Dr Ramesh
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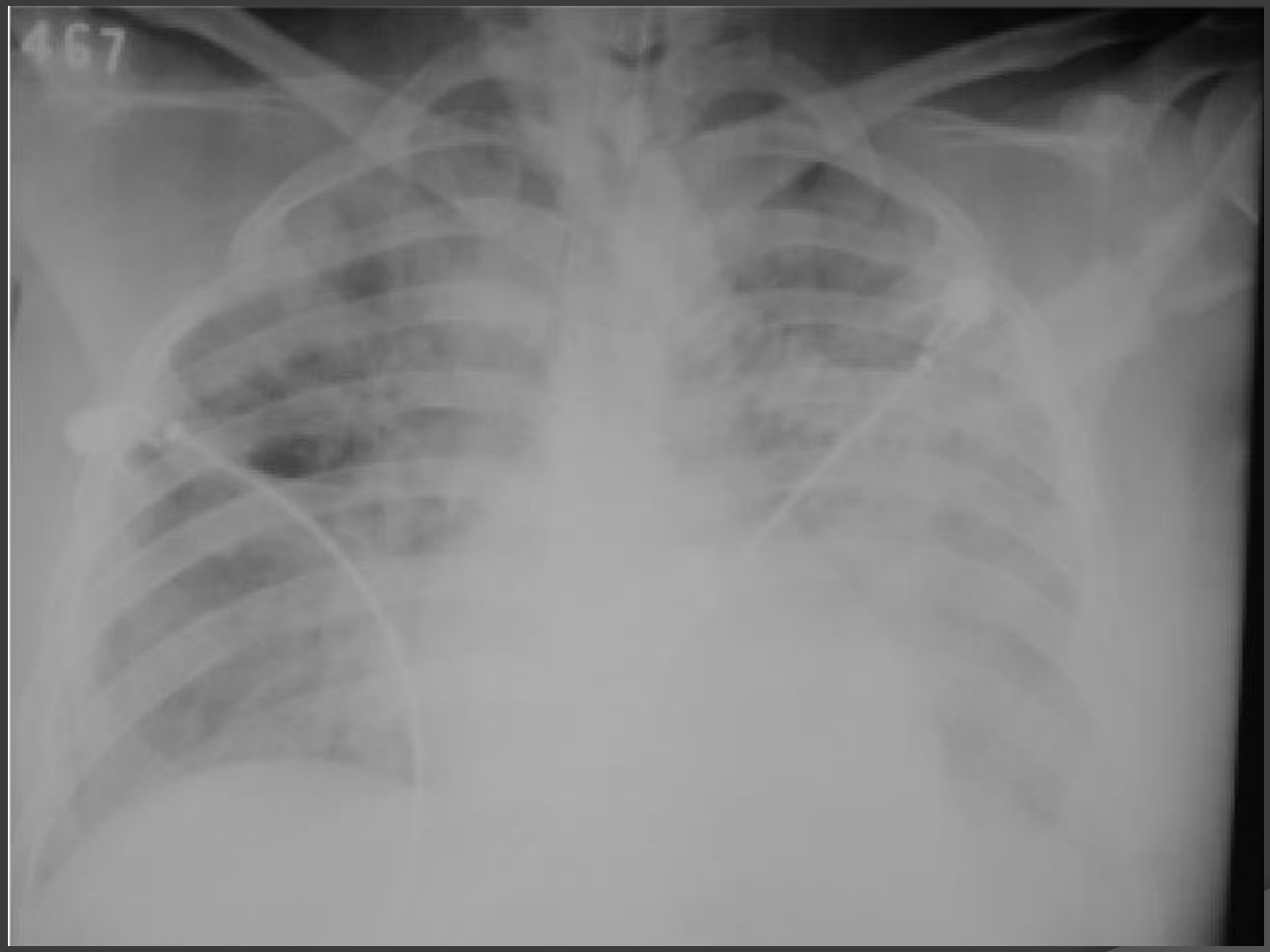
Scunthorpe Hospital

ARDS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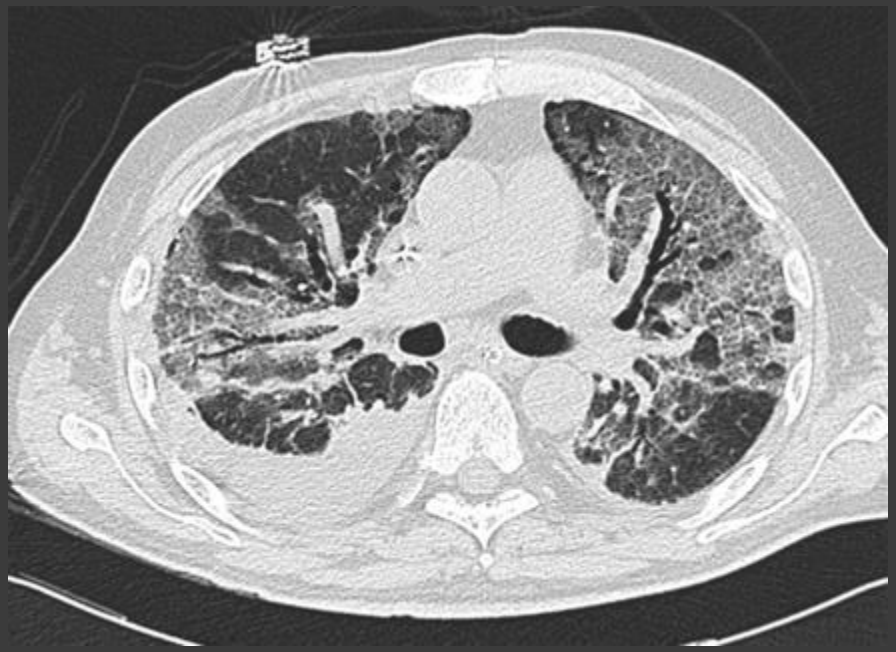


- Life threatening hypoxia and in late stages hypercarbia leading to respiratory failure needing intubation and ventilation.

Differential Diagnosis.

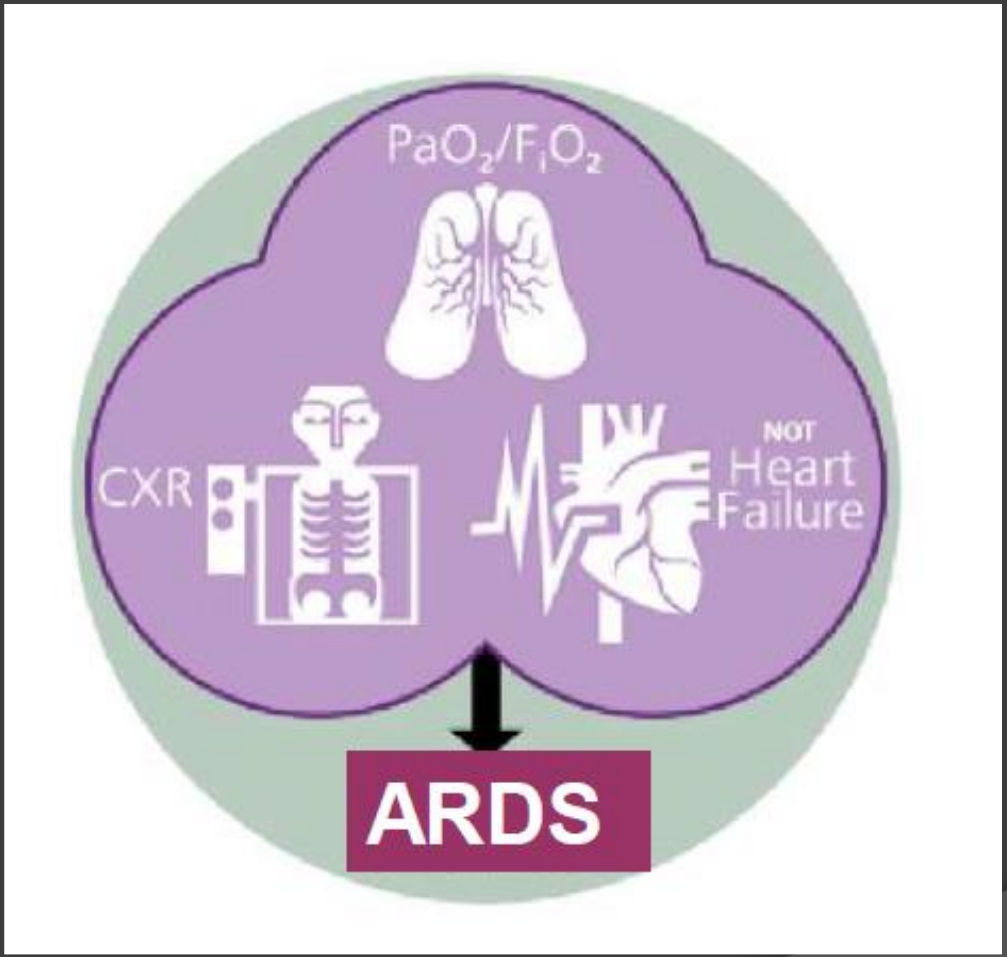
- Fluid – heart failure or ARDS.
- Pus - Pneumonia
- Blood- haemorrhage.
- Inflammation – ARDS, CT diseases.
- Cells – Tumours.

Berlin definition of ARDS.

	Acute Respiratory Distress Syndrome
Timing	Within 1 week of a known clinical insult or new or worsening respiratory symptoms
Chest imaging[a]	Bilateral opacities—not fully explained by effusions, lobar/lung collapse, or nodules
Origin of edema	Respiratory failure not fully explained by cardiac failure or fluid overload Need objective assessment (eg, echocardiography) to exclude hydrostatic edema if no risk factor present
Oxygenation[b]	
Mild	200 mm Hg < PaO_2/FIO_2 ≤ 300 mm Hg with PEEP or CPAP ≥5 cm H_2O[c]
Moderate	100 mm Hg < PaO_2/FIO_2 ≤ 200 mm Hg with PEEP ≥5 cm H_2O
Severe	PaO_2/FIO_2 ≤ 100 mm Hg with PEEP ≥5 cm H_2O

300 mmHg =	40	kPa
200 mmHg =	26.7	kPa
100 mmHg =	13.3	kPa

ARDS.



- So what ?
- Is it important to identify ARDS?

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Epidemiology, Patterns of Care, and Mortality for Patients With Acute Respiratory Distress Syndrome in Intensive Care Units in 50 Countries

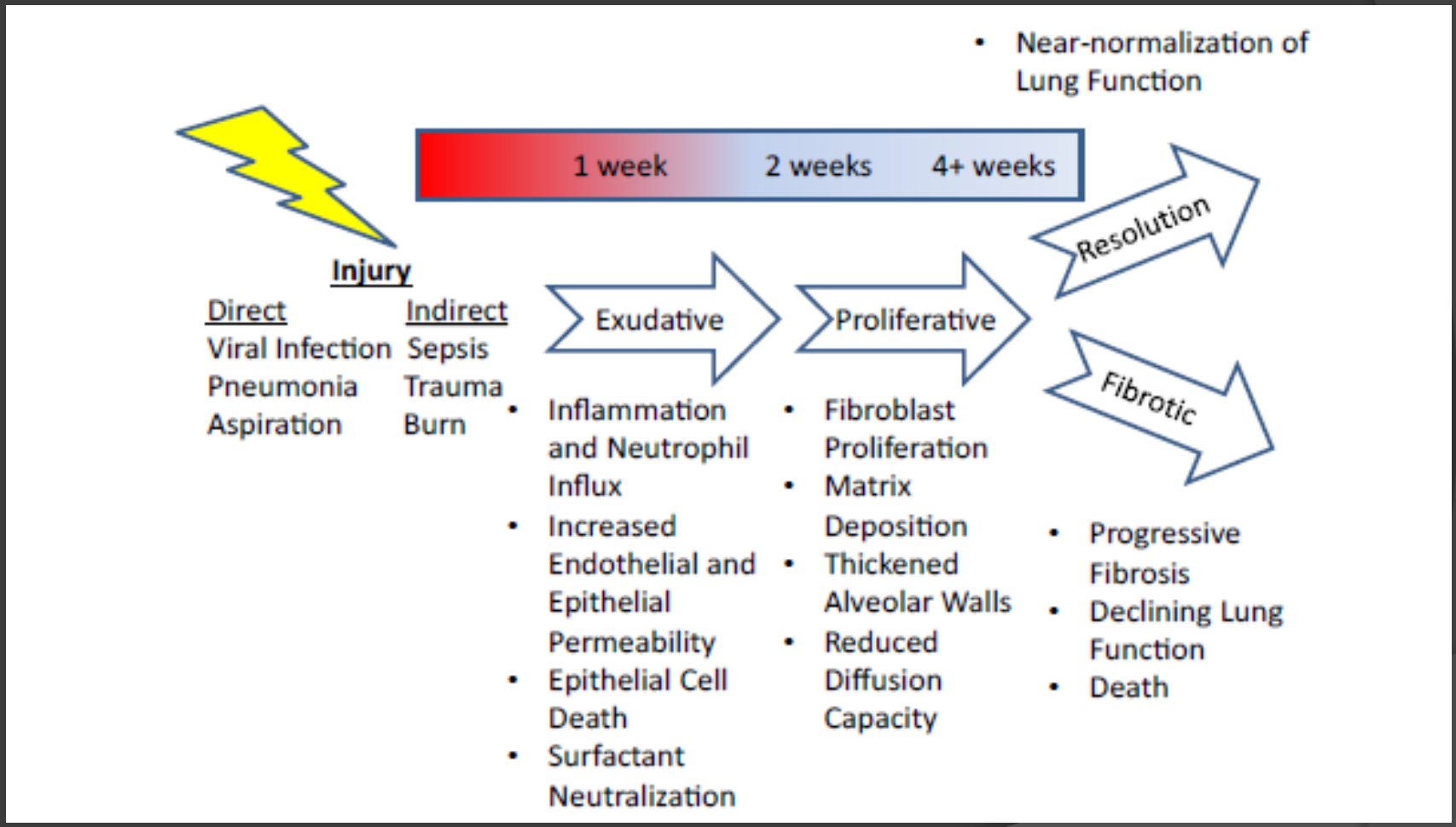
Lung safe trial 3022/29444 = 10.4%.

ARDS Severity	Mild	Moderate	Severe
Incidence	30%	40%	25%
Mortality	34%	40.6%	46.4%

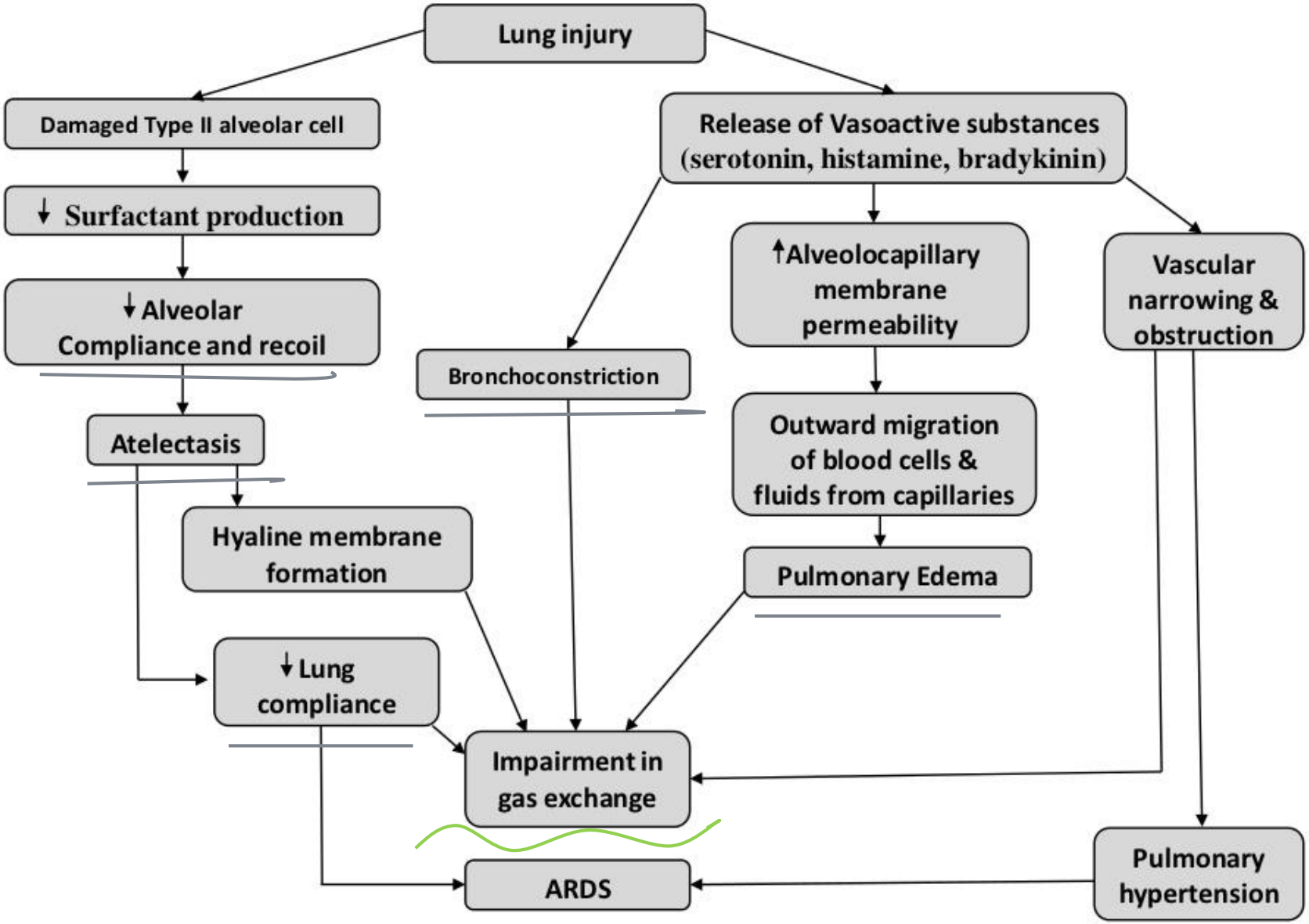
Causes of ARDS.

Pulmonary causes	Extra-pulmonary causes i.e. systemic inflammation
Pneumonia	Sepsis
Pulmonary contusion	Severe burns
Aspiration pneumonitis	Major trauma
Inhalational injury	Transfusion-associated lung injury
Pulmonary vasculitis	Severe acute pancreatitis
Submersion/drowning	Cardiopulmonary bypass (pump lung)

Pathology Of ARDS.



SCHEMATIC REPRESENTATION OF PATHOPHYSIOLOGY OF ARDS



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Comparison of Two Fluid-Management Strategies in Acute Lung Injury

The National Heart, Lung, and Blood Institute Acute Respiratory Distress Syndrome (ARDS) Clinical Trials Network*

Outcome	Conservative Strategy	Liberal Strategy	P Value
Death at 60 days (%)	25.5	28.4	0.30
Ventilator-free days from day 1 to day 28†	14.6±0.5	12.1±0.5	<0.001

VOLUME 342 MAY 4, 2000 NUMBER 18

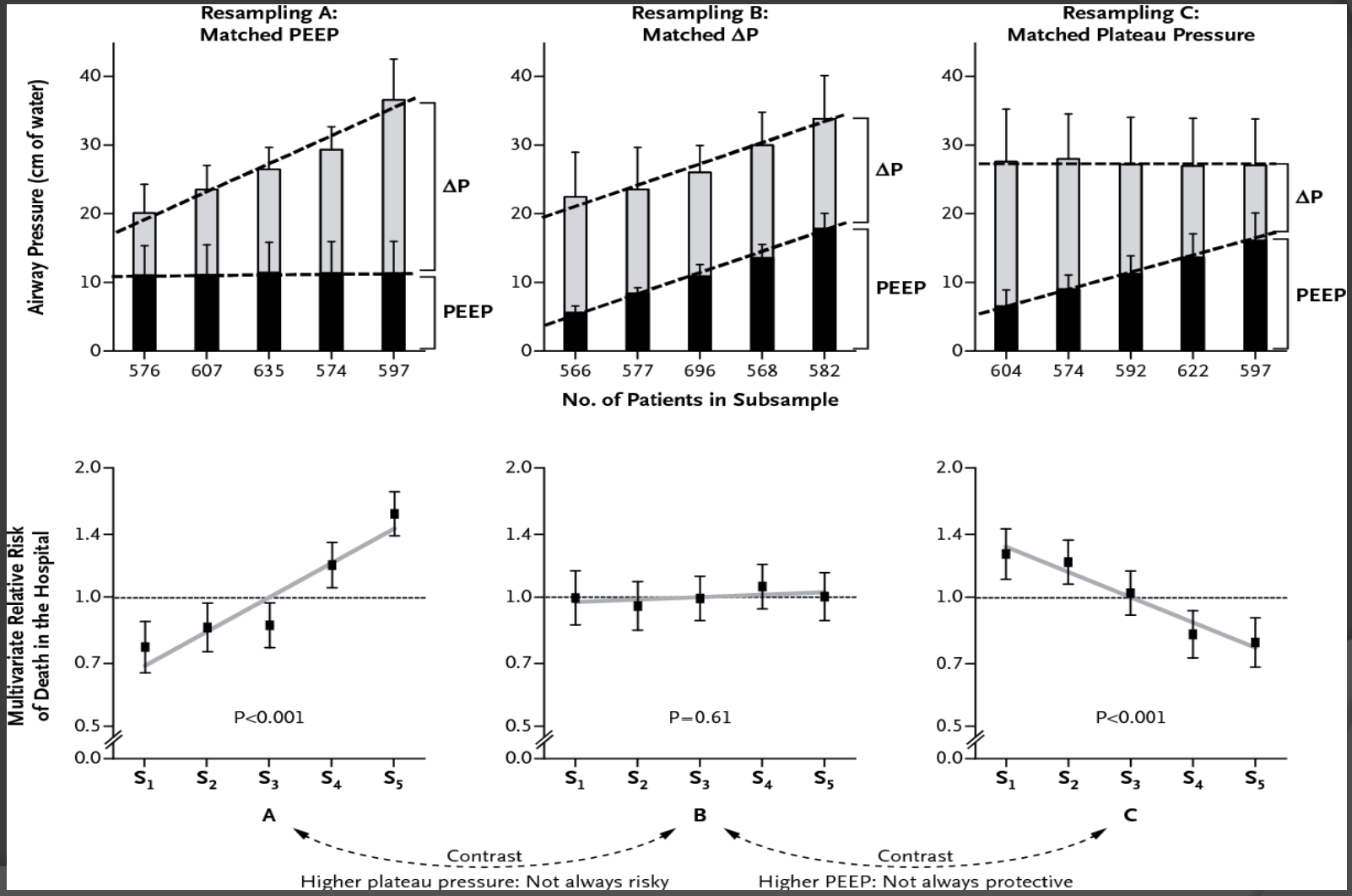
VENTILATION WITH LOWER TIDAL VOLUMES AS COMPARED WITH TRADITIONAL TIDAL VOLUMES FOR ACUTE LUNG INJURY AND THE ACUTE RESPIRATORY DISTRESS SYNDROME

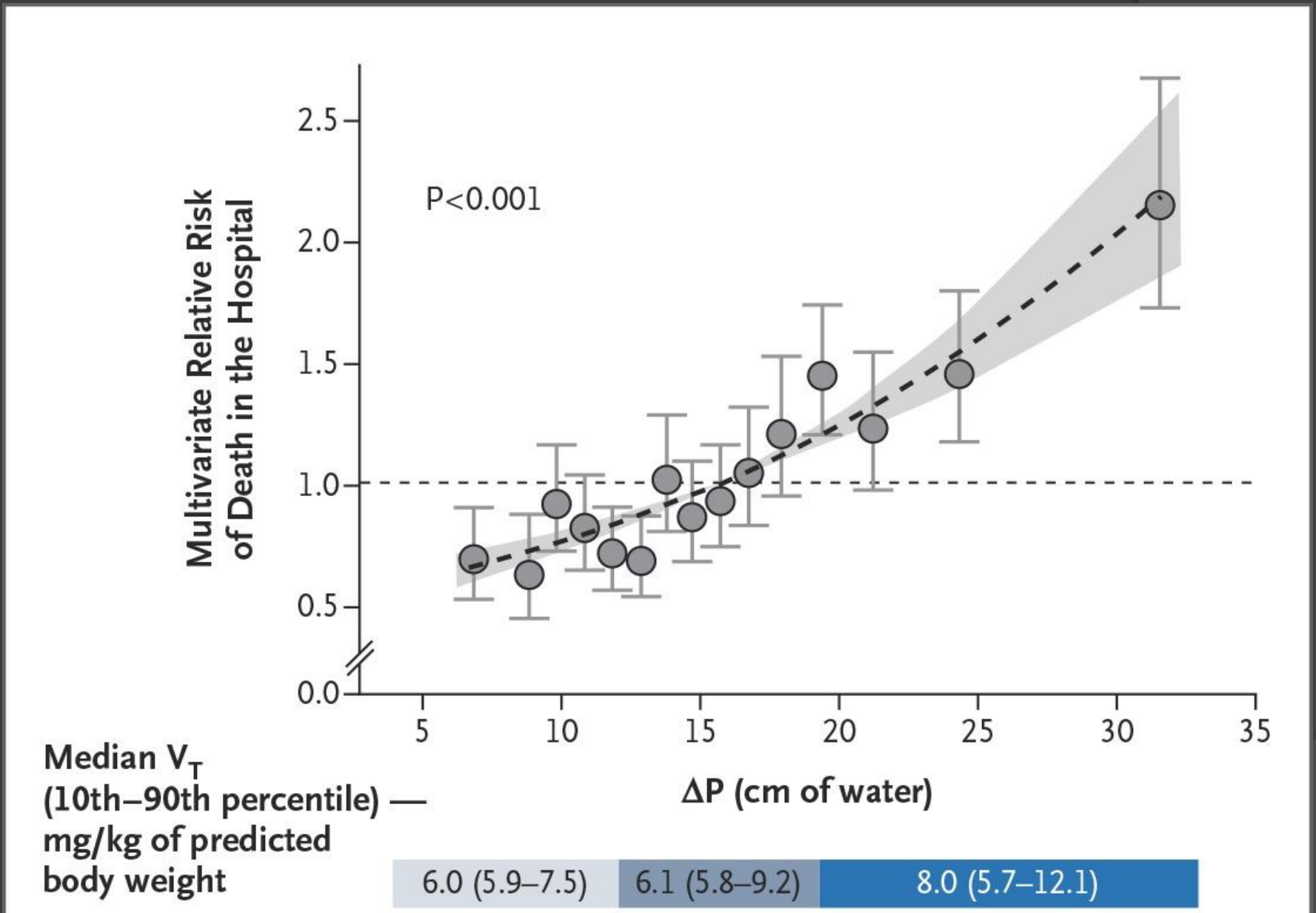
VARIABLE	GROUP RECEIVING LOWER TIDAL VOLUMES	GROUP RECEIVING TRADITIONAL TIDAL VOLUMES	P VALUE
Death before discharge home and breathing without assistance (%)	31.0	39.8	0.007
Breathing without assistance by day 28 (%)	65.7	55.0	<0.001
No. of ventilator-free days, days 1 to 28	12±11	10±11	0.007
Barotrauma, days 1 to 28 (%)	10	11	0.43
No. of days without failure of nonpulmonary organs or systems, days 1 to 28	15±11	12±11	0.006

IBW for ventilation.

Ideal Body Weight (IBW)	Male = 50 + 2.3 x ((height cm/2.54)-60) Female = 45.5 + 2.3 x ((height cm/2.54)-60)

Driving Pressure and Survival in the Acute Respiratory Distress Syndrome

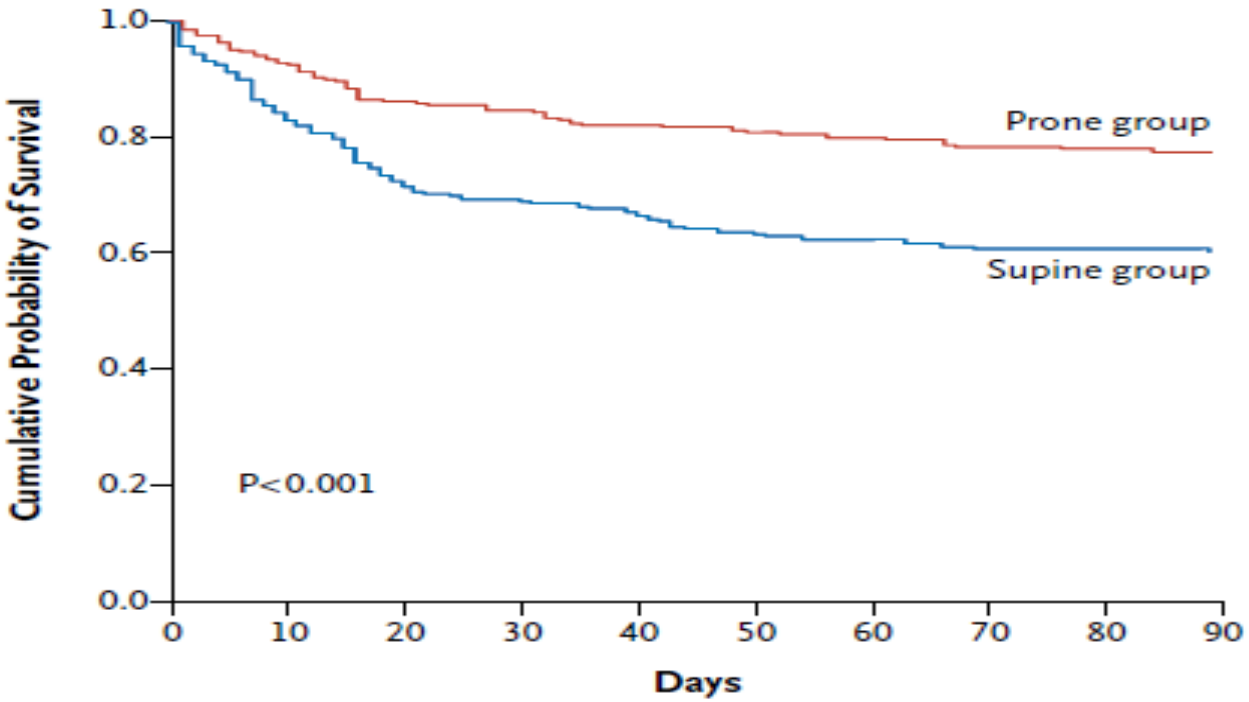



Multivariate Relative Risk of Death in the Hospital
2.5
2.0
1.5
1.0
0.5
0.0
P<0.001
5
10
15
20
25
30
35
ΔP (cm of water)
Median V_T (10th–90th percentile) — mg/kg of predicted body weight
6.0 (5.9–7.5)
6.1 (5.8–9.2)
8.0 (5.7–12.1)

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JUNE 6, 2013 VOL. 368 NO. 23

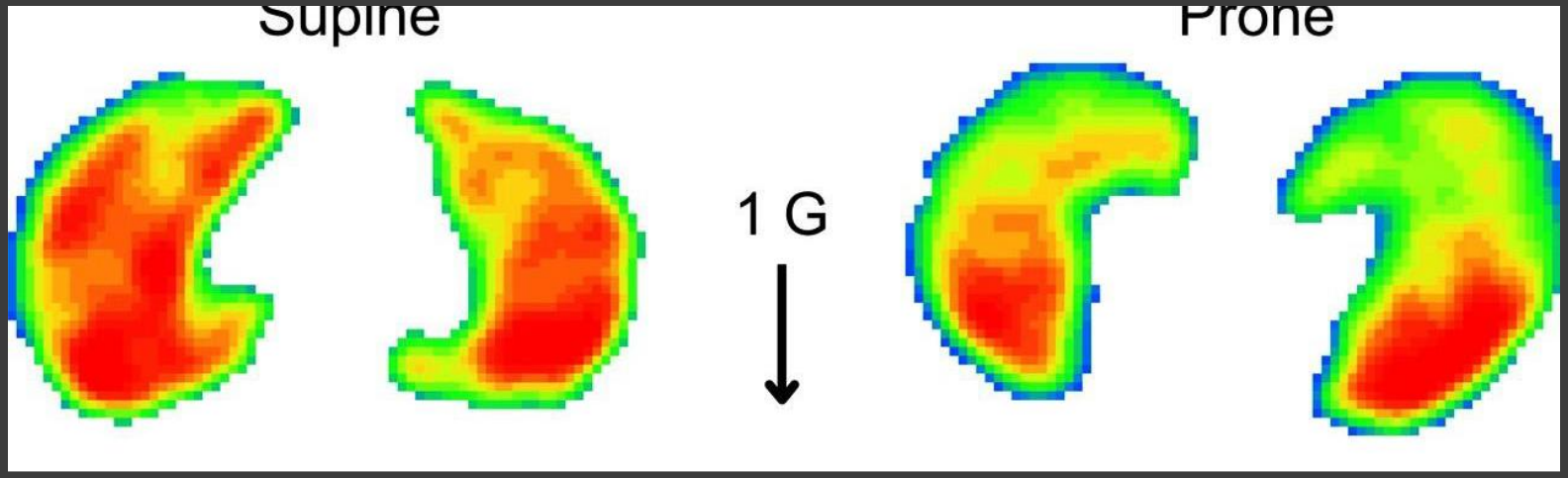
Prone Positioning in Severe Acute Respiratory Distress Syndrome



No. at Risk

Prone group	237	202	191	186	182
Supine group	229	163	150	139	136

Figure 2. Kaplan–Meier Plot of the Probability of Survival from Randomization to Day 90.


Supine
Prone
1 G

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 SEPTEMBER 16, 2010 VOL. 363 NO. 12

Neuromuscular Blockers in Early Acute Respiratory Distress Syndrome

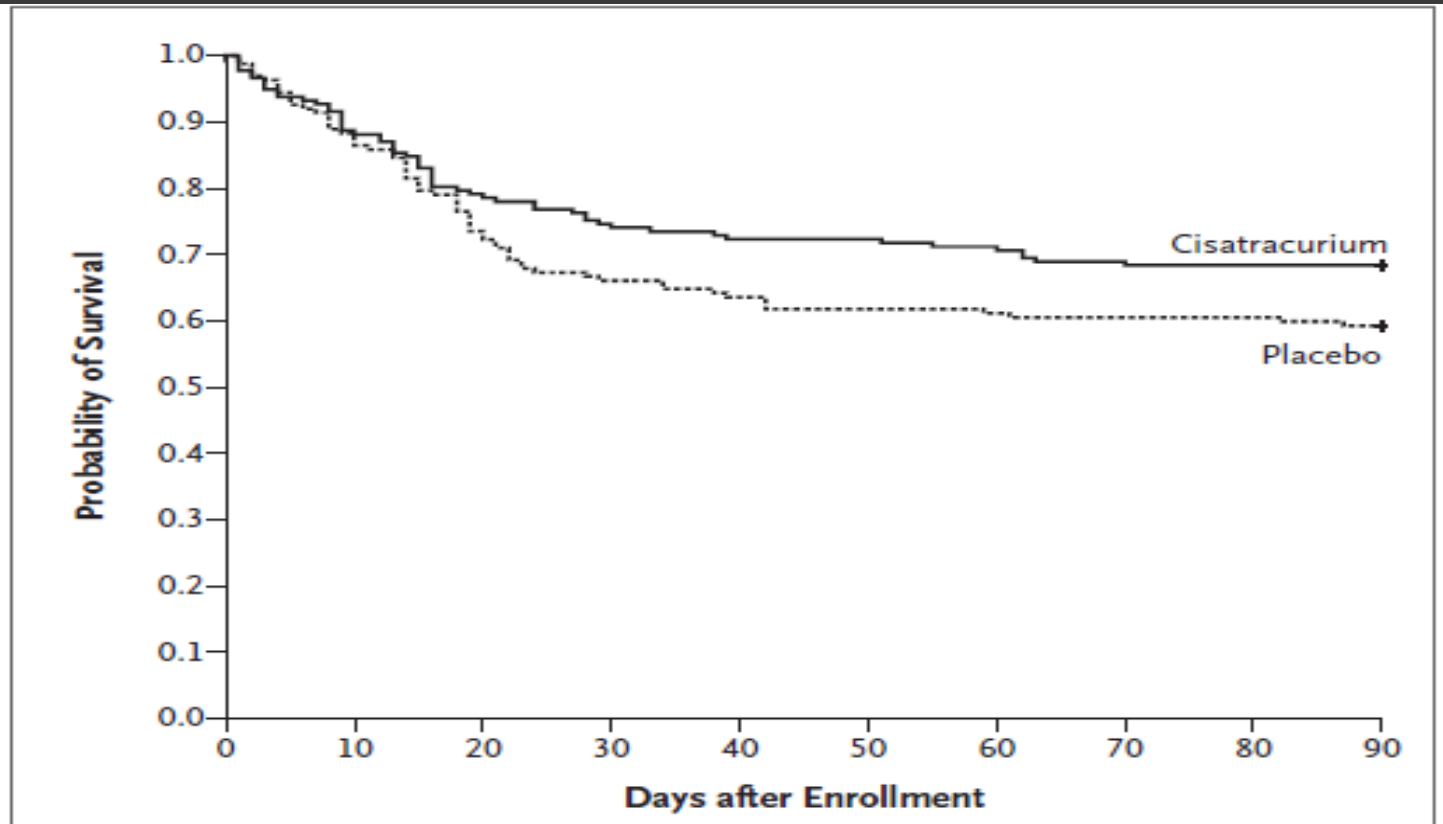


Figure 2. Probability of Survival through Day 90, According to Study Group.

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 APRIL 20, 2006 VOL. 354 NO. 16

Efficacy and Safety of Corticosteroids for Persistent Acute Respiratory Distress Syndrome

Variable	Placebo (N=91)	Methylprednisolone (N=89)	P Value
180-Day mortality — %	31.9	31.5	1.0
95% CI	23.2–42.0	22.8–41.7	

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ESTABLISHED IN 1812 MAY 24, 2018 VOL. 378 NO. 21

Extracorporeal Membrane Oxygenation for Severe Acute Respiratory Distress Syndrome

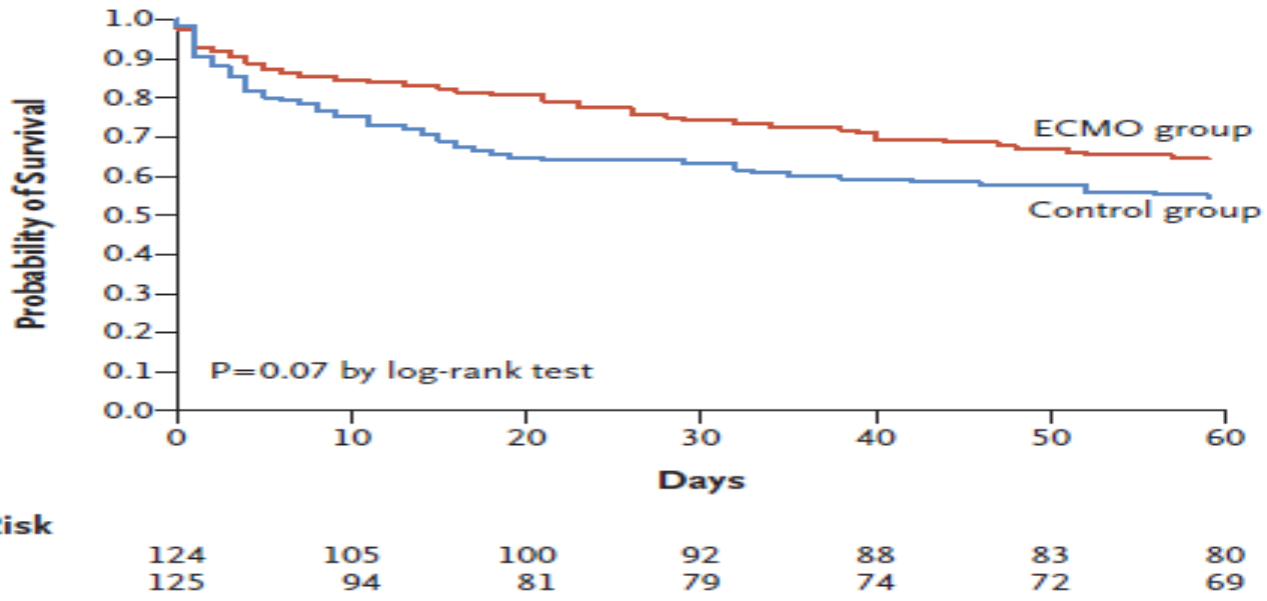


Figure 2. Kaplan–Meier Survival Estimates in the Intention-to-Treat Population during the First 60 Days of the Trial.

ECMO Referral criteria.

Murray Lung Injury Score > 2.5

Points	0	1	2	3	4
P/F ratio (kPa)	240	30-39.9	23.3-29.9	13.3-23.2	<13.3
PEEP (cmH_2O)	s5	6-8	9-11	11-14	215
Compliance (ml/cmH_2O)	280	60-79	40-59	20-39	s19
CXR quadrants infiltrated	0	1	2	3	4

Murray Score = Total Points / 4

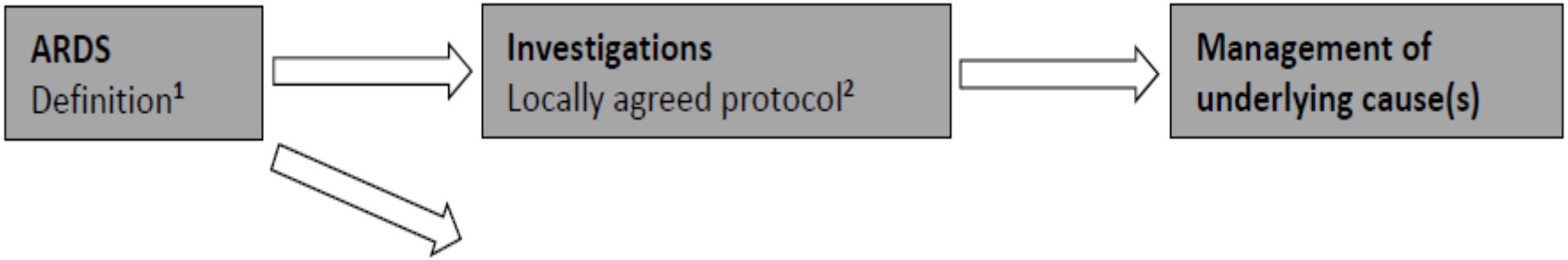
PH < 7.2

FiO_2 not > 0.8 for 7 days

Plateau pressure not > 30 cmH_2O for 7 days

No contraindication to anticoagulation

Topic	GRADE Recommendation	Conditions
Tidal Volume	Strongly in favour	Tidal volume ≤ 6 ml/Kg ideal body weight; Plateau pressure < 30cmH_2O
Prone Positioning	Strongly in favour	Proning for ≥ 12 hours per day Patients with moderate/severe ARDS (P:F ratio ≤ 20kPa)
High frequency oscillation (HFOV)	Strongly against	
Conservative Fluid Management	Weakly in favour	
Higher Peek End-Expiratory Pressure (PEEP)	Weakly in favour	Patients with moderate or severe ARDS (PF ratio ≤ 27kPa)
Neuromuscular Blocking Agents (NMBA)	Weakly in favour	Evidence for cisatracurium besylate Continuous 48-hour infusion Patients with moderate/severe ARDS (≤ 20kPa)
Extra-Corporeal Membrane Oxygenation (ECMO)	Weakly in favour	With lung-protective mechanical ventilation Patients with severe ARDS, lung injury score ≥3 or pH <7.20 due to uncompensated hypercapnoea
Inhaled Vasodilators	Weakly against	Evidence for inhaled nitric oxide
Corticosteroids	Research recommendation	
Extra-Corporeal Carbon Dioxide Removal (ECCO2R)	Research recommendation	



ARDS specific management		
Mild 200 mmHg < $PaO_2/FIO^2 \leq$ 300 MmHg with PEEP or CPAP 5 cmH_2O	**Moderate** 100 mm Hg < $PaO_2/FIO_2 \leq$ 200 Mm Hg with PEEP 5 cmH_2O	**Severe** PaO_2/FIO_2 < 100 mm Hg with PEEP 5 cmH_2O
Conservative fluid balance target		
Low tidal volume ventilation ($\leq$6 ml/Kg IBW[3]; Plateau pressure <30cmH_2O)		
	Prone positioning ($\geq$12 hr/day)	
	Neuro-muscular blockade (first 48 hour)	
	Higher PEEP[4]	
		Refer to local ECMO centre[5]
		Other measures[6]
Non ARDS-specific support		
Rehabilitation: early mobilisation, NICE CG83[7]		
Nutrition: enteral where possible, trophic feeding acceptable initially, consider naso-jejunal tube after pro-kinetics for absorption failure		
Transfusion of blood products: avoid unless absolutely indicated		
Sedation:		

Exceptional measures.

Exceptional Measures	Under exceptional circumstances (for example contraindication to ECMO) short term improvements in gas exchange and right ventricular function can be achieved by using recruitment manoeuvres, inhaled vasodilators (nitric oxide or nebulised prostacyclin) or high frequency oscillatory ventilation depending on local expertise and availability

Long term effects of ARDS.

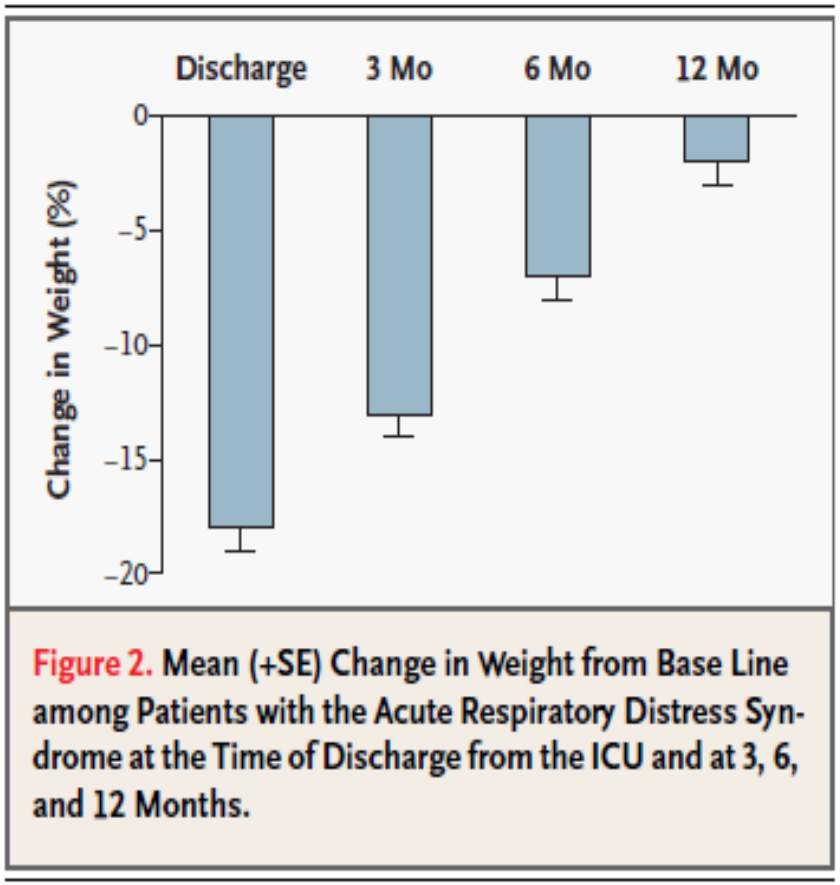


Figure 2. Mean (+SE) Change in Weight from Base Line among Patients with the Acute Respiratory Distress Syndrome at the Time of Discharge from the ICU and at 3, 6, and 12 Months.

Variable	3 Mo (N=71)*	6 Mo (N=77)†	12 Mo (N=80)‡
	median (interquartile range)		
Forced vital capacity (% of predicted)	72 (57–86)	80 (68–94)	85 (71–98)
Forced expiratory volume in one second (% of predicted)	75 (58–92)	85 (69–98)	86 (74–100)
Total lung capacity (% of predicted)§	92 (77–97)	92 (83–101)	95 (81–103)
Residual volume (% of predicted)§	107 (87–121)	97 (82–117)	105 (90–116)
Carbon monoxide diffusion capacity (% of predicted)§¶	63 (54–77)	70 (58–82)	72 (61–86)

Long term effects of ARDS.

Outcome	3 Months	6 Months	12 Months
Distance walked in 6 min			
No. evaluated	80*	78†	81‡
Median — m	281	396	422
Interquartile range — m	55–454	244–500	277–510
Percentage of predicted value§	49	64	66
Returned to work — no./total no. (%)¶	13/83 (16)	26/82 (32)	40/82 (49)
Returned to original work — no./total no. (%)	10/13 (77)	23/26 (88)	31/40 (78)
SF-36 score**			

THANK YOU.

LIPS Score > 4 Possible ARDS.

Predisposing conditions	LIPS Score
Shock	2
Aspiration	2
Sepsis	1
Pneumonia	1.5
High-risk surgery*	
Orthopaedic spine	1
Acute abdomen	2
Cardiac	2.5
Aortic vascular	3.5
High-risk trauma	
Traumatic brain injury	2
Smoke inhalation	2
Near drowning	2
Lung contusion	1.5
Multiple fractures	1.5
Risk modifiers	
Alcohol abuse	1
Obesity (BMI>30)	1
Hypoalbuminemia	1
Chemotherapy	1
$FIO_2 > 0.35$ (>4 L/min)	2
Tachypnoea (RR > 30)	1.5
$SpO_2 < 95\%$	1
Acidosis (pH < 7.35)	1.5
Diabetes mellitus**	-1