unknown neurological status,
severe hemodynamical instability,
or severe coagulopathy

** SCREEN FOR CONTRAINDICATIONS

1. Patient's or family's will against MCS
2. Clinical judgment against MCS by the primary team
3. >30 min of on-going CPR
4. Septic shock
5. Predicted extremely short-term life expectancy due to comorbidities



DESTINATIONS

•Exchange to implantable VAD (n=23)

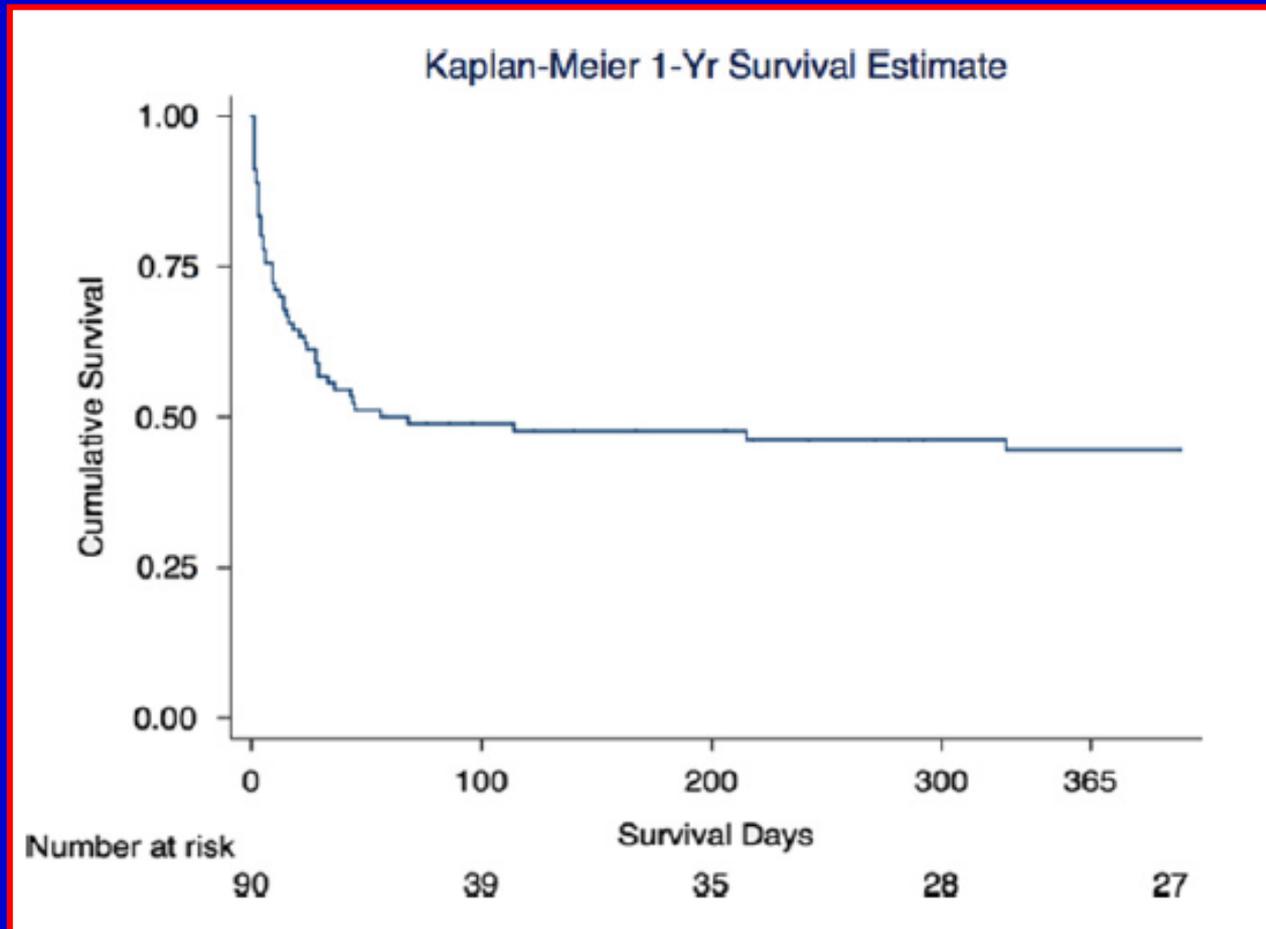
•Explant for myocardial recovery (n=16)

•Heart transplantation (n=9)

•Death (n=42)

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Clinical outcome of mechanical circulatory support for refractory cardiogenic shock in the current era

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	OR	<i>p</i>	95% CI
Age (years)	1.01	0.46	0.98 1.04
Age > 65 (years)	2.00	0.22	0.67 5.98
Male	0.62	0.33	0.25 1.60
Etiology of AMI	0.80	0.60	0.35 1.84
BMI	1.00	0.96	0.94 1.06
CAD	1.13	0.77	0.49 2.61
Diabetes	0.90	0.81	0.38 2.14
IABP	0.39	0.04	1.26 0.94
Prior CRRT	1.27	0.76	0.27 6.03

Extracorporeal Membrane Oxygenation Support in Refractory Cardiogenic Shock: Treatment Strategies and Analysis of Risk Factors

A. LOFORTE ET AL. Artificial Organs 2014

INCLUSION CRITERIA

- **Acute myocardial infarction (AMI);**
- **Acute decompensation of end-stage dilated cardiomyopathy (DCMP)**
- **Acute myocarditis**
- **High-risk percutaneous transluminal coronary angioplasty (PTCA)**
- **Failure to wean from CPB after surgery**

Extracorporeal Membrane Oxygenation Support in Refractory Cardiogenic Shock: Treatment Strategies and Analysis of Risk Factors

A. LOFORTE ET AL. *Artificial Organs* 2014

	Survivors (n = 144)	Nonsurvivors (n = 84)	P value
CPR before ECMO	8 (5.5%)	21 (25%)	<0.01
Inotropic score before ECMO*	11.1 ± 4.2	33.4 ± 6.3	0.02
Intubation time (days) on ECMO	9.7 ± 7.2	18.9 ± 5.1	0.02
MOF on ECMO	1 (0.6%)	84 (100%)	<0.01
Blood lactate level (mmol/L) 72 h after ECMO initiation	2.1 ± 1.23	7.9 ± 5.61	<0.01

Venoarterial extracorporeal membrane oxygenation for refractory cardiogenic shock post-cardiac arrest

Marc Pineton de Chambrun
Intensive Care Med (2016)

Characteristic	Entire cohort (n = 94)	Survivors (n = 26)	Non-survivors (n = 68)	P
Age (years)	50.8 ± 11.5	49.96 ± 10	51.1 ± 12.1	0.6
SOFA score	13 [15–17]	13 [12–14]	16 [14–18]	<0.0001
Body mass index (kg/m ²)	26.2 [23.4–29.3]	25.8 [23.7–28.1]	26.1 [23.4–29.4]	0.9
Etiology of cardiac arrest				
Myocardial infarction	66 (70)	19 (73.1)	47 (69.1)	0.7
Acute decompensation of chronic cardiomyopathy	8 (9)	3 (11.5)	5 (7.4)	0.5
Witnessed cardiac arrest	88 (94)	25 (96)	63 (93)	0.5
Attempted defibrillation	56 (60)	21 (80.8)	35 (51.5)	0.01
Out-of-hospital cardiac arrest	78 (83)	22 (85)	56 (82)	0.7
Shockable rhythm	56 (60)	21 (81)	35 (52)	0.02
Cardiac arrest-to-VA-ECMO interval (h)	7.4 [3.3–14]	10.7 [4.1–18.8]	6.3 [3–13]	0.07
Pre-ECMO echocardiographic findings				
Left ventricular ejection fraction ^c (%)	15 [10–20]	15 [10–20]	15 [10–20]	0.3

Venoarterial extracorporeal membrane oxygenation for refractory cardiogenic shock post-cardiac arrest

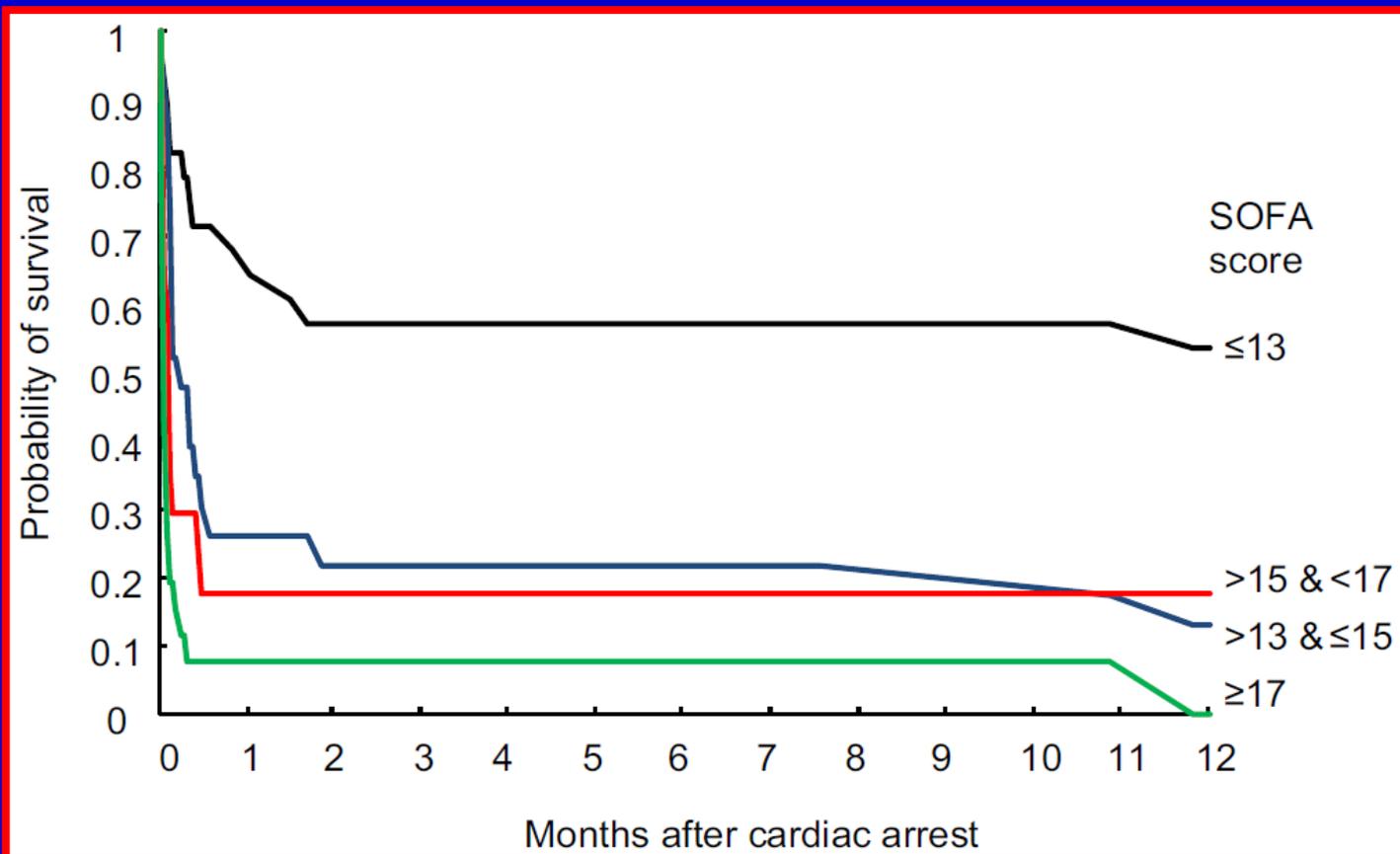
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Factor	Univariable analysis OR [95 % CI]	P	Multivariable analysis OR [95 % CI]	P
Arterial lactate >11.5 mmol/L	4.7 [1.7–12.7]	0.003		
International normalized ratio > 2.4	7.8 [2.4–25.3]	0.0006	4.9 [1.4–17.2]	0.01
Renal failure at ICU admission ^a	7.2 [2.4–21.5]	0.0004		
Pre-VA-ECMO SOFA score >14	7.5 [2.6–21.3]	0.0002	5.3 [1.7–16.5]	0.004
SAPS II >82	3.4 [1.3–9.3]	0.01		
Shockable rhythm	0.3 [0.1–0.7]	0.01	0.3 [0.1–0.9]	0.04

Venoarterial extracorporeal membrane oxygenation for refractory cardiogenic shock post-cardiac arrest

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Intensive Care Med (2016)



One Hundred Transports on Extracorporeal Support to an Extracorporeal Membrane Oxygenation Center

Mauer Biscotti, MD

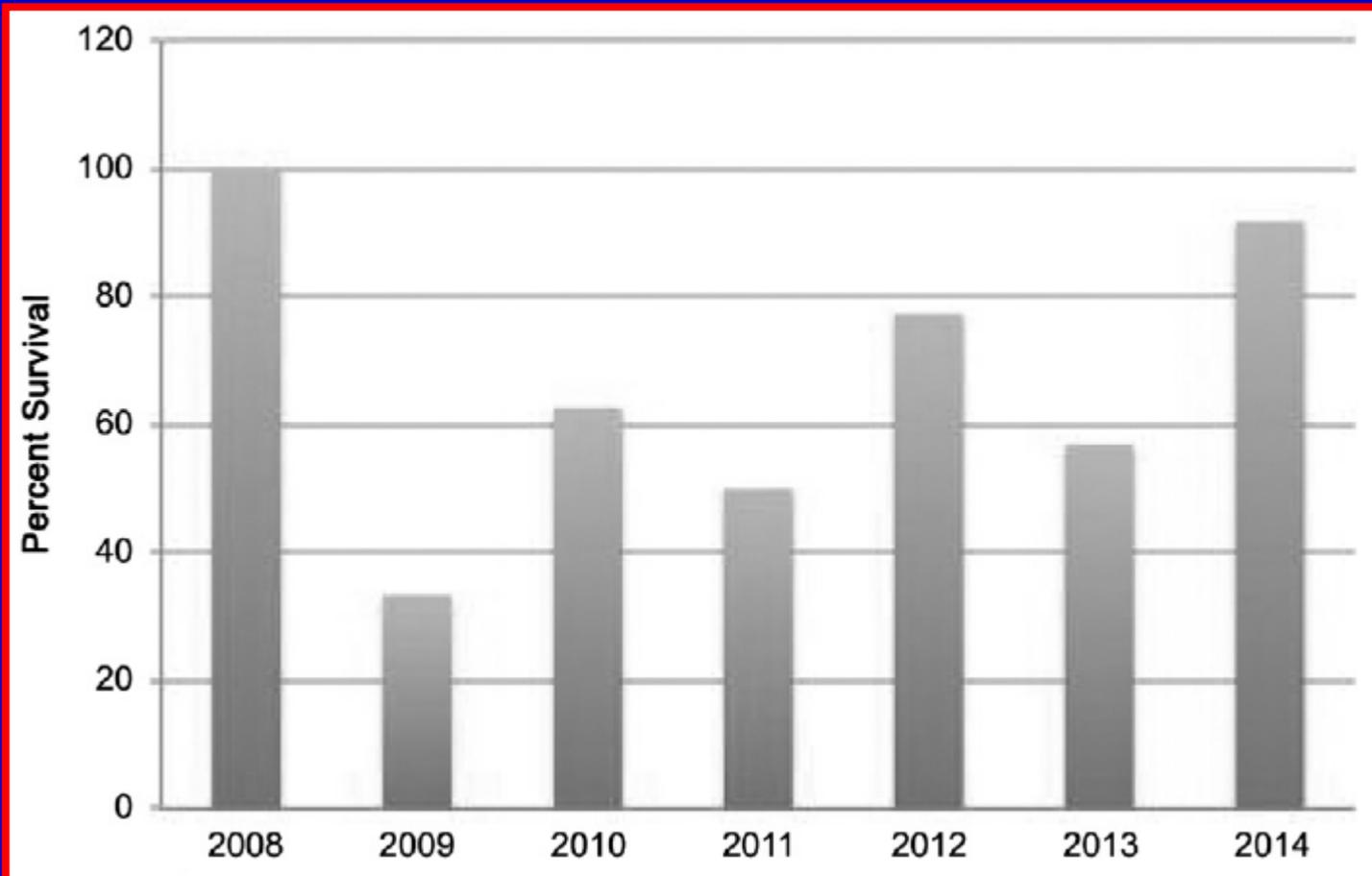
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One Hundred Transports on Extracorporeal Support to an Extracorporeal Membrane Oxygenation Center

Mauer Biscotti, MD

Ann Thorac Surg 2015,

Analysis	<i>p</i> Value	
	All Patients	Respiratory Failure
Univariate analysis		
Age	<0.0001	0.001
<30		
30–39		
40–49		
>50		
BMI	0.716	0.909
Multivariate analysis		
Age	0.007	0.005
BMI	0.597	0.541
Sex	0.401	0.319
APACHE II score	0.443	0.451
Intubation to ECMO	0.17	0.197
Days on ECMO	0.615	0.511

Many thanks

