ECCO2R Evaluation of clinical PrismaLung+ runs, efficacy and costs

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Clinical Runs

PT ID	Number	Start	Stop	Run time	AK	ECMO	Bleeding	Dialysis	D filter	Bloodflow	Cost / treatment day	
HP	RH-1	18.3	20.3	3 days	novastan	+	n	y	ST150 x1	350-400	4500	
	RH-2	20.3	23.3	3 days	novastan	+	n	y	ST150 x1	350-400	4500	
	RH-3	6.4	11.4	5 days	heparin	-	n	y	Oxiris x2	350-400	3300	
	RH-4	11.4	15.4	4 Days	heparin	-	n	y	ST150 x 2	350-400	3750	
NGJ	RH-5	22.06	25.06	3 days	heparin	+	n	y	ST150 x 1	350	4500	
	RH-6	25.6	28.6	3 days	heparin	Stop day 2	n	y	ST150 x1	350	4500	
	RH-7	28.6	30.6	3 days	heparin	-	n	y	ST150 x 1	350	4500	
	RH-8	5.7	15.7	10 days	heparin	-	n	y	ST150 x 4	350	1800	
BDJ	RH-9	26.3	1.4	5 days	heparin	stop day 2	n	y	ST150 x2	450	3000	
	RH-10	1.4	4.4	4 days	heparin	-	n	y	ST150 x 2	450	3750	
ID	RH-11	28.6	28.6	< 24 h	heparin	-	n	y	ST150 x 1	250	13500	
	RH-12	28.6	28.6	< 24 h	heparin	-	n	y	ST150 x 1	?	13500	
	RH-13	29.6	1.7	24 h	heparin	start 1.7	n	n	ST150 x 1	250	13500	

Unit price	
PL+	12000
ST150	1450
Oxiris	2250

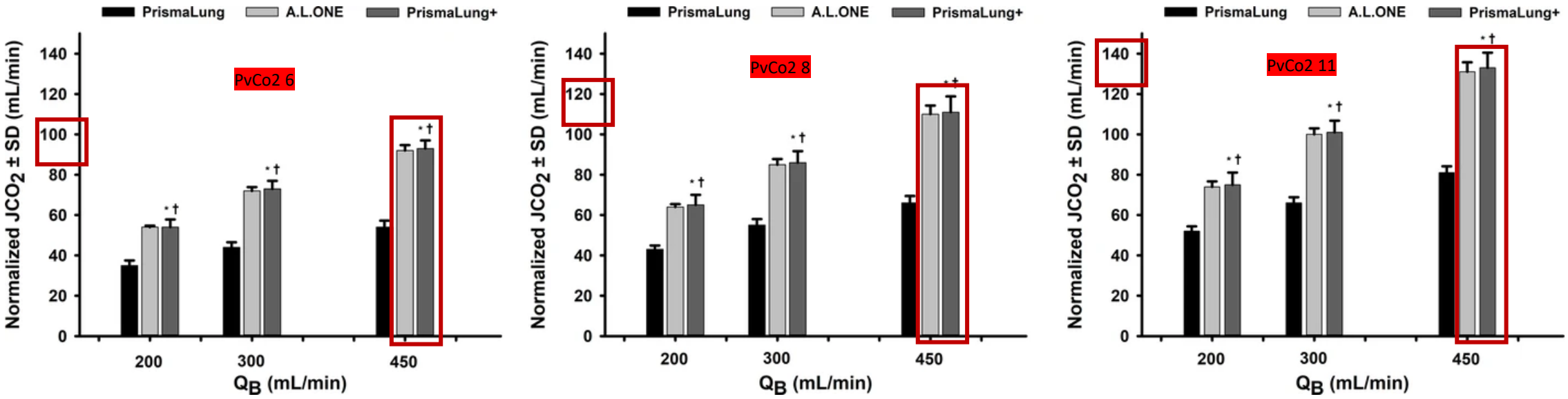
Costs overall 186.600
Treatment days 45
Average cost / day 4200

Comparing systems

- Membrane size
- Blood flow rate
- Sweep Flow rate
- Physiological efficacy
- Run time
- Anti Coag treatment
- Work load
- Costs

PrismaLung+

- Membrane size 0,8 m2 (0.35 PL version)
- Bloodflow 350 – 450 ml/min
- SF 1-10 L (perspiratio +++)
- Efficacy 70 – 130 ml Co2/min depending on PvCo2 (6-11 Kpa)
- 72 h’s runtime (can be extended)
- Heparin : APTT 45-60
- Cost 12.000 (membrane) + filters 1450 or 2250
- Workload: CRRT level
- Oxiris filter (heparin coated) or ST150



: https://icm-experimental.springeropen.com/articles/10.1186/s40635-020-00301-7

Figuren viser på Y aksen hvor meget Co2 der skal tilføres en cirkel med blod tilkoblet et EcCo2R system (3 forskellige: prismalung, A.L.ONE og prismalung+) for at opnå steady state, dvs hvor meget det enkelte system fjerner.
På x aksen ses værdier for 3 forskellige blodflows over membranen.
Første del (a) ved Partial tryk Co2 i blodet på 45 mm Hg = 6 Kpa
Midterste del (b) ved 60 mm Hg = 8 Kpa
Sidste del ved 80 mm Hg = knap 11 Kpa.

- **Bloodflow 450 ml/min (Q)**
- **Sweep Flow 10 L (max)**
- CO2 RR = Mw CO2 x Q x Total CO2(pre – post)
- Mw CO2 : 1 mmol CO2 = 22,13 ml CO2
- CO2 dissolvant Constant: 0.23 mmol/L/Kpa
- Tot CO2 (mmol/L) = HCO3 (mmol/L) + 0.23 x PCO2 (kpa)

- **Pre membrane: 695 ml CO2 / L**

Tot CO2 pre: 29,5 + (0.23 x 7,27) = 31,17 mmol/L

CO2 content pre: 31,17 mmol/l x 22,3 ml/mmol = 695 ml / L

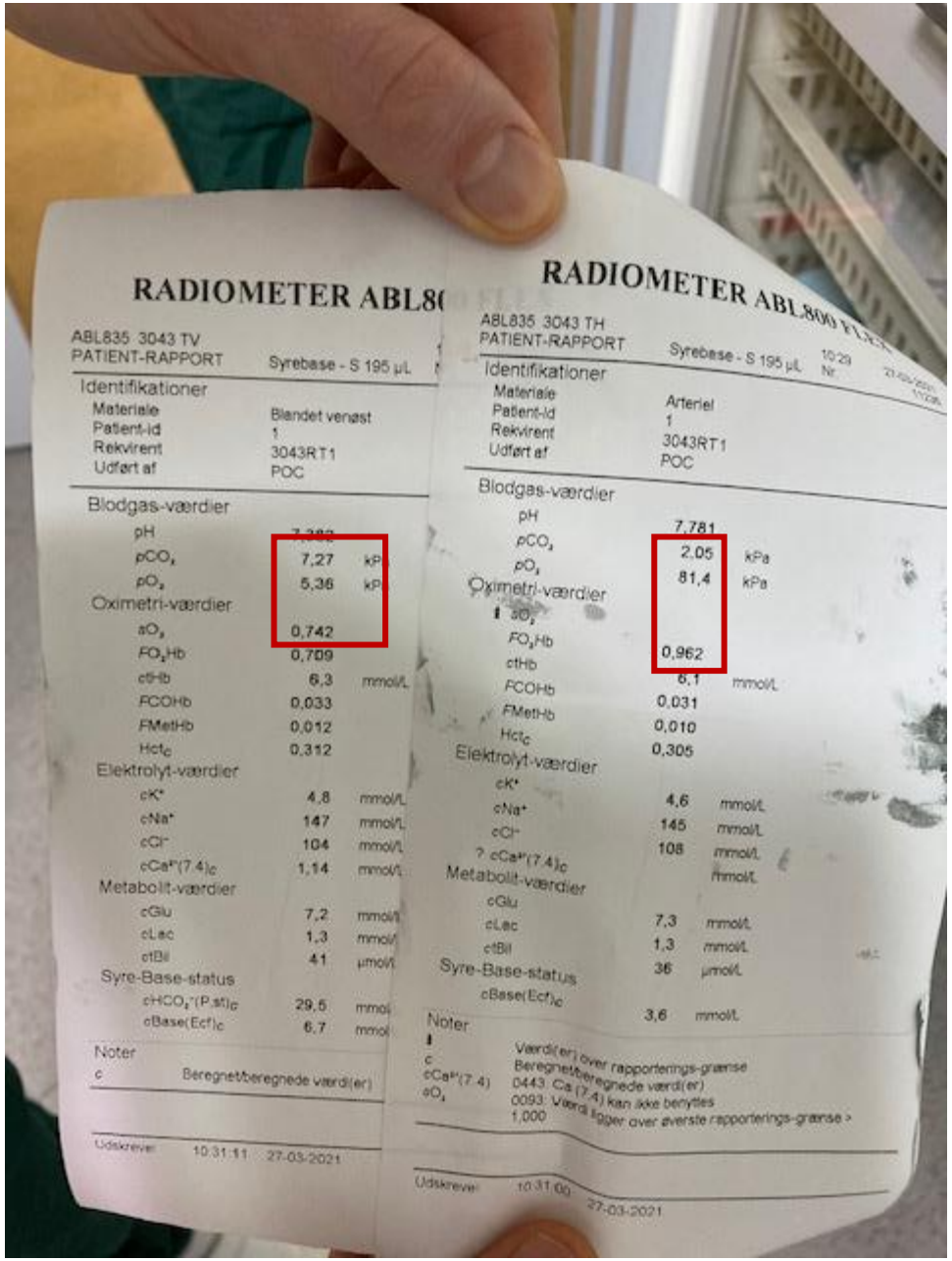
- **Post membrane: 501 ml CO2 / L**

Tot CO2 post: 22 (estimated) + 0.23 x 2,05 = 22,47 mmol/L

CO2 content post: 22,47 mmol/ L x 22,3 ml/mmol = 501 ml/ L

(695 – 501) ml/ L x 0.45 L /min = 194 ml/L x 0.45 L /min

CO2 RR at 450 ml Bloodflow and 10 L SF: 87 ml CO2 / min



Patient data

Male

Age: 47

Weight: 107 kg

Height: 185 cm

Temperature: 36,9

RQ = VCO2 / VO2 = 0.8

VCO2 = 0,8 x VO2

VO2 = (157,3 x BSA) + (10 x sex) – (10,5 x Ln age) + 4,8

(male = 1, female = 0)

+ 10% / degree fewer

A Bergstra[1], R B van Dijk, H L Hillege, K I Lie, G A Mook

Eur Heart J 1995 May;16(5):698-703

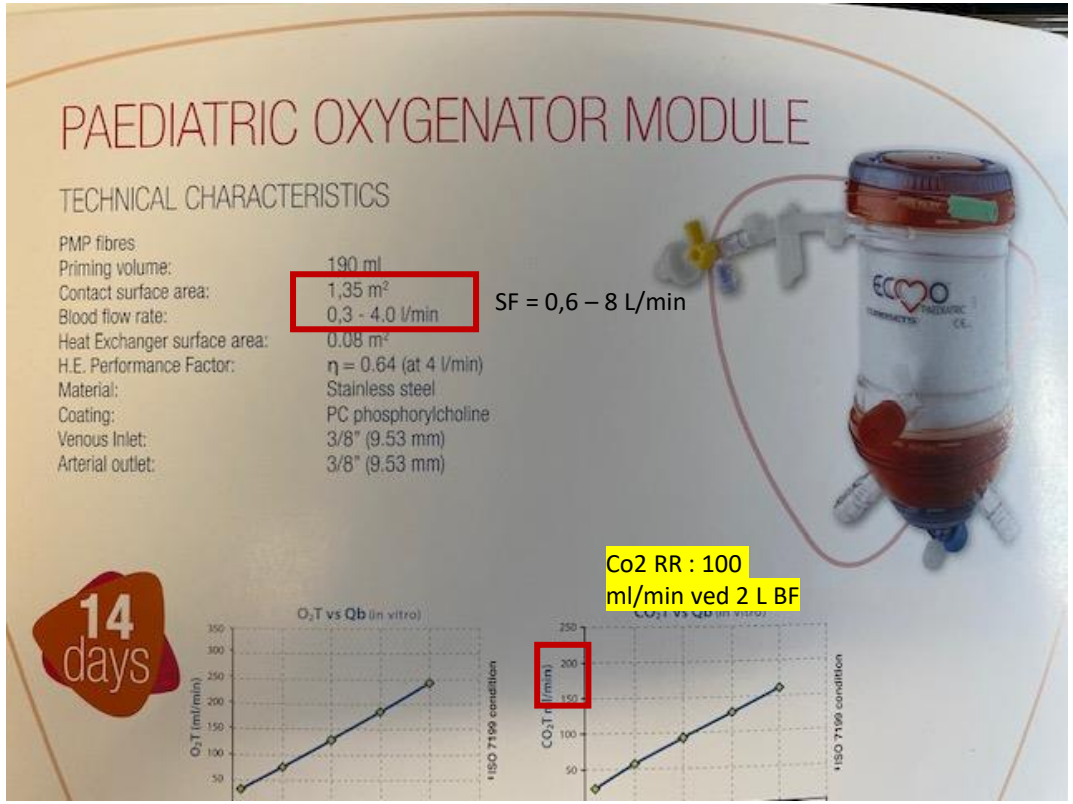
- VO2= 336 ml O2/min
- VCO2 = 0,8 x 336 = 269 ml CO2 / min
- Normal lung CO2RR: 50-70%

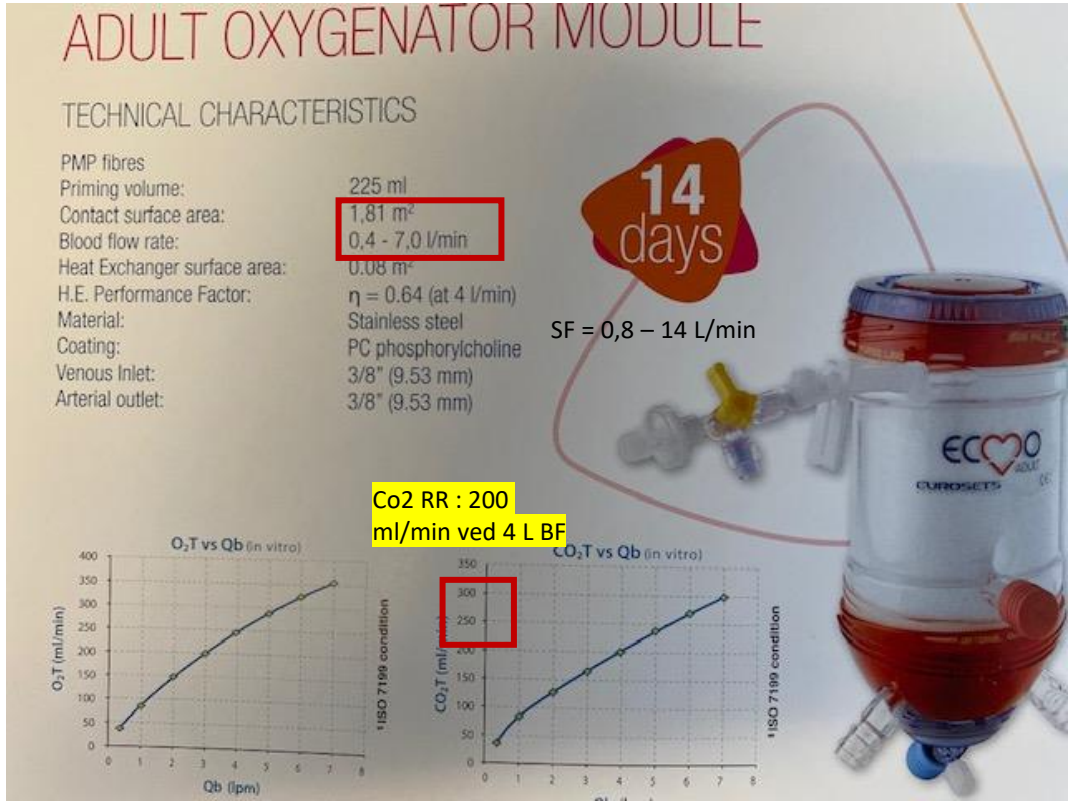
CO2RR PL+ : 87 ml/min (32%)

CO2RR ECMO pæd 2 L flow: 100 ml/min (37 %)

CO2RR ECMO 4 L flow: 200 ml/min (74%)

ECMO CO2 removal



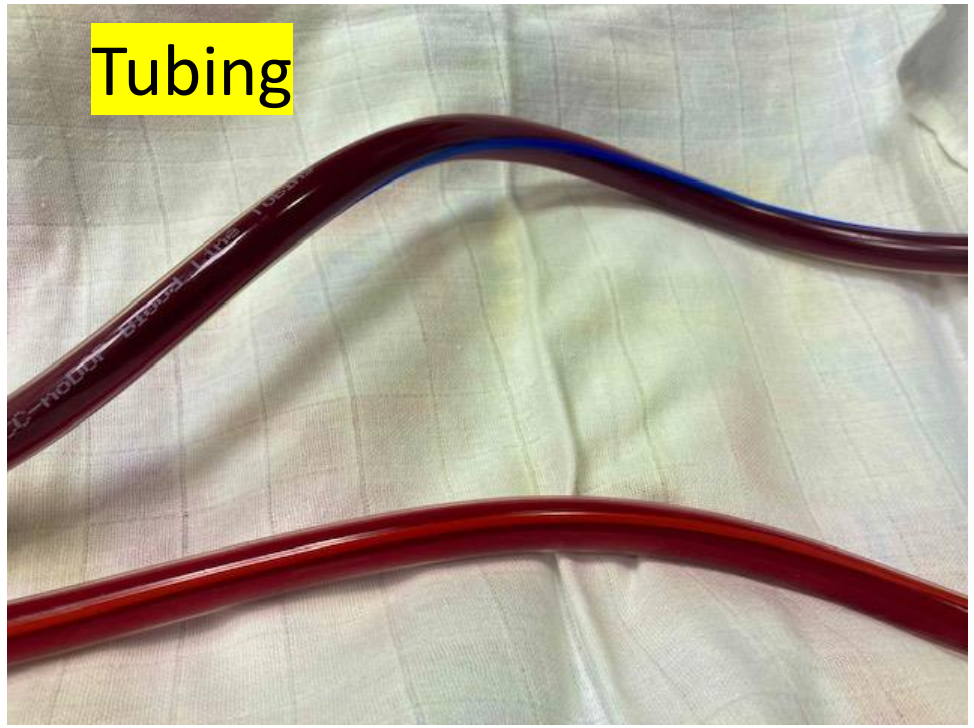


- Runtime: up to 10 + days but variable…
- Heparin ACT 180 – 200 (160-180)
- Dual lumen Catheter 16.000 + ECMO circuit + medos pumphead 7900 + oxygenator 9800 = 33.700

- Workload: ECMO certified nurse + bed nurse (1,5)
  Daily maintainance by perfusionist

VV ECMO set up

Tubing



Avalon 13F: 900 ml/min
16 F: 1500 ml/min
19 F : 2200 ml/min

Cathedar

Conclusion and futher Q's to be adressed

We will use PL+ in a VV ECMO setting as 'bridge to wean'

When oxygenation but not CO2 elimination is restored

Protocolled use: 10 patients

Preferably with other ECMO centers in Scandinavia

Outcome: can we shorten the ECMO run?

Prospective Evaluation of in-vivo efficacy and system stability, ability to wake and mobilize patients

How are other ECMO centers using ECCO2R systems?