Quelle assistance circulatoire en cas de choc cardiogénique ?

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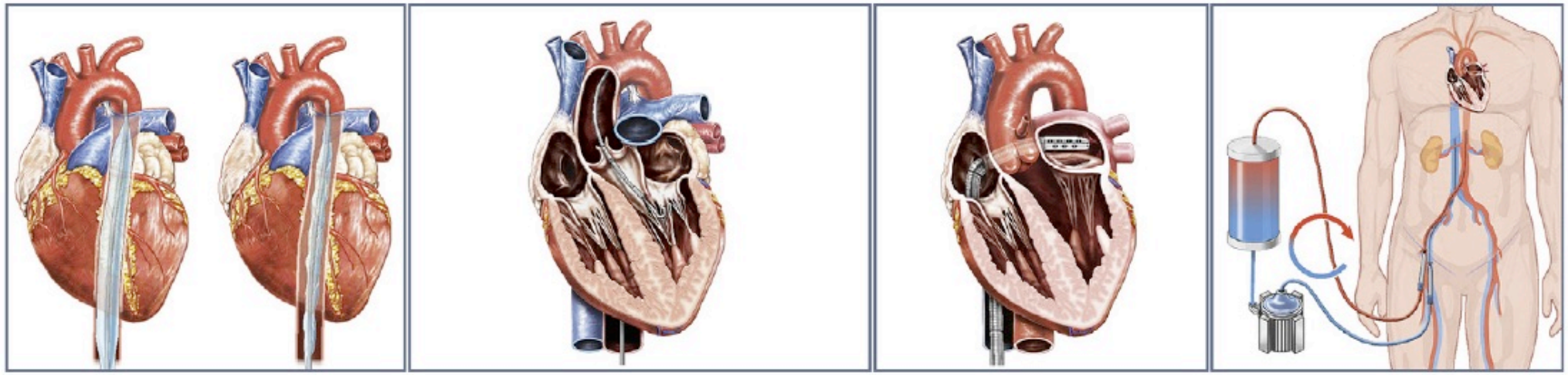
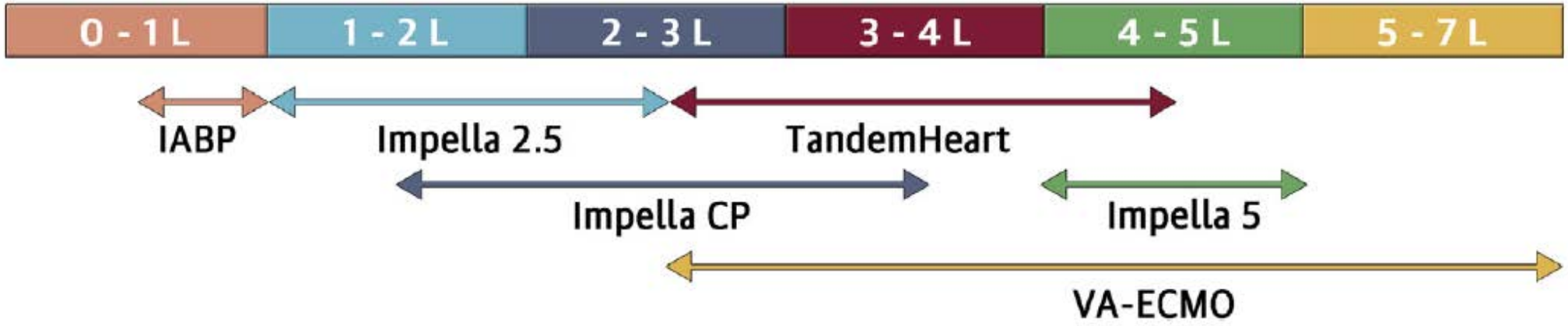
Disclosures

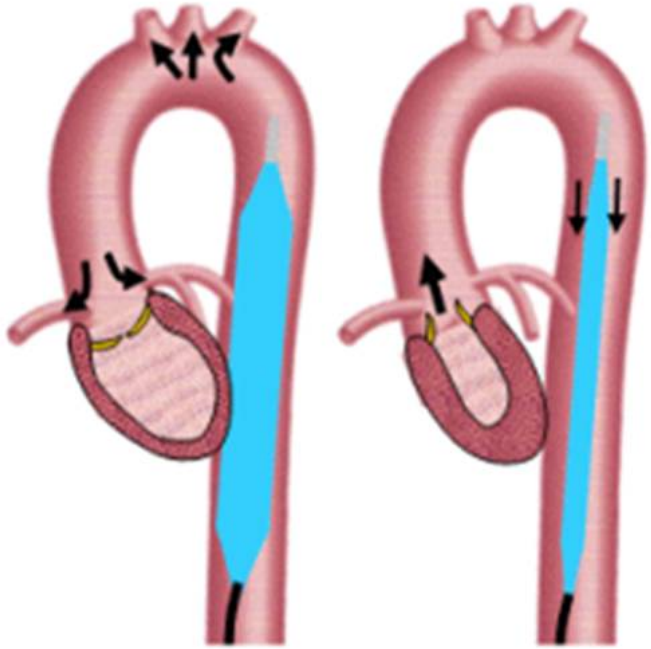
- Principal Investigator:
  - EOLIA trial, VV ECMO in ARDS
    - *NCT01470703, Partly sponsored by MAQUET, Getinge Group*
  - ANCHOR trial, VA ECMO in AMI-CS
    - *NCT04184635, Partly sponsored by MAQUET, Getinge Group*
- Received honoraria for lectures and consulting from
  - MAQUET, BAXTER

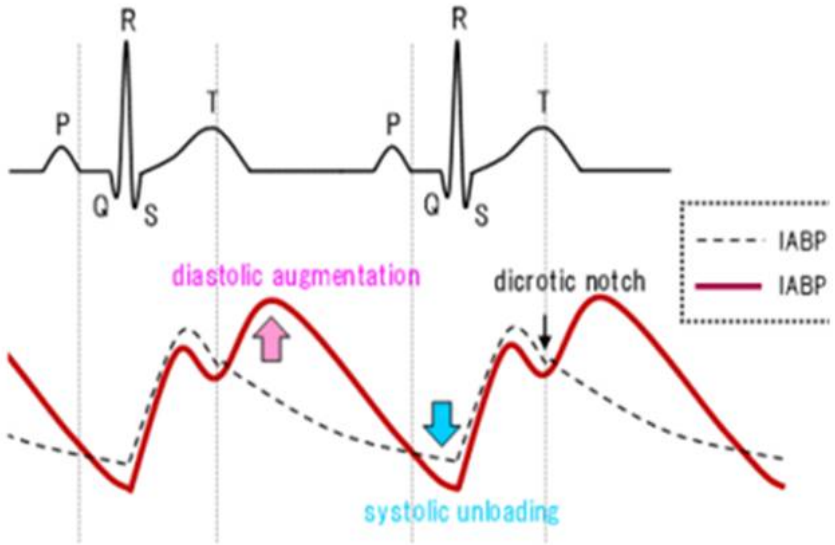




JACC: CARDIOVASCULAR INTERVENTIONS VOL. 9, NO. 9, 2016

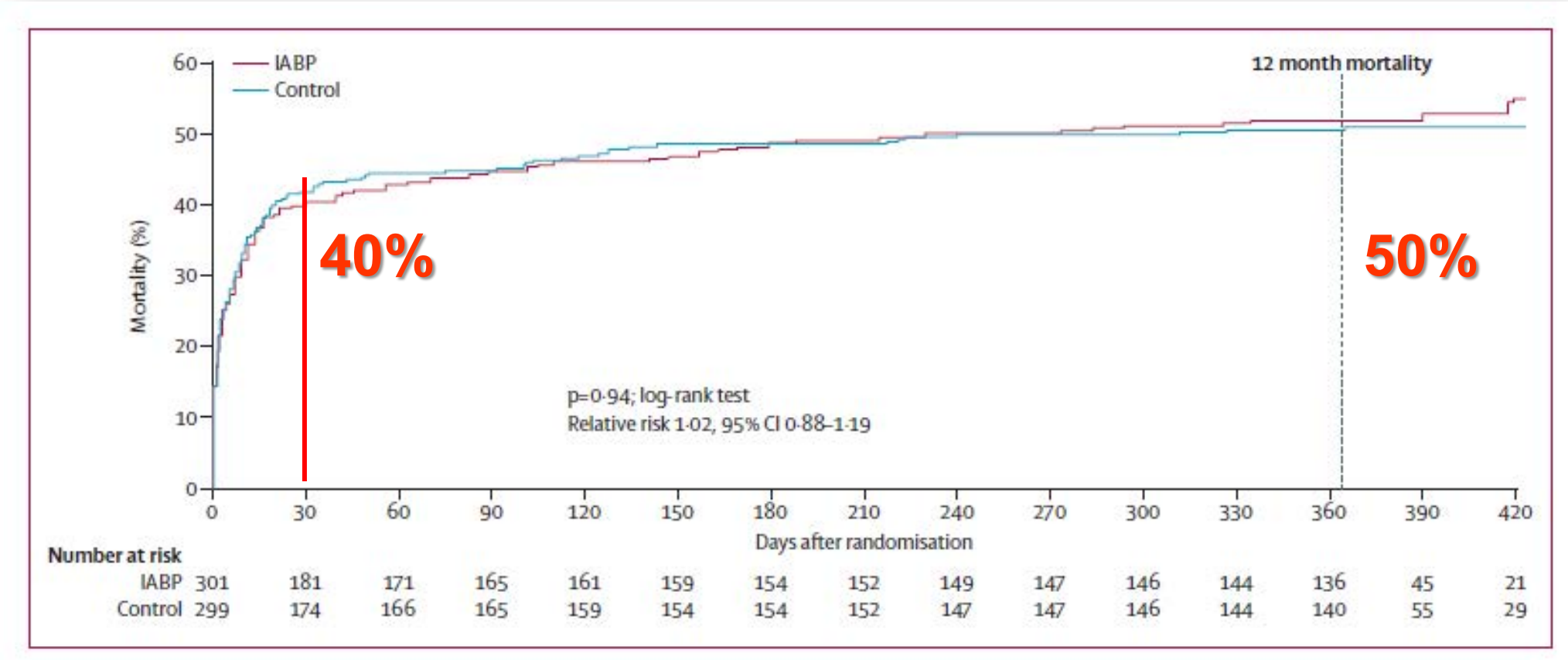
The case of the IABP…





Intra-aortic balloon counterpulsation in acute myocardial infarction complicated by cardiogenic shock (IABP-SHOCK II): final 12 month results of a randomised, open-label trial

www.thelancet.com Published online September 3, 2013



ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation

European Heart Journal (2012) **33**, 2569–2619

2010

IABP insertion is recommended in patients with haemodynamic instability (particularly those in cardiogenic shock and with mechanical complications). | I | C

2012

Intra-aortic balloon pumping may be considered. | IIb | B

Routine use of IABP in patients with cardiogenic shock is not recommended. | III | A

2014

IABP insertion should be considered in patients with haemodynamic instability/cardiogenic shock due to mechanical complications. | IIa | C

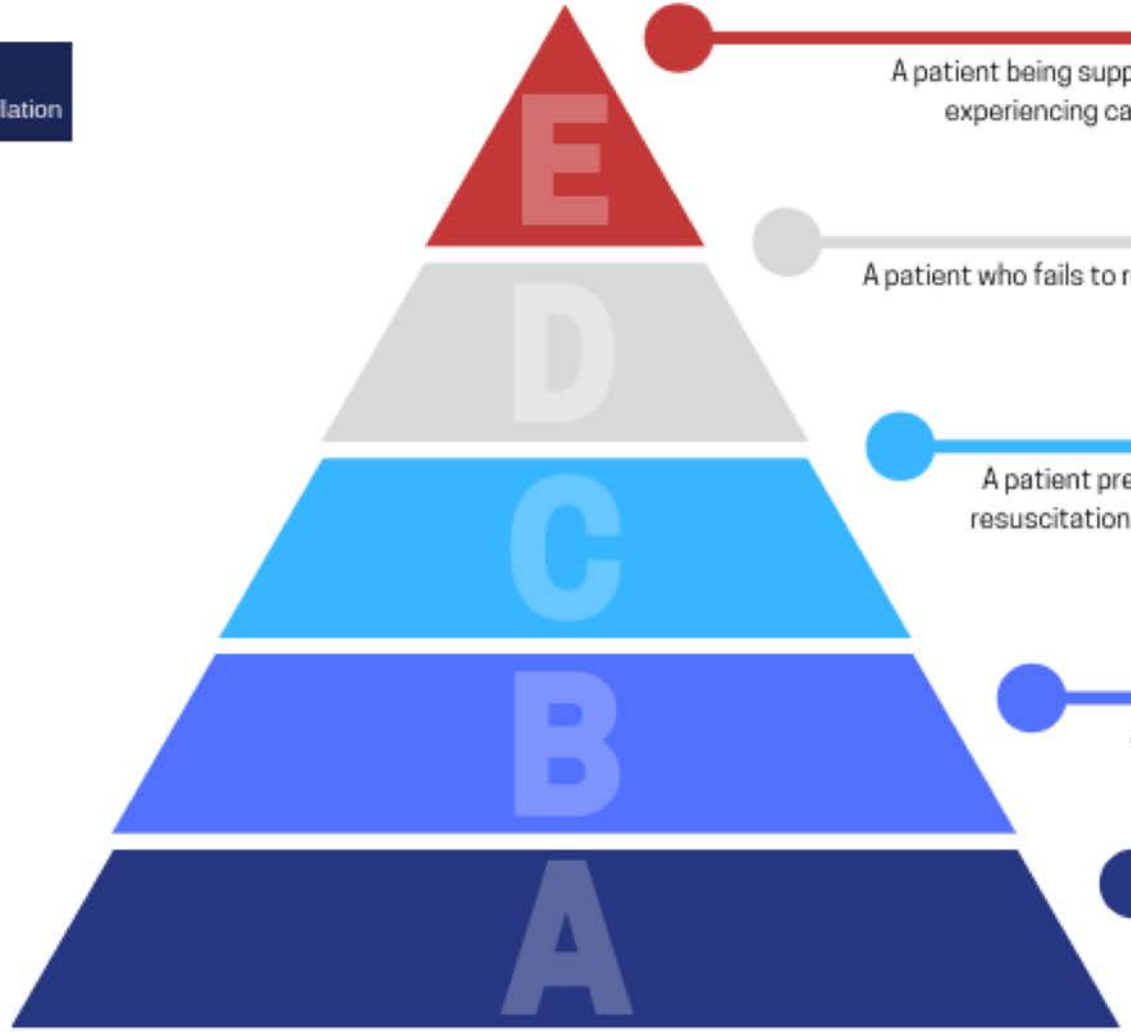
Guidelines…

SCAI
Society for Cardiovascular Angiography & Interventions

SCAI Stages of Cardiogenic Shock

Adapted from the SCAI Clinical Expert Consensus Statement on the Classification of Cardiogenic Shock
Endorsed by ACC, AHA, SCCM, and STS

Arrest (A) Modifier:
CPR, including defibrillation



EXTREMIS

A patient being supported by multiple interventions who may be experiencing cardiac arrest with ongoing CPR and/or ECMO.

DETERIORATING

A patient who fails to respond to initial interventions. Similar to stage C and getting worse.

CLASSIC

A patient presenting with hypoperfusion requiring intervention beyond volume resuscitation (inotrope, pressor, or mechanical support including ECMO). These patients typically present with relative hypotension.

BEGINNING

A patient who has clinical evidence of relative hypotension or tachycardia without hypoperfusion.

AT RISK

A patient with risk factors for cardiogenic shock who is not currently experiencing signs or symptoms. For example, large acute myocardial infarction, prior infarction, acute and/or acute on chronic heart failure.

Baran DA, Grines CL, Bailey S, et al. SCAI clinical expert consensus statement on the classification of cardiogenic shock. Catheter Cardiovasc Interv. 2019;1–9. https://doi.org/10.1002/ccd.28329
For more information, please visit: www.scai.org/shockdefinition

ESC
European Society of Cardiology
European Heart Journal (2021) **42**, 3599–3726
doi:10.1093/eurheartj/ehab368

ESC GUIDELINES

2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

Developed by the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)

With the special contribution of the Heart Failure Association (HFA) of the ESC

2021 ESC Guidelines

Recommendations for the use of short-term mechanical circulatory support in patients with cardiogenic shock	Class[a]	Level[b]
Short-term MCS should be considered in patients with cardiogenic shock as a BTR, BTD, BTB. Further indications include treatment of the cause of cardiogenic shock or long-term MCS or transplantation.	IIa	C
IABP may be considered in patients with cardiogenic shock as a BTR, BTD, BTB, including treatment of the cause of cardiogenic shock (i.e. mechanical complication of acute MI) or long-term MCS or transplantation.[450]	IIb	C
IABP is not routinely recommended in post-MI cardiogenic shock.[500–502]	III	B

European Heart Journal (2021) **42**, 3599–3726

Should VA-ECMO be abandoned after ECLS-SHOCK?...

Careful analysis of ECLS-SHOCK:
All is about patients selection/management…

ORIGINAL ARTICLE

N Engl J Med 2023

Extracorporeal Life Support in Infarct-Related Cardiogenic Shock

H. Thiele, U. Zeymer, I. Akin, M. Behnes, T. Rassaf, A.A. Mahabadi, R. Lehmann, I. Eitel, T. Graf, T. Seidler, A. Schuster, C. Skurk, D. Duerschmied, P. Clemmensen, M. Hennersdorf, S. Fichtlscherer, I. Voigt, M. Seyfarth, S. John, S. Ewen, A. Linke, E. Tigges, P. Nordbeck, L. Bruch, C. Jung, J. Franz, P. Lauten, T. Goslar, H.-J. Feistritzer, J. Pöss, E. Kirchhof, T. Ouarrak, S. Schneider, S. Desch, and A. Freund, for the ECLS-SHOCK Investigators*

CONCLUSIONS

In patients with **acute myocardial infarction complicated by cardiogenic shock** with planned early revascularization, the **risk of death** from any cause at the 30-day follow-up was **not lower** among the patients who received **ECLS therapy** than among those who received **medical therapy alone**

Characteristic	ECLS (N=209)	Control (N=208)
ECLS therapy — no. (%)	192 (91.9)	26 (12.5)
Initiation in catheterization laboratory		
Before revascularization	42/192 (21.9)	4/26 (15.4)
During revascularization	50/192 (26.0)	8/26 (30.8)
	/192 (52.1)	7/26 (26.9)
	0/192	3/26 (11.5)
	0/192	4/26 (15.4)
	7 (1.5–4.8)	2.7 (2.2–3.8)
	/192 (95.3)	16/19 (84.2)
	7 (15–18)	17 (15–17)
Active left ventricular unloading during ECLS therapy — no./total no. (%)	11/191 (5.8)	6/19 (31.6)
Other mechanical circulatory support in patients without ECLS — no./total no. (%)	0/17	28/182 (15.4)
Intraaortic balloon pump	—	1/28 (3.6)
Impella 2.5	—	1/28 (3.6)
Impella CP	—	24/28 (85.7)
Impella 5.0	—	1/28 (3.6)
Impella 5.5	—	1/28 (3.6)
Permanent left ventricular assist device — no./total no. (%)	1 (0.5)	1 (0.5)

ECLS-SHOCK compared early VA-ECMO vs tMCS if hemodynamic deterioration

Rescue TCS 26%

25-30% of control group patients will be rescued by cross-over to t-MCS

Virtually no chance to demonstrate a benefit within a RCT…

ORIGINAL ARTICLE

N Engl J Med 2023

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CONCLUSIONS

In patients with AMI-CS with early PCI, D-30 mortality was not lower with systematic vs. rescue (SCAI D-E) ECLS

A notably high rate of prolonged cardiac arrest before inclusion

Table 1. Characteristics of the Patients at Baseline.*

Characteristic	ECLS (N=209)	Control (N=208)
Median age (IQR) — yr	62 (56–69)	63 (57–71)
Male sex — no. (%)	170 (81.3)	169 (81.2)
Median body-mass index (IQR)†	27 (25–30)	28 (25–31)
Signs of impaired organ perfusion — no.(%)		
Altered mental status	200 (95.7)	198 (95.2)
Cold, clammy skin and limbs	202 (96.7)	204 (98.1)
Oliguria	150 (71.8)	150 (72.1)
Median blood pressure (IQR) — mm Hg		
Systolic	95 (80–120)	97 (80–120)
Diastolic	61 (50–73)	60 (50–71)
Median heart rate (IQR) — beats/min	90 (75–110)	95 (71–110)
Resuscitation before randomization — no. (%)	162 (77.5)	162 (77.9)
Median time until return of spontaneous circulation during longest continuous resuscitation (IQR) — min	20 (10–25)	20 (12–28)

ORIGINAL ARTICLE

Intraaortic Balloon Support for Myocardial Infarction with Cardiogenic Shock

Holger Thiele, M.D., Uwe Zeymer, M.D., Franz-Josef Neumann, M.D., Miroslaw Ferenc, M.D., Hans-Georg Olbrich, M.D., Jörg Hausleiter, M.D., Gert Richardt, M.D., Marcus Hennersdorf, M.D., Klaus Empen, M.D., Georg Fuernau, M.D., Steffen Desch, M.D., Ingo Eitel, M.D., Rainer Hambrecht, M.D., Jörg Fuhrmann, M.D., Michael Böhm, M.D., Henning Ebelt, M.D., Steffen Schneider, Ph.D., Gerhard Schuler, M.D., and Karl Werdan, M.D., for the IABP-SHOCK II Trial Investigators*

Resuscitation before randomization — no./total no. (%)

IABP (N = 301)	Control (N = 299)
127 (42.2)	143 (47.8)

ORIGINAL ARTICLE

PCI Strategies in Patients with Acute Myocardial Infarction and Cardiogenic Shock

H. Thiele, I. Akin, M. Sandri, G. Fuernau, S. de Waha, R. Meyer-Saraei, P. Nordbeck, T. Geisler, U. Landmesser, C. Skurk, A. Fach, H. Lapp, J.J. Piek, M. Noc, T. Goslar, S.B. Felix, L.S. Maier, J. Stepinska, K. Oldroyd, P. Serpytis, G. Montalescot, O. Barthelemy, K. Huber, S. Windecker, S. Savonitto, P. Torremante, C. Vrints, S. Schneider, S. Desch, and U. Zeymer, for the CULPRIT-SHOCK Investigators*

Resuscitation before randomization — no./total no. (%)

Culprit-Lesion-Only PCI Group (N = 344)	Multivessel PCI Group (N = 342)
177/341 (51.9)	189/342 (55.3)

Table 1. Characteristics of the Patients at Baseline.*

Characteristic	ECLS (N=209)	Control (N=208)
Median heart rate (IQR) — beats/min	90 (75–110)	95 (71–110)
Resuscitation before randomization — no. (%)	162 (77.5)	162 (77.9)
Median time until return of spontaneous circulation during longest continuous resuscitation (IQR) — min	20 (10–25)	20 (12–28)

Hypotension only hemodynamic variable to define CS…

Many CA patients have post-ROSC vasoplegia….

What was the actual hemodynamic PHENOTYPE?

Low vs. N-to-High CI?

As for Septic Shock patients, ECMO can only rescue…

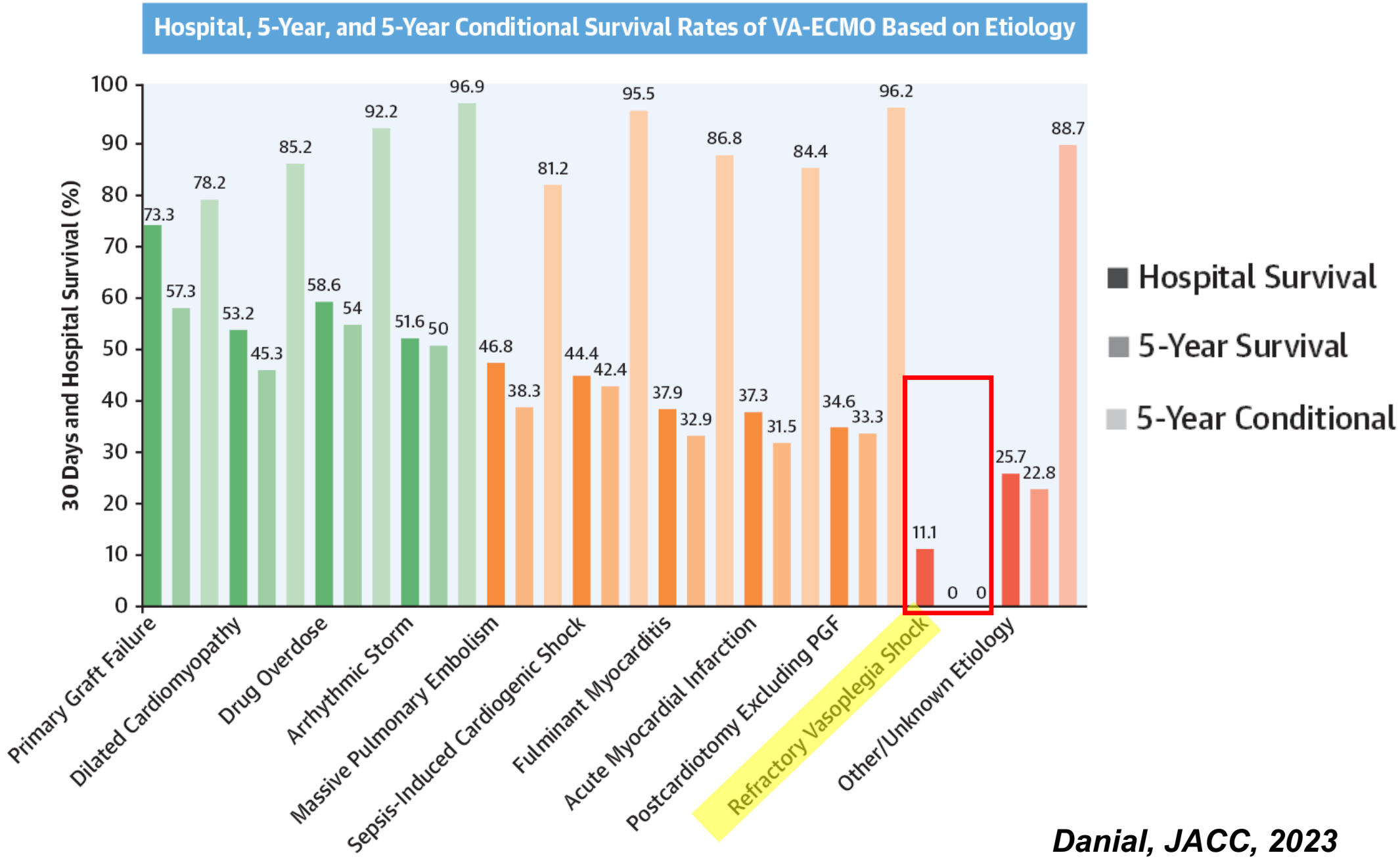
Patients with CS and low cardiac output syndrome…

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY VOL. 81, NO. 9, 2023

PUBLISHED BY ELSEVIER

Association Between Shock Etiology and 5-Year Outcomes After Venoarterial Extracorporeal Membrane Oxygenation

Pichoy Danial, MD,[a] Maud-Emmanuel Olivier, MD,[a] Nicolas Bréchot, MD, PhD,[b,c] Maharajah Ponnaiah, MD,[d] Thibaut Schoell, MD,[a] Cosimo D'Alessandro, MD,[a] Pierre Demondion, MD,[a] Marina Clément, MD,[a] Charles Juvin, MD,[a] Aude Carillion, MD, PhD,[c] Adrien Bouglé, MD, PhD,[c,d] Alain Combes, MD, PhD,[b,d] Pascal Leprince, MD, PhD,[a,c] Guillaume Lebreton, MD, PhD[a,c]



Danial, JACC, 2023

A notably low rate of LV unloading/venting…

Related to patients characteristics at randomization?

Mechanical Left Ventricular Unloading in Patients Undergoing Venoarterial Extracorporeal Membrane Oxygenation

E. Wilson Grandin, MD, MPH, MED,[a,b] Jose I. Nunez, MD,[c] Brooks Willar, MD,[d] Kevin Kennedy, MS,[b] Peter Rycus, MPH,[e] Joseph E. Tonna, MD, MS,[e,f] Navin K. Kapur, MD,[g] Shahzad Shaefi, MD, MPH,[h] A. Reshad Garan, MD, MS[a]

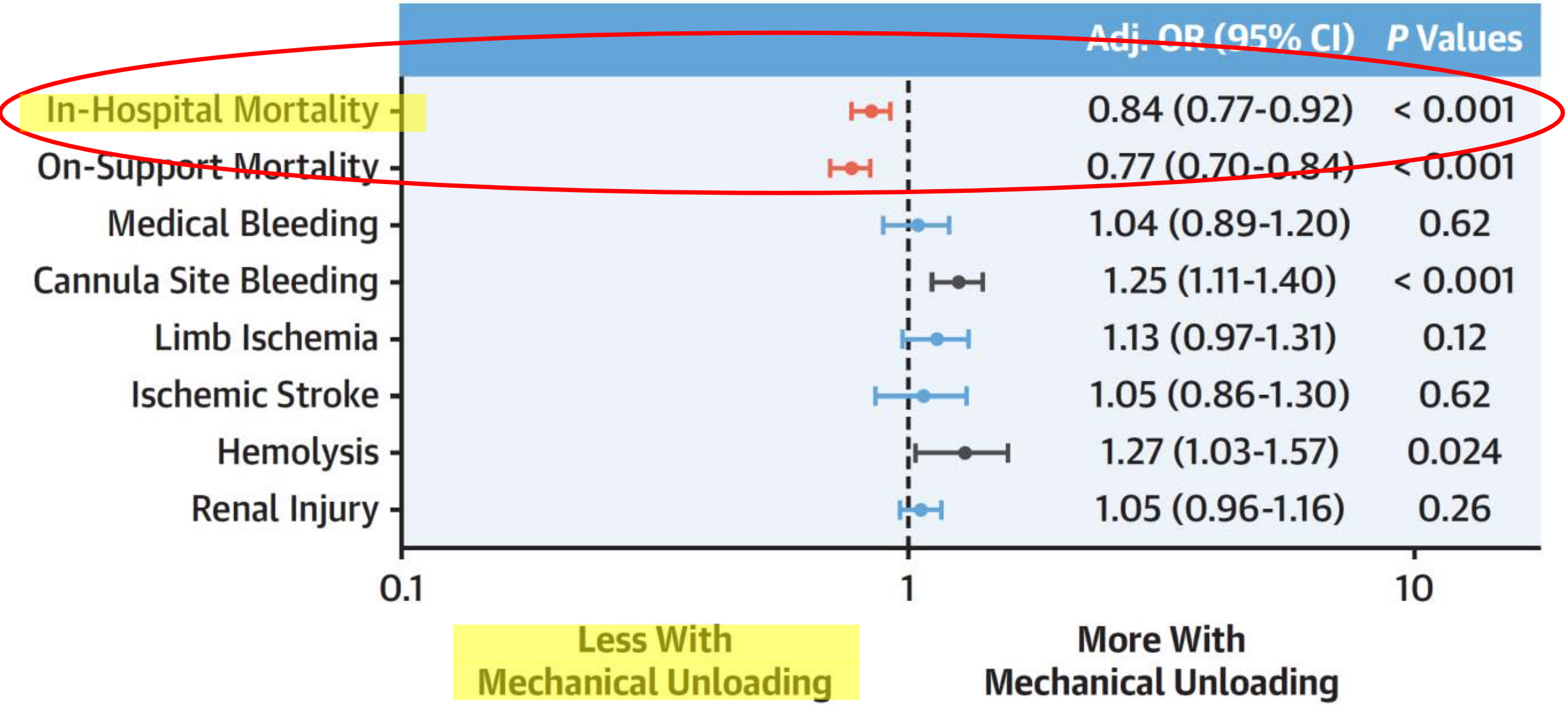
JACC VOL. 79, NO. 13, 2022
APRIL 5, 2022:1239–1250

ABSTRACT

BACKGROUND Venoarterial extracorporeal membrane oxygenation (VA-ECMO) increases left ventricular (LV) afterload, potentially provoking LV distention and impairing recovery. LV mechanical unloading (MU) with intra-aortic balloon pump (IABP) or percutaneous ventricular assist device (pVAD) can prevent LV distension, potentially at the risk of more complications, and net clinical benefit remains uncertain.

OBJECTIVES This study aims to determine the association between MU and outcomes for patients undergoing VA-ECMO.

METHODS The authors queried the Extracorporeal Life Support Organization registry for adults receiving peripheral VA-ECMO from 2010 to 2019 and stratified them by MU with IABP or pVAD. The primary outcome was in-hospital mortality; secondary outcomes included on-support mortality and complications during VA-ECMO.


Adj. OR (95% CI)
P Values
In-Hospital Mortality
0.84 (0.77-0.92)
< 0.001
On-Support Mortality
0.77 (0.70-0.84)
< 0.001
Medical Bleeding
1.04 (0.89-1.20)
0.62
Cannula Site Bleeding
1.25 (1.11-1.40)
< 0.001
Limb Ischemia
1.13 (0.97-1.31)
0.12
Ischemic Stroke
1.05 (0.86-1.30)
0.62
Hemolysis
1.27 (1.03-1.57)
0.024
Renal Injury
1.05 (0.96-1.16)
0.26
0.1
1
10
Less With Mechanical Unloading
More With Mechanical Unloading

ECLS-SHOCK trial, NEJM 2013

	ECLS (n=209)	Control (n=208)
Active left ventricular unloading during ECLS therapy; n/total (%)	11/190 (5.8)	6/19 (31.6)
Reason for unloading*; n/total (%)		
No arterial waveform pulsatility	4/11 (36.4)	3/6 (50.0)
No aortic valve opening assessed by echocardiography	0/11	0/6
Velocity time interval <10 cm over left ventricular outflow tract	2/11 (18.2)	0/6
Increase in diameters and volume of the left ventricle assessed by echocardiography	2/11 (18.2)	1/6 (16.7)

<3% patients with Low CI ????…

ECLS-SHOCK trial, NEJM 2013

	ECLS (n=209)	Control (n=208)
Active left ventricular unloading during ECLS therapy;	11/190 (5.8)	6/19 (31.6)

Hypotension only hemodynamic variable to define CS…
What was the actual hemodynamic PHENOTYPE?
Low vs. N-to-High CI?

A very short duration of VA-ECMO support

Related to patients characteristics at randomization?

Characteristic	ECLS (N = 209)	Control (N = 208)
ECLS therapy — no. (%)	192 (91.9)	26 (12.5)
Initiation in catheterization laboratory		
Before revascularization	42/192 (21.9)	4/26 (15.4)
During revascularization	50/192 (26.0)	8/26 (30.8)
After revascularization	100/192 (52.1)	7/26 (26.9)
Initiation after catheterization laboratory		
<24 hr	0/192	3/26 (11.5)
≥24 hr	0/192	4/26 (15.4)
Median duration of ECLS therapy (IQR) — days	2.7 (1.5–4.8)	2.7 (2.2–3.8)
Peripheral antegrade perfusion sheath during ECLS therapy — no./total no. (%)	183/192 (95.3)	16/19 (84.2)
Median diameter of arterial cannula (IQR) — French size	17 (15–18)	17 (15–17)
Active left ventricular unloading during ECLS therapy — no./total no. (%)	11/191 (5.8)	6/19 (31.6)
Other mechanical circulatory support in patients without ECLS — no./total no. (%)	0/17	28/182 (15.4)
Intraaortic balloon pump	—	1/28 (3.6)
Impella 2.5	—	1/28 (3.6)
Impella CP	—	24/28 (85.7)
Impella 5.0	—	1/28 (3.6)
Impella 5.5	—	1/28 (3.6)
Permanent left ventricular assist device — no./total no. (%)	1 (0.5)	1 (0.5)

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY VOL. 79, NO. 13, 2022

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Mechanical Left Ventricular Unloading in Patients Undergoing Venoarterial Extracorporeal Membrane Oxygenation

E. Wilson Grandin, MD, MPH, MEd,[a,b] Jose I. Nunez, MD,[c] Brooks Willar, MD,[d] Kevin Kennedy, MS,[b] Peter Rycus, MPH,[e] Joseph E. Tonna, MD, MS,[e,f] Navin K. Kapur, MD,[g] Shahzad Shaefi, MD, MPH,[h] A. Reshad Garan, MD, MS[a]

	Total (N = 1,678)	IABP (n = 1,123)	pVAD (n = 555)	*P* Value
Time on ECMO, d	5.00 (3.00-8.00)	5.00 (3.00-8.00)	5.00 (3.00-9.00)	0.51

ORIGINAL

The ENCOURAGE mortality risk score and analysis of long-term outcomes after VA-ECMO for acute myocardial infarction with cardiogenic shock

Intensive Care Med 2016

Grégoire Muller[1], Erwan Flecher[3], Guillaume Lebreton[2], Charles-Edouard Luyt[1], Jean-Louis Trouillet[1], Nicolas Bréchot[1], Matthieu Schmidt[1], Ciro Mastroianni[2], Jean Chastre[1], Pascal Leprince[2], Amedeo Anselmi[3] and Alain Combes[1*]

Characteristic	All patients ($n = 138$)	Survivors ($n = 65$)	Non-survivors ($n = 73$)
ECMO duration, days	7 (4–10)	8 (5–12)	5 (3–9)

Characteristic	ECLS (N = 209)	Control (N = 208)
ECLS therapy — no. (%)	192 (91.9)	26 (12.5)
Initiation in catheterization laboratory		
Before revascularization	42/192 (21.9)	4/26 (15.4)
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Active left ventricular unloading during ECLS therapy — no./[illegible] no. (%)	11/191 (5.8)	6/19 (31.6)
Other mechanical circulatory support in patients w[illegible]ut ECLS —	0/17	28/182 (15.4)

Questions about the hemodynamic phenotype of included patients, and management of VA-ECMO weaning

A surprising high rate of death related to refractory CS…

	ECLS (n=209)	Control (n=208)
All-cause mortality at 30 days; n/total (%)	100/209 (47.8)	102/208 (49.0)
Causes of death at 30 days		
Refractory cardiogenic shock, n/total (%)	51/100 (51.0)	56/102 (54.9)
Sudden cardiac death; n/total (%)	7/100 (7.0)	5/102 (4.9)
Recurrent myocardial infarction; n/tot	2/100 (2.0)	2/102 (2.0)
Mechanical complication of infarction; n/total (%)	1/100 (1.0)	1/102 (1.0)
	4/100 (4	
	26/100 (2	
	4/100 (4	
Unknown cause; n/total (%)	0/100	
Other cause; n/total (%)	5/100 (5.0)	0/102

Questions about the hemodynamic phenotype of included patients, and management of VA-ECMO weaning

Questions about underutilization of t-MCS in Control patients

A surprising low rate of LVAD for non-recovering LV dysfunction…

Characteristic	ECLS (N = 209)	Control (N = 208)
ECLS therapy — no. (%)	192 (91.9)	26 (12.5)
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ORIGINAL ARTICLE

N Engl J Med 2012.

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Holger Thiele, M.D., Uwe Zeymer, M.D., Franz-Josef Neumann, M.D., Miroslaw Ferenc, M.D., Hans-Georg Olbrich, M.D., Jörg Hausleiter, M.D., Gert Richardt, M.D., Marcus Hennersdorf, M.D., Klaus Empen, M.D., Georg Fuernau, M.D., Steffen Desch, M.D., Ingo Eitel, M.D., Rainer Hambrecht, M.D., Jörg Fuhrmann, M.D., Michael Böhm, M.D., Henning Ebelt, M.D., Steffen Schneider, Ph.D., Gerhard Schuler, M.D., and Karl Werdan, M.D., for the IABP-SHOCK II Trial Investigators*

33 patients (5.5%) had a VAD at Day 30
Mortality higher than for other patients
69.7% vs. 38.8%, P<0.001

Should Impella become the Gold Standard for AMICS after DANGER?…

Careful analysis of Danger…

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Microaxial Flow Pump or Standard Care in Infarct-Related Cardiogenic Shock

J.E. Møller, T. Engstrøm, L.O. Jensen, H. Eiskjær, N. Mangner, A. Polzin, P.C. Schulze, C. Skurk, P. Nordbeck, P. Clemmensen, V. Panoulas, S. Zimmer, A. Schäfer, N. Werner, M. Frydland, L. Holmvang, J. Kjærgaard, R. Sørensen, J. Lønborg, M.G. Lindholm, N.L.J. Udesen, A. Junker, H. Schmidt, C.J. Terkelsen, S. Christensen, E.H. Christiansen, A. Linke, F.J. Woitek, R. Westenfeld, S. Möbius-Winkler, K. Wachtell, H.B. Ravn, J.F. Lassen, S. Boesgaard, O. Gerke, and C. Hassager, for the DanGer Shock Investigators*

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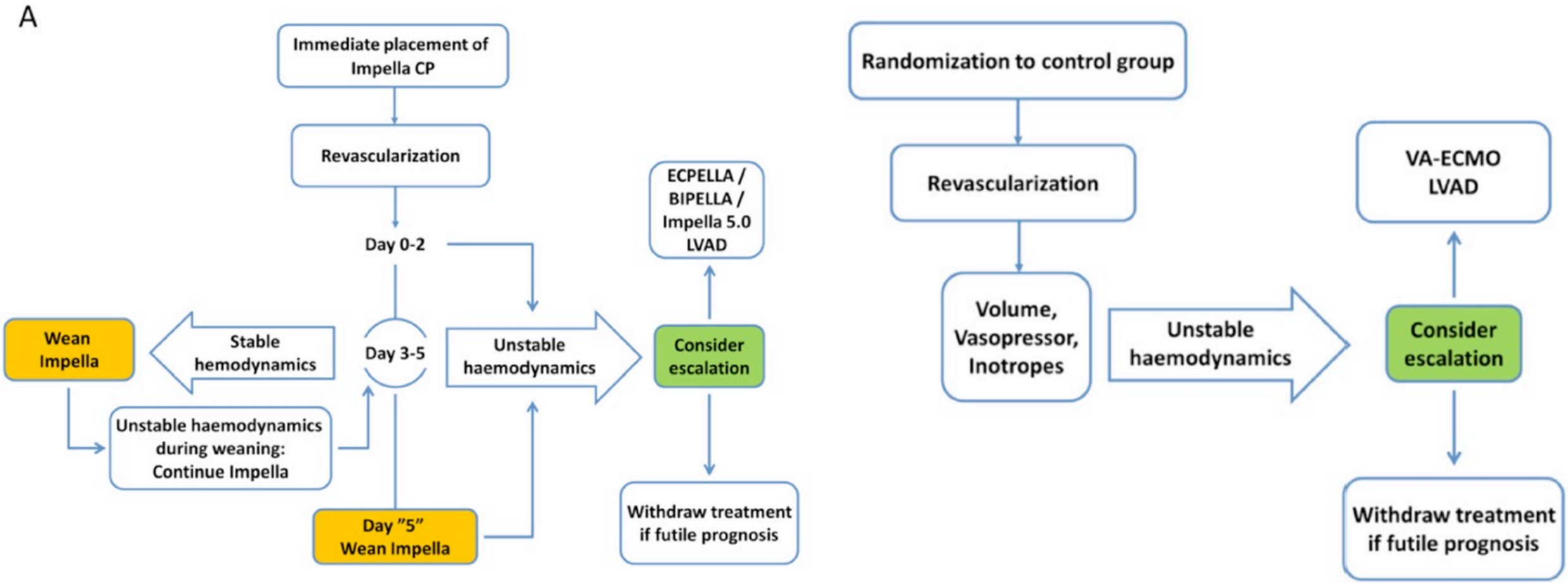
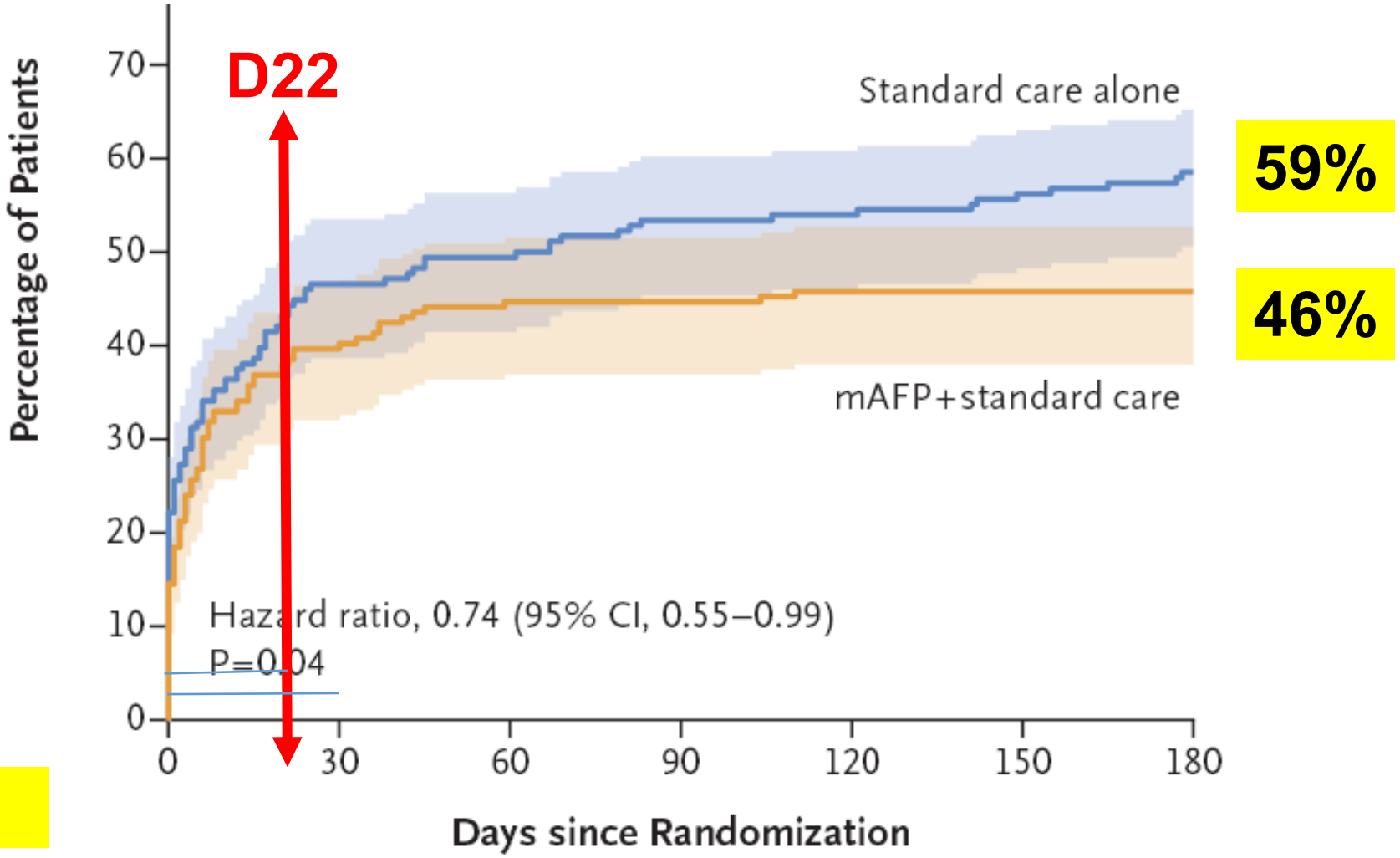
Danish/German Cardiogenic Shock Trial (DanGerShock) NCT01633502



Patients with Glasgow <8 after ROSC not eligible

Death from any cause



360 Patients

No. at Risk							
Standard care	176	94	89	82	81	77	72
mAFP+standard care	179	108	99	99	97	97	97

ESC European Society of Cardiology

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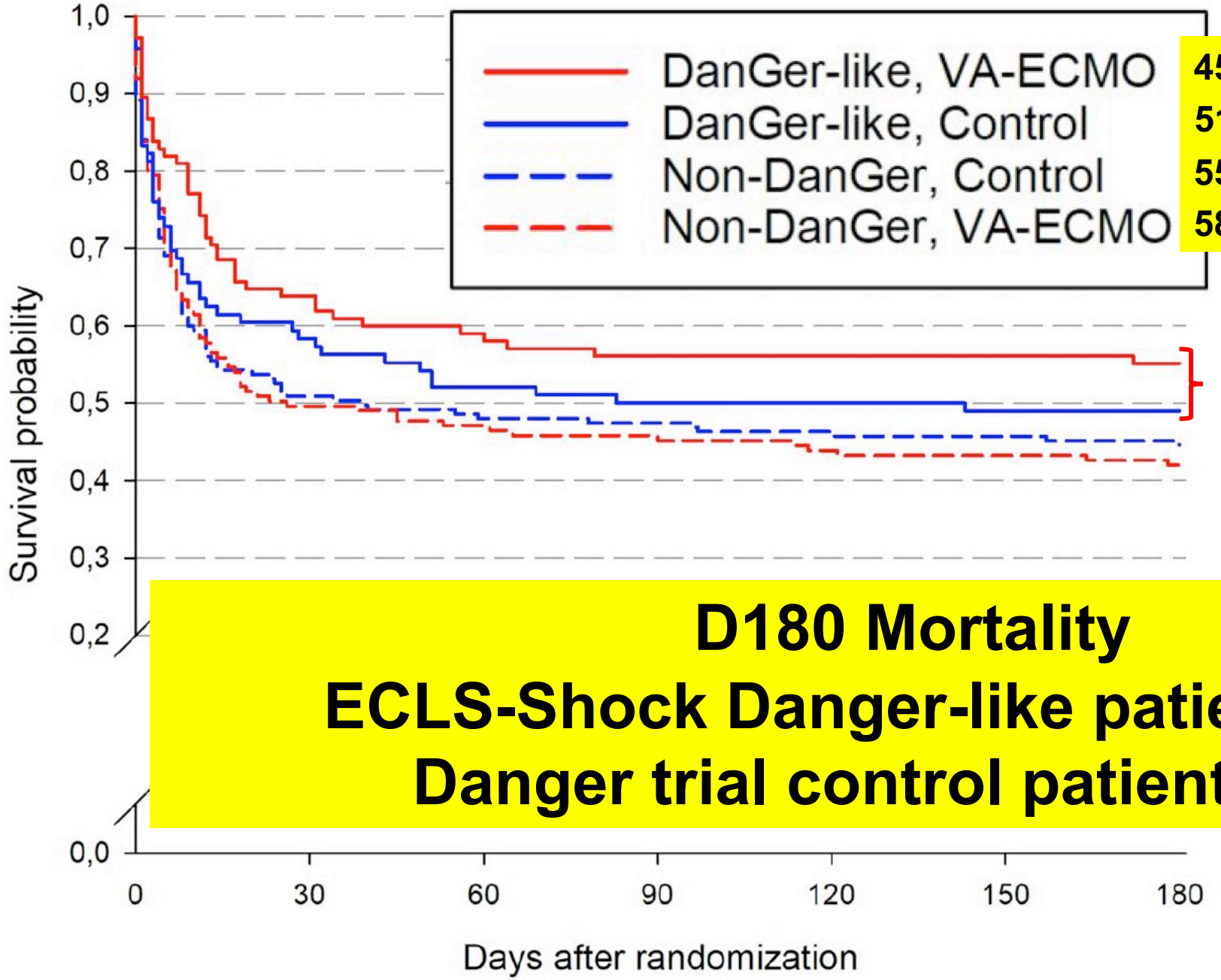
https://doi.org/10.1093/ehjacc/zuae093

BRIEF REPORT
Acute coronary syndromes

Do DanGer-SHOCK-like patients benefit from VA-ECMO treatment in infarct-related cardiogenic shock? results of an individual patient data meta-analysis

Uwe Zeymer [1,2]*, Anne Freund[3], Matthias Hochadel[1], Petr Ostadal[4], Jan Belohlavek [5], Steffen Massberg [6], Stefan Brunner[6], Marcus Flather [7], David Adlam[8], Christian Hassager [9], Jacob E. Moeller[10], Steffen Schneider[1], Steffen Desch [3], and Holger Thiele [3]

Individual patient data analysis, 4 RCTs of VA-ECMO in AMI-CS
DanGer-Shock-like patients (STEMI only, low likelihood of brain injury)
But no Data on Hemodynamic phenotype



Danger Impella	Danger Control
46%	59%

45% vs.51%
HR, 0.84; 0.56–1.26]

D180 Mortality
ECLS-Shock Danger-like patients, 48%
Danger trial control patients 59%

Management	Microaxial Flow Pump plus Standard Care (N=179)	Standard Care Alone (N=176)
Escalation to additional mechanical circulatory support		
Placement of Impella 5.0 device — no. (%)	7 (3.9)	5 (2.8)
Placement of Impella CP for venting during venoarterial ECMO therapy — no. (%)	0	4 (2.3)
Placement of Impella 2.5 device — no. (%)	0	1 (0.6)
Placement of Impella RP device — no. (%)	0	0
Venoarterial ECMO — no. (%)	21 (11.7)	33 (18.8)
Median time from randomization to placement of venoarterial ECMO (IQR) — hr	14 (4–54)	2 (1–5)
Placement of permanent LVAD — no. (%)	10 (5.6)	4 (2.3)
Any escalation to additional mechanical circulatory support — no. (%)	28 (15.6)§	37 (21.0)¶

Unusually high death rate in controls

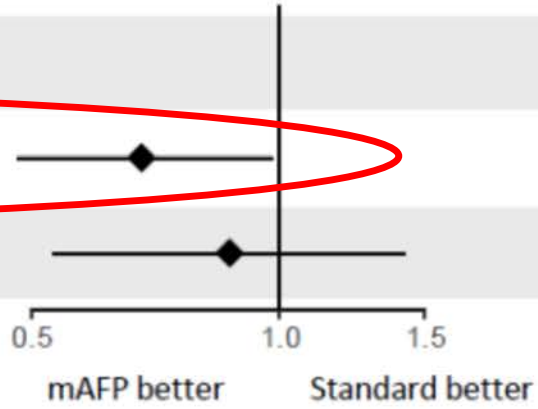
Event	Microaxial Flow Pump plus Standard Care (N=179)	Standard Care Alone (N=176)	Effect Size (95% CI)†
Primary end point: death from any cause at 180 days — no. (%)	82 (45.8)	103 (58.5)	0.74 (0.55 to 0.99)‡
Secondary end point			
Composite cardiac end point — no. (%)§	94 (52.5)	112 (63.6)	0.72 (0.55 to 0.95)
No. of days alive and out of the hospital (range)¶	82 (0 to 177)	73 (0 to 179)	8 (−8 to 25)
Adverse events			
Composite safety end point — no. (%)‖	43 (24.0)	11 (6.2)	4.74 (2.36 to 9.55)
Moderate or severe bleeding — no. (%)**	39 (21.8)	21 (11.9)	2.06 (1.15 to 3.66)
Limb ischemia — no. (%)	10 (5.6)	2 (1.1)	5.15 (1.11 to 23.84)
Renal-replacement therapy — no. (%)	75 (41.9)	47 (26.7)	1.98 (1.27 to 3.09)
Stroke — no. (%)	7 (3.9)	4 (2.3)	1.75 (0.50 to 6.01)
Cardioversion after ventricular tachycardia or fibrillation — no. (%)	59 (33.0)	52 (29.5)	1.17 (0.75 to 1.83)
Sepsis with positive blood culture†† — no. (%)	21 (11.7)	8 (4.5)	2.79 (1.20 to 6.48)

Table 1 Outcomes until 30 and 180 days in DanGer-like and non-DanGer-like patients enrolled in four randomized trials comparing the routine use of VA-ECMO vs. control

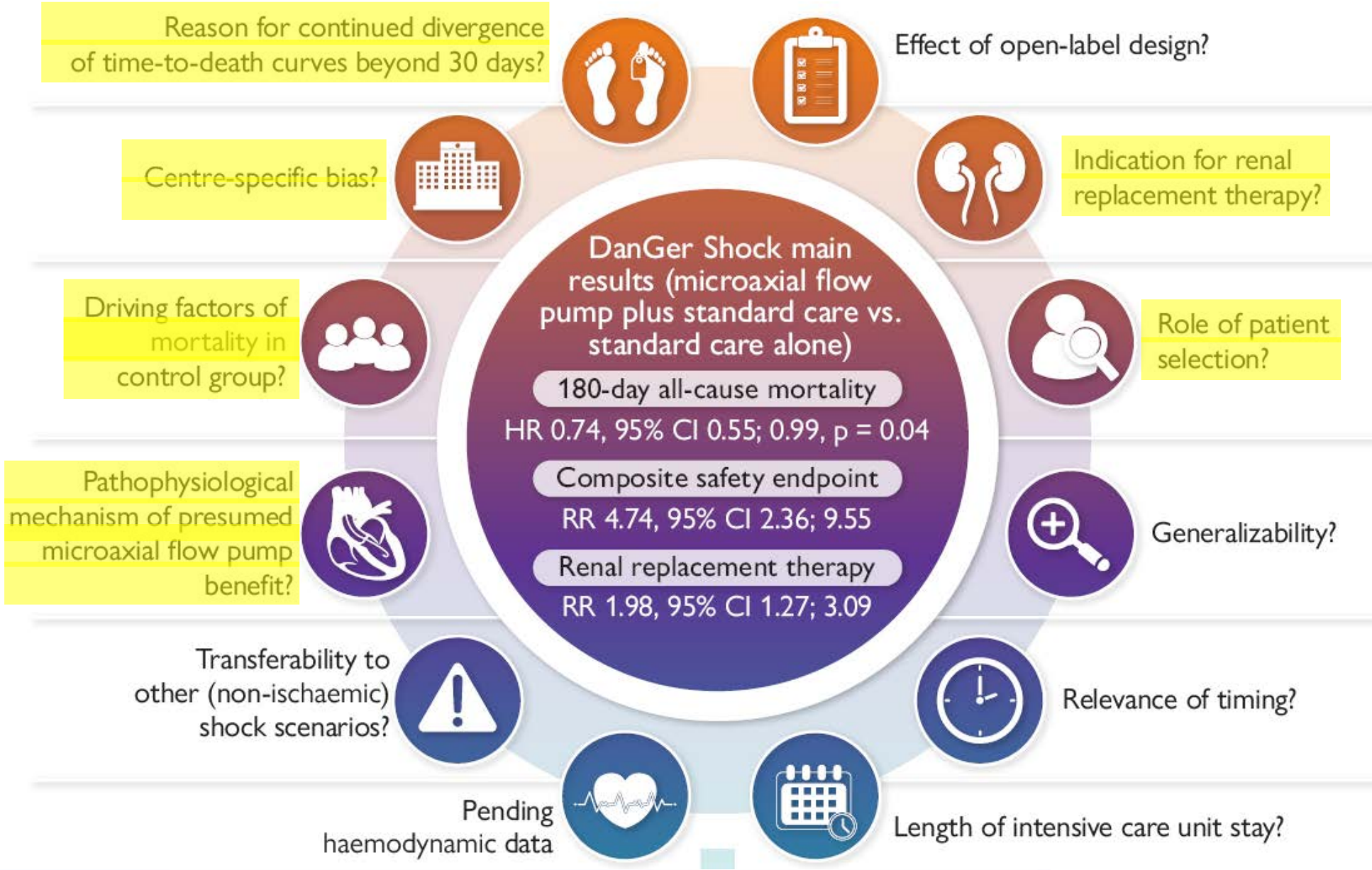
Outcomes	DanGer-like	non-DanGer-like	
Primary endpoint			
Death ≤ 180 days	96/201 (48%)	190/336 (57%)	0.048
Causes of death:			
Cardiac	56 (28%)	110 (33%)	
Brain injury	10 (5%)	46 (14%)	
Other	30 (15%)	34 (10%)	
Secondary endpoints 30 days			
Death ≤ 30 days	78/201 (39%)	167/336 (50%)	0.014
Moderate or severe bleeding (BARC ≥ 3) ≤ 30 days	42/201 (21%)	58/336 (17%)	0.30
Stroke ≤ 30 days	5/201 (2%)	12/336 (4%)	0.49
Peripheral ischaemic vascular complication ≤ 30 days	18/201 (9%)	22/336 (7%)	0.30
Sepsis ≤ 30 days	46/197 (23%)	41/329 (12%)	0.001
Renal replacement therapy ≤ 30 days	27/180 (15%)	38/315 (12%)	0.35

Heterogeneity of Treatment effect Across Country of Enrollment

Country	Mircoaxial Flow Pump	Standard of Care	Hazard Ratio (95%CI)
Denmark	51/106 (48.1)	70/109 (64.2)	0.68 (0.48 - 0.98)
Germany/UK	31/73 (42.5)	33/67 (49.3)	0.87 (0.53 - 1.42)



The DanGer Shock trial: a new dawn but much to uncover



Enzo Lüsebrink [1,2]*, Leonhard Binzenhöfer[1,2], and Holger Thiele [3]* European Heart Journal (2024) **45**, 4181–4183

Challenges of tCS RCTs

More questions than answers after these latest RCTs???

Intensive Care Med
https://doi.org/10.1007/s00134-024-07356-0

WHAT'S NEW IN INTENSIVE CARE

What's new in VA-ECMO for acute myocardial infarction-related cardiogenic shock

Alain Combes[1,2*], Susanna Price[3,4] and Bruno Levy[5]

Adequate ECMO indications

- SCAI SHOCK D-E patients
- Low cardiac output: CI < 1,8-2 L/min/m²
- Lactate >3 or Increasing lactate
- Increasing inotropes/vasopressors

RCTs are needed

- Indication biases in retrospective series
- No high quality evidence

Potential benefits of ECMO

- Halts the vicious circle of end-organ hypoperfusion
- Bridge to LV recovery post AMI LV sideration
- Bridge to VAD/Htx for non-recovering patients

ECMO FOR AMICS

ECMO NON-indications

- SCAI SHOCK C patients
- CI > 2-2,2 L/min/m²
- Advanced age/comorbidities
- Prolonged cardiac arrest
- Advanced multiple organ failure

Challenges of RCTs

- Short time window for enrolment, hard to obtain consent before randomization
- Lack of equipoise? High rate of cross-over to ECMO
- Frequently underpowered
- Protocolized management difficult
- ECMO/postECMO competing risk of mortality

ECMO-associated complications

- Severe bleeding and/or thrombosis
- Thrombocytopenia, hemolysis
- Limb ischemia
- LV dilation / Pulmonary edema
- Infection / Sepsis
- Drug sequestration

Optimized Management under ECMO

- Management in an experienced ECMO center
- LV unloading in most patients
- Leg distal perfusion of the superficial femoral artery
- Anticoagulation
- No intubation/Early Extubation

Optimized Management after ECMO

- Protocolized weaning
- Femoral artery closing device
- Heart failure clinic for optimized treatment
- Long-term VAD or heart transplantation for non-recovering LV

Combes et al, Intensive Care Med, 2024

De Backer *et al. Critical Care* (2024) 28:203
https://doi.org/10.1186/s13054-024-04988-y

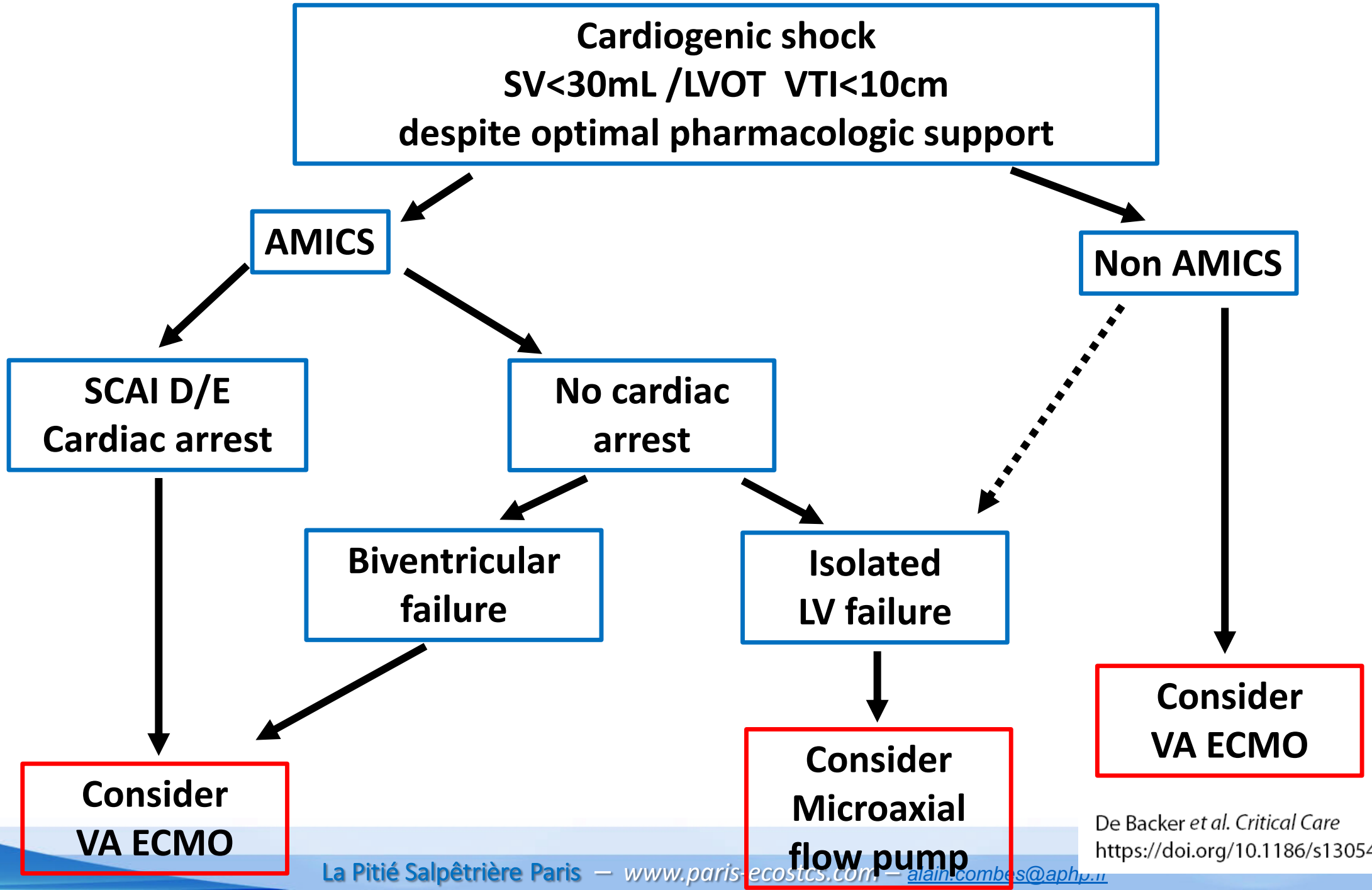
Critical Care

COMMENT

Open Access

Mechanical circulatory support in cardiogenic shock: microaxial flow pumps for all and VA-ECMO consigned to the museum?

Daniel De Backer[1*], Dirk W. Donker[2,3], Alain Combes[4], Alexandre Mebazaa[5], Jacob E. Moller[6,7] and Jean-Louis Vincent[8]



De Backer *et al. Critical Care* (2024) 28:203
https://doi.org/10.1186/s13054-024-04988-y

The ANCHOR trial

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ACTION

ANCHOR STUDY

Experimental Treatment Arm

– Protocolized conventional management of cardiogenic shock
– VA-ECMO will be started as rapidly as possible
– For patients randomized at non-ECMO centers, a mobile ECMO team will initiate ECMO at the non-ECMO center and transport the patient to the ECMO center immediately
– IABP inserted in the contralateral femoral artery (unless technically not possible)
– ECMO management according to protocol
– ECMO weaning according to protocol

Control Conventional Treatment Arm

– Protocolized conventional management of cardiogenic shock
– IABP not recommended. No other mechanical device (e.g., Impella, Thoratec PHP, TandemHeart) permitted
– Rescue VA-ECMO if one of 1 or 2 or 3:
- 1 Refractory cardiogenic shock defined as
  a. Cardiac index <1.2 l/min/m² or VTI <6 cm AND
  b. Assessment and correction of hypovolemia AND
  c. (dobutamine ≥15 microg/kg/min + norepinephrine ≥1.5 microg/kg/min) OR epinephrine ≥ 0.75 microg/kg/min
  d. Serum lactate >5 mmol/L or serum lactate increased >50% in the last 6 hours
- 2 Uncontrolled lethal arrhythmia K >4.5 mmol/l AND Mg >1.0 mmol/l AND Intubation and mechanical ventilation with deep sedation AND IV Loading of amiodarone AND IV xylocaine
- 3 Refractory cardiac arrest

PLUS Mandatory validation by an independent adjudicator


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