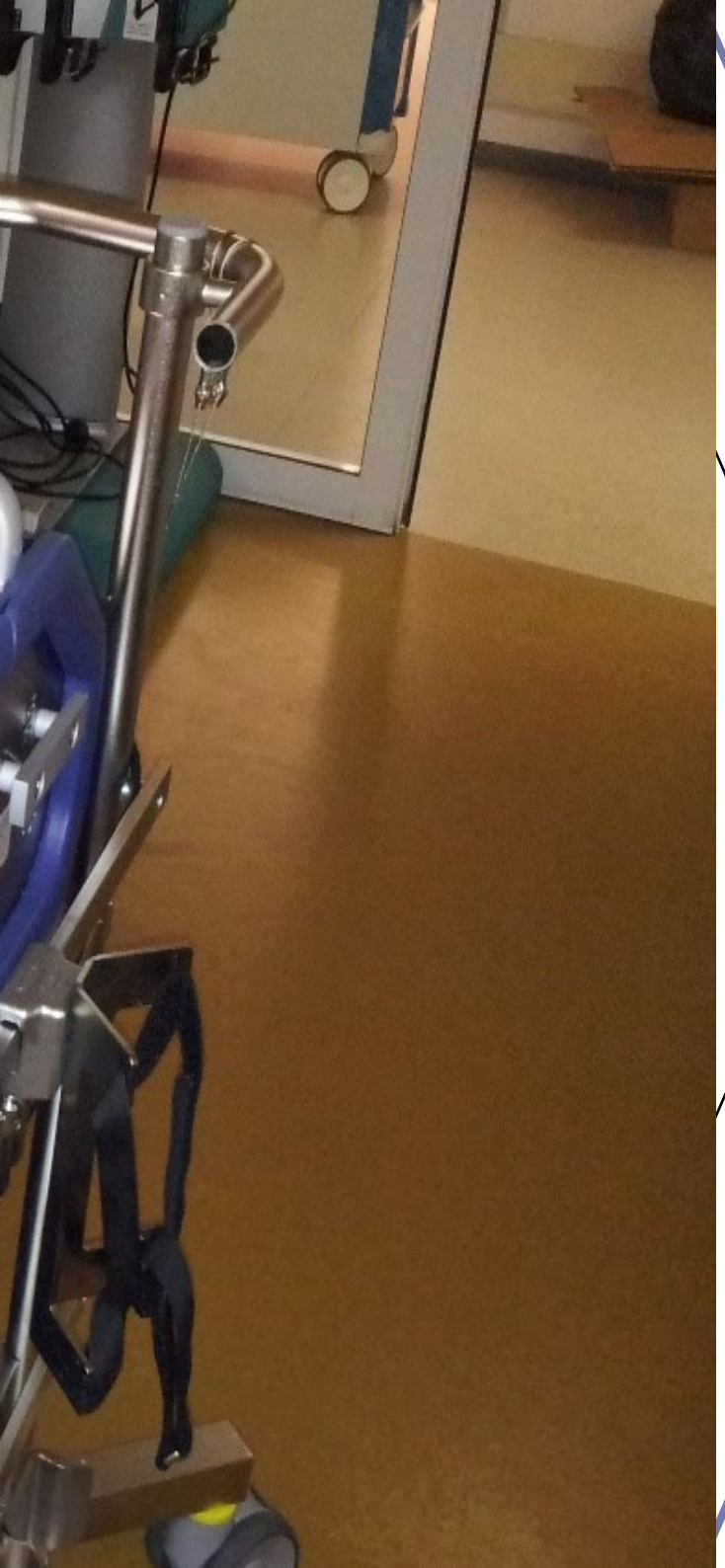
JCOR 31 MAI 2025

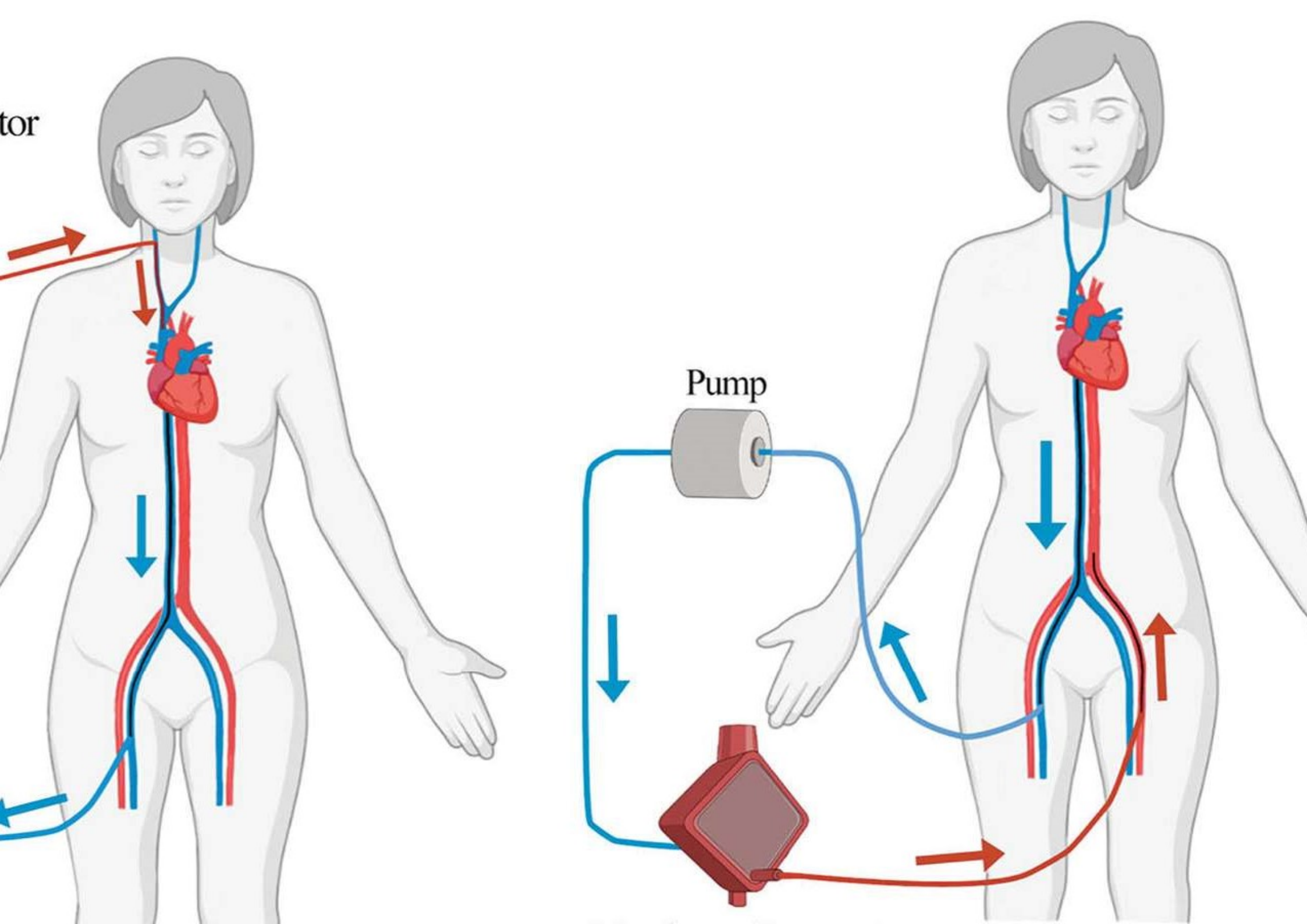
DE L'OXYGÉNATION CORPORELLE DANS LE ROME DE DÉTRESSE PIRATOIRE AIGU

Pr SAMIA AYED
de Réanimation Médicale



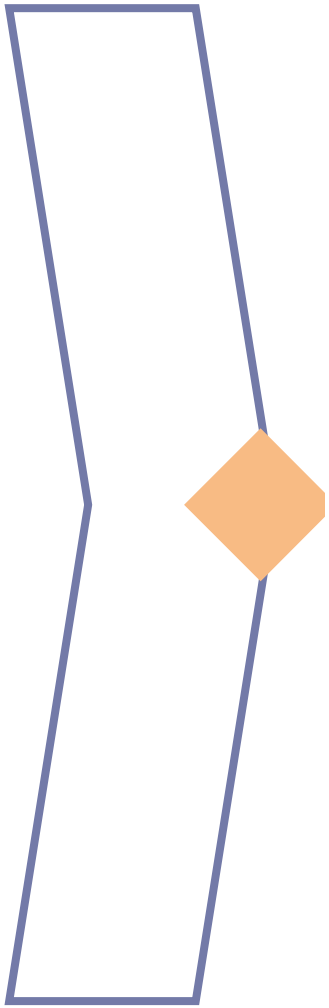
DÉFINITION ECM

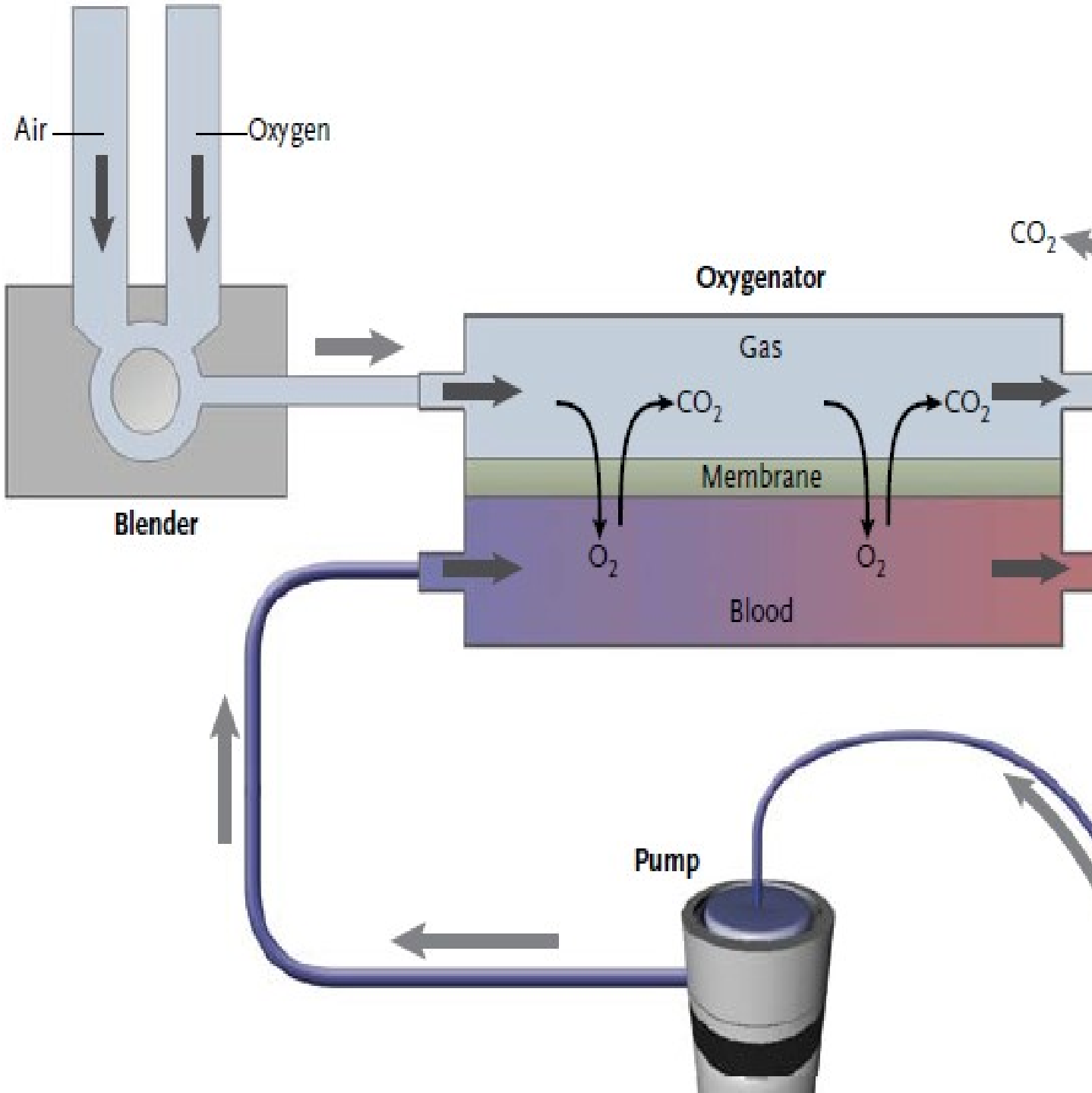
- Technique de support de la fonctio
  respiratoire
- Oxygénation du sang à l'extérieur d
  les poumons ne peuvent pas rempl
- Utilisée comme dernier recou
  situations de défaillance respiratoi
  sévère.

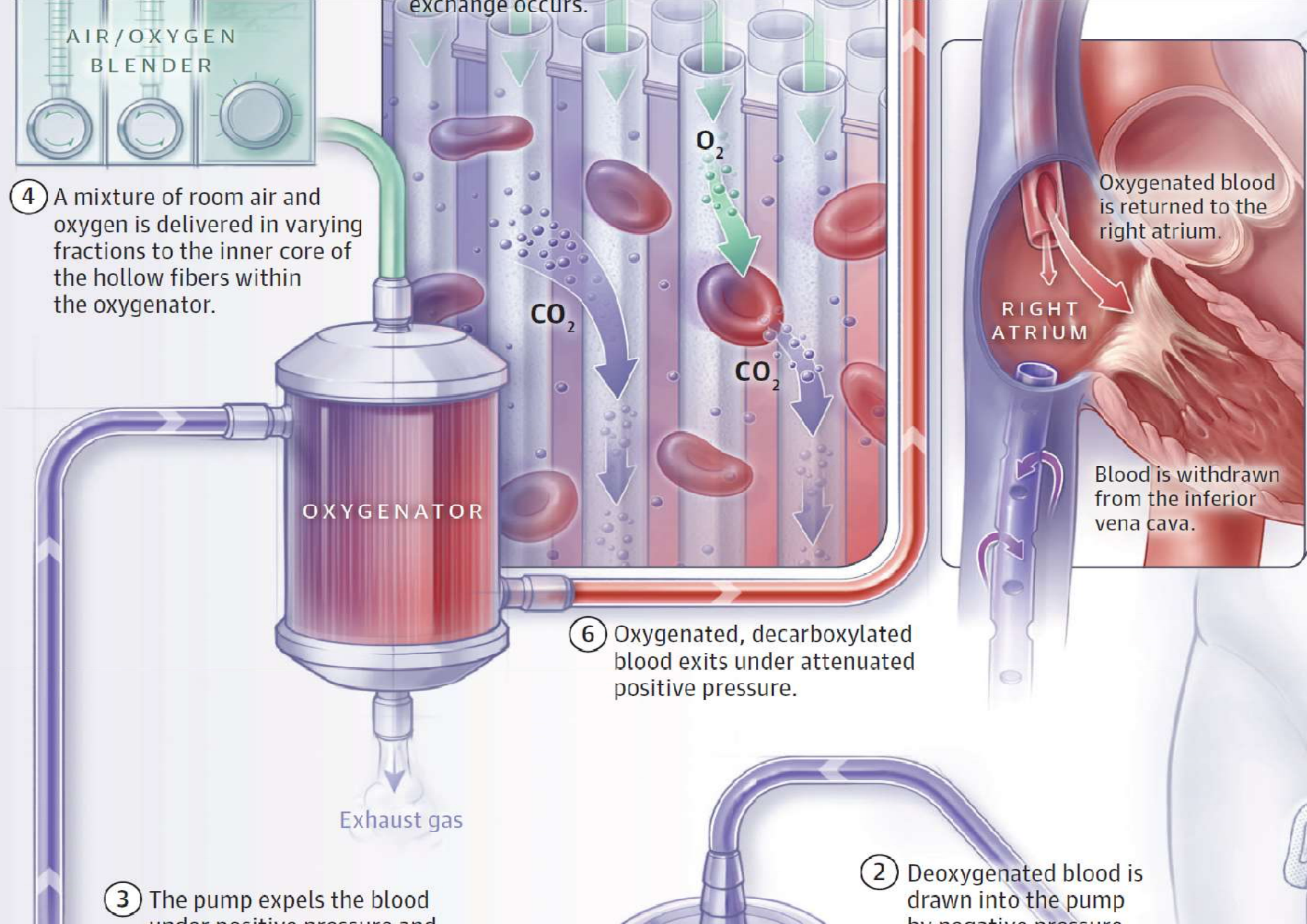

tor
Pump

nt le sang du
sser à travers
oxygénation
dioxyde de
e retournant

s et le cœur
oxygénation.






AIR/OXYGEN BLENDER
4 A mixture of room air and oxygen is delivered in varying fractions to the inner core of the hollow fibers within the oxygenator.
exchange occurs.
O_2
CO_2
CO_2
OXYGENATOR
Exhaust gas
6 Oxygenated, decarboxylated blood exits under attenuated positive pressure.
RIGHT ATRIUM
Oxygenated blood is returned to the right atrium.
Blood is withdrawn from the inferior vena cava.
2 Deoxygenated blood is drawn into the pump
3 The pump expels the blood

HISTORIQUE

1968: Kolobow and Zapol develop the **first membrane oxygenator**

Permitting prolonged extracorporeal oxygenation

1971: First clinical report of the use of the **Bramson machine**

Donald Hill, 1972; NEJM

24 yrs old man

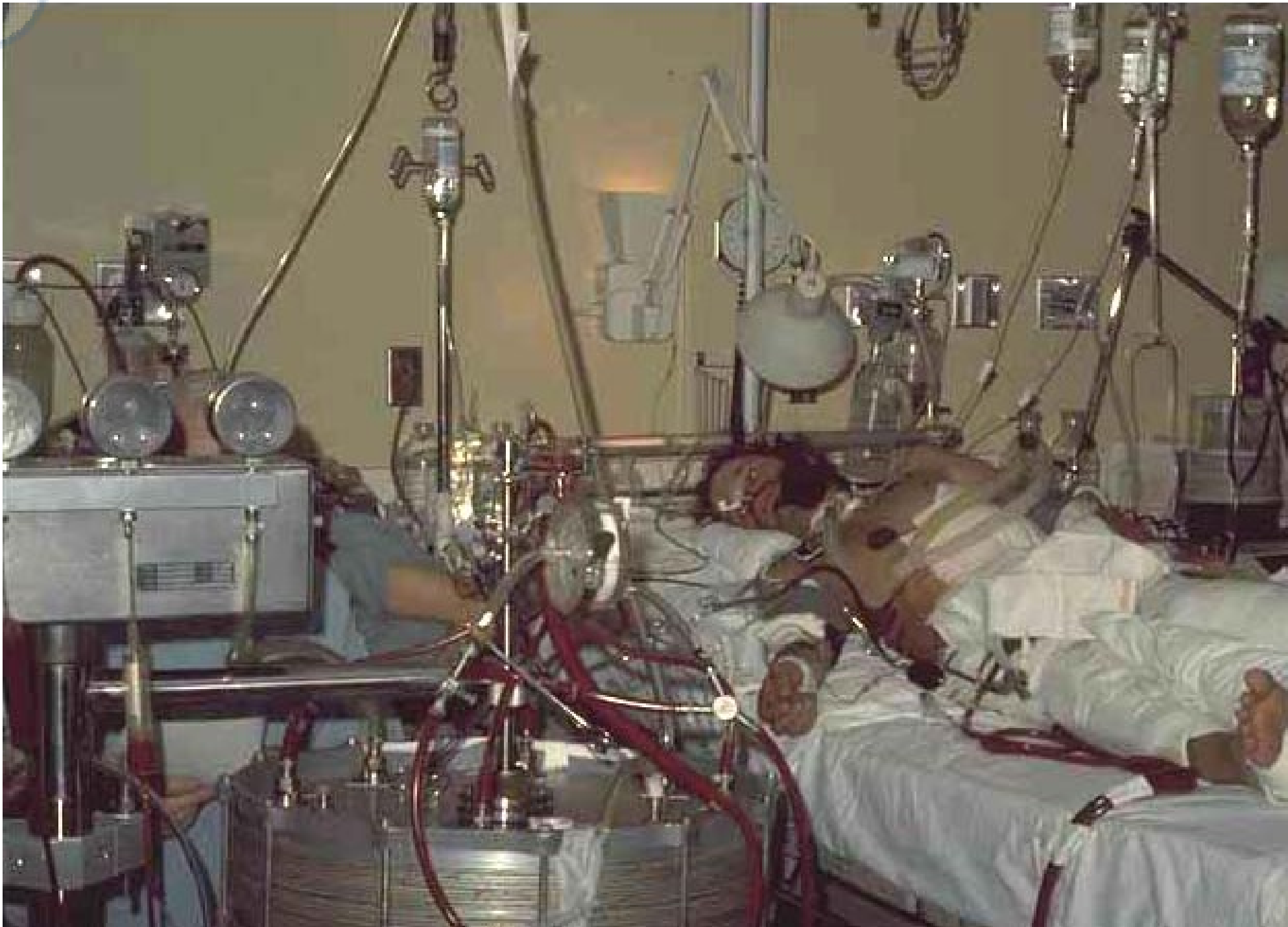
Blunt thoracic trauma

« Shock Lung »

VA ECMO for 75h

Fully recovered

J. Donald Hill, M.D., Thomas G. O'Brien, M.D., James J. Murray, M.D., Leon Dont
M. L. Bramson, A.C.G.I., J. J. Osborn, M.D., and F. Gerbode, M.D.



ere Acute Respiratory Failure

A Randomized Prospective Study

entres

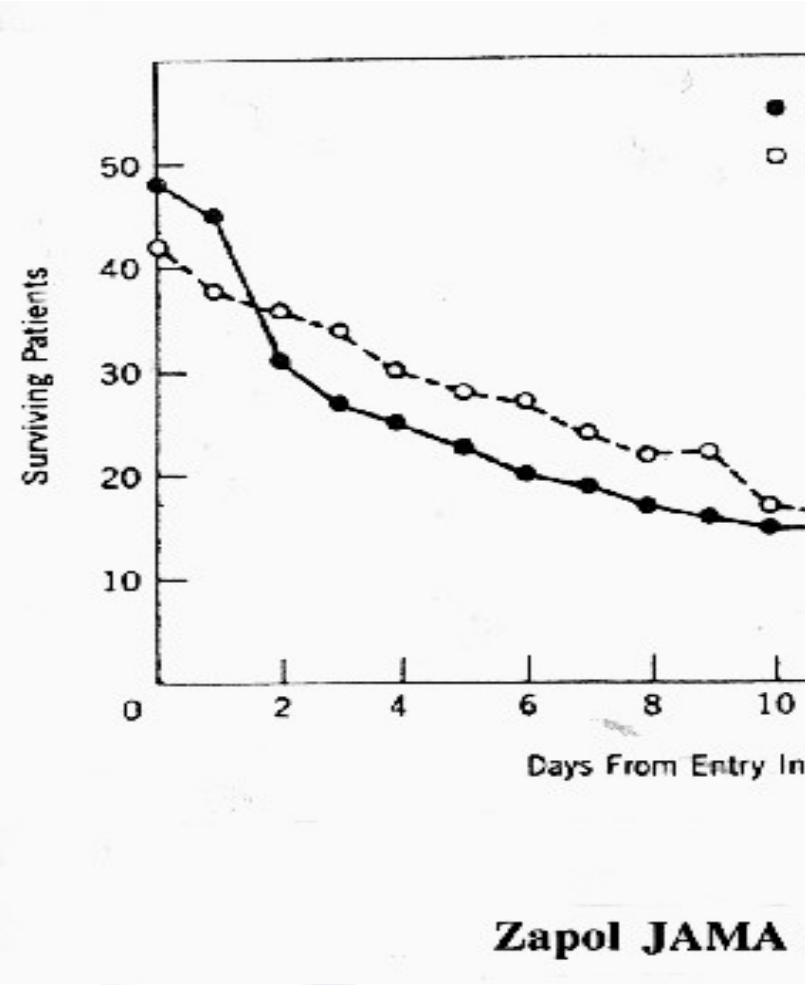
ients inclus: 48 ventilation mécanique
ntionnelle/ 42 patients ventilation
nique conventionnelle + ECMO

: Quatre patients dans chaque groupe

bales Causes de décès:

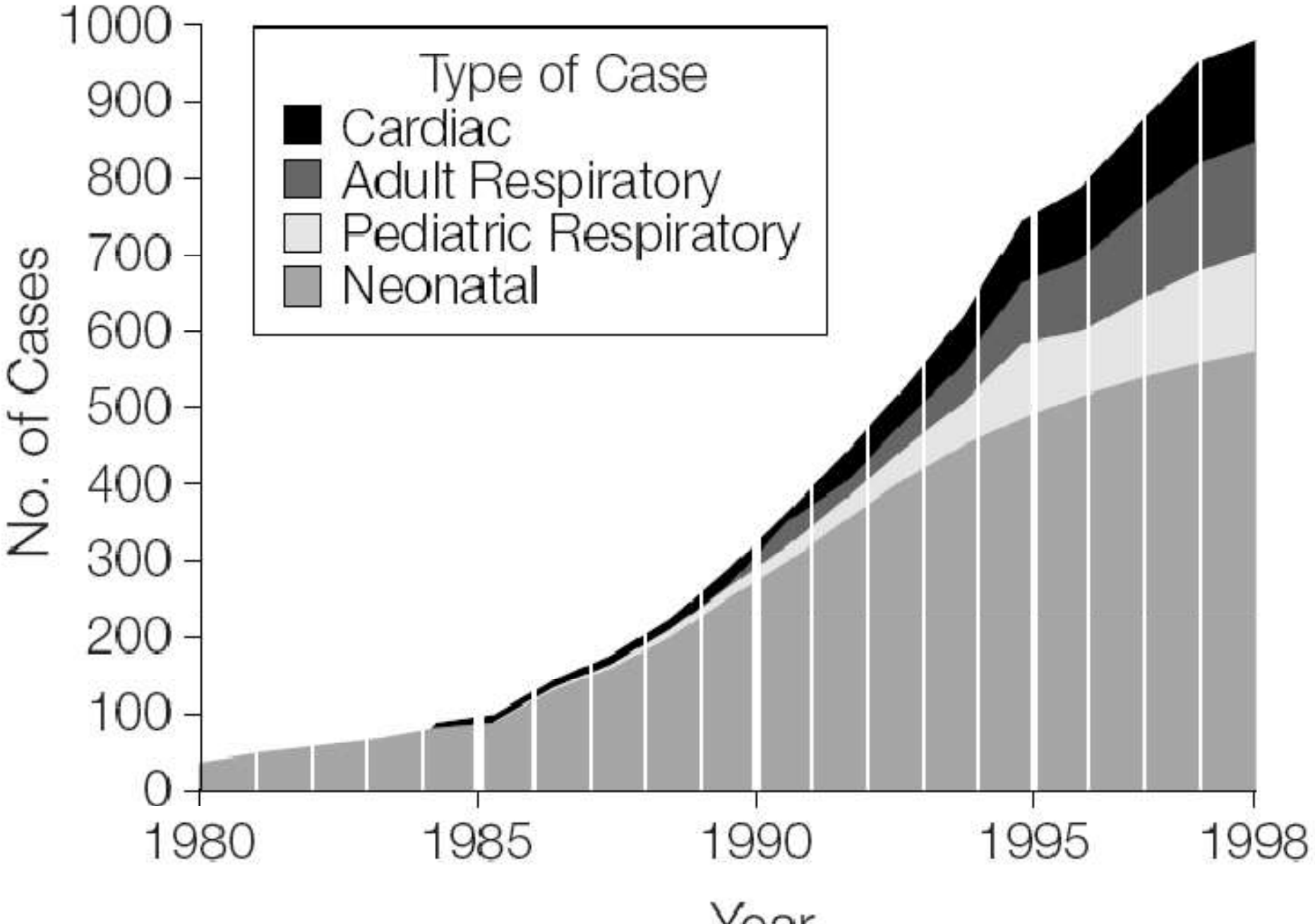
avation progressive des échanges gazeux

ndrement de la compliance secondaire à une
mmation pulmonaire diffuse, nécrose et
se



pport respiratory gas exchange but did not

Extracorporeal Life Support Cases



n for severe adult respiratory failure (CESAR): re randomised controlled trial

i randomisé contrôlé conduit en UK, 2001-2006

eul centre : the Glenfield Hospital, Leicester

ères d'inclusion:

Adulte (18-65 years)

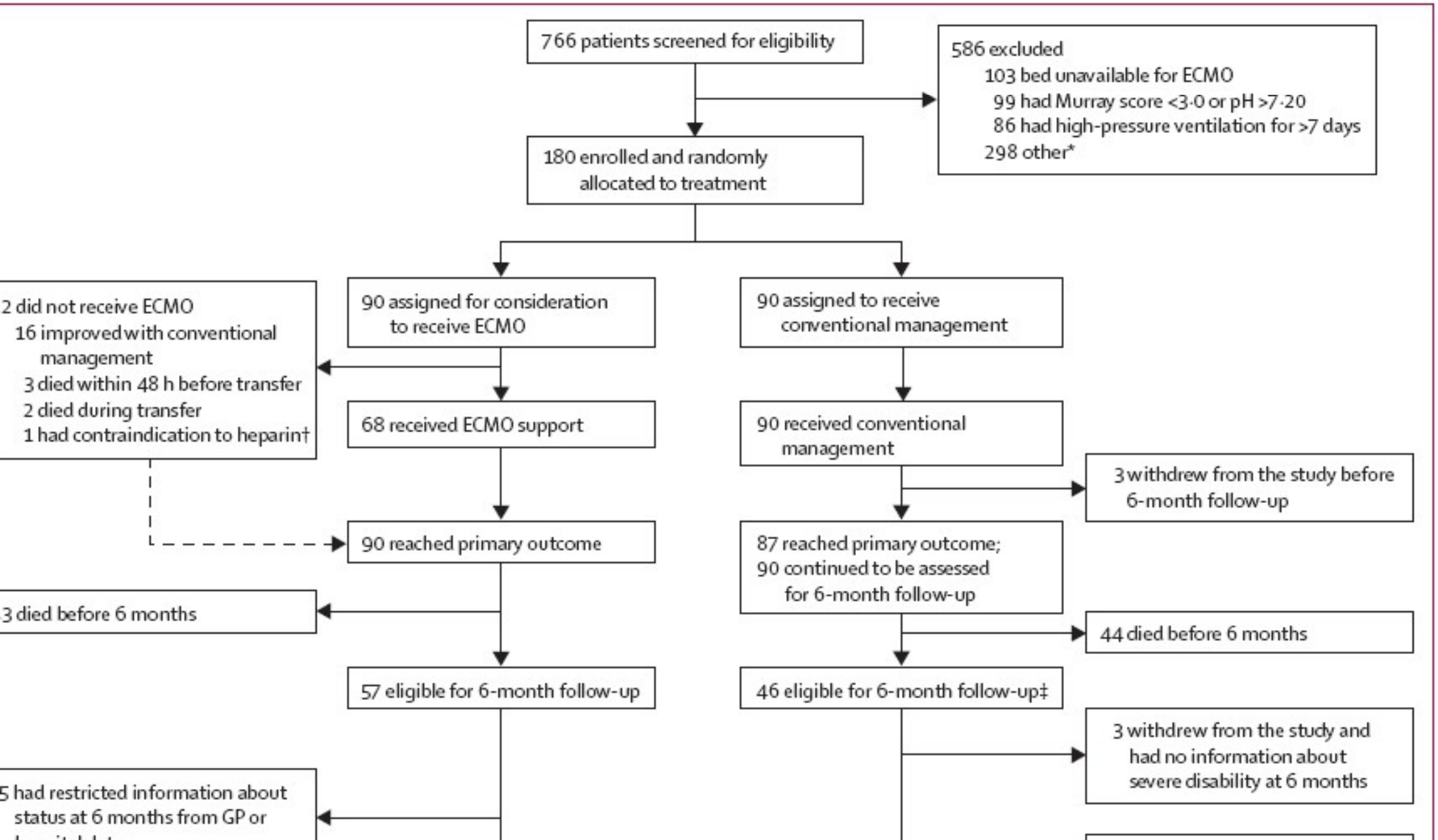
DRA Sévère, *potentiellement réversible*

core de Murray (LIS) ≥ 3,0

cidose respiratoire (pH <7,20)

ère de jugement principal: mortalité ou séquelles sévères à six mois

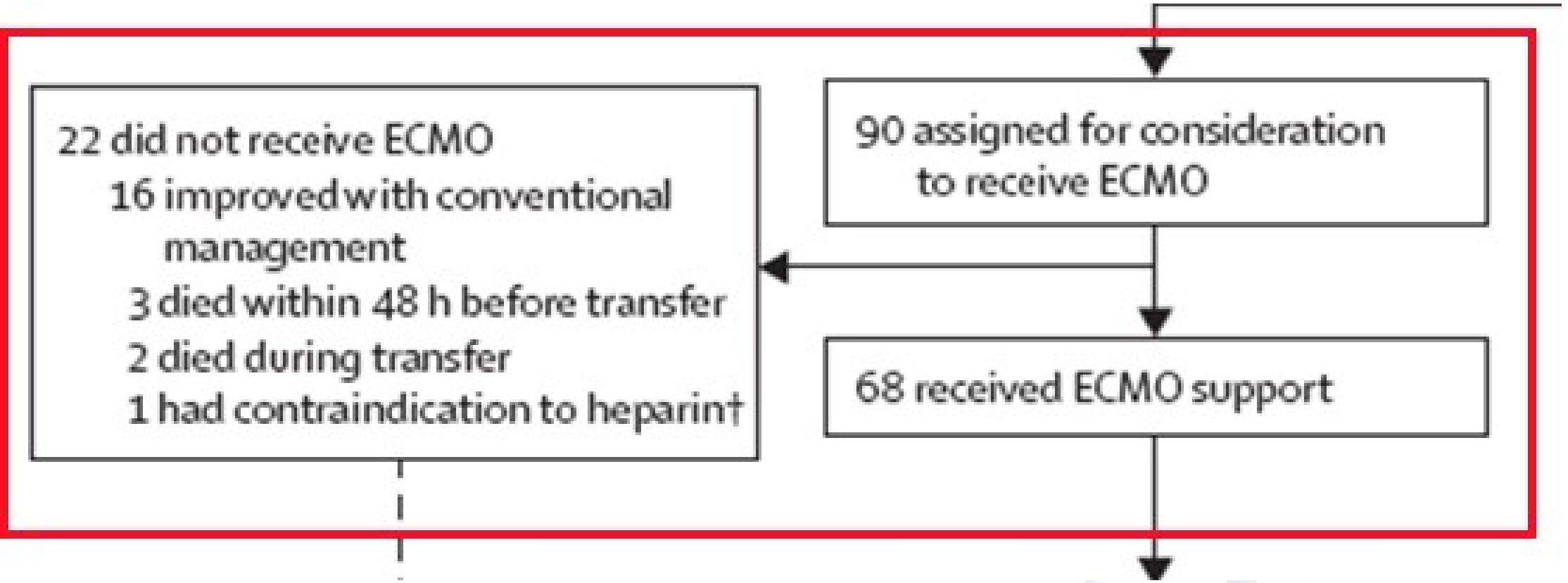
n for severe adult respiratory failure (CESAR): re randomised controlled trial



	ECMO group (n=90)*	Conventional management group (n=90)	Relative ri (95% CI, p
n or severe disability at 6 months	NA	NA	0·69 (0·05
	57 (63%)	41 (47%)‡	NA
	33 (37%)	46 (53%)‡	NA

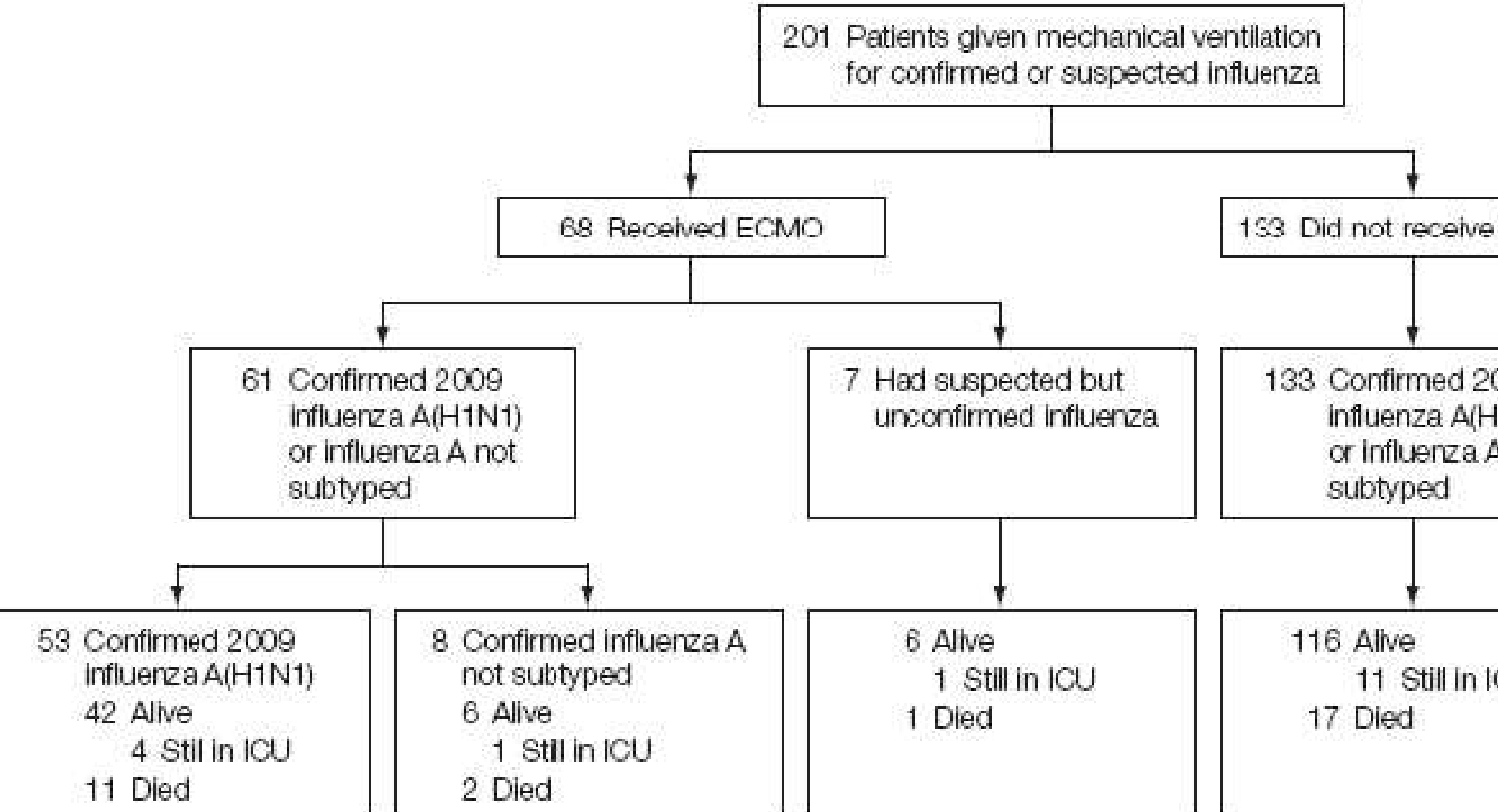
al to consideration for treatment by ECMO treatment led to a gain of 0·03 quality-adjus
(QALYs) at 6-month follow-up. A lifetime model predicted the cost per QALY of ECMO to
52 (95% CI 7622–59 200) at a discount rate of 3·5%.

	33 (37%)	45 (45%)	NA
e disability			
	57 (63%)	41 (46%)	NA
	0	1 (1%)	NA


90 assigned for consideration to receive ECMO
22 did not receive ECMO
16 improved with conventional management
3 died within 48 h before transfer
2 died during transfer
1 had contraindication to heparin†
68 received ECMO support

Respiratory Distress Syndrome

Investigators*



ble 1. Comparison of Patients With Influenza A Who Received ECMO and Those Who ceived Mechanical Ventilation But Without ECMO at ECMO Centers[a]

Parameter	ECMO (n = 61)	Mechanical Ventilation But Without ECMO (n = 133)	*P* Value
, median (IQR), y	36 (27-45)	44 (31-54)	.02
e sex	29 (48)	63 (47)	.54
, median (IQR)	29 (23-36)	29 (24-37)	.92
onic lung disease	18 (30)	35 (26)	.64
ACHE III comorbidity[b]	5 (8)	30 (23)	.02
gnancy or postpartum	10 (16)	12 (9)	.21
betes mellitus	9 (15)	23 (17)	.64
N1 positive	56 (92)	107 (80)	.05
CU admission Mechanical ventilation	53 (87)	117 (88)	.80
Vasopressor	35 (57)	46 (34)	.02
Renal replacement therapy	5 (8)	9 (7)	.95
ation or length of stay, median (IQR), d			
Mechanical ventilation	18 (9-27)	8 (4-14)	.001
ICU	22 (13-32)	12 (7-18)	.001
Hospital	28 (15-43)	20 (13-31)	.07
tality in ICU	14 (23)	12 (9)	.01

JOURNAL of MEDICIN

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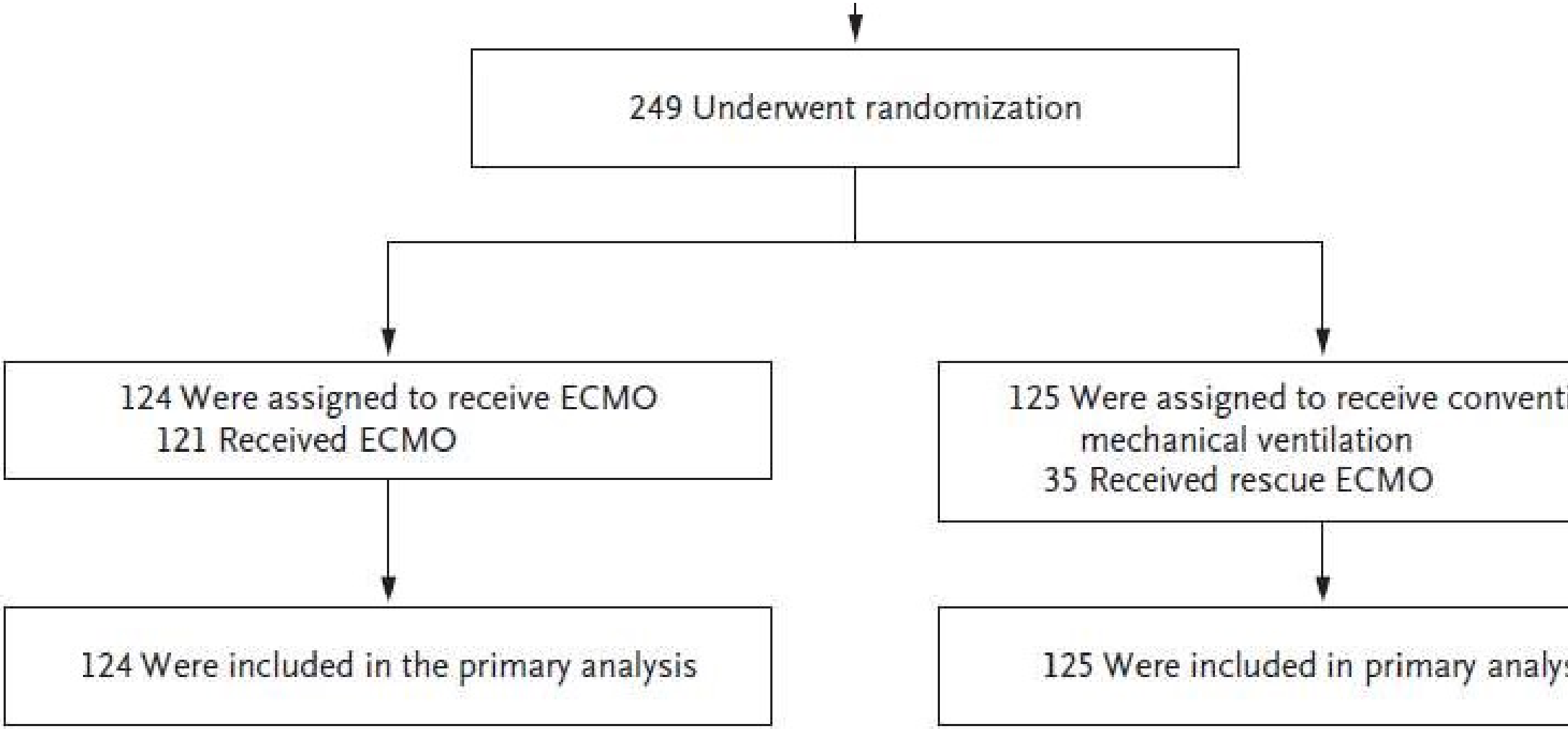
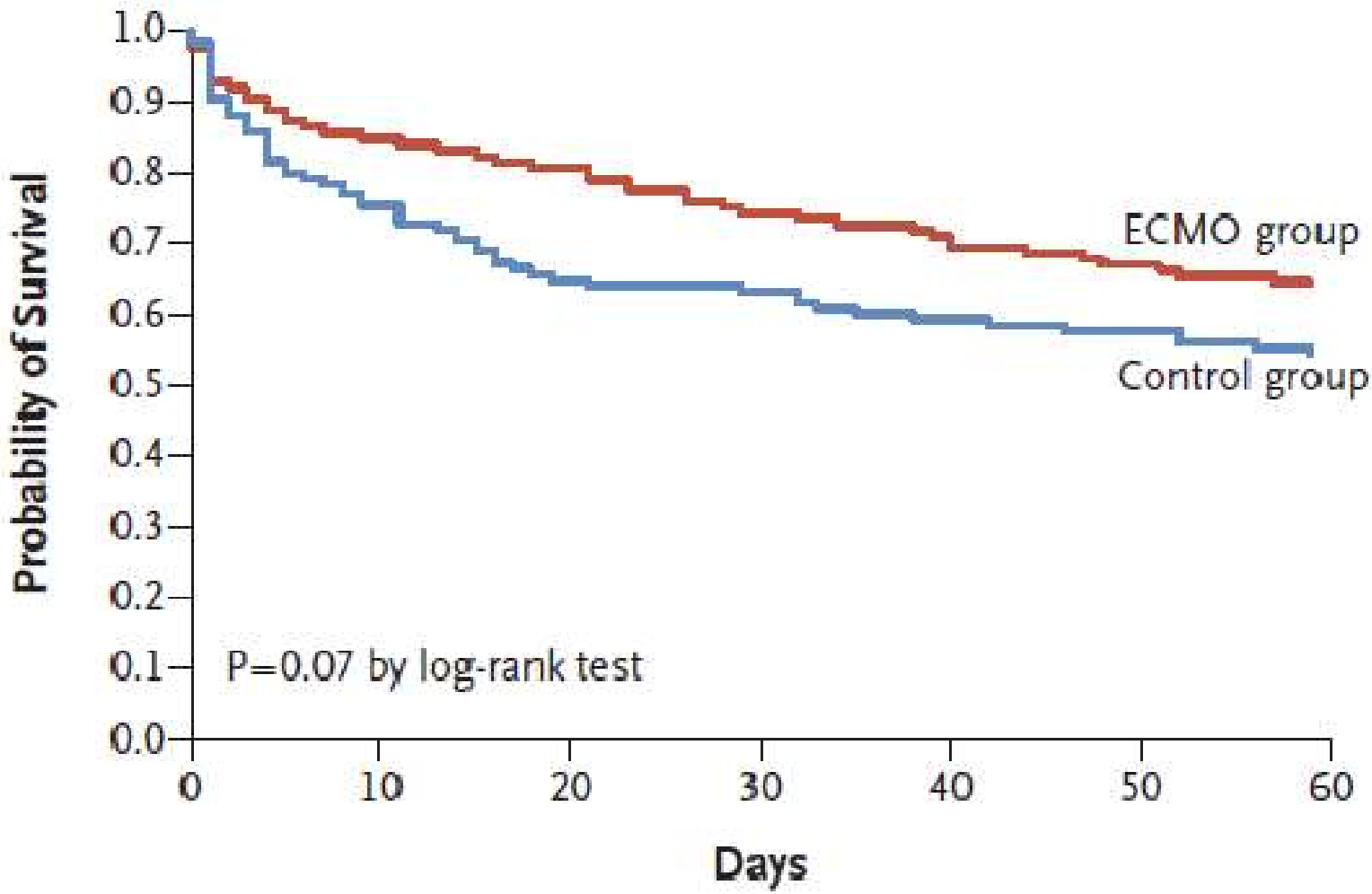
tracorporeal Membrane Oxygenation for Severe Respiratory Distress Syndrome

EOLIA STUDY

- Essai randomisé contrôlé international
- Inclusion: SDRA sévère:
  - P/F < 50 mmHg pendant plus de 3 heures
  - P/F < 80 mmHg pendant plus de 6 heures
  - pH < 7,25 et $PaCO_2$ ≥ 60 mmHg pendant plus de 6 heures
- Randomisation: ventilation mécanique conventionnelle versus traitement conventionnel + ECMO précoce
- Possibilité de cross-over


249 Underwent randomization
124 Were assigned to receive ECMO
121 Received ECMO
125 Were assigned to receive conventi
mechanical ventilation
35 Received rescue ECMO
124 Were included in the primary analysis
125 Were included in primary analys



No. at Risk							
ECMO	124	105	100	92	88	83	80
Control	125	94	81	79	74	72	69

Figure 2. Kaplan–Meier Survival Estimates in the Intention-to-Treat Population during the First 60 Days of the Trial.

ycle of long-term outcomes
xtracorporeal membrane oxygenation
ere acute respiratory distress syndrome

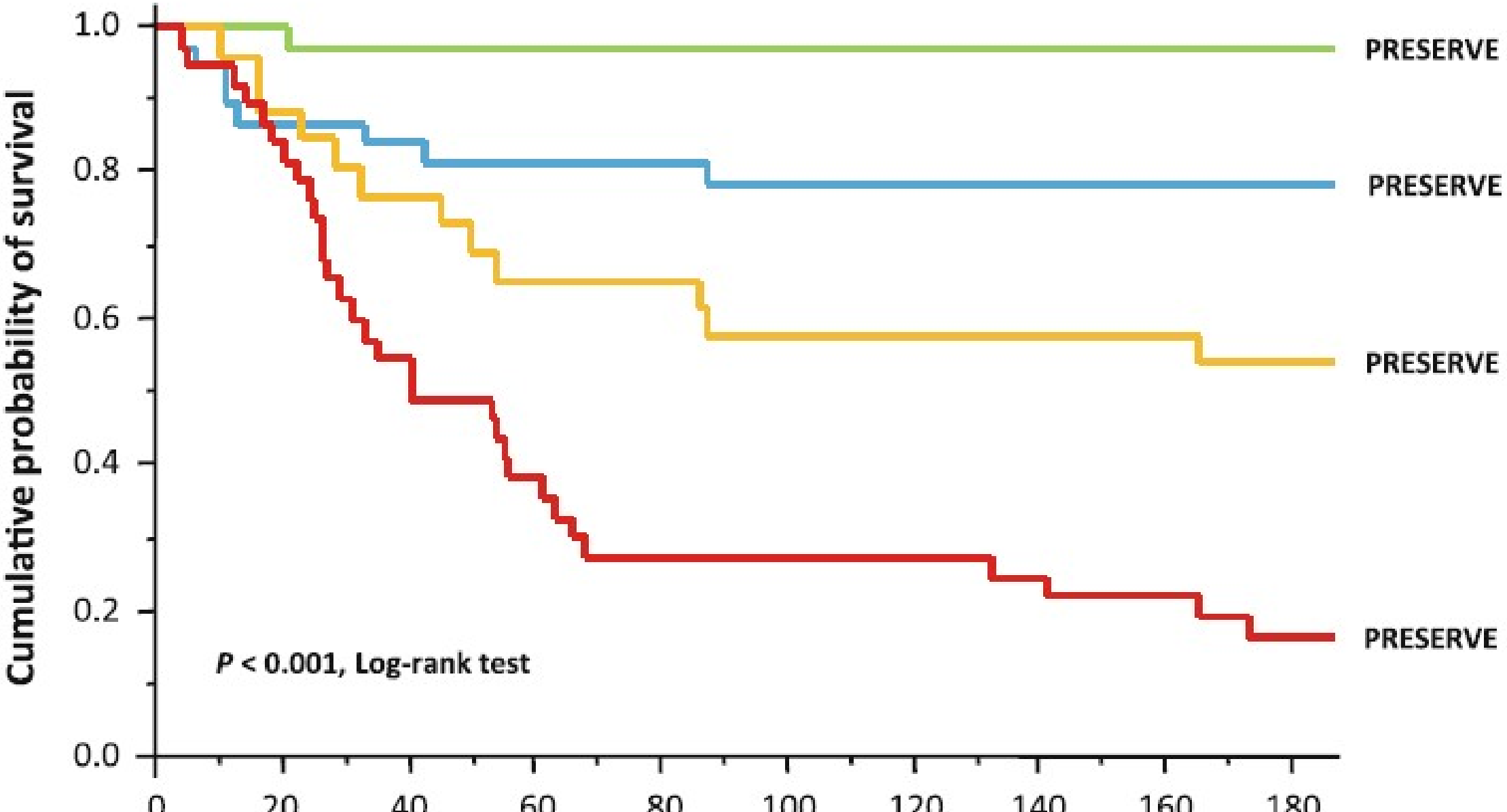
Factor	OR (95 % CI)	*p*-Value
Age	1.08 (1.04–1.12)	<0.001
Body mass index	0.90 (0.84–0.97)	0.004
Immunocompromised[a]	4.33 (1.55–12.12)	0.005
SAPS II[b]	1.04 (1.00–1.08)	0.028
Days of MV	1.07 (1.01–1.14)	0.015
No prone positioning before ECMO	2.93 (1.04–8.25)	0.043
PEEP, cm H_2O	0.84 (0.71–0.99)	0.039
Plateau pressure, cm H_2O	1.18 (1.05–1.32)	0.006

xtracorporeal membrane oxygenation
ere acute respiratory distress syndrome

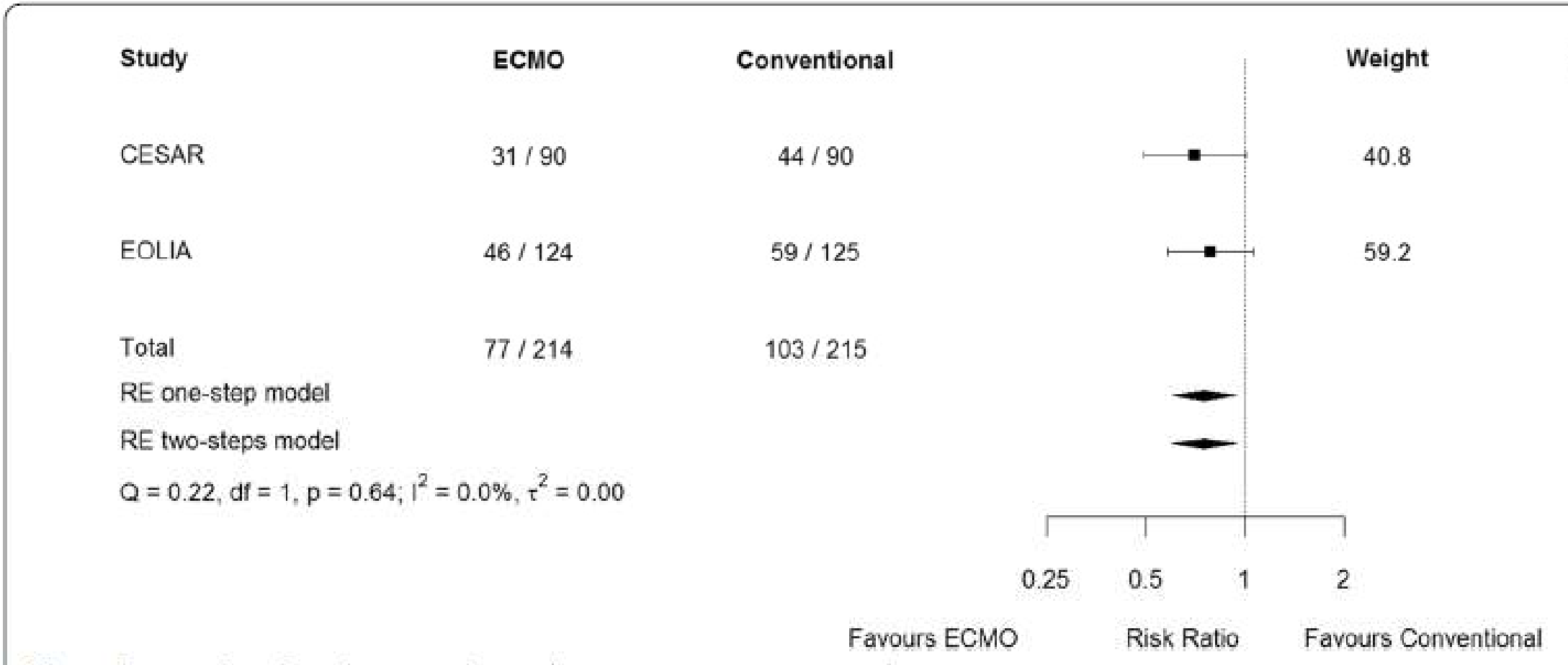
Table 4 The PRESERVE score calculated with parameters available at the time of decision to initiate ECMO

Parameter	Score
Age (years)	
<45	0
45–55	2
>55	3
Body mass index >30	−2
Immunocompromised	2
SOFA >12[a]	1
MV >6 days	1
No prone positioning before ECMO	1
PEEP < 10 cm H_2O	2
Plateau pressure >30 cm H_2O	2
Total score[c]	0–14

ere acute respiratory distress syndrome



MO for severe ARDS: systematic review
d individual patient data meta-analysis



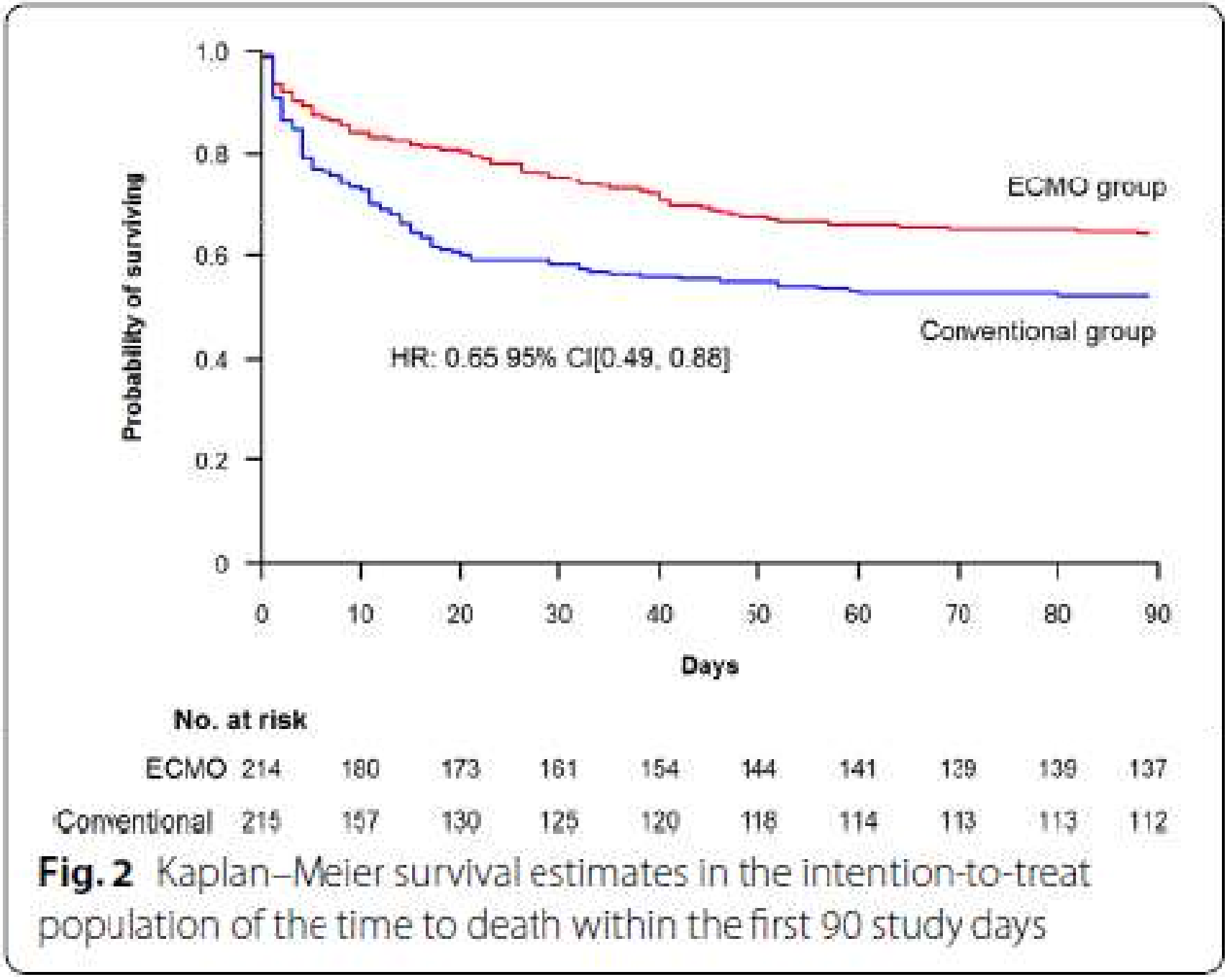
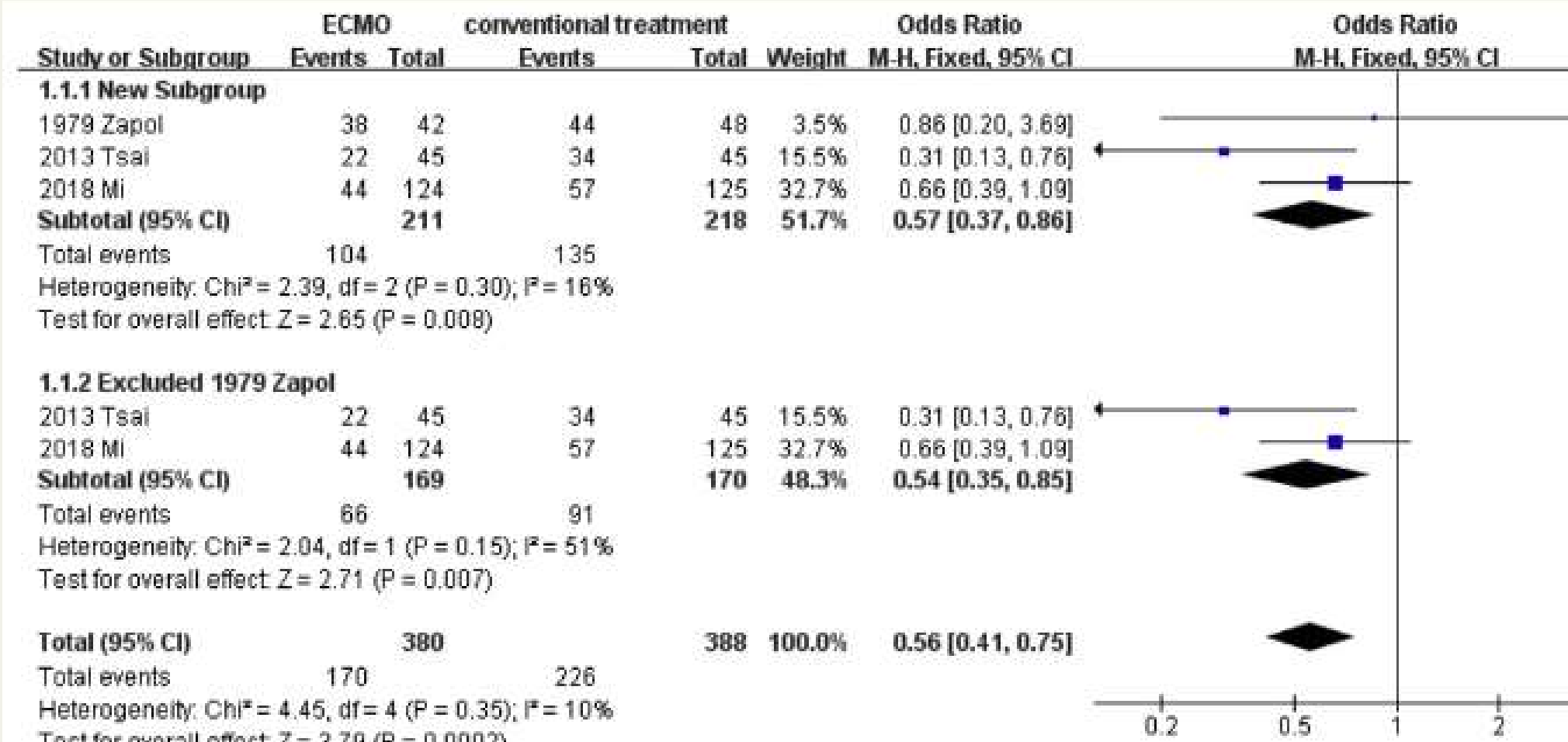
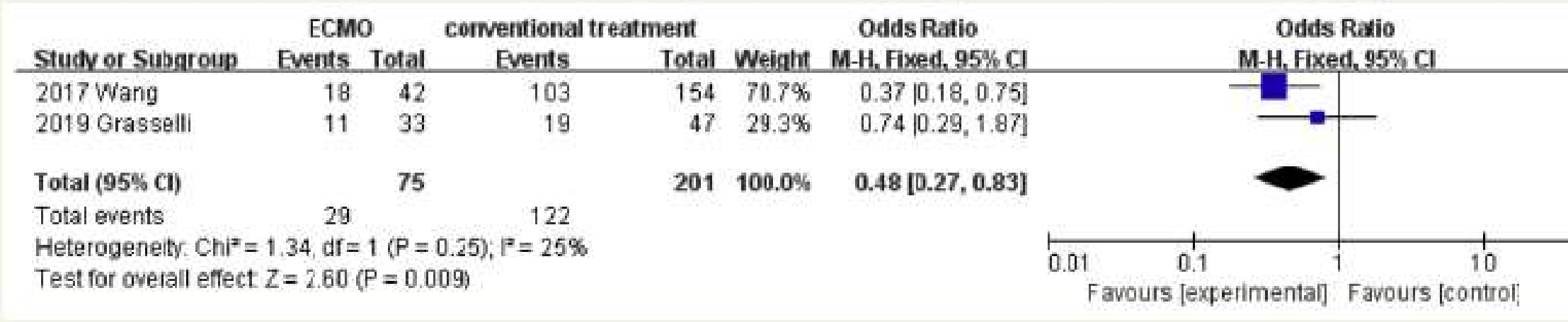


Fig. 2 Kaplan–Meier survival estimates in the intention-to-treat population of the time to death within the first 90 study days

real Membrane Oxygenation Care for Acute Respiratory drome: A Systematic Review nalysis



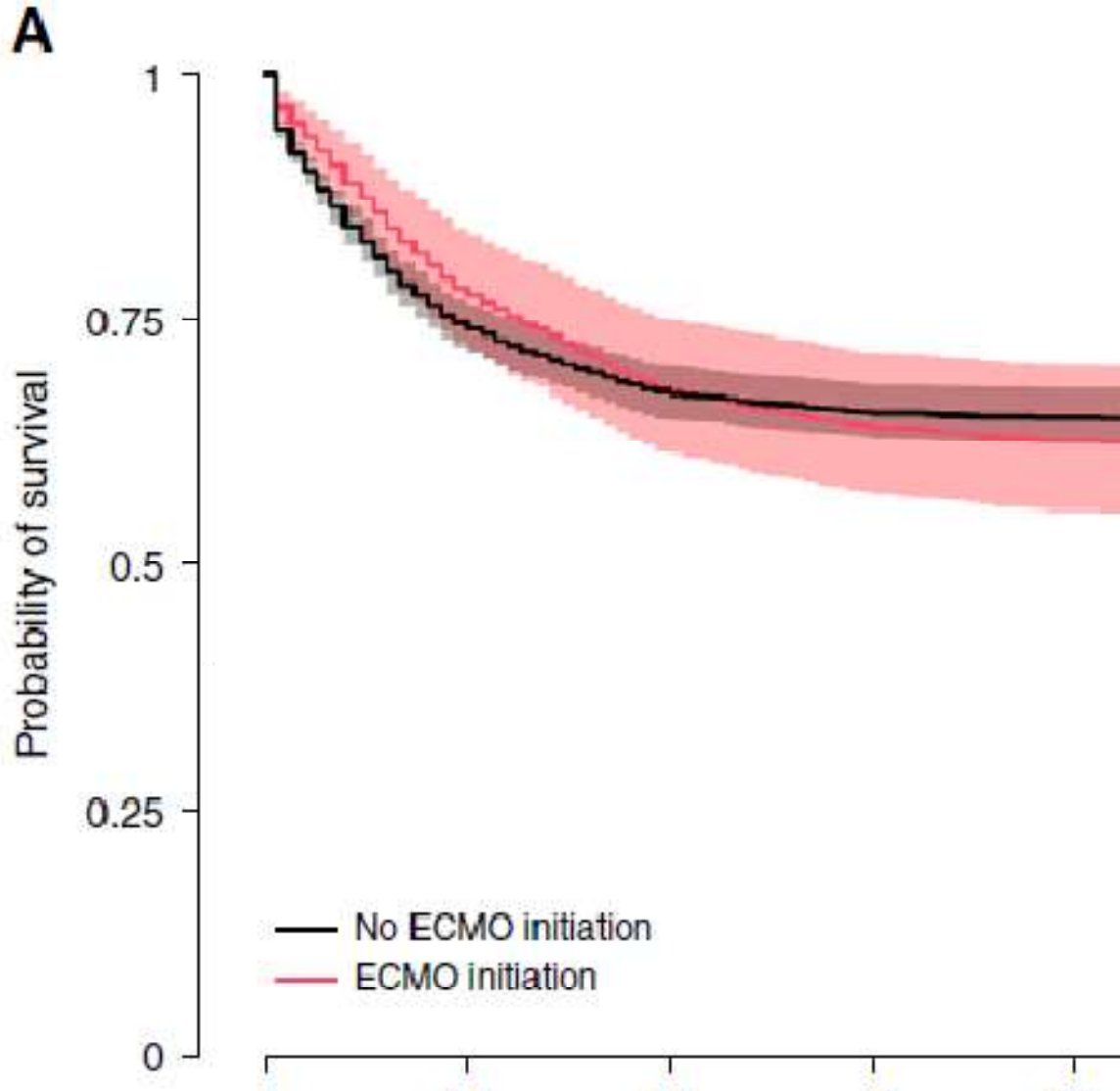
oreal Membrane Oxygenation Care for Acute Respiratory drome: A Systematic Review nalysis

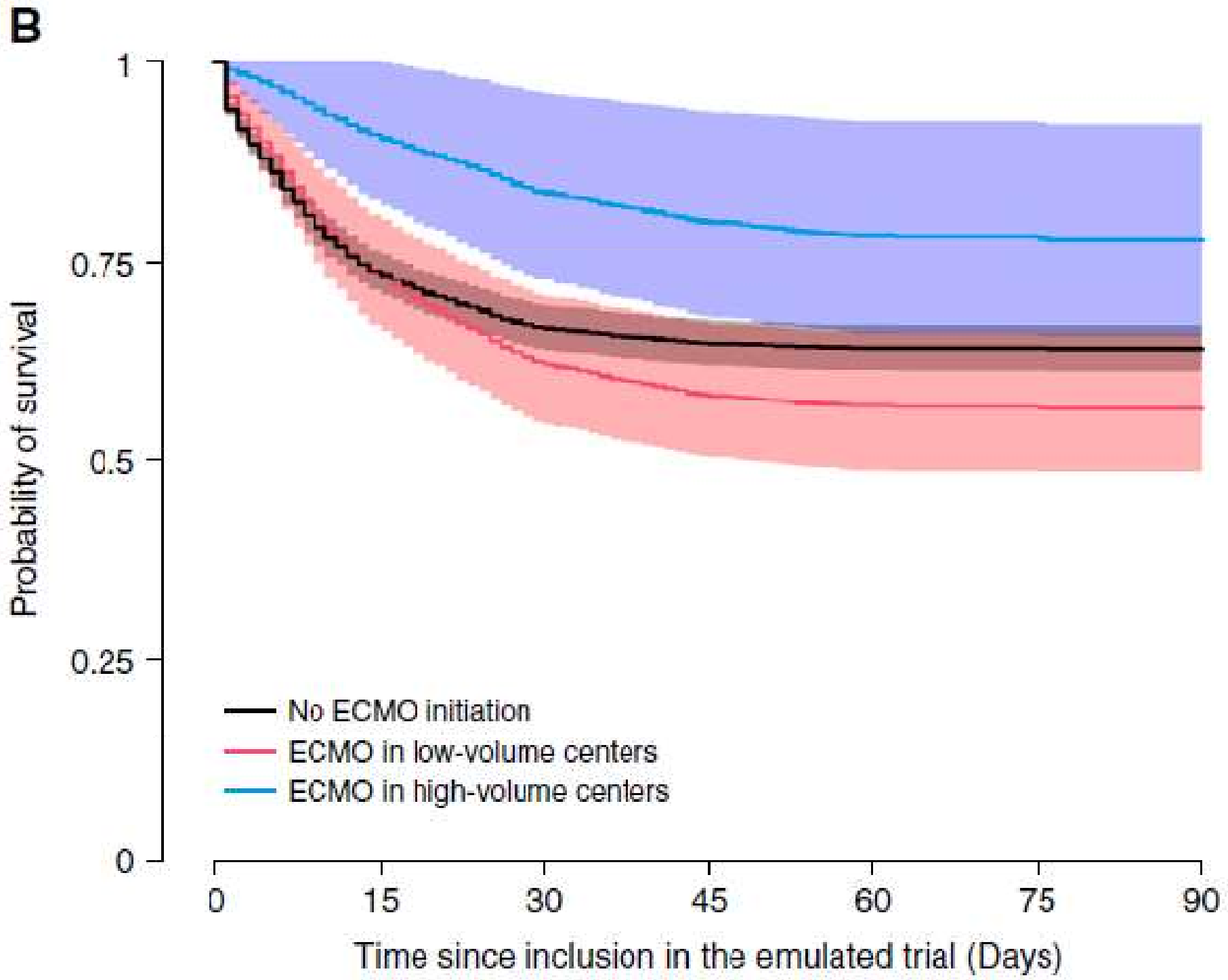


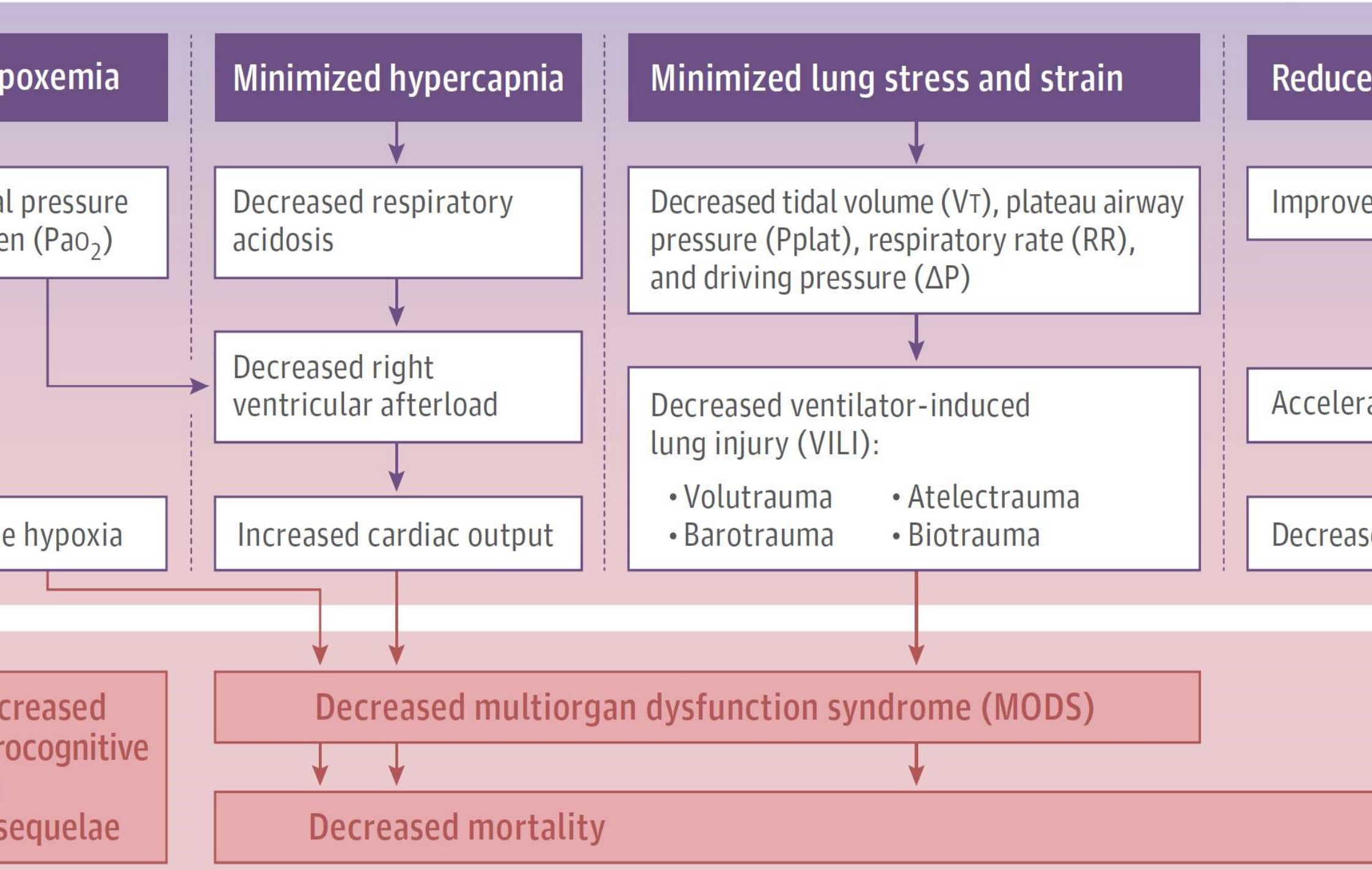
gure 6 Extracorporeal membrane oxygenation (ECMO) versus conventional mechanical ventilation: 1-yea antel–Haenszel statistic [MH], 0.48; 95% confidence interval [CI], 0.27–0.83; n=2).

poreal Membrane Oxygenation for Severe Acute Re
Syndrome Associated with COVID-19
ed Target Trial Analysis

multicentrique
on: SDRA sévère secondaire à la
-19 (P/F < 80 mmHg ou PaCO2 >
nHg)
patients éligibles
versus non ECMO à J7 VMI




B
1
0.75
0.5
0.25
0
Probability of survival
No ECMO initiation
ECMO in low-volume centers
ECMO in high-volume centers
0
15
30
45
60
75
90
Time since inclusion in the emulated trial (Days)


poxemia
Minimized hypercapnia
Minimized lung stress and strain
Reduce
al pressure
en (Pao_2)
Decreased respiratory acidosis
Decreased tidal volume (V_T), plateau airway pressure (Pplat), respiratory rate (RR), and driving pressure (ΔP)
Improve
Decreased right ventricular afterload
Decreased ventilator-induced lung injury (VILI):
• Volutrauma
• Barotrauma
• Atelectrauma
• Biotrauma
Accelera
e hypoxia
Increased cardiac output
Decreas
creased
rocognitive
sequelae
Decreased multiorgan dysfunction syndrome (MODS)
Decreased mortality

...ONNEL ECMO VV A DEBIT ELEVE AU COURS DU SDRA

...inuer l'intensité de la VM et protéger le poumon

...mettre au poumon de se reposer ...(To allow healing of the lungs...)

...nplacer complètement la fonction pulmonaire

...Chez les patients mourant d'hypoxémie réfractaire**... OU**

...Chez les patients dont la VM devient dangereuse

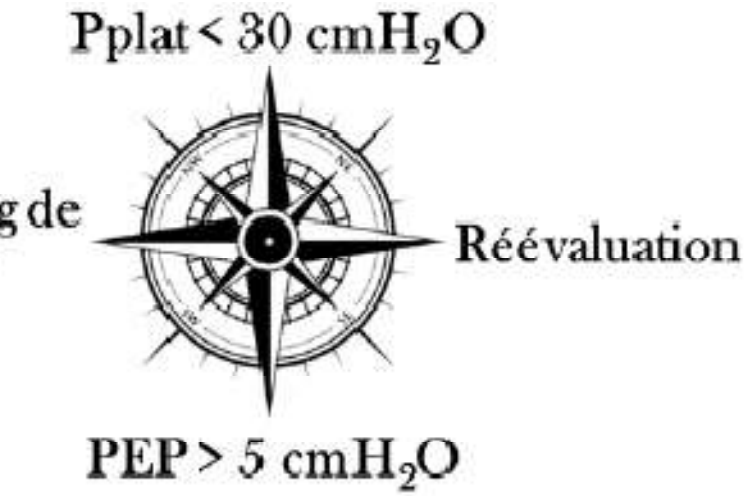
...O VV précoce?

...inuer rapidement l'intensité de la VM et son retentissement

...ours ECMO VV...?

...... Sauf si état de choc associé

en 2019



P/F < 80 — Discuter ECMO VV

P/F < 150 — Curarisation
Décubitus ventral

P/F < 200 — PEP élevée
si améliore oxygénation

Vt autour de 6 ml/kg de PPT
Pplateau < 30 cmH2O
PEP > 5 cmH2O
Surveiller hypercapnie

SDRA confirmé

nitiation de
ion invasive
édation en
nimation

Vt autour de 6 ml/kg de PPT à la phase initiale
en l'absence d'acidose métabolique profonde

Recherche systématique des critères diagnostiques de SDRA

Sévérité du SDRA

ECMO veino-veineuse
- ❑ Si hypoxémie réfract
  applicable
- ❑ A discuter avec un ce

Modalités de la curarisa
- ❑ Précocement, dans l

Modalités du décubitus
- ❑ séance ≥ 16 heures,

SDRA modéré ou sévère
Utilisation PEP élevée si
- ❑ Amélioration de l'ox
- ❑ Sans dégradation sig
  système respiratoire
- ❑ Maintien Pplateau <

Critères du SDRA
- ❑ $PaO_2/FiO_2 \leq 300$ mm
- ❑ PEP ≥ 5 cmH_2O
- ❑ Opacités bilatérales
- ❑ Non expliquées par
- ❑ Évolution depuis mo

Traitement possible
- ➢ Monoxyde d'azote inh
  en DV avant discussio
- ➢ Ventilation spontanée
  autour de 6 ml/kg san

Pas de recommandation p
- ➢ $ECCO_2R$
- ➢ Pression motrice
- ➢ Ventilation spontanée

nce extracorporelle au cours du syndrome de détresse toire aiguë (chez l'adulte et l'enfant, à l'exclusion veau-né). Conférence de consensus organisée ociété de réanimation de langue française

oreal Life Support for Patients with Acute Respiratory Distress Syndrome l Paediatric). Consensus Conference Organized by the French Intensive Care Society

L. Argaud · A. Blet · T. Boulain · L. Contentin · A. Dechartres · J.-M. Dejode · L. Donetti · M. Fartoukh · K. Kuteifan · S. Lasocki · J.-M. Liet · A.-C. Lukaszewicz · H. Mal · E. Maury · D. Osman · H. Outin d · F. Schneider · F. Tamion

Annals of Intensive Care 2014, **4**:15
nnalsofintensivecare.com/content/4/1/15

Annals of Intensive Car
a SpringerOpen Journal

W Open Access

corporeal life support for patients with acute ratory distress syndrome: report of a sensus Conference

ichard[1*], Laurent Argaud[2], Alice Blet[3], Thierry Boulain[4], Laetitia Contentin[5], Agnès Dechartres[6]

Journal 2021

Management of Adult Patients Supported with Venoven
racorporeal Membrane Oxygenation (VV ECMO): Gui
rom the Extracorporeal Life Support Organization (EL

Joseph E. Tonna, MD, MS,*† Darryl Abrams, MD,‡ Daniel Brodie, MD‡ John C. Greenwood, M
Jose Alfonso Rubio Mateo-Sidron, MD,¶ Asad Usman, MD, MPH,‖ and Eddy Fan, MD, PhD#

viewers: Nicholas Barrett, MBBS,** Matthieu Schmidt,†† Thomas Mueller, MD,‡‡ Alain Combes, MD
Kiran Shekar, MBBS, PhD§§

life support for adults
piratory distress syndrome

The NEW ENGLAND JOURNAL of MEDICINE

CLINICAL THERAPEUTICS

Extracorporeal Membrane Oxygenation for ARDS in Adults

Daniel Brodie, M.D., and Matthew Bacchetta, M.D.

pport for Adults With Respiratory Failure
s