

Réhabilitation sous Assistance Circulatoire



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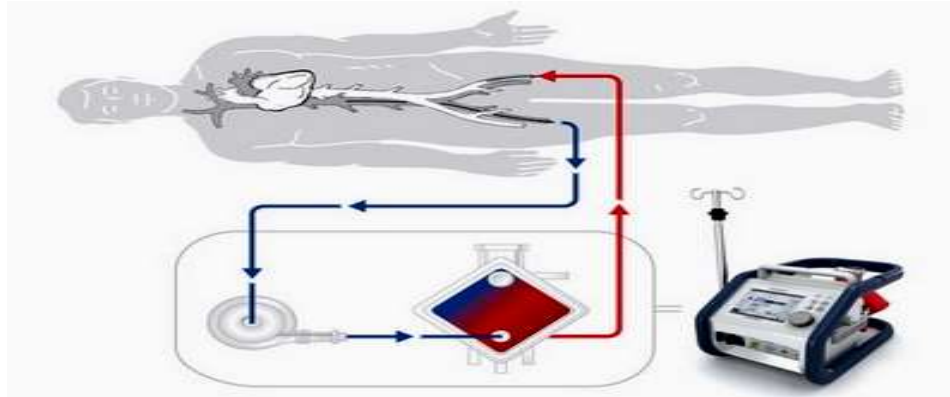
Conflict of interest:

- Advisory Board F4-Pharma, FindImmune, LASCCO
- PI of a RDZ trial using FX06

ECLS systems, support modes, clinical conditions, and applications

	Extracorporeal Life Support (ECLS)				
SYSTEM	Extracorporeal Membrane Oxygenation (ECMO)			Extracorporeal Carbon Dioxide Removal (ECCO ₂ R)	
SUPPORT MODE	VA ECMO	VVA ECMO	VV ECMO	VV ECCO ₂ R	AV ECCO ₂ R
CONDITION	Cardiac failure	Cardiorespiratory failure	Respiratory failure	CO ₂ retention	
APPLICATION	• Cardiac ECMO • ECPR • EISOR	Cardiac and respiratory ECMO	Respiratory ECMO	Lung protection	

The VA-ECMO circuit:



Peripheral cannulation

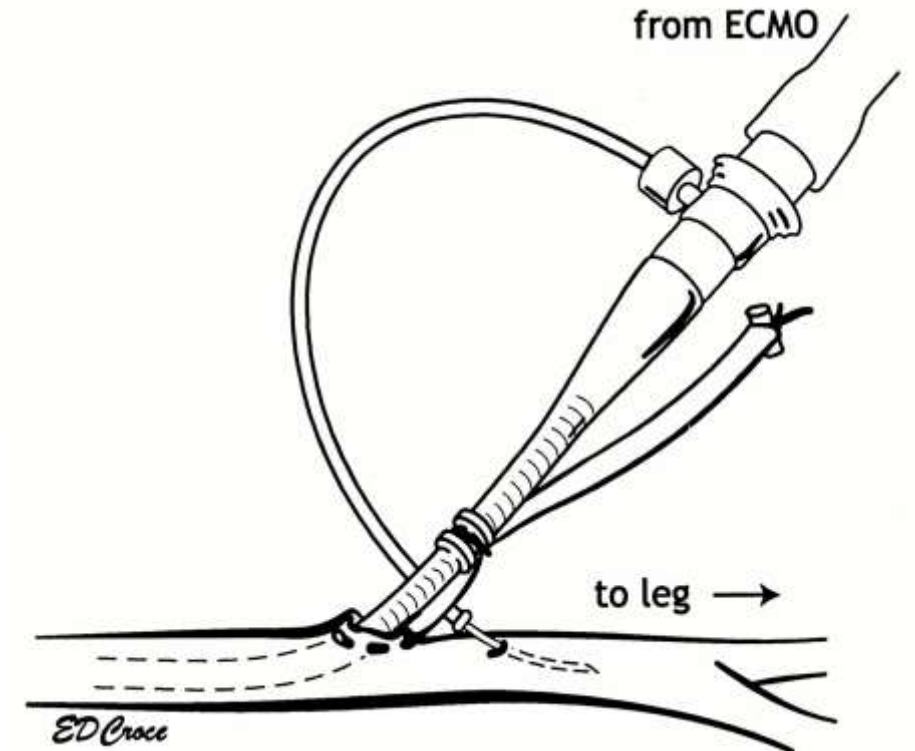
Surgical cut-down



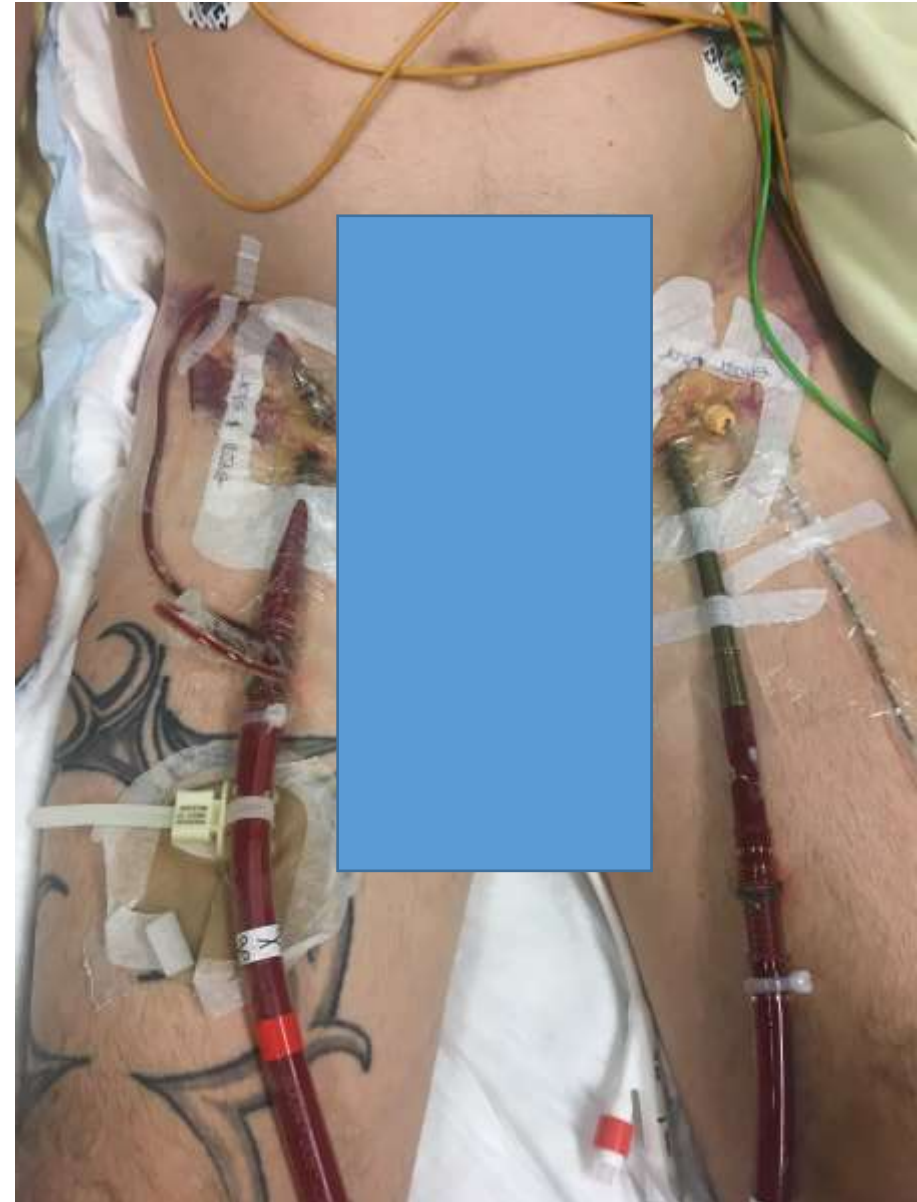
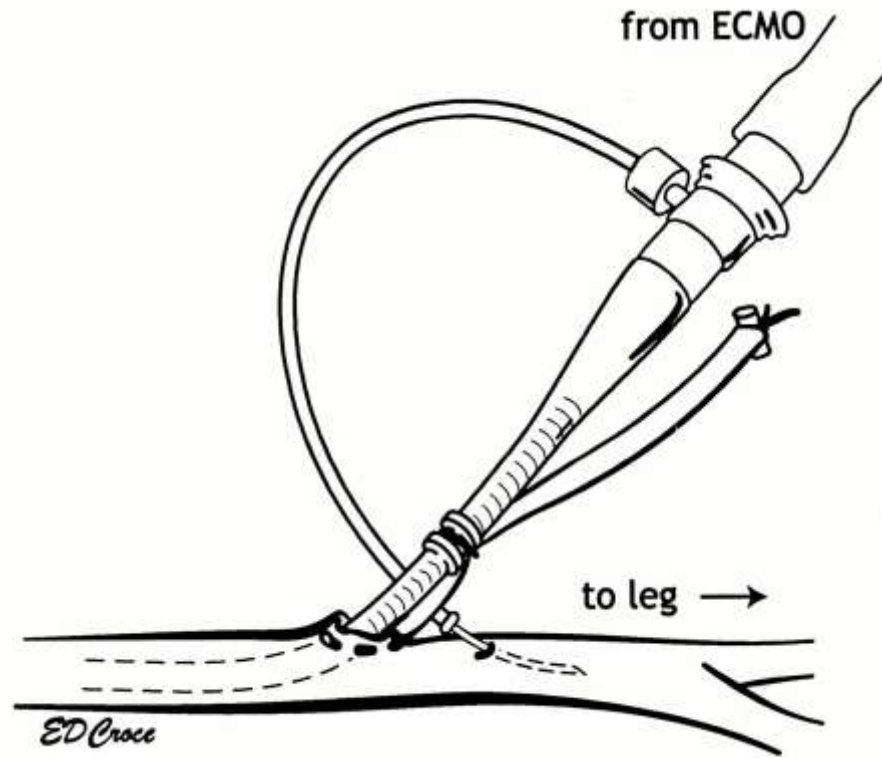
femoral
artery
cannulation
site



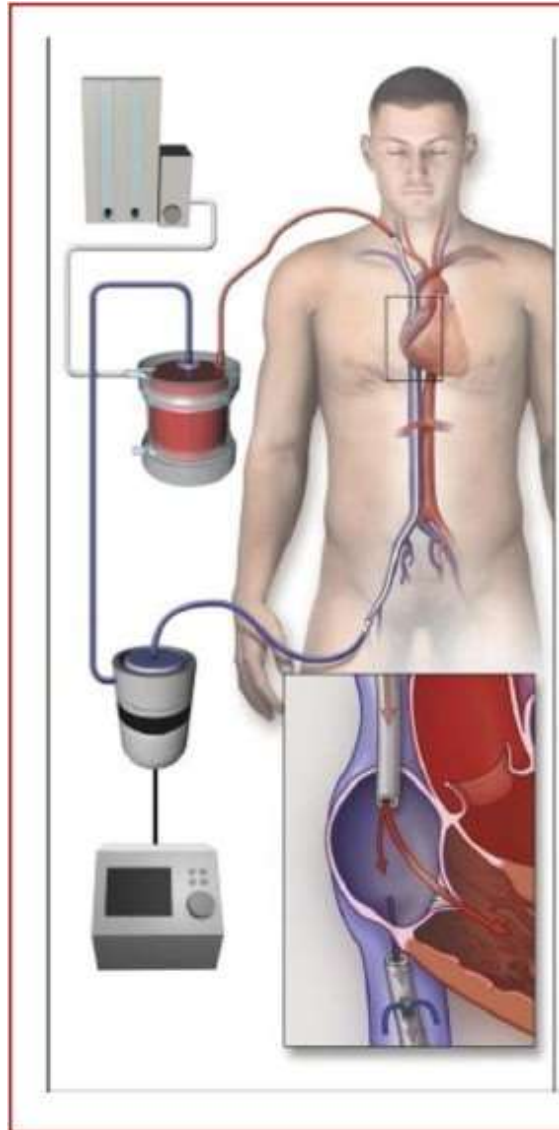
from ECMO



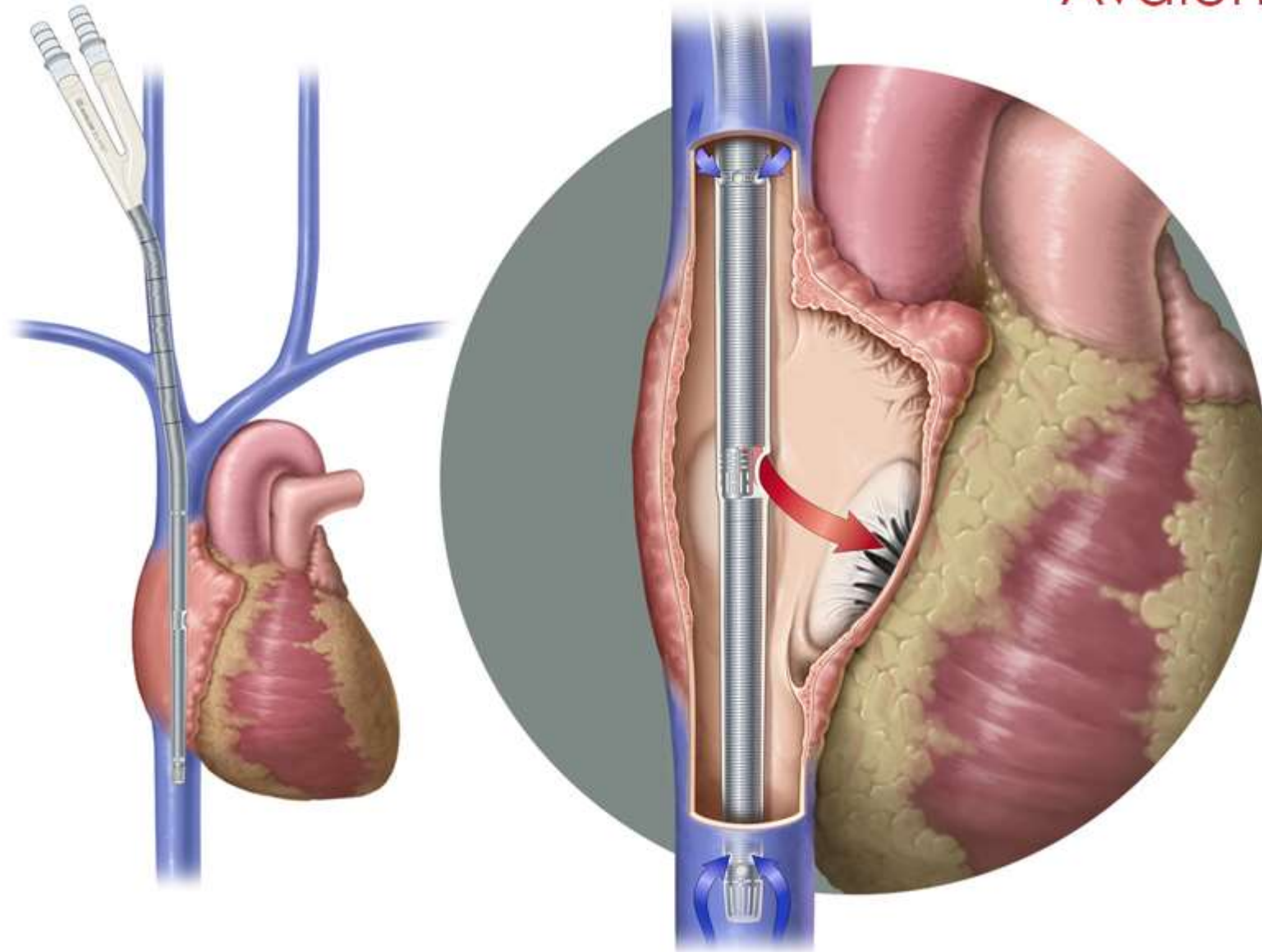
Percutaneous Peripheral cannulation



The VV-ECMO circuit:



Avalon Elite™

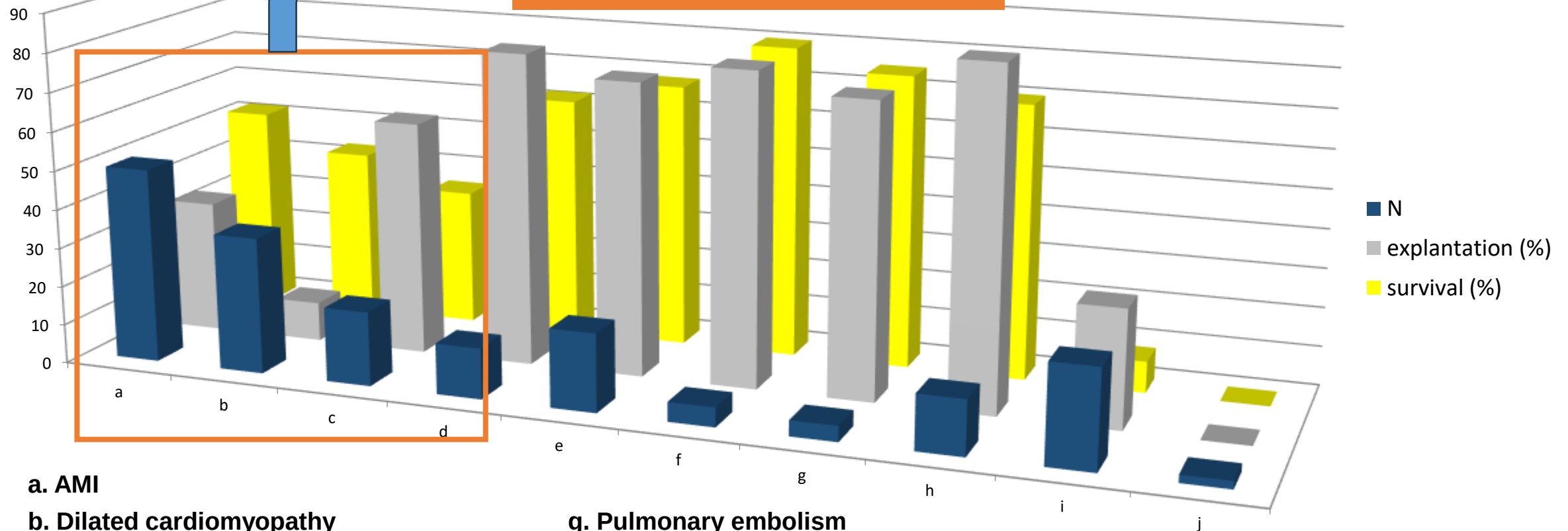




2009-2011. 200 ECMO VAP

INSTITUT DE CARDIOLOGIE
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GREFFE
ASSISTANCE LONGUE DUREE



a. AMI

b. Dilated cardiomyopathy

c. Post-cardiotomy

d. Primary graft dysfunction

e. Myocarditis

f. Drug poisoning

g. Pulmonary embolism

h. Refractory septic shock

i. Refractory out of hospital cardiac arrest

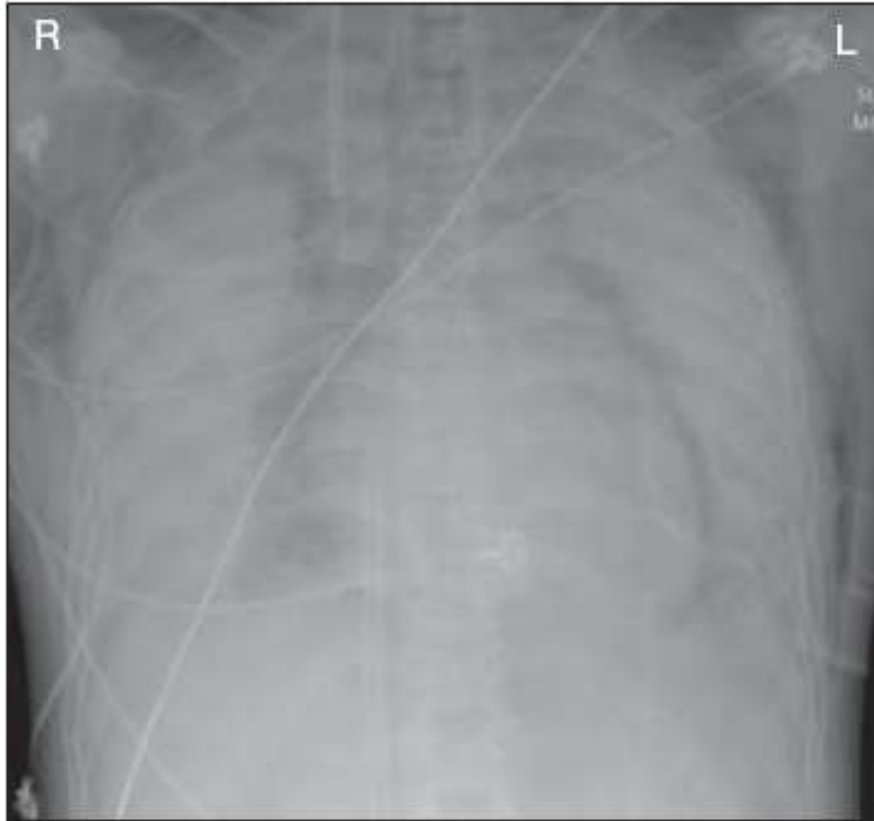
j. Late graft dysfunction

Extracorporeal Membrane Oxygenation for 2009 Influenza A(H1N1) Acute Respiratory Distress Syndrome

The Australia and New Zealand
Extracorporeal Membrane
Oxygenation (ANZ ECMO) Influenza
Investigators*

JAMA. 2009;302(17)

Chest radiograph



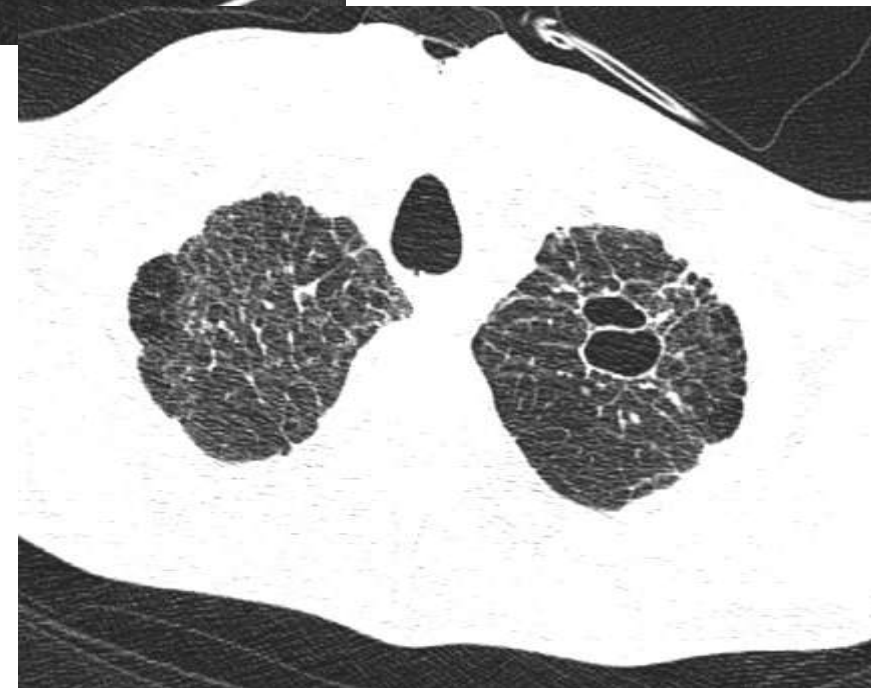
Computed tomogram



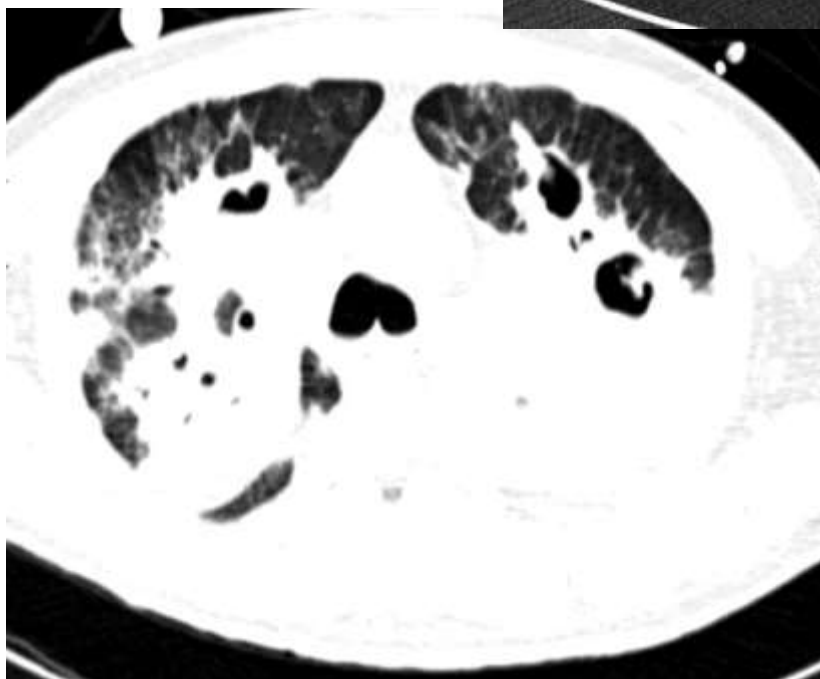
18/01



22/04



08/03



W Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial

William D Schweickert, Mark C Pohlman, Anne S Pohlman, Olivera Ngou, Amy Pawlik, Cheryl E Ebrazi, Linda Spear, Megan Mill et, Michael Franczyk, Dennis Deprizio, Gregory A Schmidt, Amy Bowman, Rebecca Barr, Kathryn E McCallister, Jesse H Hall, John P Weiss

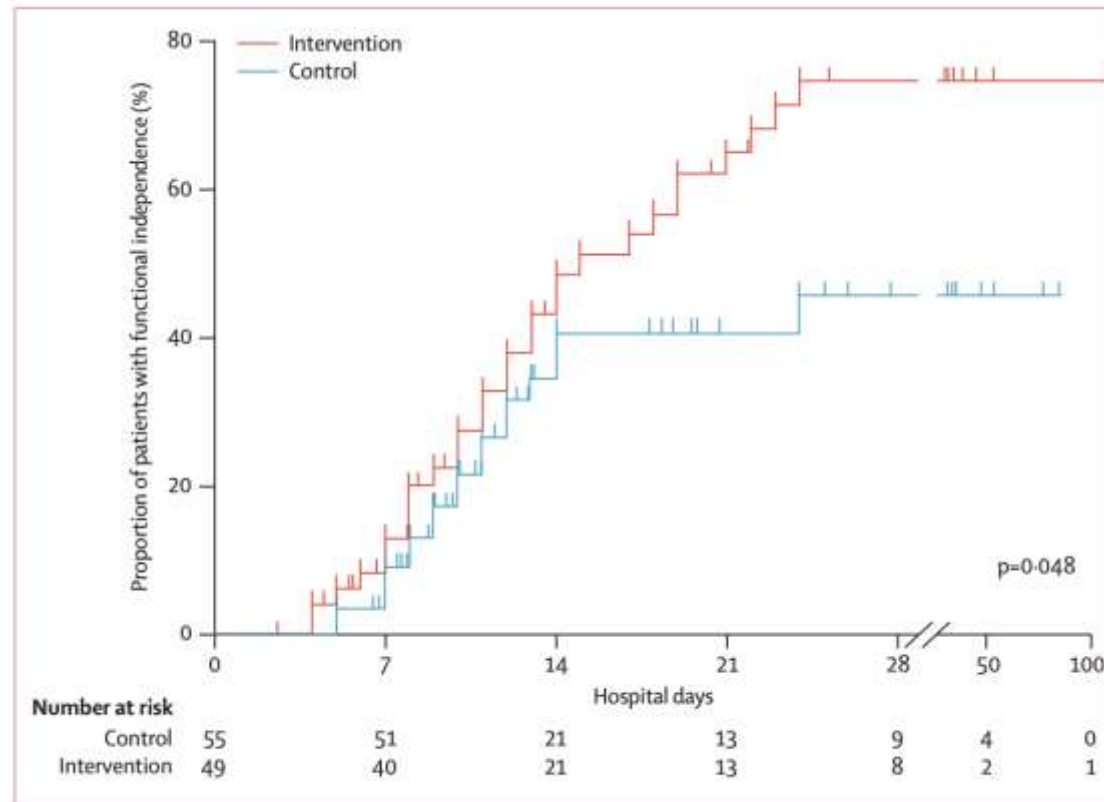


Figure 2: Probability of return to independent functional status in intervention and control groups

	Intervention (n=49)	Control (n=55)	p value
Return to independent functional status at hospital discharge	29 (59%)	19 (35%)	0.02
ICU delirium (days)	2.0 (0.0-6.0)	4.0 (2.0-7.0)	0.03
Time in ICU with delirium (%)	33% (0-58)	57% (33-69)	0.02
Hospital delirium (days)	2.0 (0.0-6.0)	4.0 (2.0-8.0)	0.02
Hospital days with delirium (%)	28% (26)	41% (27)	0.01
Barthel Index score at hospital discharge	75 (7.5-95)	55 (0-85)	0.05
ICU-acquired paresis at hospital discharge	15 (31%)	27 (49%)	0.09
Ventilator-free days*	23.5 (7.4-25.6)	21.1 (0.0-23.8)	0.05
Duration of mechanical ventilation (days)	3.4 (2.3-7.3)	6.1 (4.0-9.6)	0.02
Duration of mechanical ventilation, survivors (days)	3.7 (2.3-7.7)	5.6 (3.4-8.4)	0.19
Duration of mechanical ventilation, non-survivors (days)	2.5 (2.4-5.5)	9.5 (5.9-14.1)	0.04
Length of stay in ICU (days)	5.9 (4.5-13.2)	7.9 (6.1-12.9)	0.08
Length of stay in hospital (days)	13.5 (8.0-23.1)	12.9 (8.9-19.8)	0.93
Hospital mortality	9 (18%)	14 (25%)	0.53

Data are n (%), median (IQR), or mean (SD). ICU=intensive care unit. *Ventilator-free days from study day 1 to day 28. Barthel Index scale 0-100, APACHE II scale 0-71.

Table 3: Main outcomes according to study group

PROLONGED EXTRACORPOREAL OXYGENATION FOR ACUTE POST-TRAUMATIC RESPIRATORY FAILURE (SHOCK-LUNG SYNDROME)

Use of the Bramson Membrane Lung

J. DONALD HILL, M.D., THOMAS G. O'BRIEN, M.D., JAMES J. MURRAY, M.D., LEON DONTIGNY, M.D.,
M. L. BRAMSON, A.C.G.I., J. J. OSBORN, M.D., AND F. GERBODE, M.D. NEJM, 1972



Oxygénateur
Bramson



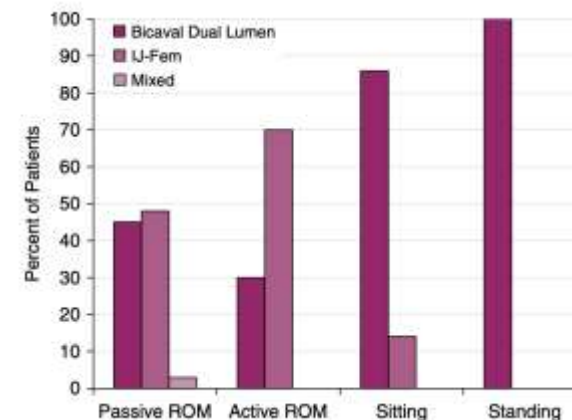
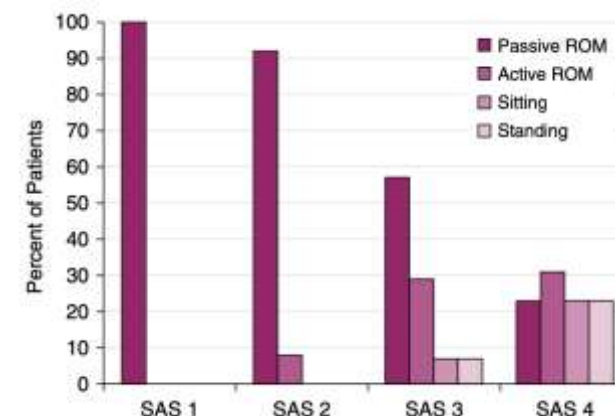




Intensive Care Physiotherapy during Extracorporeal Membrane Oxygenation for Acute Respiratory Distress Syndrome

Laveena Munshi¹, Tadahiro Kobayashi², Julian DeBacker¹, Ravi Doobay³, Teagan Telesnicki¹, Vincent Lo⁴, Nathalie Cote⁴, Marcelo Cypel⁵, Shaf Keshavjee⁵, Niall D. Ferguson^{1,6}, and Eddy Fan¹

	No Physiotherapy (n = 11)	Physiotherapy* (n = 50)	P Value
Age	44 ± 14	45 ± 14	0.92
Male sex	6 (55)	39 (78)	0.11
Charlson comorbidity index score	0 (0–2), 54% score of 0	1 (0–1), 50% score of 0	0.91
Years			0.19
2010–2012	3 (27)	8 (16)	
2013–2015	8 (72)	42 (86)	
Cause of ARDS			0.67
Pneumonia	9 (82)	40 (80)	
Other	2 (18)	10 (25)	
PaO ₂ /F _i O ₂ pre-ECMO	60 (52–96)	77 (60–98)	0.30
Duration of mechanical ventilation pre-ECMO, h	28 (8–96)	72 (21–168)	0.12
APACHE II score pre-ECMO	28 ± 9	27 ± 8	0.63
ECMO type			0.71
Venovenous	10 (91)	47 (94)	
Mixed modalities	1 (10)	3 (6)	
ECMO cannulation site			0.45
Bicaval dual-lumen	6 (55)	26 (52)	
Internal jugular/femoral	4 (36)	23 (46)	
Mixed	1 (9)	1 (2)	
ECMO Day 1 characteristics			
ECMO flow	4.6 (3.15–5.1)	4.4 (4–5.1)	0.72
ECMO sweep	4.5 (3.5–5.3)	4.0 (3.0–5.0)	0.39
PaO ₂	83 (59–112)	72 (65–91)	0.65
SAS	1 (1–1)	1 (1–2)	0.07
SLED anytime on ECMO [†]	3 (27)	21 (42)	0.35
Duration of ECMO [‡]	8 (7–10)	13 (10–19)	<0.001
ICU mortality	7 (64)	1 (22)	0.006
In-hospital mortality	7 (64)	1 (22)	0.006



Modalities of Exercise Training in Patients with Extracorporeal Membrane Oxygenation Support

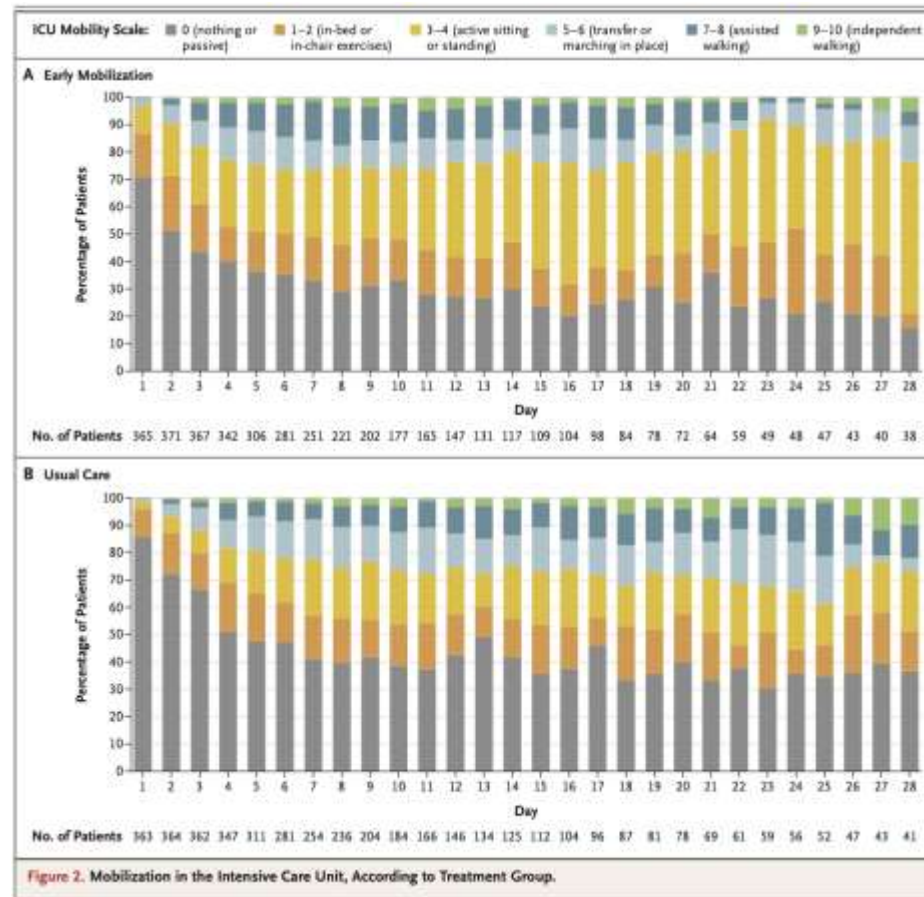
Christos Kourek ¹ , Serafim Nanas ¹, Anastasia Kotanidou ¹, Vasiliki Raidou ¹ , Maria Dimopoulou ¹, Stamatis Adamopoulos ², Andreas Karabinis ³ and Stavros Dimopoulos ^{1,3,*} 

Modality of Exercise	Proposed Exercise Protocol *
Early mobilization	<u>Awake patients with level of consciousness</u>
	➤ 1 to 3 sets of 8 to 10 repetitions of 5 active range of motion and resistance exercises such as leg press, squats from sitting position;
	➤ 15–30 min of active cycling with moderate to slightly high intensity;
	➤ Mobilization in a standing position and walking;
	➤ Respiratory rehabilitation and breathing exercises for 2 sets of 10 min per set;
Early mobilization	➤ Functional electrical stimulation of the lower limb muscles;
	1. Inspiratory muscle training.
	<u>Unconscious patients</u>
	➤ Passive mobilization via stretching, splinting and passive movements;
	➤ Continuous passive motion;
Early mobilization	➤ Functional electrical stimulation of the lower limb muscles;
	➤ Passive cycling for 20 min.
	Proposed duration: 60 min per session, 5 times per week while on ECMO.

Early Active Mobilization during Mechanical Ventilation in the ICU

The TEAM Study Investigators and the ANZICS Clinical Trials Group*

RDZ multicentrique, 750 patients
Kiné intensive 21±15 min/J
vs.
Standard 9±9 min/J

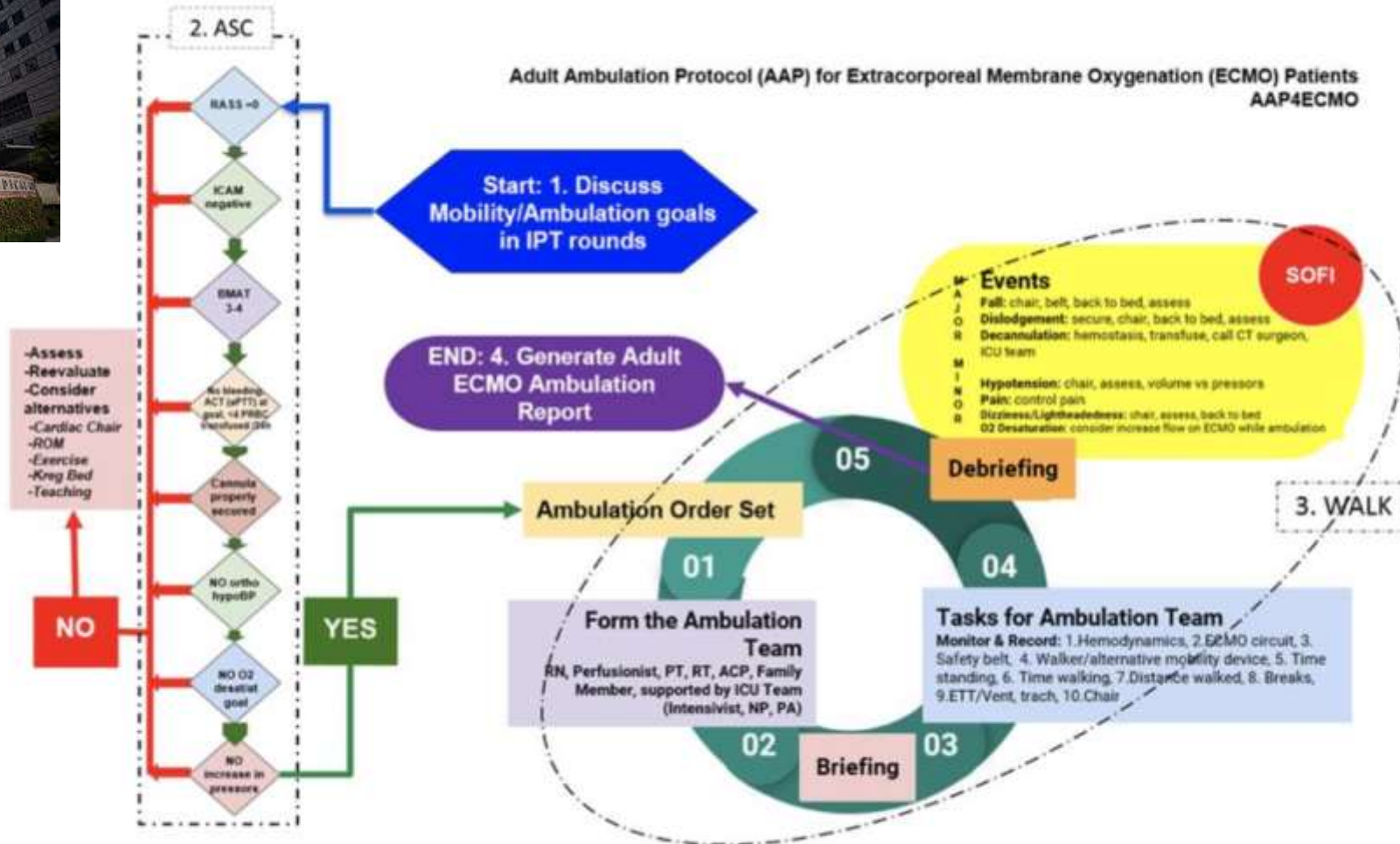


Mortalité & durée de ventilation mécanique idem
Effets indésirables > groupe intensif

SAFETY FIRST



AAP4ECMO Concept



Legend: RASS= Richmond Agitation Sedation Scale, ICAM= ICU Confusion Assessment Tool, BMAT=Bedside Mobility Assessment Tool, SOFI = Safety Opportunities for Improvement, RN =Registered Nurse, PT= Physical Therapist, RT=Respiratory Therapist, ACP= Assistant Care Partner, NP=Nurse Practitioner, PA=Physician Assistant, ICU= Intensive Care Unit
IPT = Interprofessional Team, ASC = Ambulation Safety Checklist



Complete this form before ambulating VV or VA ECMO patients.

Yes	Ambulation Safety Checklist (ASC)	No
	Is RASS =0?	
	Is I-CAM negative?	
	Is BMAT 3-4?	
	NO Bleeding? ACT/aPTT at goal? NO >4units blood product transfused/24h?	
	Is cannula visible & secured?	
	Is O2 Sats at goal? No desaturation with activity?	
	No increase in vasopressors needs?	

If the answer is "YES" to ALL questions then:		If the answer is "NO" to ONE or MORE questions then:		
Form the Ambulation Team: ☐ RN ☐ Perfusionist ☐ PT ☐ RT ☐ ACP ☐ Family Member ☐ ICU team (Intensivist, PA, NP) available		Assess Re-evaluate Consider Alternatives: -ROM -Cardiac chair -Kreg bed		
Tasks (briefing): <table border="0"> <tr> <td> Monitor ☐ Hemodynamics ☐ ECMO circuit ☐ ETT/VENT/O2 </td> <td> Record ☐ Time standing ☐ Time walking ☐ Distance walked ☐ Breaks </td> </tr> </table>			Monitor ☐ Hemodynamics ☐ ECMO circuit ☐ ETT/VENT/O2	Record ☐ Time standing ☐ Time walking ☐ Distance walked ☐ Breaks
Monitor ☐ Hemodynamics ☐ ECMO circuit ☐ ETT/VENT/O2	Record ☐ Time standing ☐ Time walking ☐ Distance walked ☐ Breaks			
Debriefing: discuss with ambulation team members the patient's overall performance and				
Adverse Events (AE) Major = Complete SOFI ☐ Fall: chair, belt, back to bed, assess ☐ Dislodgement: secure, chair, back to bed, assess ☐ Decannulation: hemostasis, transfuse, call CT surgeon, ICU team Minor ☐ Hypotension: chair, assess, volume vs pressors ☐ Pain: control pain ☐ Dizziness/Lightheadedness: chair, assess, back to bed ☐ O2 Desaturation: consider increase flow on ECMO while ambulation				



Conclusion

- Active physiotherapy = feasible in VV and VA-ECMO patients
and associated with strong beneficial effects
- Needs a trained team with a dedicated program