Regionaalhaigla

Ecmo- yes, not yet or never

Indrek Rätsep

North Estonia Medical Centre

Evidence that VV-ECMO saves lives

- Early RCTs: **CAESAR, ANZ-ECMO, EOLIA**

- Barbaro RP, McLaren G, Boonstra PS, Iwashyna TJ, Slutsky AS, Fan E, et al. (Michigan, US)

Extracorporeal membrane oxygenation support in COVID-19: an international **cohort study** of the Extracorporeal Life Support Organization registry.

In 1035 patients receiving ECMO for Covid-19, **mortality at 90 days was < 40%.**

Schmidt M, Hajage D, Lebreton G, Monsel A, Voiriot G, Levy D, et al. (Paris, France)

Extracorporeal membrane oxygenation for severe acute respiratory distress syndrome associated with COVID-19: a retrospective **cohort** study.

In 492 patients receiving ECMO for COVID-19, **mortality at 60 days was < 31%**.

- There are no RCTs of ECMO in COVID-19, but there are

3 important emulated trials

- Shaefi S, Brenner SK, Gupta S, O'Gara BP, Krajewski ML, Charytan DM, et al. Extracorporeal membrane oxygenation in patients with severe respiratory failure from COVID-19. Intensive Care Med. 2021;47:208–21.

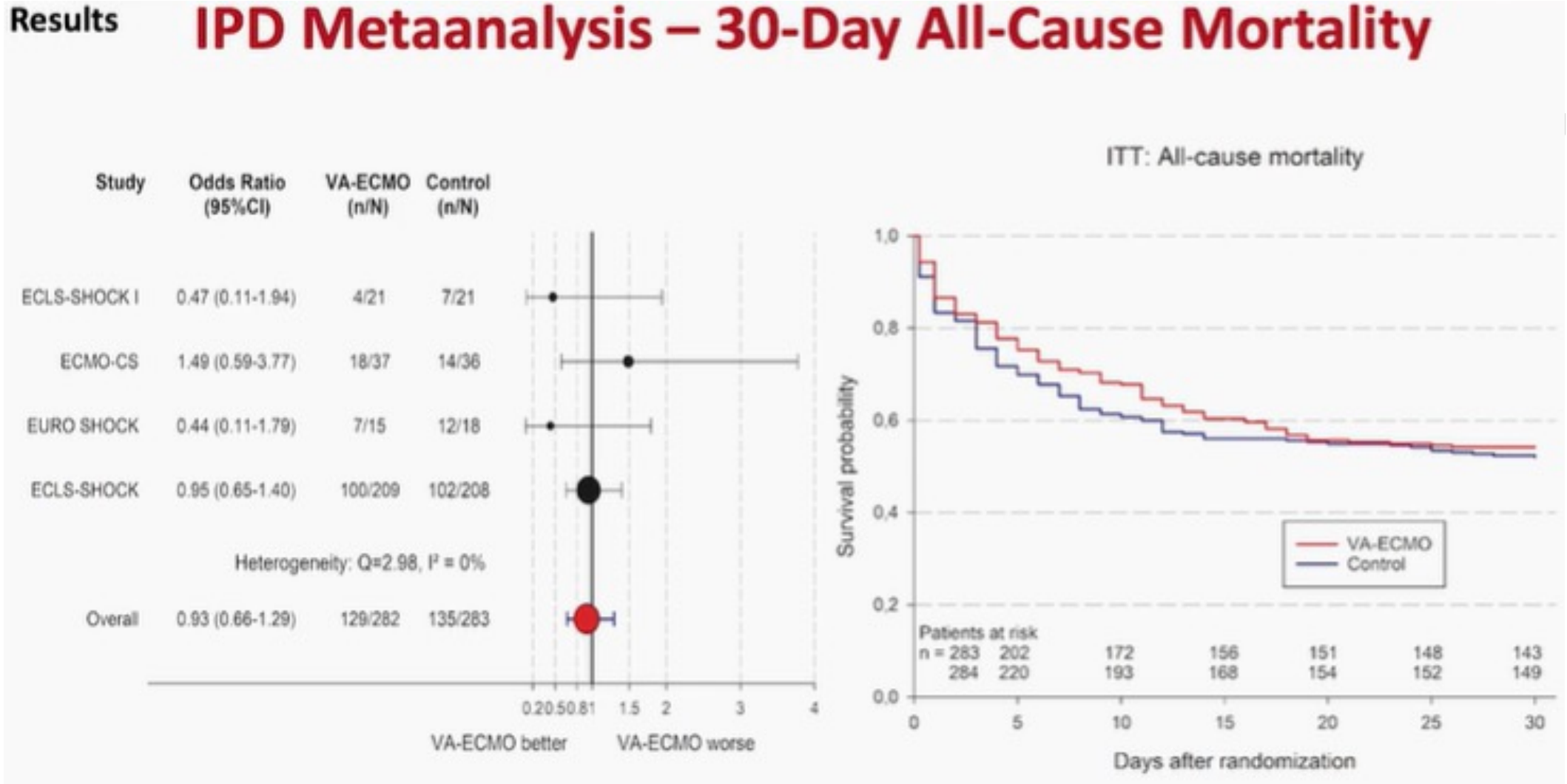
- Hajage D, Combes A, Guervilly C, Lebreton G, Mercat A, Pavot A, et al. Extracorporeal membrane oxygenation for severe acute respiratory distress syndrome associated with COVID-19: an emulated target trial analysis. Am J Respir Crit Care Med. 2022;206(3):281–94.

- Urner M, Barnett AG, Bassi GL, Brodie D, Dalton HJ, Ferguson ND, et al. Venovenous extracorporeal membrane oxygenation in patients with acute covid-19 associated respiratory failure: comparative effectiveness study. BMJ. 2022;377: e068723.

Evidence in eCPR

- INCEPTION 2023; eCPR surv (+ cpc1-2) 20% vs. 16% (160 pt), -
- Prague OHCA 2022; eCPR survival (+cpc 1-2) 32% vs. 22% (256 pt), -
- ARREST, Yannopoulos 2020 eCPR survival 43% vs. cCPR 15% (30 pt), +

Evidence of CS and VA- ECMO

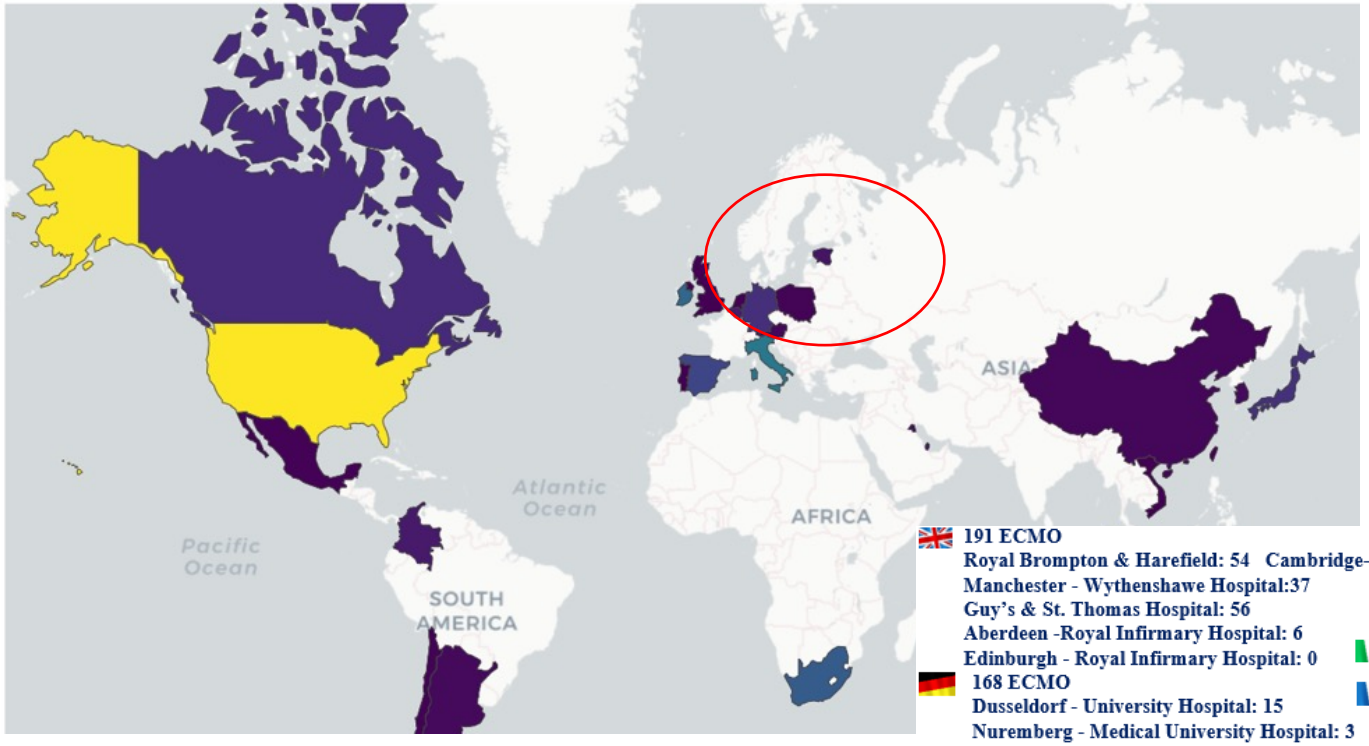


The last RCT-s confirm that it is the same to be denied than to have an ECMO.

A.Vuylsteke, Royal Papworth, UK

COVID-19 Critical Care Consortium
Incorporating ECMOCARD

14 August, 2020



EuroECMO-COVID Survey
10 August 2020

EuroECMO COVID

191 ECMO
Royal Brompton & Harefield: 54 Cambridge-Royal Papworth:38
Manchester - Wythenshawe Hospital:37
Guy's & St. Thomas Hospital: 56
Aberdeen -Royal Infirmary Hospital: 6
Edinburgh - Royal Infirmary Hospital: 0

168 ECMO
Dusseldorf - University Hospital: 15
Nuremberg - Medical University Hospital: 3
Hannover - Medical School: 11
Leipzig - Heart Center: 1
Regensburg - University Hospital: 21
Essen - University Hospital: 6
Berlin - Heart Center: 0 Langen-Asklepios K:11
Aachen - University Hospital: 18
Kassel – ECMO Center: 8
Freiburg – University Heart Center: 27
Koln – ECMO Center: 19
Tubingen – University Hospital: 17
Frankfurt – University Hospital: 11

22 ECMO
Maastricht - UMC: 8
Rotterdam - Erasmus UMC: 1
Leiden – UMC: 2
Utrecht – UMC: 4
Amsterdam – UMC: 1
Nieuwegein - St. Antonius Ziekenhuis: 5
Breda – Hospital: 0
Nijmegen – UMC: 1

102 ECMO
Leuven - University Hospital: 14
Aalst - OLV: 7

4 ECMO
Dublin - Mater Hospital: 4

368 ECMO
Paris- Centers: 310
Montpellier – CHU: 7
Perpignan – CHU: 4
Jossigny - de Ma:rne-la-Vallée Hospital Center: 4
Rennes – CHU: 5
Nimes – CHU: 4
Lyon - CHU: 7
Amiens – CHU: 14
Dijon – CHU: 13

4 ECMO
Tallinn -North Regional Hospital: 2
Tartu - University Clinic: 2

22 ECMO
Zurich – University Hospital: 10
Zurich – Hirslanden Clinic: 0
Lugano – Cardiocentro Ticino: 0
Lausanne – CHUV: 7
Bern – University Hospital: 3
Basel – University Hospital: 2

31 ECMO
Porto – San Joao Hospital: 17
Lisbon- Santa Maria Hospital: 10
Coimbra – Hospital Center: 3
Vila Nova Gaia - Gaia/Espinho Hospital: 1

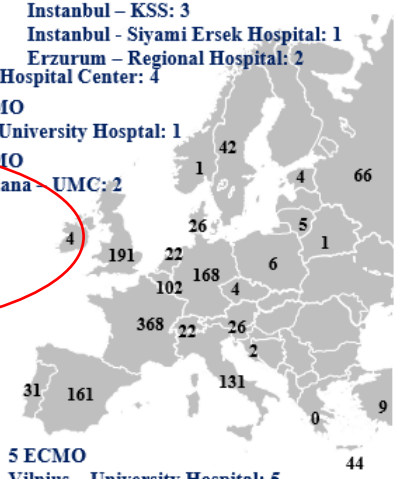
161 ECMO
Valladolid – University Clinic Hospital: 5
Madrid - Fundación Jiménez Díaz Hospital: 4
Madrid - Hospital Clinico San Carlos: 3

1 ECMO
Minsk -Republican Center Cardiology: 1

9 ECMO
Istanbul - Koşuyolu Hospital: 3
Instanbul – KSS: 3
Instanbul - Siyami Ersek Hospital: 1
Erzurum – Regional Hospital: 2

1 ECMO
Oslo -University Hosptal: 1

2 ECMO
Ljubljana – UMC: 2



5 ECMO
Vilnius – University Hospital: 5

0 ECMO
Greek Centers: 0

26 ECMO
Copenhagen - University Hospital: 20
Aarhus - University Hospital: 6

26 ECMO
Innsbruck - University Hospital: 6
St. Polten – Hospital: 7
Vienna – Medical University Hospital: 7
Salzburg Hospital: 3
Graz Hospital: 1
Klagenfurt Hospital: 2
Linz/Wels Hospital: 0
Vienna Krankenhaus Nord: 0

44 ECMO
Sheba Hospital: 14
Ichilov Hospital: 5 Sh. Tsedek Hospital: 4 Assaf Harofeh H:2
Carmel Hospital:2
Wolfson Hospital: 6
Beilinson Hospital: 4
Soroka Hospital: 3
Hadassa H:2 Rambam H: 2

4 ECMO
Prague – University Hospital: 4

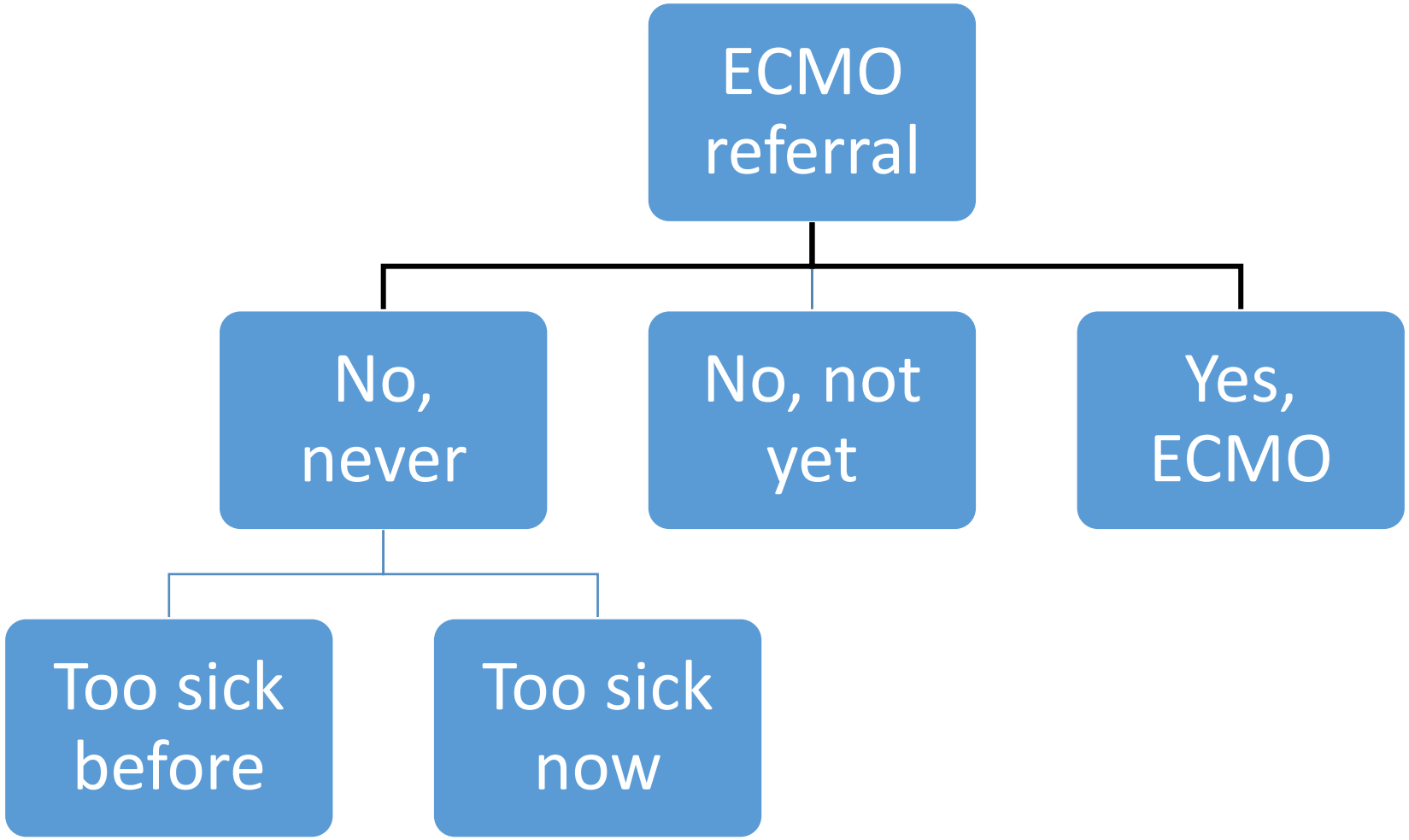
6 ECMO
Warsaw – Hospital: 4
Polish Centers: 2

The aim of our study was to follow the patients who were denied ECMO.

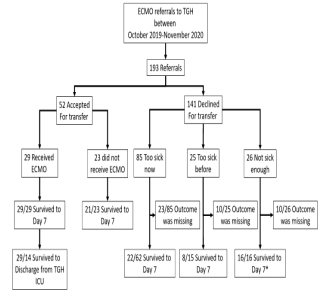
- To describe referral patterns and short-term outcomes of „mixed bag“ of patients in respiratory (Covid & non-Covid) or circulatory failure declined for ECMO.

- The primary study endpoints were:
  - **referral outcome (accepted/declined)** and
  - **patient outcome (alive/deceased)**

Referral pathway in Tallinn



Referral outcome:



89 pt.

86 pt

3 to Tartu ECMO center

42 Declined for ECMO

44 Accepted for ECMO

Too sick now 27/42

Too sick before 6/42

Not sick enough 9/42

Day 7 survival 36/44

Day 7 survival 3/3

D7 survival 7/27

D7 survival 3/6

D7 survival 9/9

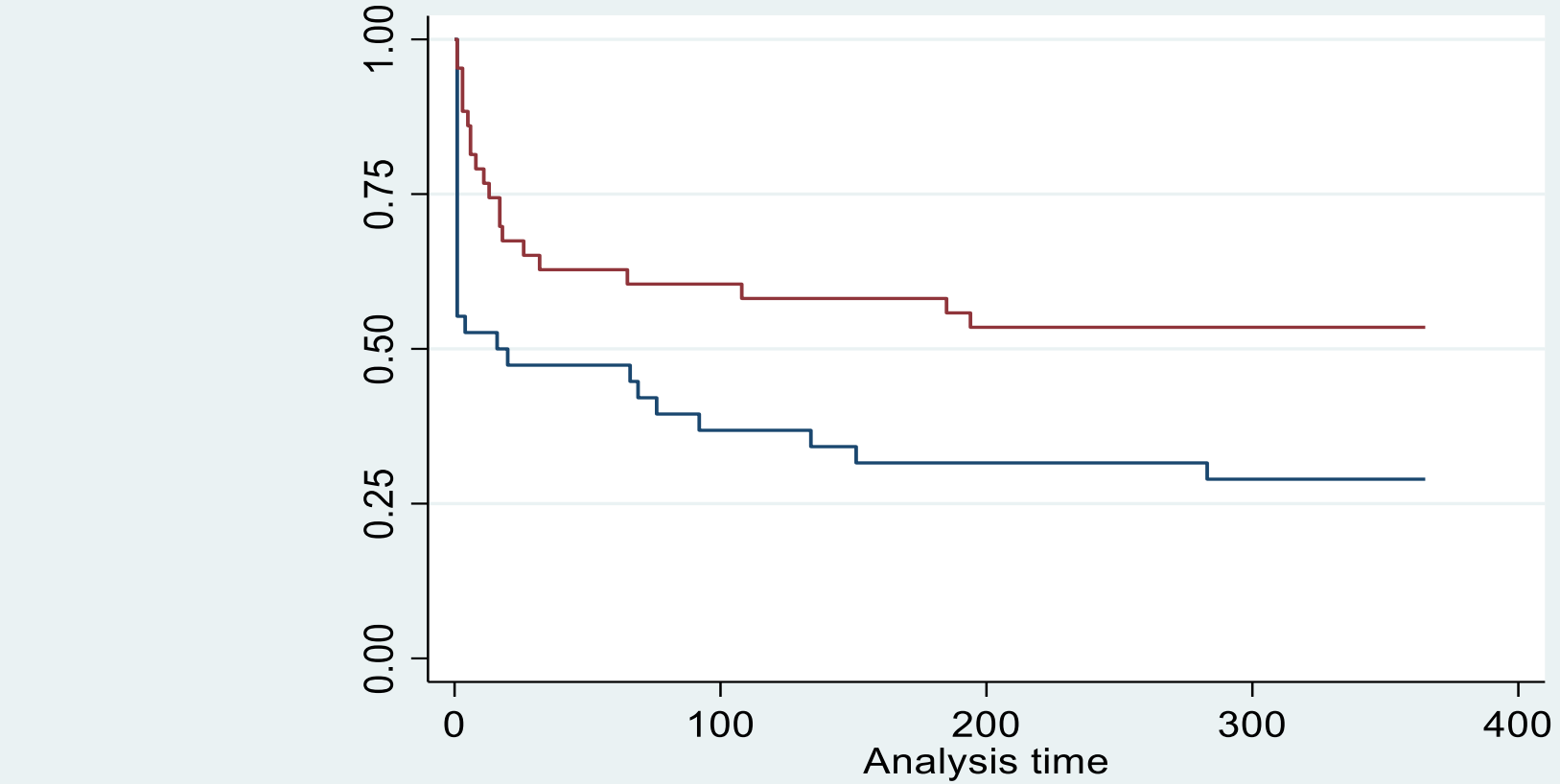
	Declined for ECMO N= 42	Accepted for ECMO N= 44	p value
Timeline	2019-2023	2020-2023	
Gender, Male	30/42 (76%)	27/44 (61%)	0,121
Age (yr); mean (range)	53 (19-75)	50 (13-74)	0,218
≤44	22%	30%	0,225
45–60	48%	48%	1
≥61	32%	21%	0,337
Dominant organ failure			
CPR	25%	25%	1
(Cardiogenic) shock	33%	45%	0,142
Acute Lung Injury	42%	55%	0,294

	ECMO (n=42)		Ei ECMO (n=44)		
	n	%	n	%	p-väärtus
Sugu:					
mehed	27	61,4	30	76,9	0.127
naised	17	38,6	9	23,1	
Vanus:					
keskmine; SD; vahemik	49,8 15,1; 13-74		54,7 12,8; 19-75		0.115*
≤44	14	31,8	7	17,5	0.188
45–60	21	47,7	19	47,5	
≥61	9	20,5	14	35,0	
CPR					
ei	33	75,0	31	73,8	0.899
jah	11	25,0	11	26,1	
C_Shock					
ei	24	54,6	28	66,7	
jah	20	45,4	14	33,3	0.250
AL_Injury					
ei	20	45,5	26	61,9	0.126
jah	24	54,6	16	38,1	
7 day outcome					
Elus – 1	36	81,8	19	45,2	<0,001
Surnud- 0	8	18,2	23	54,8	
30 day outcome					
Elus – 1	29	66% 65,9	13	32% 31,7	0.002
Surnud- 0	15	34,1	28	68,3	
Hosp_OC					
Elus – 1	25	56,8	11	26,8	0.005
Surnud- 0	19	43,2	30	73,2	
Referral_12m					
1	25	58,1	11	26,8	
0	18	41,9	30	73,2	0.004

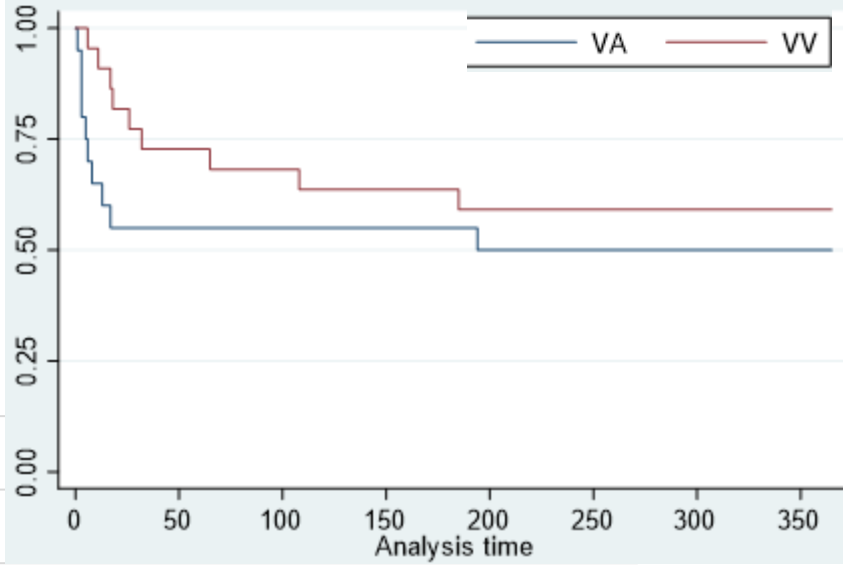
- Chi-square test to compare the differences between the frequencies.
- t-test to compare the statistical significance between the means.

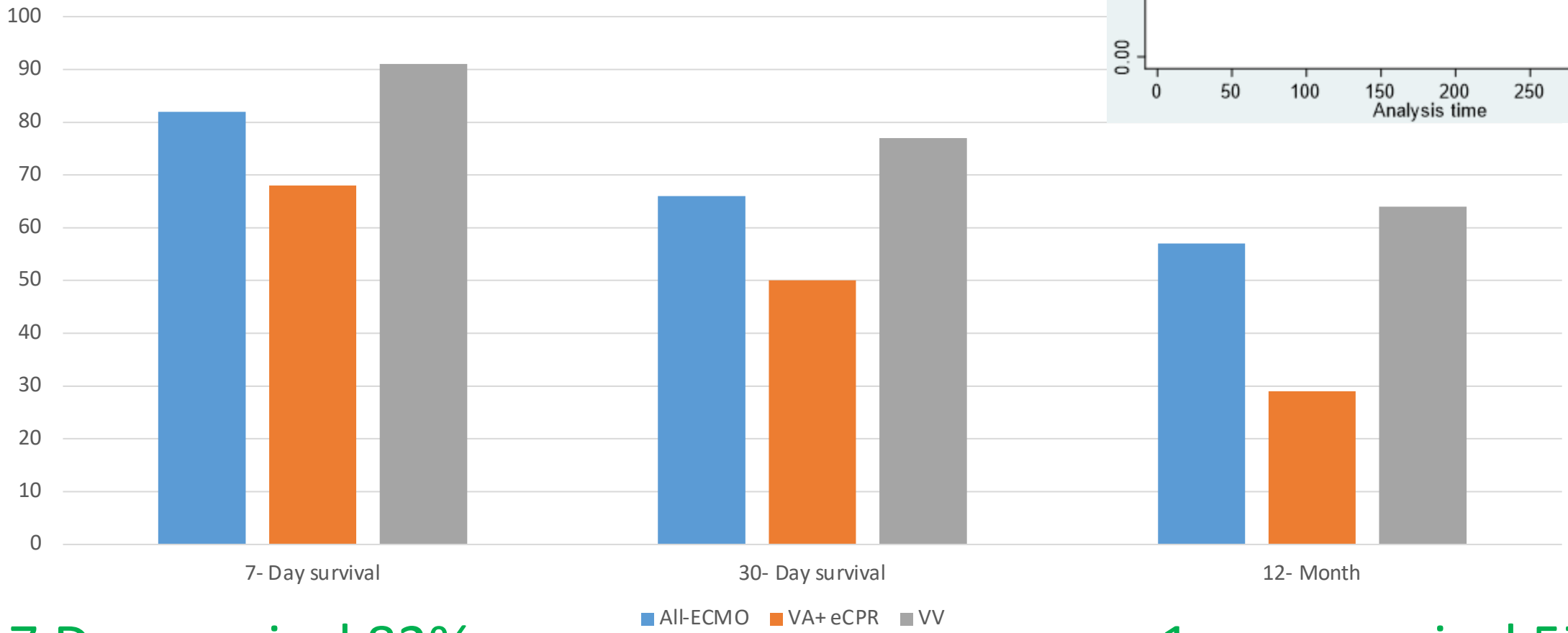
Survival estimates: ECMO vs non-ECMO

p=0.021 HR=0,50 95%CI 0.28 −0.90



Pt. accepted for ECMO:



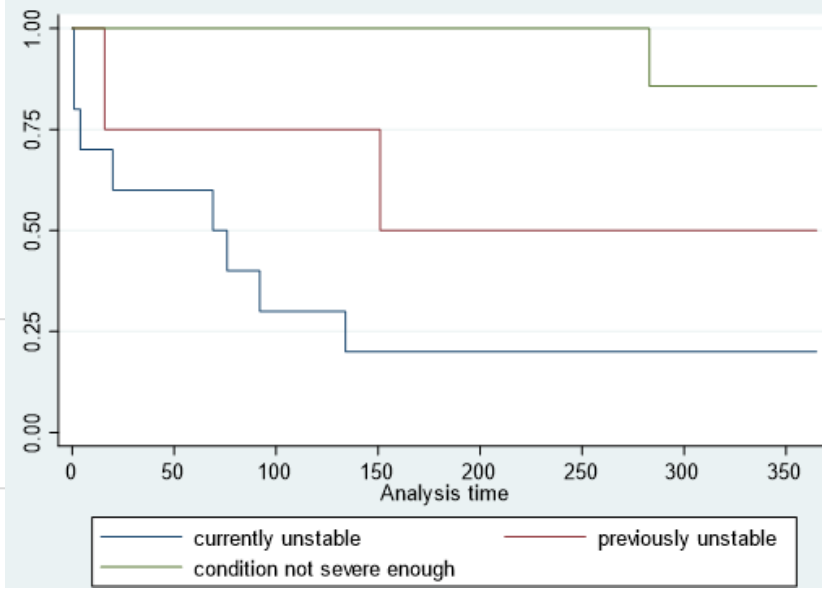


7 Day survival 82%

30 Day survival 66%

1 year survival 57%

Pt. declined for ECMO:



Not sick enough
Too sick before
Too sick now

120
100
80
60
40
20
0

D7 survival; 100
D7 survival; 43
D7 survival; 27
30%
D30 survival; 87
D30 survival; 29
D30 survival; 14
24%
1 Year survival; 75
1 Year survival; 29
1 Year survival; 9
16%

D7 survival
D30 survival
1 Year survival

	Reason for refusal	Deceased	Survived	Total
Not sick enough	Suboptimal MV	1	4	5
9 pt./22%	Suboptimal inotropic support	0	1	1
	Other (iNO, CRRT)	0	2	2
Too sick before	Heart failure	2	0	2
6 pt./14%	Pre-existing lung disease	1	0	1
	Extreme overweight and other	2	1	3
Too sick now	Refractory shock	3	0	3
27/64%	Unsurvivable illness	3	0	3
	Prolonged cardiac arrest	5	1	6
	Prolonged MV	3	1	4
	Other comorbid condition	4	1	4
	Advanced age	6	0	6
	ECMO not available	2	3*	5

Am J Respir Crit Care Med. 2021 Oct 15; 204(8): 994–997.
Published online 2021 Mar 30. doi: 10.1164/rccm.202105-1312LE
PMCID: PMC85
PMID: 343

Outcomes of Patients Denied Extracorporeal Membrane Oxygenation during the COVID-19 Pandemic in Greater Paris, France

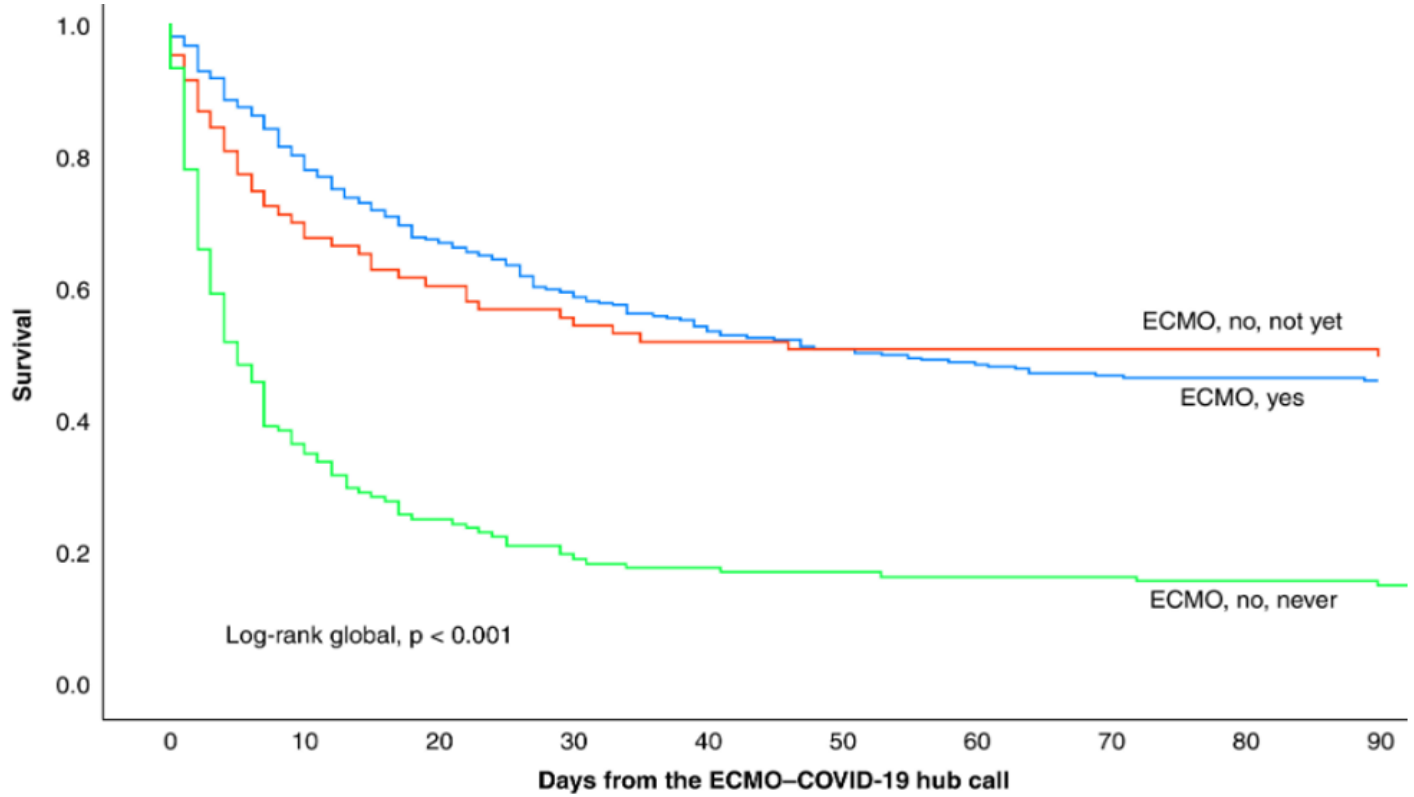
David Levy,[1,2] Guillaume Lebreton,[1,2] Marc Pineton de Chambrun,[1,2] Guillaume Hékimian,[1,2] Juliette Chomm
[1,2] Nicolas Bréchot,[1,2] Charles-Edouard Luyt,[1,2] Pascal Leprince,[1,2] Alain Combes,[1,2] and Matthieu Schmidt[1]

Venovenous ECMO criteria
- PaO_2/FiO_2 <50 for >3 h
- PaO_2/FiO_2 <80 for >6 h
- pH <7·25 and $PaCO_2$ ≥60 for >6 h
- Neuromuscular-blocking agents and prone position highly recommended

Contraindications
- Age >70 years
- Severe comorbidities
- Cardiac arrest (except no-flow 0 min and low-flow <15 min)
- Mechanical ventilation duration >10 days
- Multiple organ failure (except isolated acute kidney injury)

EOLIA

- 302pt. - yes
- 211- denied as „never“
  - 19% as age > 65 y, (in ½ of cases also other factors)
  - 66% as MV > 10days, (in ½ of cases also other factors)
  - MOF, Imunosupression and extreme obesity
- 62pt. – denied as „no, not yet“



- 90-day survival was obtained for **233** patients denied ECMO and **302** treated on it.
- Survival was not different between "ECMO, yes" and "ECMO, no, not yet" patients (**49% vs. 46%;** log-rank test, *P* = 0.93).
- 90-day survival of "ECMO, no, never" patients was significantly lower than the two other groups (**14%**; log-rank test, *P* < 0.001).

Reports of Original Investigations | Published: 06 June 2023

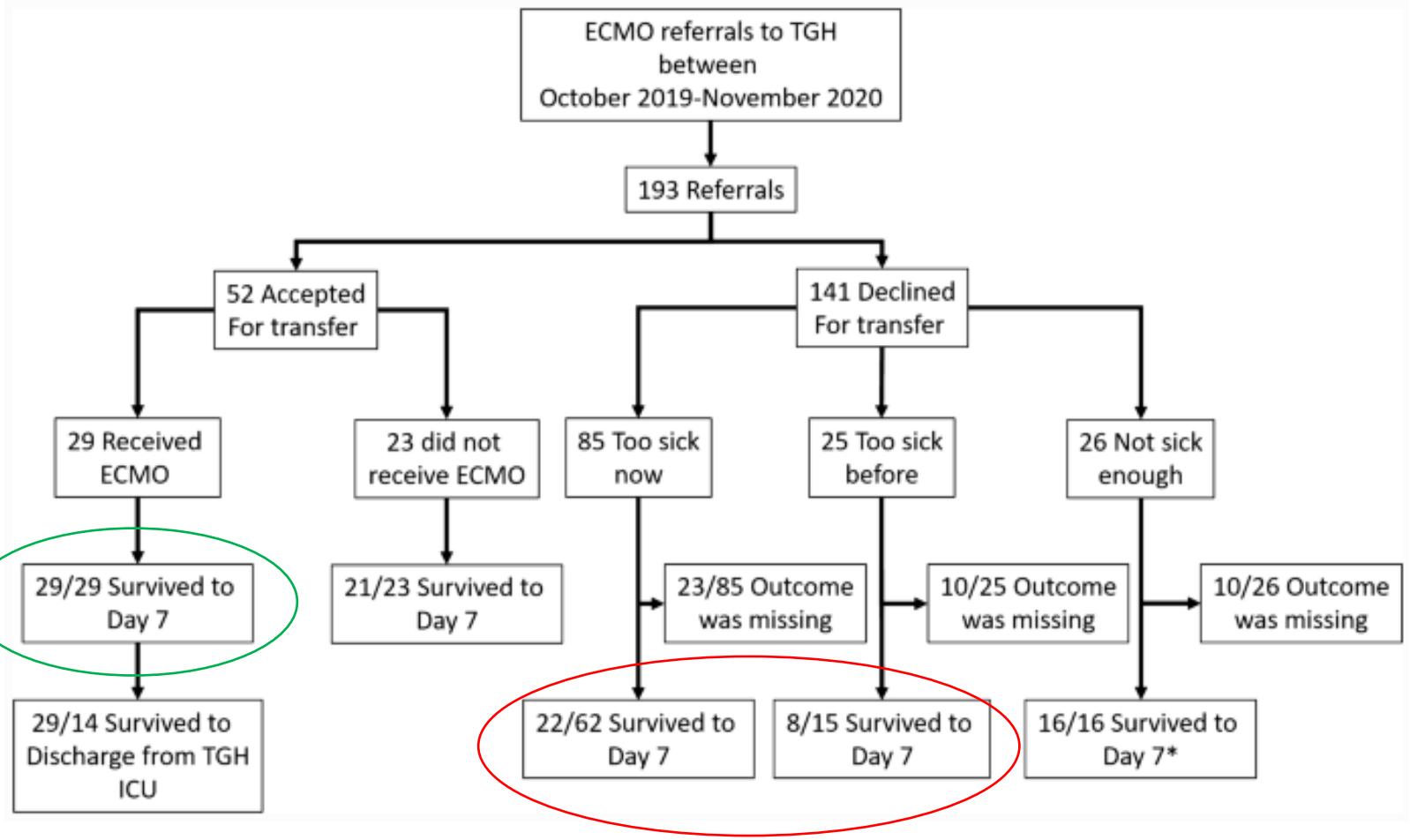
Outcomes of patients with respiratory failure declined for extracorporeal membrane oxygenation: a prospective observational study

Devenir des patient·es atteint·es d'insuffisance respiratoire n'ayant pas pu recevoir une oxygénation par membrane extracorporelle : une étude observationnelle prospective

Ricardo Teijeiro-Paradis MD, Jasmine Grenier MD, Martin Urner MD, Ghislaine Douflé MD, MEd, Andrew Steel MBBS, MSc, Marcelo Cypel MD, MSc, Shaf Keshavjee MD, MSc, Margaret Herridge MD, MSc, MPH, Ewan Goligher MD, PhD, John Granton MD, Niall Ferguson MD, MSc, Eddy Fan MD, PhD & Lorenzo Del Sorbo MD

Canadian Journal of Anesthesia/Journal canadien d'anesthésie **70**, 1226–1233 (2023) | Cite this article

- "too sick now," "too sick before," or "not sick enough"
- Pt. outcome was collected on day 7 after the referral.



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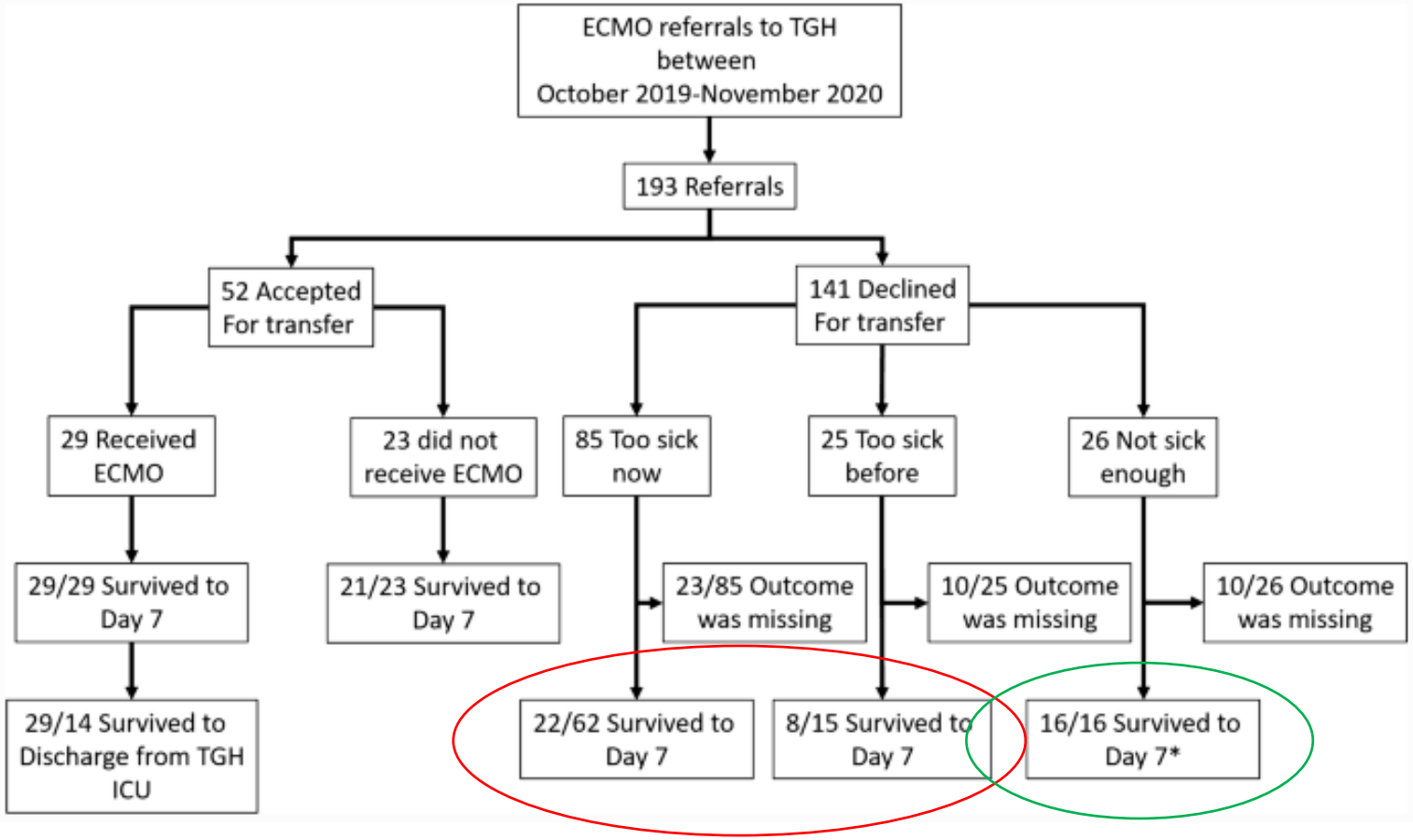
Referral outcome:

- 98% of accepted patients and 49% of the declined pt. were still alive on day 7



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Declined patient survival was heavily dependent on the reason being not accepted:

- 35% for patients deemed "too sick now,"
- 53% for "too sick before"
- 100% for "not sick enough"

Conclusion

- A short term (7-day) survival was **89%** in our group of ECMO patients and **100%** in those who were declined from ECMO as „too good“.

These results are well in line with the published results from Toronto GH.

- A 30-day and 12-month survival were observed **87%** and **75%** of patients declined ECMO as being „not sick enough,“ and **66%** and **57%** for ECMO receivers, respectively.

- The worst outcome goes with the patients denied ECMO because of too severe health condition at the moment of referral.

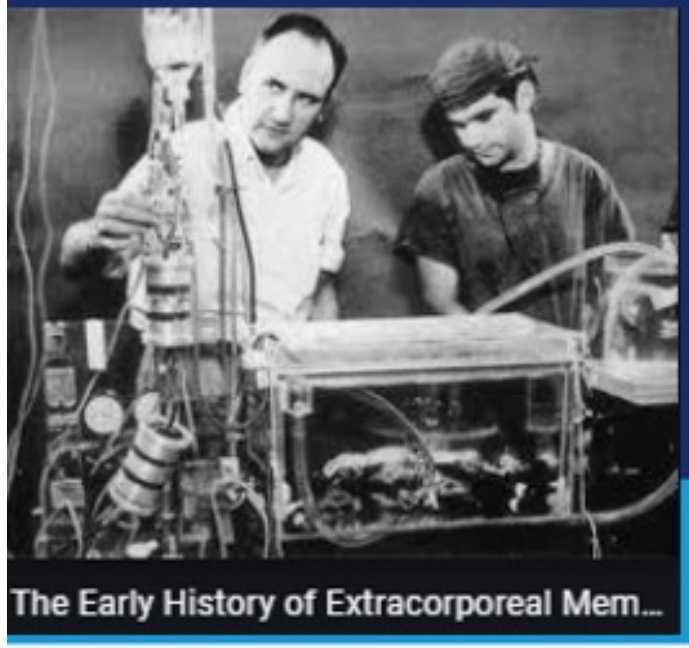
Their survival rates at day 7, day 30 and month 12 were just 30%, 24% and 16%

- Expert assessment is similar to admitting patients referred to critical care,

with age, premorbid dependency, underlying diagnosis, illness severity, and resource availability identified as factors influencing admission decisions.

In light of that, general predictive scorings like CCI and the Canadian fragility index, for example, would be worth testing.

In Memoriam: Dr Theodor Kolobow



The Early History of Extracorporeal Mem...

A tribute to Dr Kolobow written by Luciano Gattinoni, Antonio Pesenti, Lorenzo Berra and Robert Bartlett has been published in *Intensive Care*

March 30, 2018

Tribute