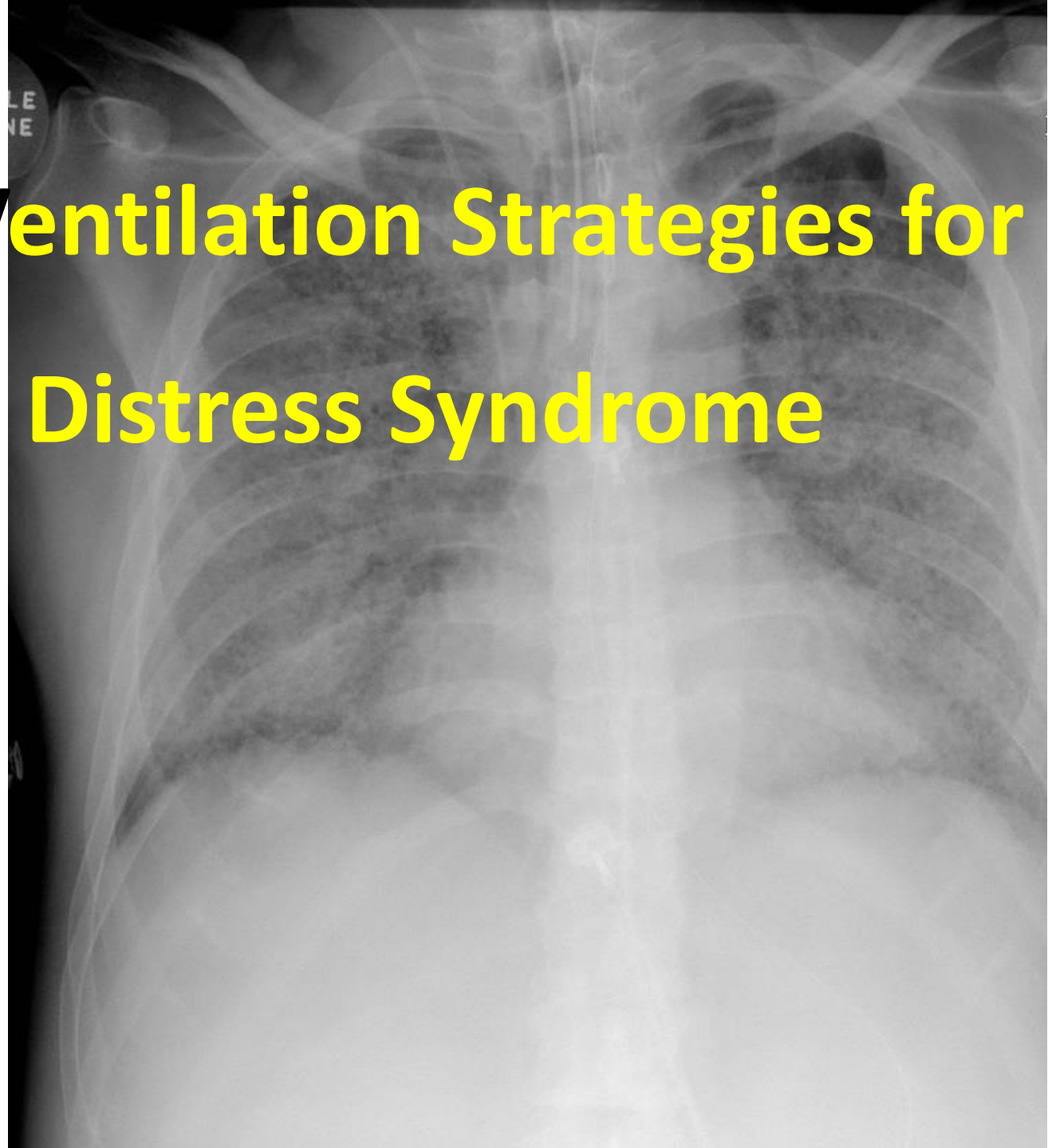
# Updated Mechanical Ventilation Strategies for Acute Respiratory Distress Syndrome

臺北榮民總醫院

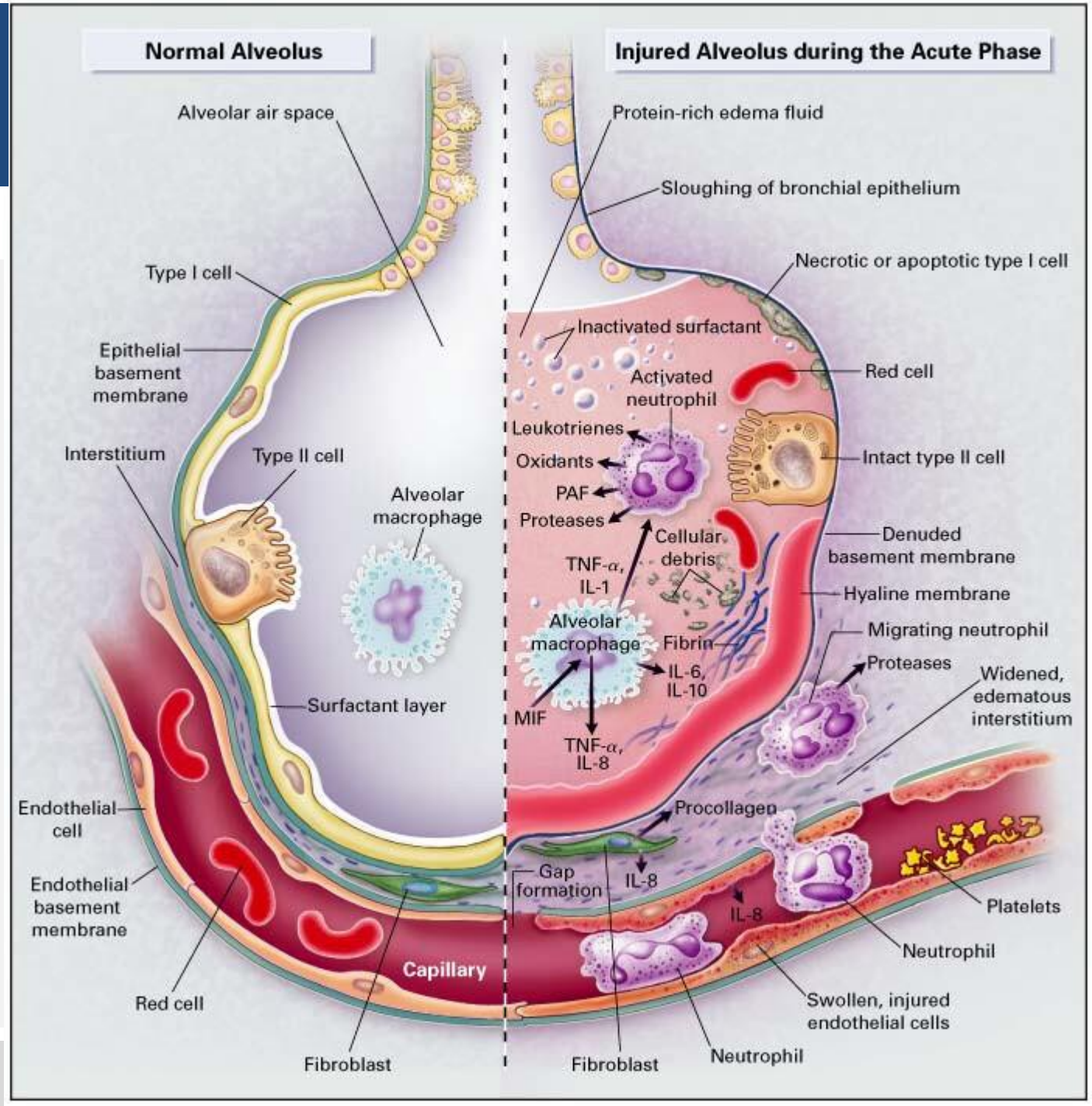
胸腔部 呼吸治療科

余文光醫師



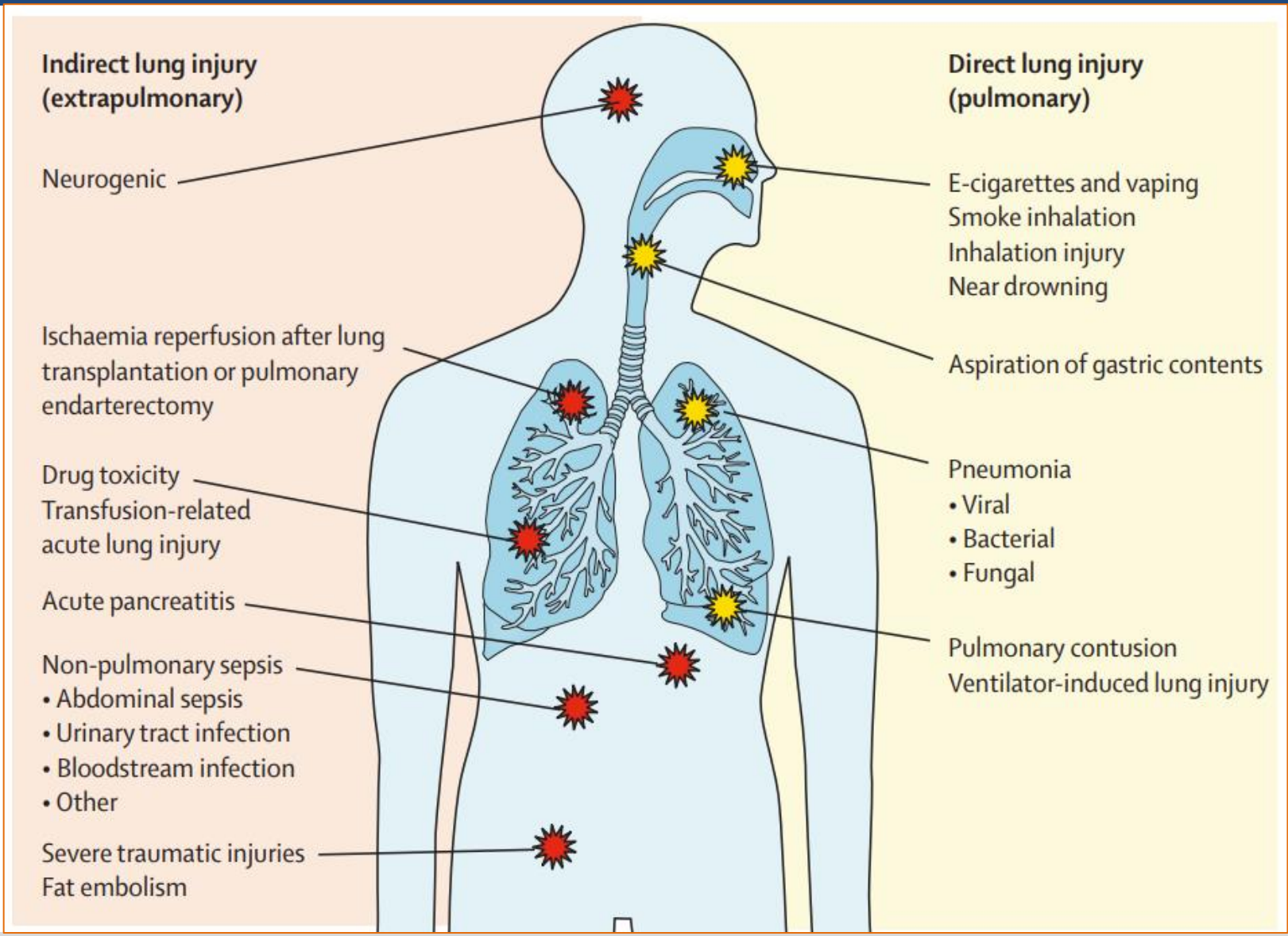
# ARDS: Definition

**An acute, severe, and diffuse inflammatory injury of the lung parenchyma caused by predisposing risk factors, leading to clinically significant arterial hypoxemia that necessitates oxygen supplementation via invasive, non-invasive mechanical ventilation or high-flow nasal oxygen.**




N Engl J Med. 2000;342:1330-1349.

# ARDS Causes



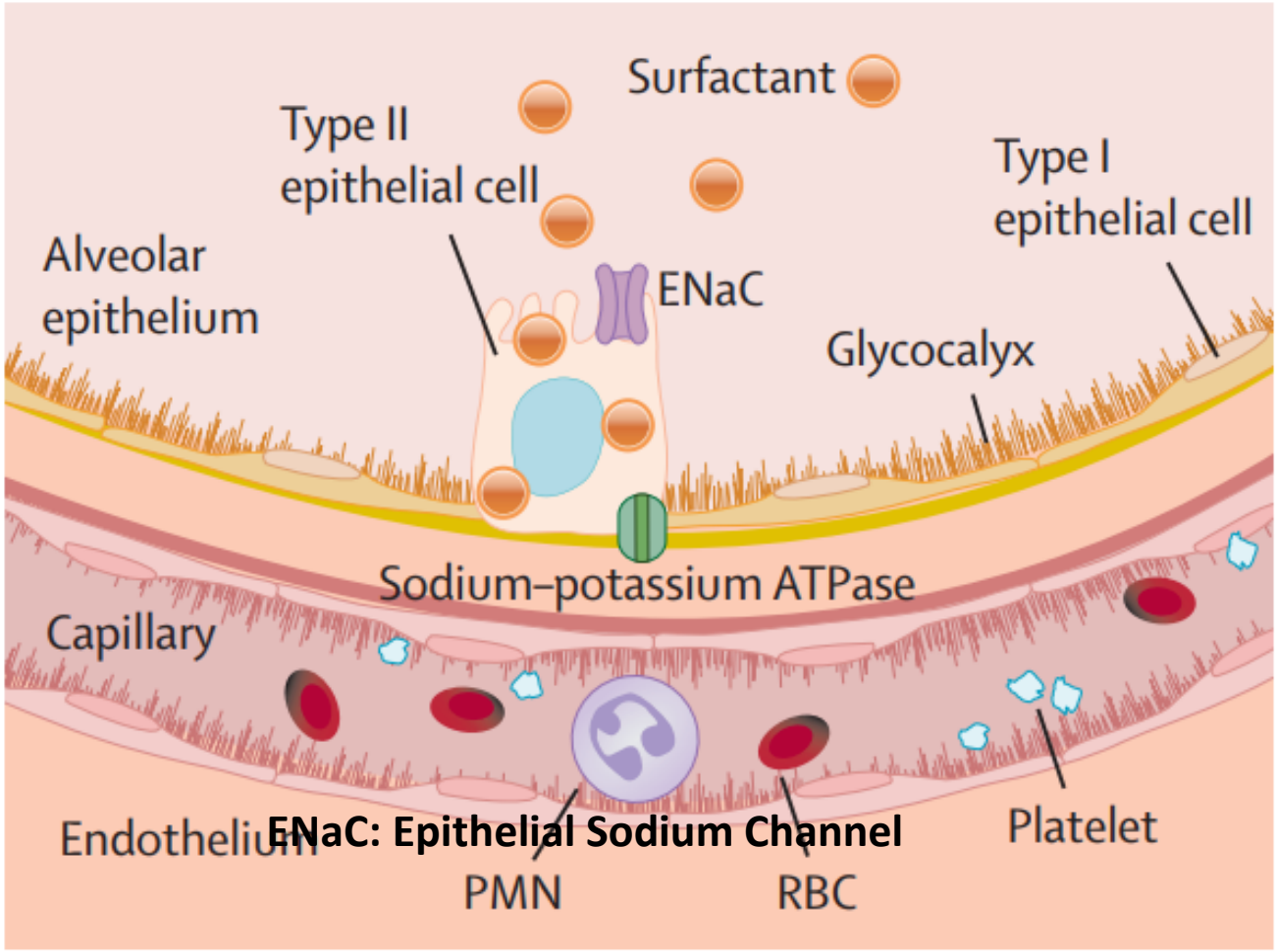

Lancet 2022;400:1145.

# Pathophysiology: Pulmonary Epithelial and Endothelial Injury

**Normal alveolar–capillary barrier**

## Normal epithelium

- Airspace is dry
- Intact epithelial tight junctions
- Intact epithelial glycocalyx
- Normal surfactant production
- Vectorial sodium and chlorine transport




**ENaC: Epithelial Sodium Channel**

## Normal endothelium

- Intact endothelial tight junctions
- Intact endothelial glycocalyx
- No adhesion molecules displayed
- White blood cells including neutrophils (ie, PMNs), RBCs, and platelets transit the capillary freely

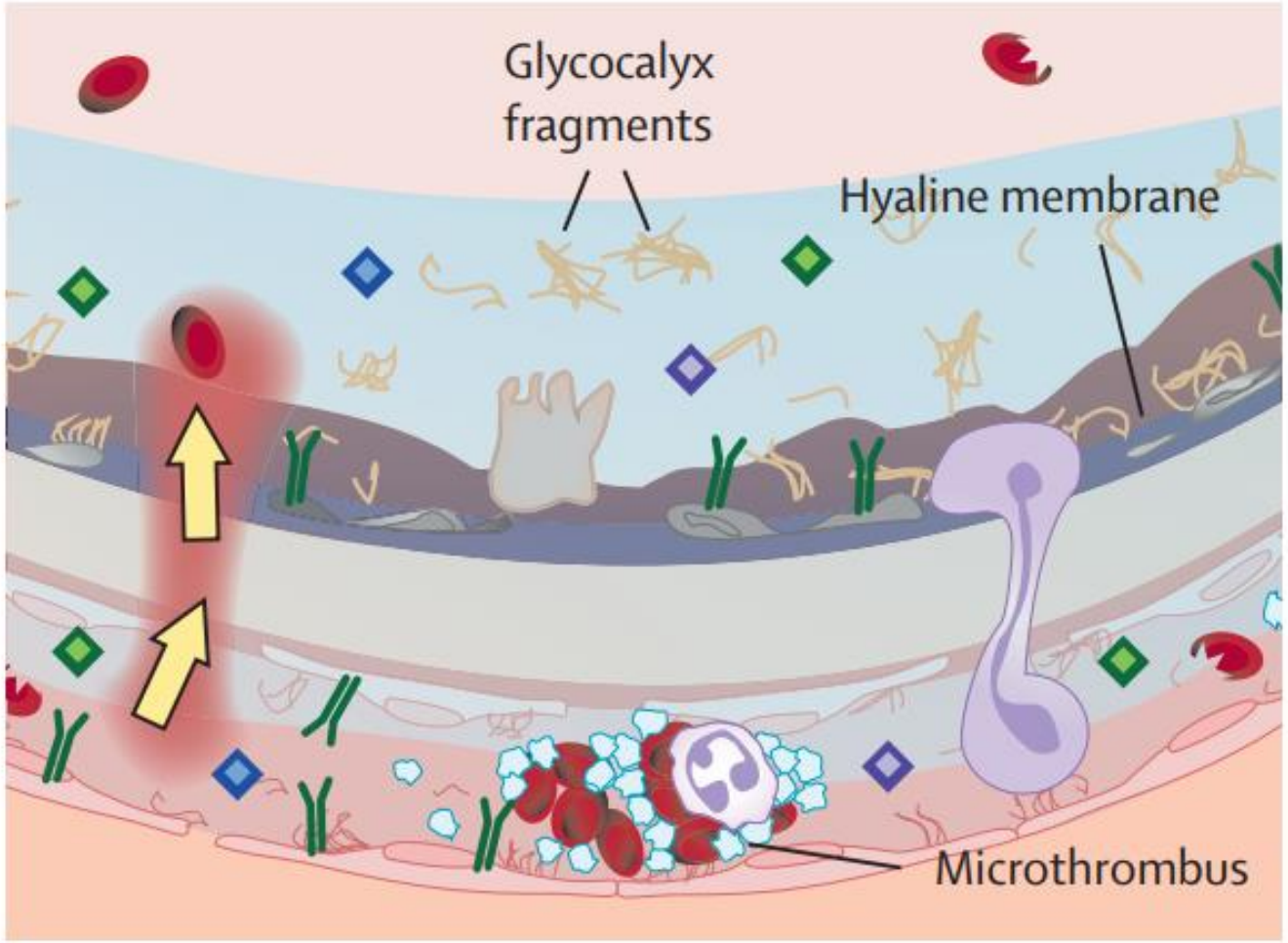
**Lancet 2022;400:1145.**

# Pathophysiology: Pulmonary Epithelial and Endothelial Injury

**Severe injury**

## Epithelial injury

- Severe oedema formation
- Severe disruption of tight junctions
- Epithelial necrosis
- Hyaline membrane formation
- Absent sodium and chlorine transport
- Glycocalyx shedding
- Increased chemokines and adhesion molecules
- RBCs in airspace

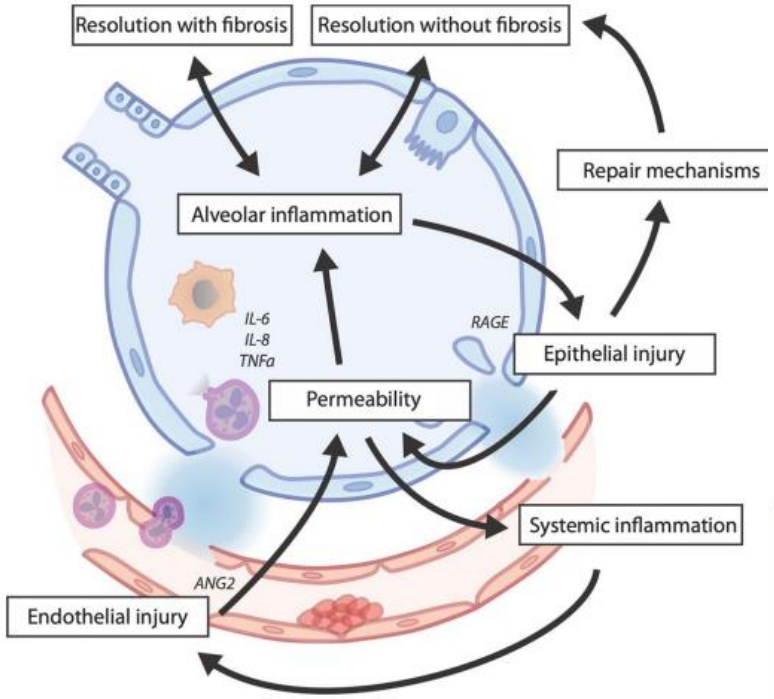



## Endothelial injury

- More severe endothelial disruption with transit of fluid out of the capillary
- Loss of endothelial glycocalyx
- RBC injury
- PMN transmigration
- Platelet microthrombi

Lancet 2022;400:1145.

# Mechanisms and Biomarkers of ARDS




Lancet 2022;400:1145

**Inflammasone activation**

*IL-18, IL-1beta, and Ferritin*

IL-1 inhibitors
NLRP3 inhibitors
Disulfiram

**Epithelial injury**

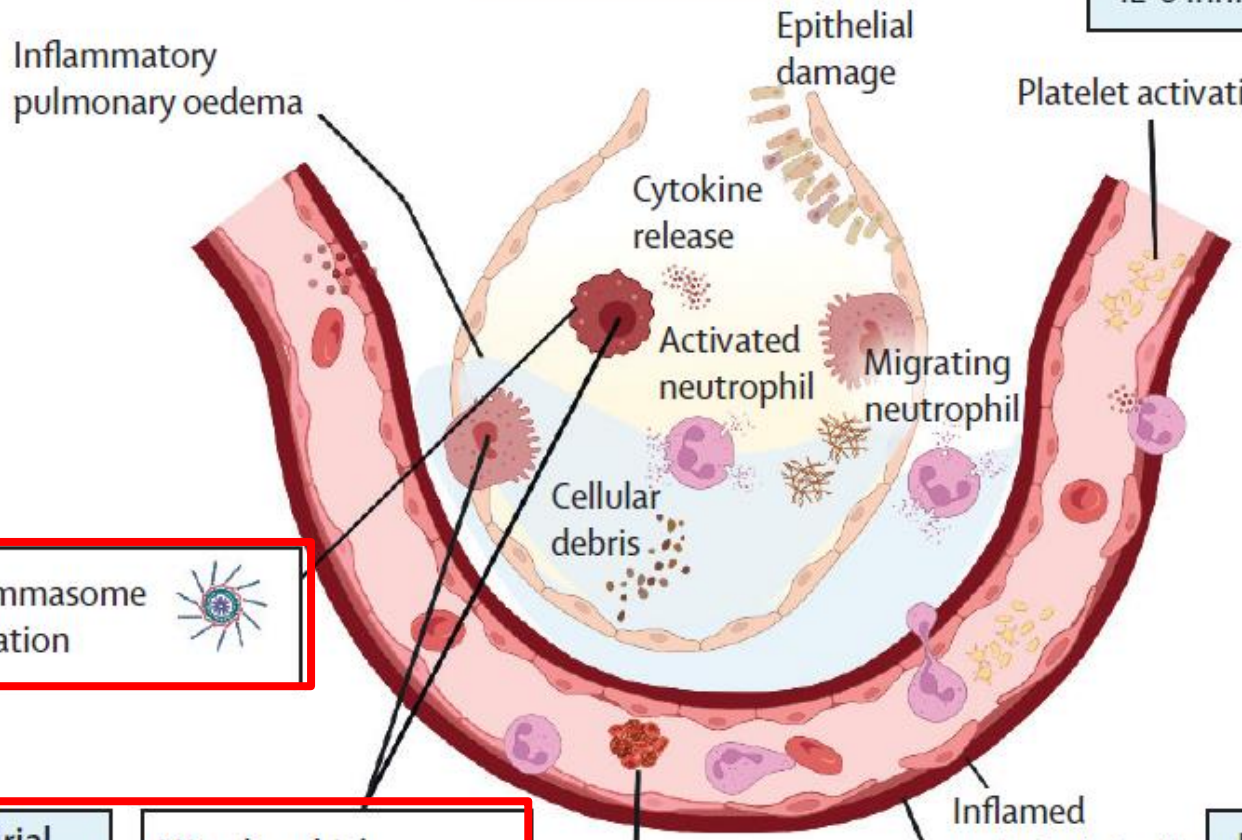
*sRAGE and SP-D*

Solnatide

**Inflammation**

*IL-6 and sTNFR1*

Corticosteroids
Mesenchymal stromal cells
Simvastatin
IL-6 inhibitors




**Neutrophil recruitment**

*BALF neutrophils*
*Neutrophil extracellular traps formation*

Cathepsin S inhibitor
Ulinastatin

**Mitochondrial dysfunction**

*Mitochondrial DNA*

Mesenchymal stromal cells

Mitochondrial dysfunction and reactive oxygen species

**Endothelial injury**

*Ang-2*

Recombinant ACE2
Citrulline

# ARDS: Definition

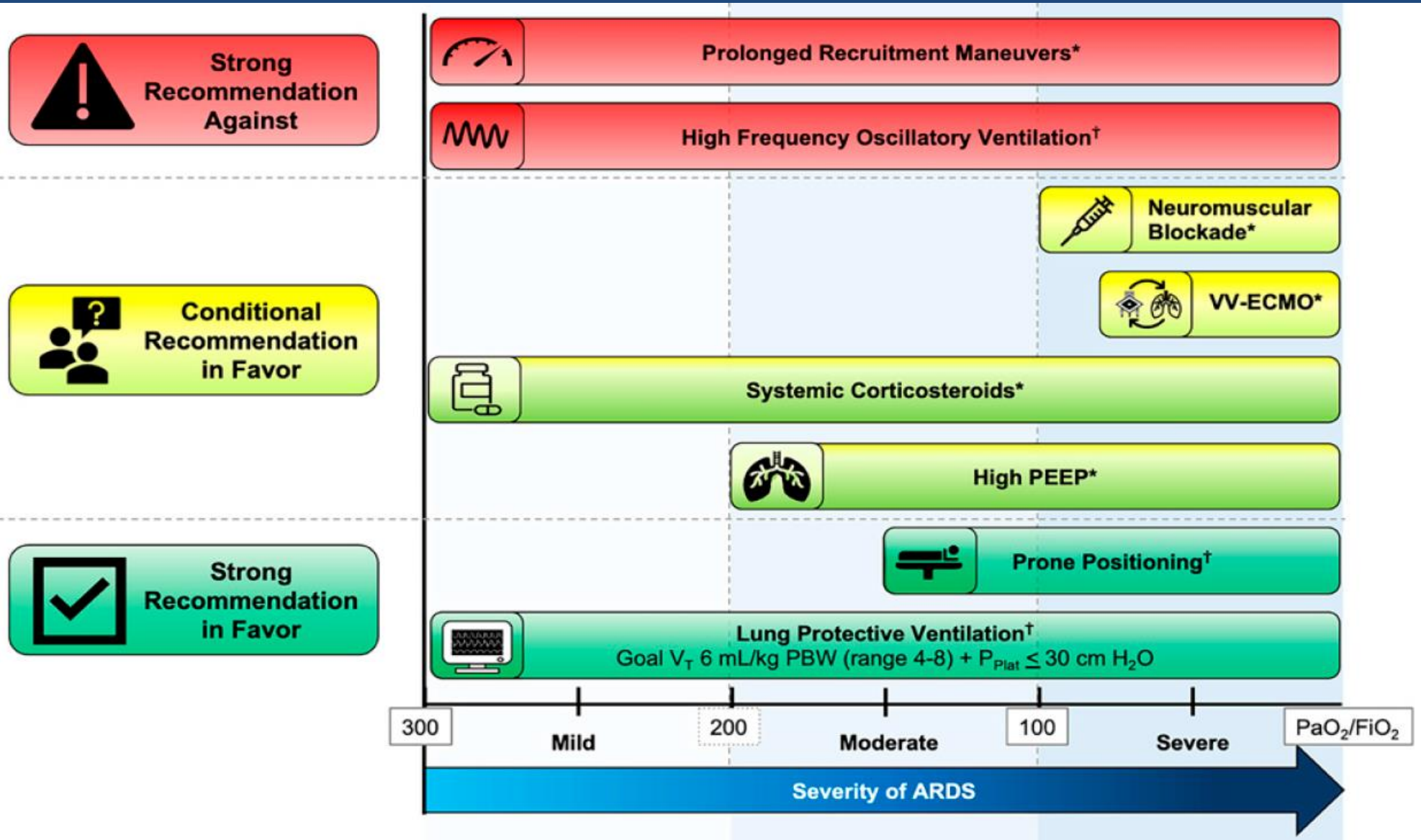
Conceptual model: ARDS is an acute, diffuse, inflammatory lung injury precipitated by a predisposing risk factor, such as pneumonia, nonpulmonary infection, trauma, transfusion, burn, aspiration, or shock. The resulting injury leads to increased pulmonary vascular and epithelial permeability, lung edema, and gravity-dependent atelectasis, all of which contribute to loss of aerated lung tissue. The clinical hallmarks are arterial hypoxemia and diffuse radiographic opacities associated with increased shunting, increased alveolar dead space, and decreased lung compliance. The clinical presentation is influenced by medical management (position, sedation, paralysis, positive end-expiratory airway pressure, and fluid balance). Histological findings vary and may include intraalveolar edema, inflammation, hyaline membrane formation, and alveolar hemorrhage.

| Criteria That Apply to All ARDS Categories | |
|---|---|
| Risk factors and origin of edema | Precipitated by an acute predisposing risk factor, such as pneumonia, nonpulmonary infection, trauma, transfusion, aspiration, or shock. Pulmonary edema is not *exclusively or primarily* attributable to cardiogenic pulmonary edema/fluid overload, and hypoxemia/gas exchange abnormalities are not primarily attributable to atelectasis. However, ARDS can be diagnosed in the presence of these conditions if a predisposing risk factor for ARDS is also present. |
| Timing | Acute onset or worsening of hypoxemic respiratory failure within 1 week of the estimated onset of the predisposing risk factor or new or worsening respiratory symptoms. |
| Chest imaging | Bilateral opacities on chest radiography and computed tomography or bilateral B lines and/or consolidations on ultrasound* not fully explained by effusions, atelectasis, or nodules/masses. |

| | Criteria That Apply to Specific ARDS Categories | | |
|---|---|---|---|
| | **Nonintubated ARDS†** | **Intubated ARDS** | **Modified Definition for Resource-Limited Settings‡** |
| Oxygenation§‖ | $Pa_{O_2}:FI_{O_2} \leq 300$ mm Hg or $Sp_{O_2}:FI_{O_2} \leq 315$ (if $Sp_{O_2} \leq 97\%$) on HFNO with flow of ≥30 L/min or NIV/CPAP with at least 5 cm $H_2O$ end-expiratory pressure | Mild¶: $200 < Pa_{O_2}:FI_{O_2} \leq 300$ mm Hg or $235 < Sp_{O_2}:FI_{O_2} \leq 315$ (if $Sp_{O_2} \leq 97\%$)<br>Moderate: $100 < Pa_{O_2}:FI_{O_2} \leq 200$ mm Hg or $148 < Sp_{O_2}:FI_{O_2} \leq 235$ (if $Sp_{O_2} \leq 97\%$)<br>Severe: $Pa_{O_2}:FI_{O_2} \leq 100$ mm Hg or $Sp_{O_2}:FI_{O_2} \leq 148$ (if $Sp_{O_2} \leq 97\%$) | $Sp_{O_2}:FI_{O_2} \leq 315$ (if $Sp_{O_2} \leq 97\%$)†. Neither positive end-expiratory pressure nor a minimum flow rate of oxygen is required for diagnosis in resource-limited settings. |

Am J Respir Crit Care Med. 2024;209:37-47.

# Guideline Recommendations for ARDS Management




Am J Respir Crit Care Med. 2024:24-36.

# Treatment of ARDS

| Therapies | Novel Trial Findings |
|---|---|
| Lung protective ventilation (LPV) | ARMA: Lower mortality with LPV |
| Open lung ventilation | ALVEOLI: No difference in hospital mortality<br>ExPress: No difference in 28-day mortality<br>LOVS: No difference in 28-day hospital mortality<br>ART: Higher 28-day mortality with open lung ventilation<br>STAMINA: No difference in 90-day in hospital or ICU mortality |
| High-frequency oscillatory ventilation (HFOV) | OSCILLATE: Higher hospital mortality with HFOV<br>OSCAR: No difference in 30-day mortality |
| Prone position | PROSEVA: Lower 28-day mortality with prone position<br>ECMOSARS: May be beneficial in patients support by V-V ECMO<br>PRONECMO: No difference in 90-day in hospital or ICU mortality |
| Neuromuscular blocking agents (NMBA) | ACURASYS: Lower adjusted 90-day mortality with NMBA<br>ROSE: No difference in 90-day mortality |
| Fluid therapy | FACTT: No difference in mortality; more ventilator free days with conservative fluid strategy |
| Statins | HARP-2: No difference in 28-day mortality with simvastatin<br>SAILS: No difference in 60-day or hospital mortality with rosuvastatin |
| Image-guide ventilation | LIVE: Personalisation of mechanical ventilation did not decrease mortality |
| Extracorporeal membrane oxygenation (ECMO) | CESAR: Lower 6-months mortality with ECMO<br>EOLIA: No difference in 60-day mortality |

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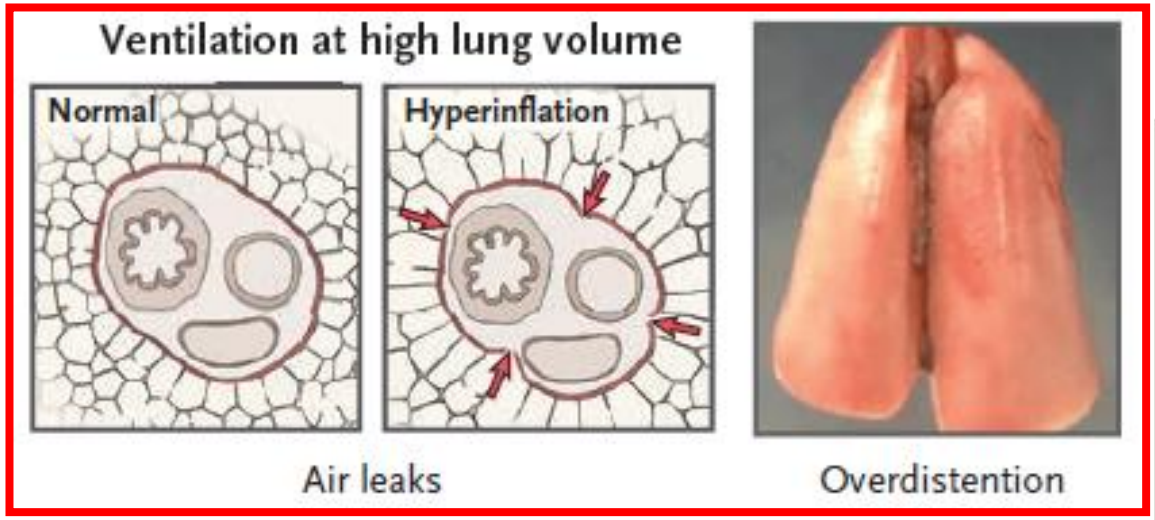
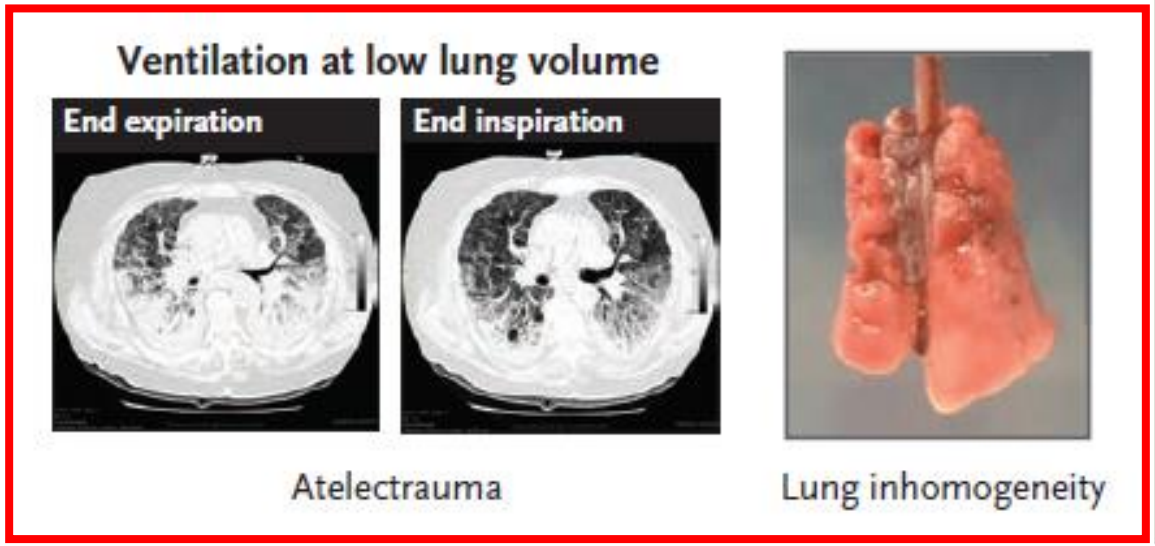
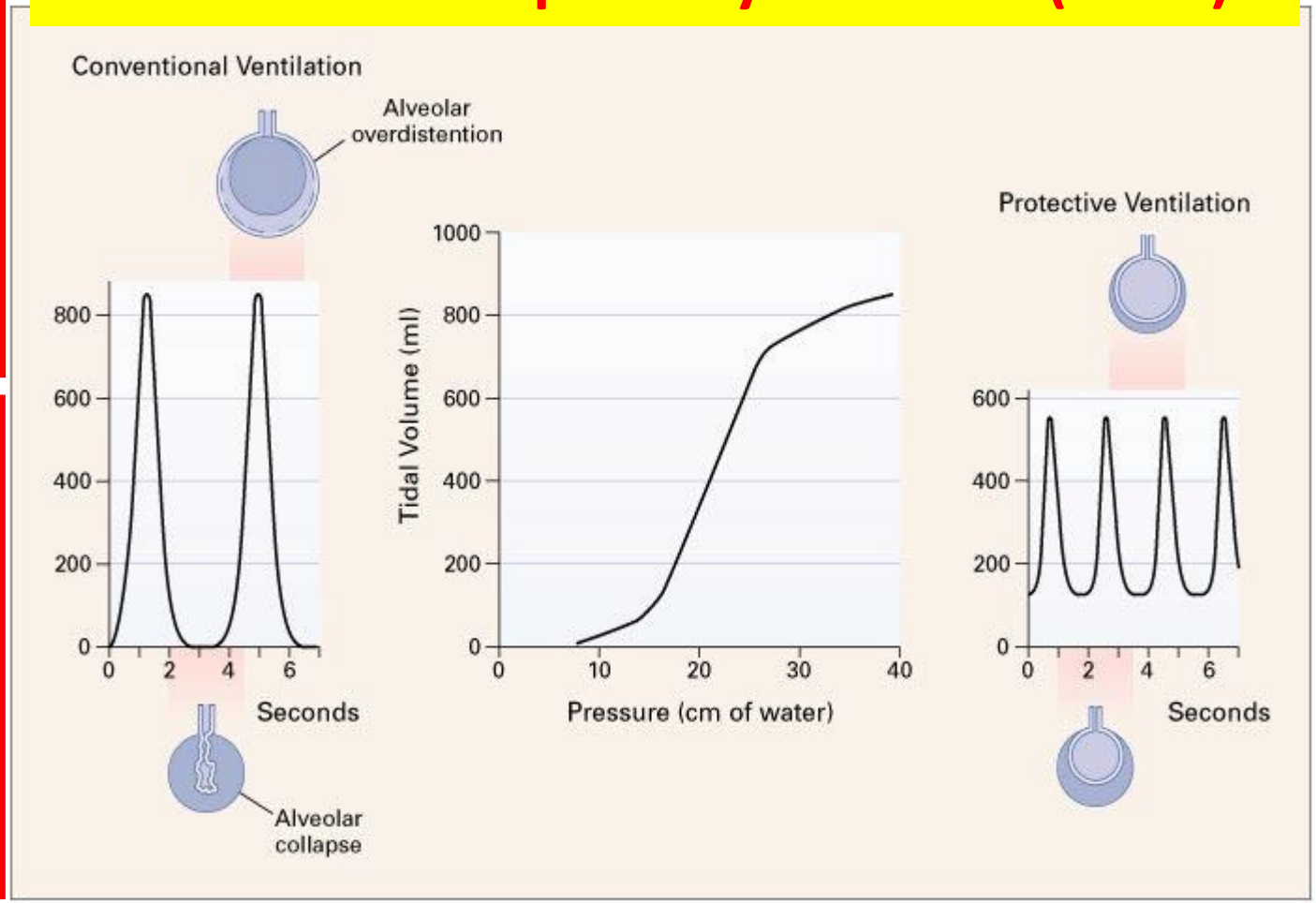
# Pathophysiology: Ventilator-Induced Lung Injury



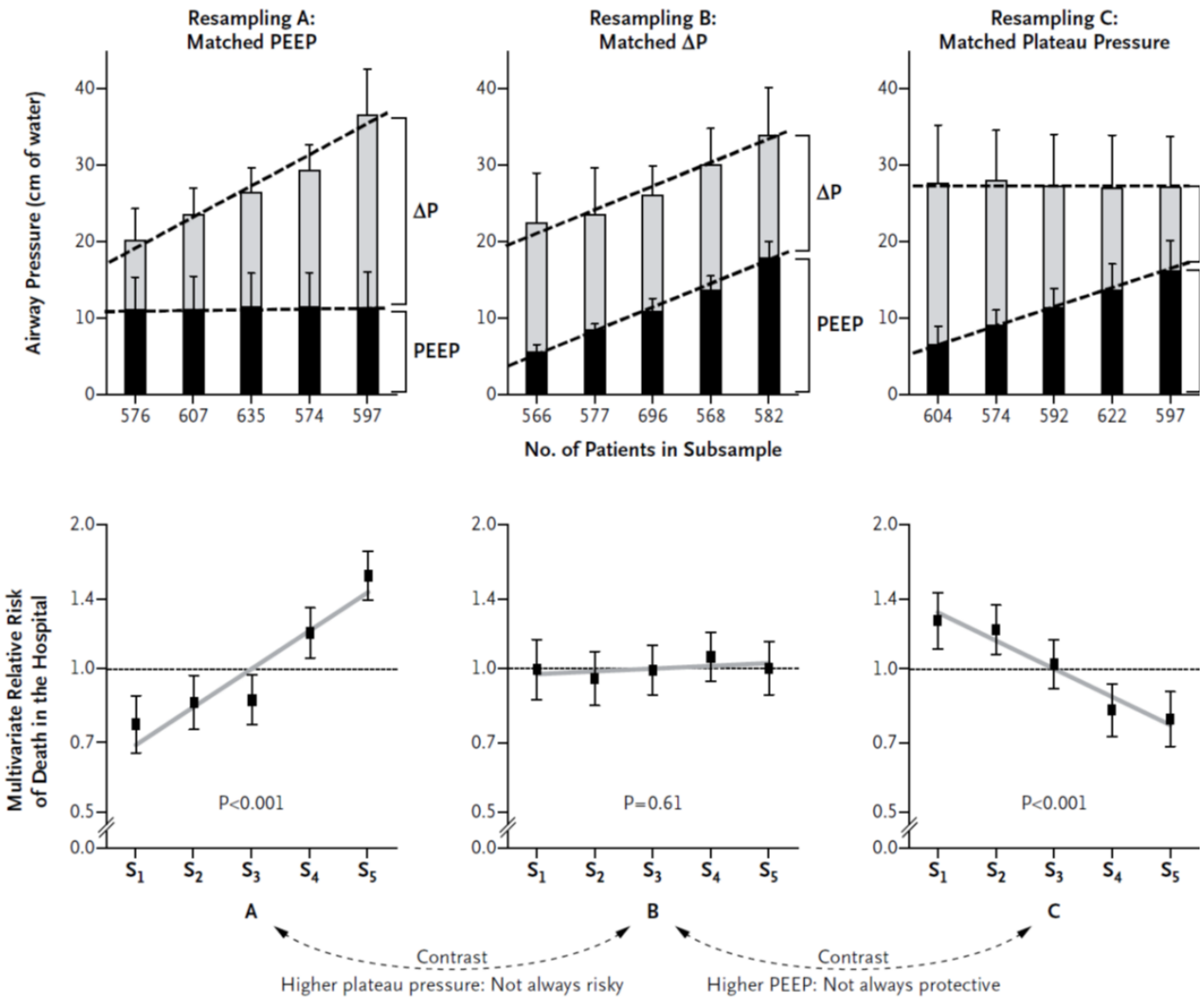



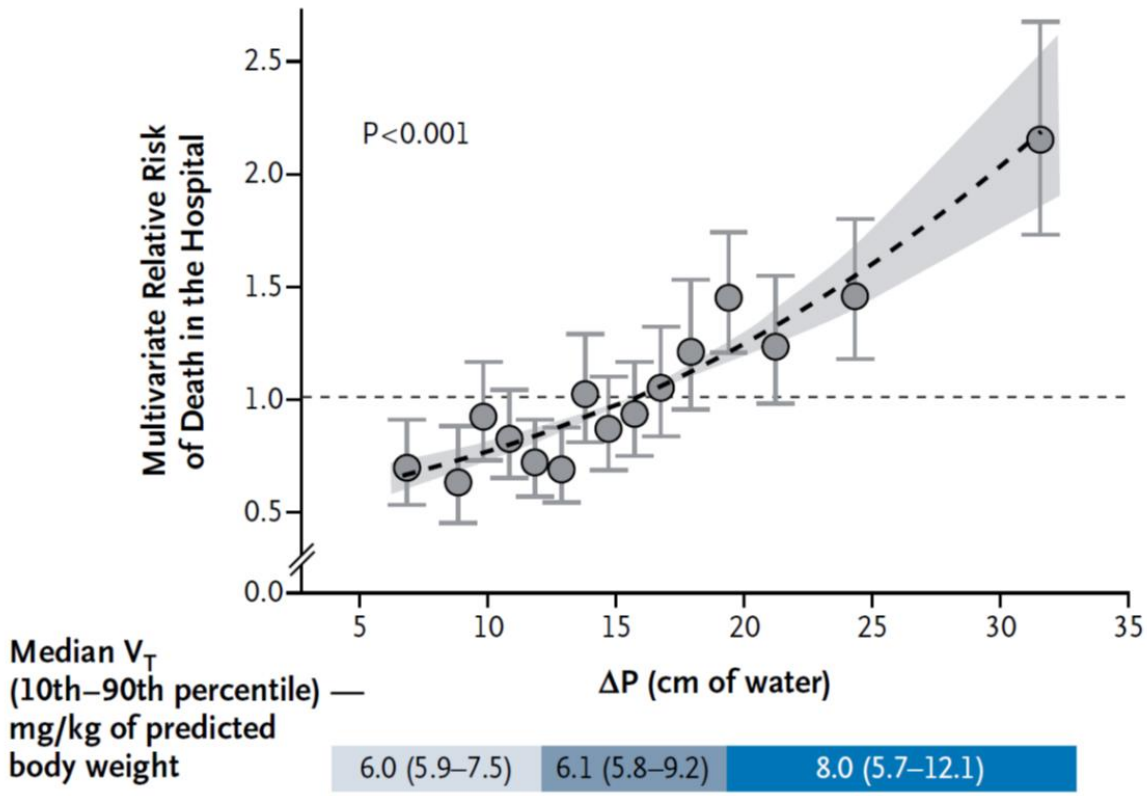

**Driving Pressure**
**Positive End Expiratory Pressure (PEEP)**




N Engl J Med. 2013;369:2126-2136.

# ARDS Management: Driving Pressure




N Engl J Med. 2015;19;372:747-55.

# ARDS Management: Driving Pressure

## Effect of a Driving Pressure-Limiting Strategy for Patients with Aute Respiratory Distress Syndrome Secondary to Community-Acquired Pneumonia: the STAMINA Randomised Cinical Trial

### Step 1 Baseline

Implement standard protective settings:

- Tidal volume (Vt) = 6 ml/kg of predicted body weight
- Keep Plateau Pressure (Pplat) <= 30 cm H2O

### Step 2 PEEP Up

**Perform incremental titration phase:**

- Increase PEEP by 2 cm $H_2O$ every min up to 20 cm $H_2O$
- STOP if: Peak pressure >= 40, Pplat > 33, or hemodynamic instability

### Step 3 PEEP Down

**Perform decremental titration phase:**

- Reduce PEEP by 2 cm $H_2O$ every min down to 8 cm $H_2O$
- Measure compliance at each level

### Step 4 Target Set

**Select optimal PEEP and adjust:**

- Set PEEP to compliance peak
- If DP > 14 cm $H_2O$, reduce Vt down to 4 ml/kg to achieve target DP <= 14

Br J Anaesth. 2025;134:693-702.

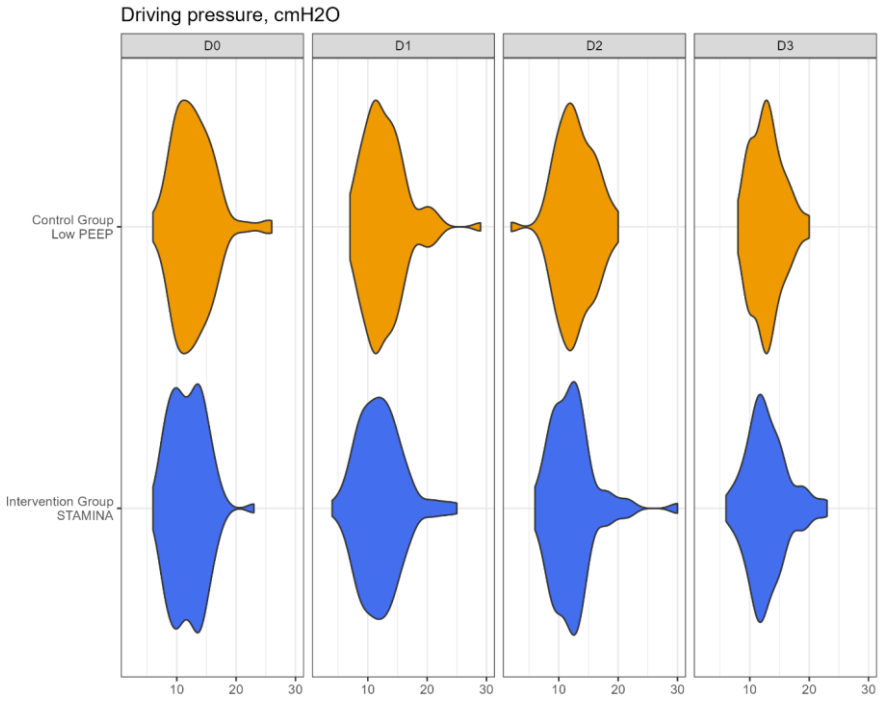
# ARDS Management: Driving Pressure

## P = 0.28

No statistical difference in primary outcome (proportional OR = 0.72, 95% CI 0.39-1.32).

## -0.7 cm H2O

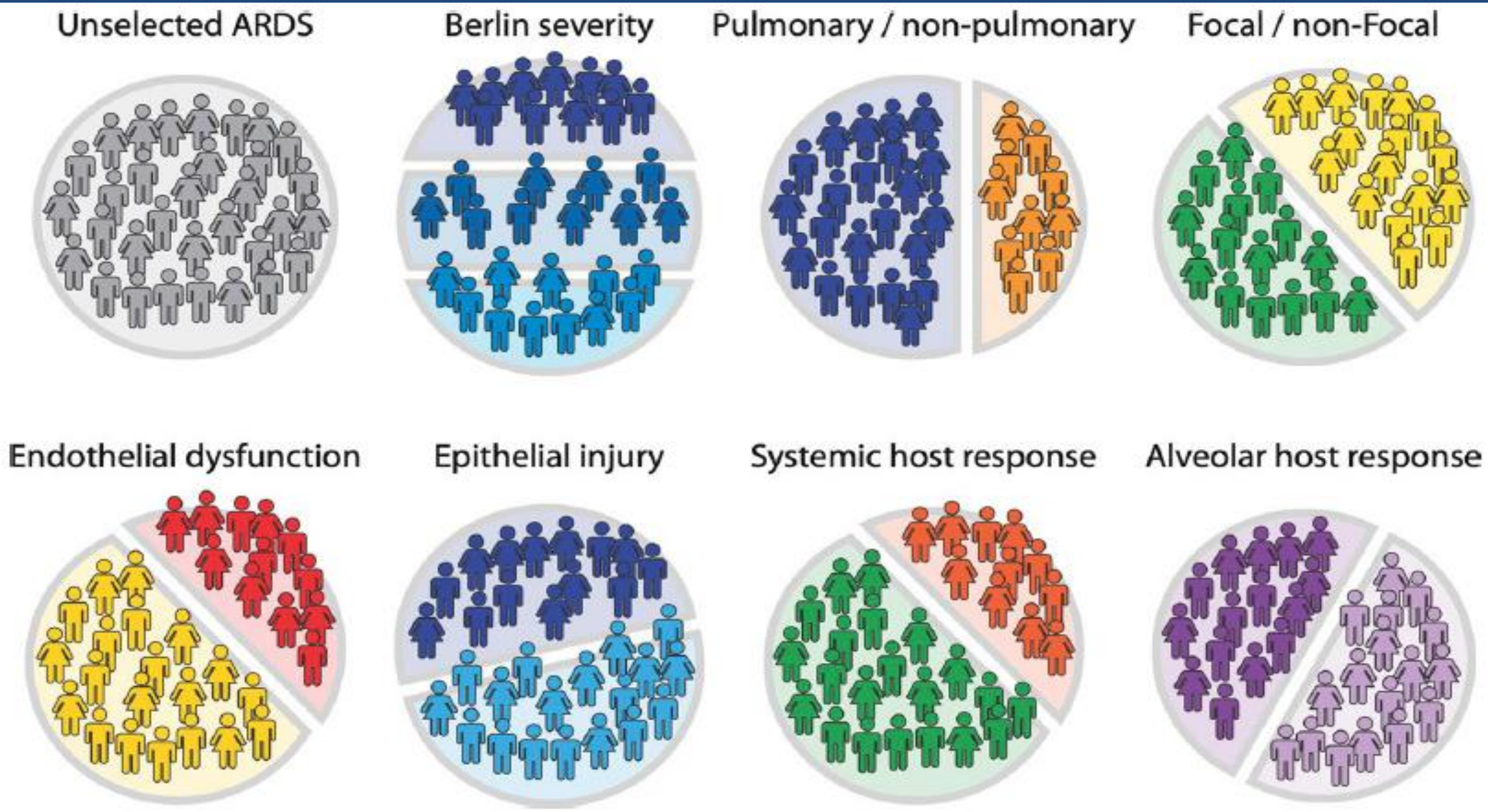
Mean difference in driving pressure between groups up to day 3. Visually narrow and clinically insignificant.




| Outcome Metric | STAMINA (n=96) | Control (n=102) | Effect (95% CI) / P-val |
|---|---|---|---|
| Ventilator-Free Days, Mean (SD) | 6 (9) days | 7 (9) days | MD -1.28 (-3.6 to 1.26) |
| Ventilator-Free Days, Median | 0 (0-15) days | 0 (0-17) days | ORp 0.72 (0.39-1.32) |
| ICU Mortality, n (%) | 63/96 (66%) | 54/102 (53%) | OR 1.66 (0.87-3.17); P=0.13 |
| Hospital Mortality, n (%) | 63/96 (66%) | 56/102 (55%) | OR 1.48 (0.77-2.85); P=0.24 |
| Barotrauma (Safety), n (%) | 4/96 (4.2%) | 3/102 (2.9%) | OR 1.35 (0.28-6.55); P=0.71 |
| ICU Length of Stay, Mean (SD) | 17 (16) days | 17 (15) days | MD -0.71 (-4.11 to 2.69) |

Br J Anaesth. 2025;134:693-702.

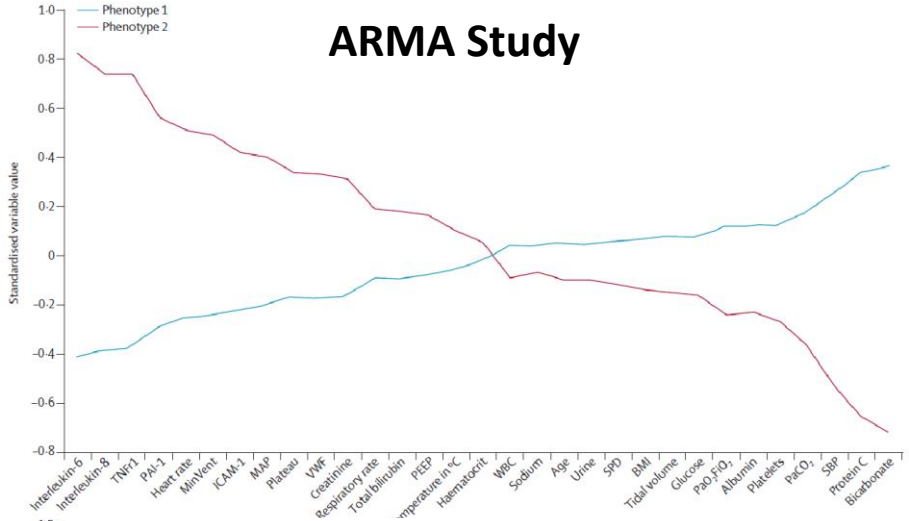
# ARDS Heterogeneity

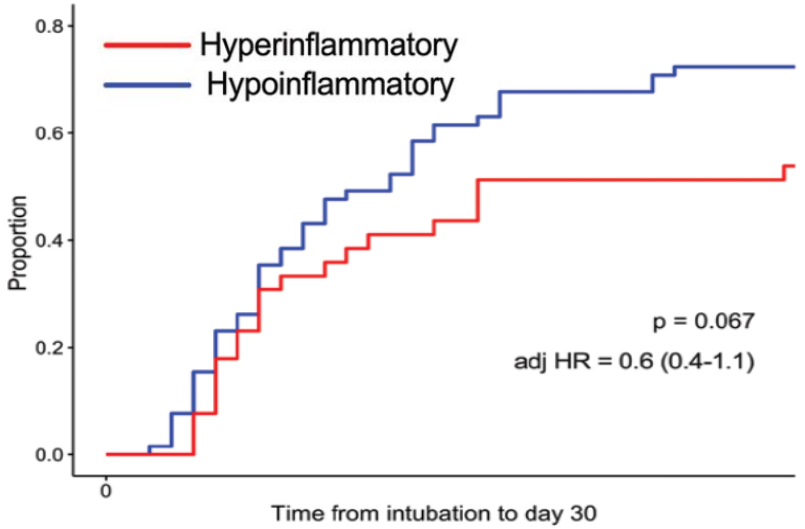


# Hypoinflammatory/Hyperinflammatory Phenotypes

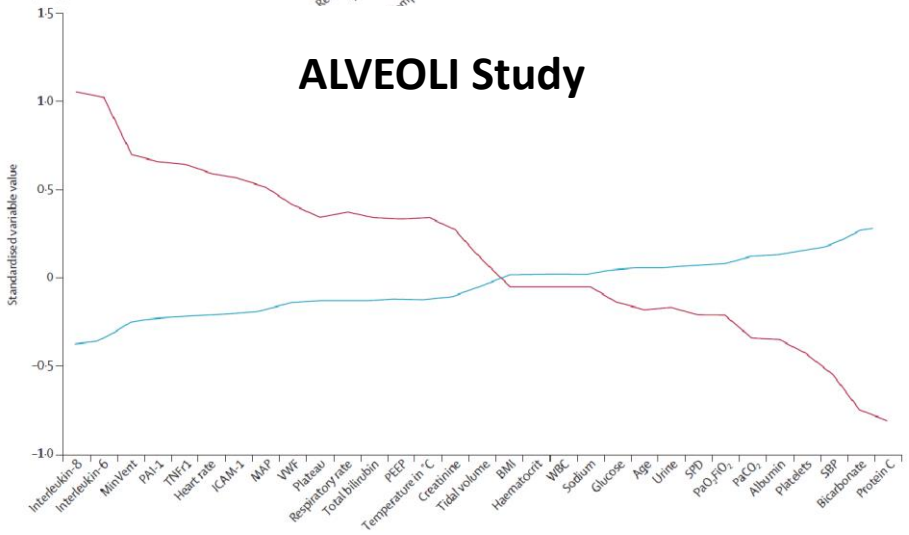
## Latent Class Analysis of ARDS

### ARMA Study

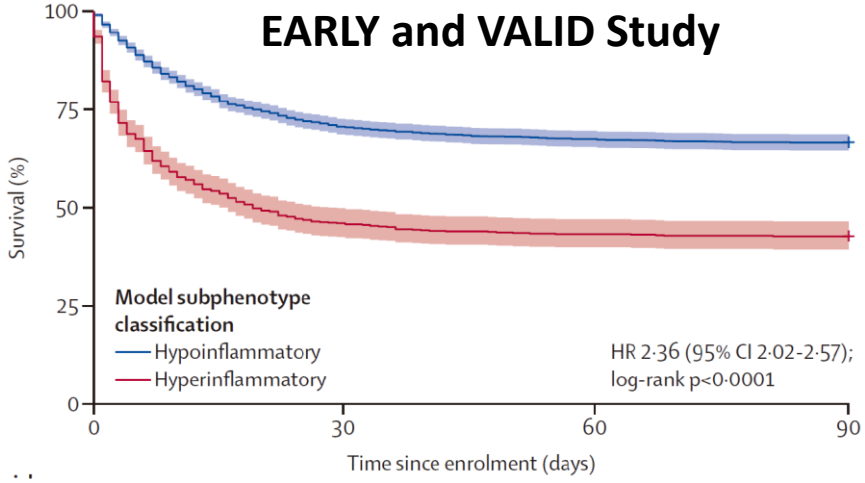



### ALVEOLI Study




### EARLY and VALID Study

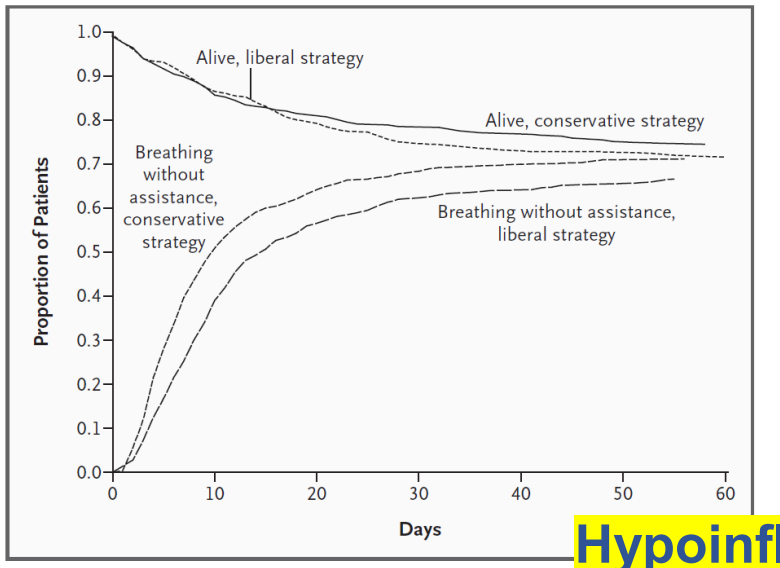



Lancet Respir Med.2014;2:611-620 and 2022;10:367-377. Thorax.2018;73:439-445. Crit Care Med.2019;47:1724-1734.

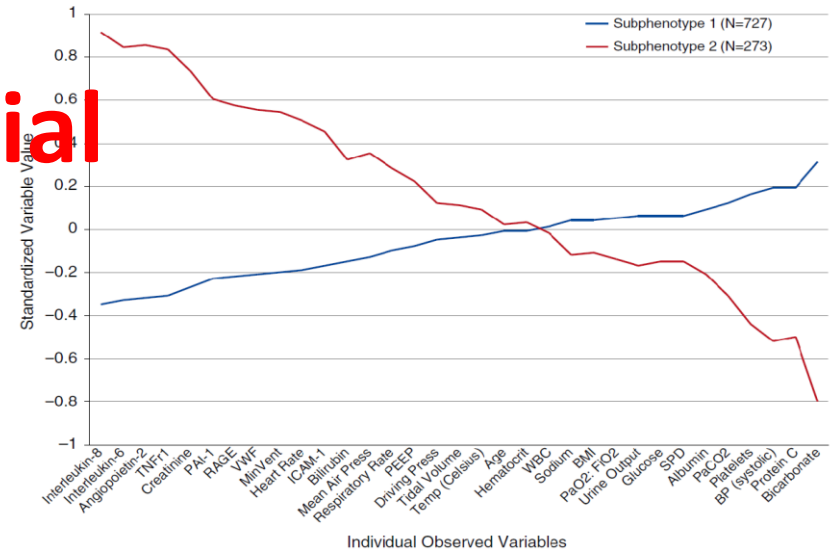
# Hypoinflammatory/Hyperinflammatory Phenotypes

ORIGINAL ARTICLE

## Comparison of Two Fluid-Management Strategies in Acute Lung Injury




**FACTT trial**




| | Subphenotype 1 (*n* = 727) | Subphenotype 2 (*n* = 273) | *P* Value |
|---|---|---|---|
| 60-d mortality, % | 21 | 44 | <0.0001 |
| 90-d mortality, % | 22 | 45 | <0.0001 |
| Ventilator-free days, median | 19 | 3 | <0.0001 |

**Hypoinflammatory** **Hyperinflammatory**

| Fluid-management strategy | Subphenotype 1 | | Subphenotype 2 | | *P* Value |
|---|---|---|---|---|---|
| | Liberal (*n* = 355) | Conservative (*n* = 372) | Liberal (*n* = 142) | Conservative (*n* = 131) | |
| 60-d mortality, % | 24 | 17 | 39 | 49 | 0.0093 |
| 90-d mortality, % | 26 | 18 | 40 | 50 | 0.0039 |
| Ventilator-free days, median | 17 | 21 | 5 | 0 | 0.35 |

N Engl J Med. 2006;354:2564-2575. Am J Respir Crit Care Med. 2017;195:331-338.

# Hypoinflammatory/Hyperinflammatory Phenotypes

## PEEP in ARDS

### ARMA and ALVEOLI Study

| | Phenotype 1 (n=404) | | Phenotype 2 (n=145) | | |
|---|---|---|---|---|---|
| | Low PEEP (n=202) | High PEEP (n=202) | Low PEEP (n=71) | High PEEP (n=74) | p value* |
| Mortality at 90 days | 33 (16%) | 48 (24%) | 36 (51%) | 31 (42%) | 0·049 |
| Ventilator-free days | 20 (10–25) | 21 (3–24) | 2 (0–21) | 4·5 (0–20) | 0·018 |
| Organ failure free-days | 22 (11–26) | 22 (9–26) | 4 (0–18) | 6·5 (0–21) | 0·003 |

Data are n (%) or median (IQR). *p value for interaction between positive end-expiratory pressure (PEEP) assignment and phenotype.

### EARLI and VALID Study

| ARDS Severity by $PaO_2/FiO_2$ | Mortality in Low PEEP | Mortality in High PEEP | P value |
|---|---|---|---|
| Mild ($PaO_2/FiO_2$ 200 – 300) n=828 | 35% (133/384) | 34% (59/173) | 0·96 |
| Moderate ($PaO_2/FiO_2$ 100 – < 200) n=1341 | 39% (172/441) | 39% (174/449) | |
| Severe ($PaO_2/FiO_2 \leq 100$) n=644 | 48% (55/114) | 46% (167/366) | |

**SOFA subgroups based on mean SOFA score**

| ARDS Severity by SOFA score | Mortality in Low PEEP | Mortality in High PEEP | P value |
|---|---|---|---|
| Low SOFA (≤ 10) n=1314 | 30% (139/457) | 30% (132/441) | 0·51 |
| High SOFA (> 10) n=1063 | 54% (165/308) | 50% (230/464) | |

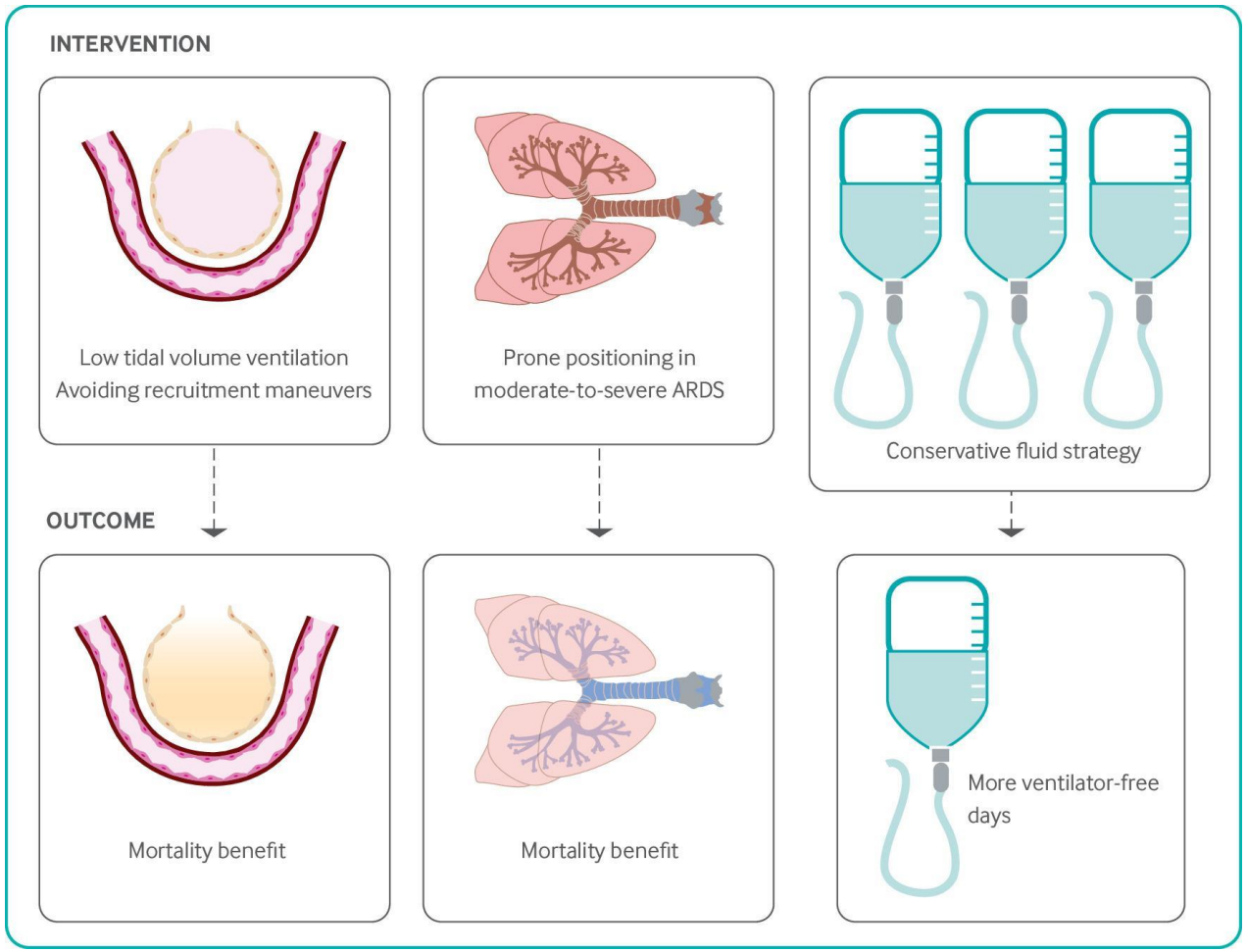
Lancet Respir Med. 2014;2:611-620 and 2022;10:367-377.

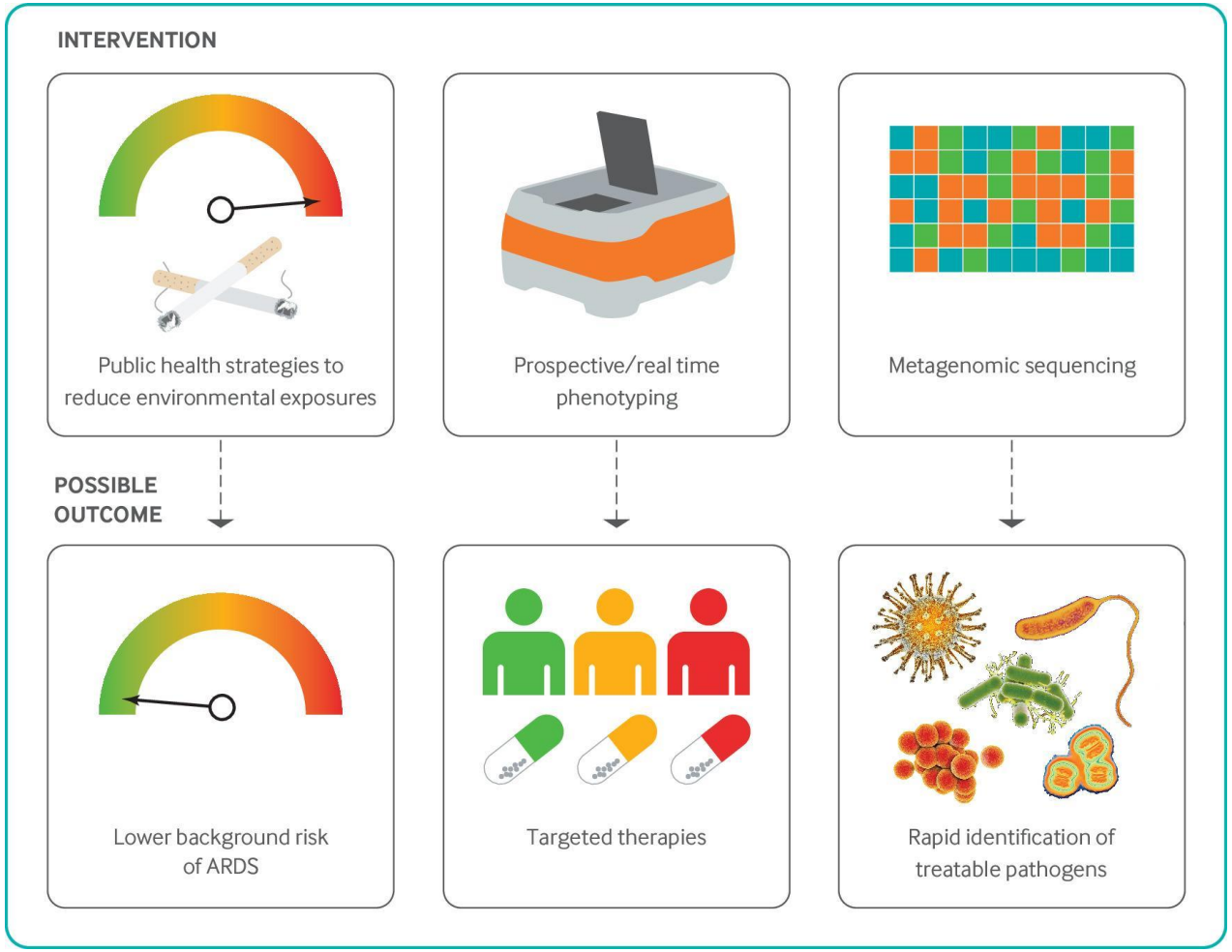
# ARDS Heterogeneity and Management

# ARDS Heterogeneity and Management

## One Size Fits One.

# ARDS Treatment: Current and Future Direction



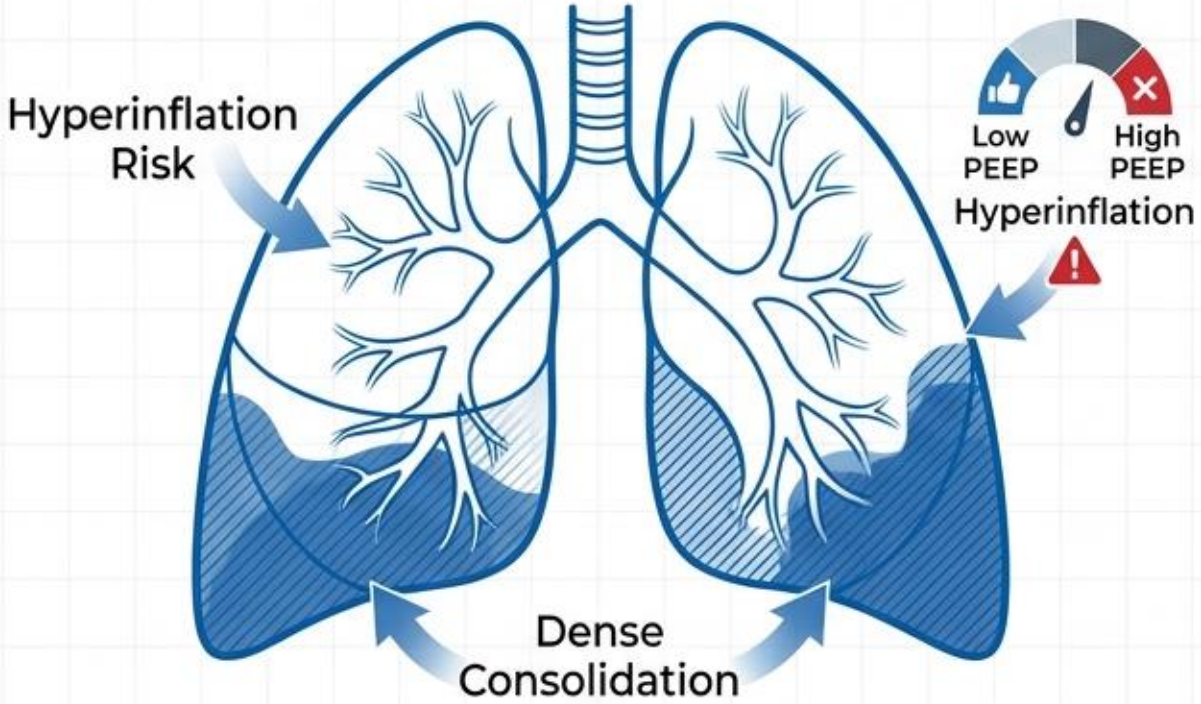




BMJ. 2024:387:e076612

# ARDS Treatment: Focal VS. Non-Focal

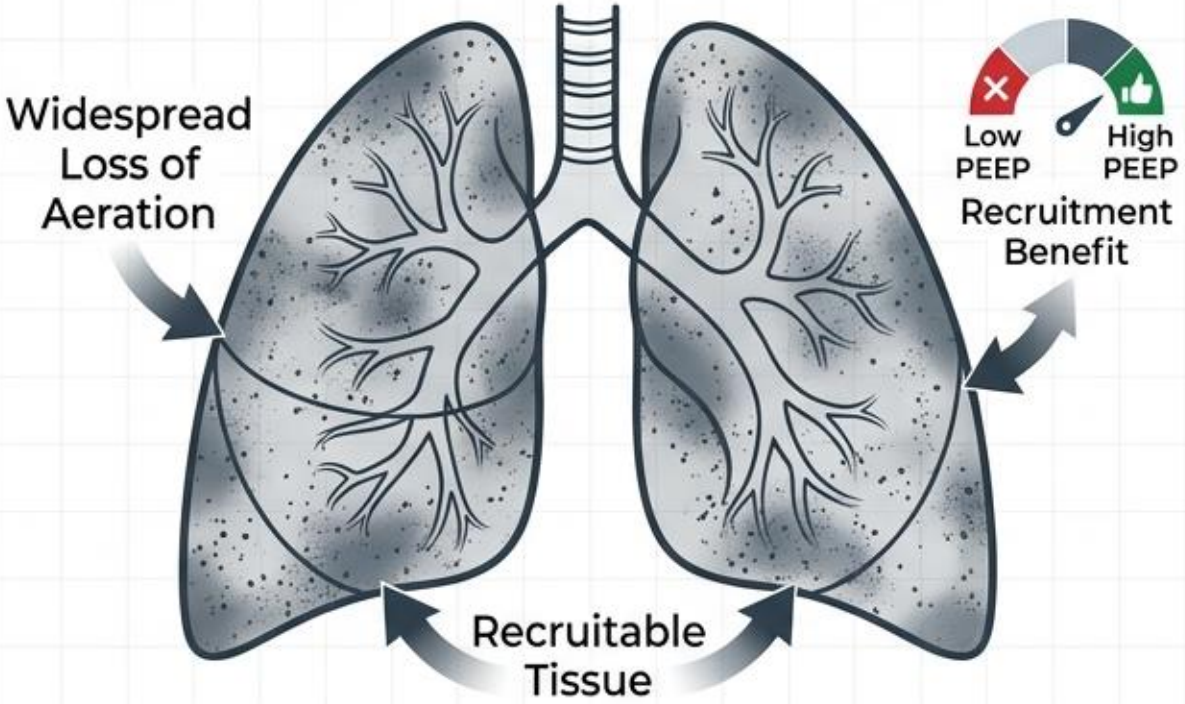
## Focal ARDS

Localized consolidations. Higher lung volumes. Poor response to high PEEP (risk of hyperinflation of healthy tissue).




## Non-Focal ARDS

Diffuse, patchy loss of aeration. Lower lung compliance. High amount of recruitable lung tissue (benefits from high PEEP/recruitment).




Lancet Respir Med. 2019;7:870-880

# ARDS Treatment: LIVE Study

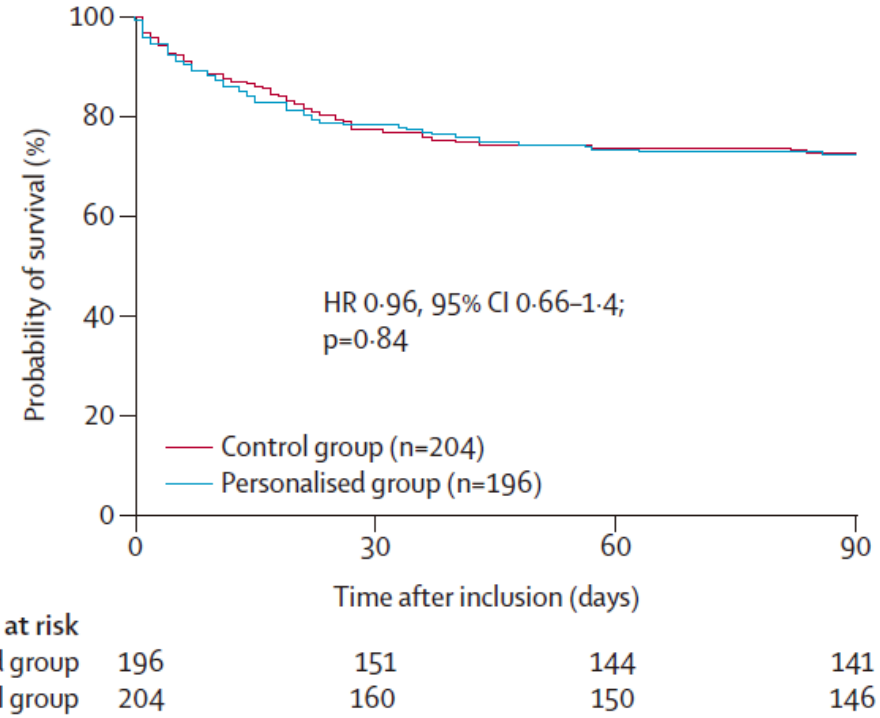
**One-Size-Fits-All:**
Low Tidal Volume (6 mL/kg) + Low PEEP table.

**Morphology-Tailored:**
Limit hyperinflation.
Higher TV (8 mL/kg) + Low PEEP + Early Prone.

**Morphology-Tailored:**
Maximize recruitment.
Low TV (6 mL/kg) + High PEEP + Recruitment Maneuvers.

| | Control Group (Standard Care) | Personalised Group (Focal) | Personalised Group (Non-Focal) |
|---|---|---|---|
| **Tidal Volume** | 6 mL/kg | 8 mL/kg | 6 mL/kg |
| **PEEP** | via PEEP/FiO2 table | 5-9 cm H2O | set to reach Pplat 30 cm H2O |
| **Recruitment Manoeuvre** | Rescue | Rescue | Mandatory |
| **Prone Position** | Encouraged | Mandatory | Rescue |

## Outcomes

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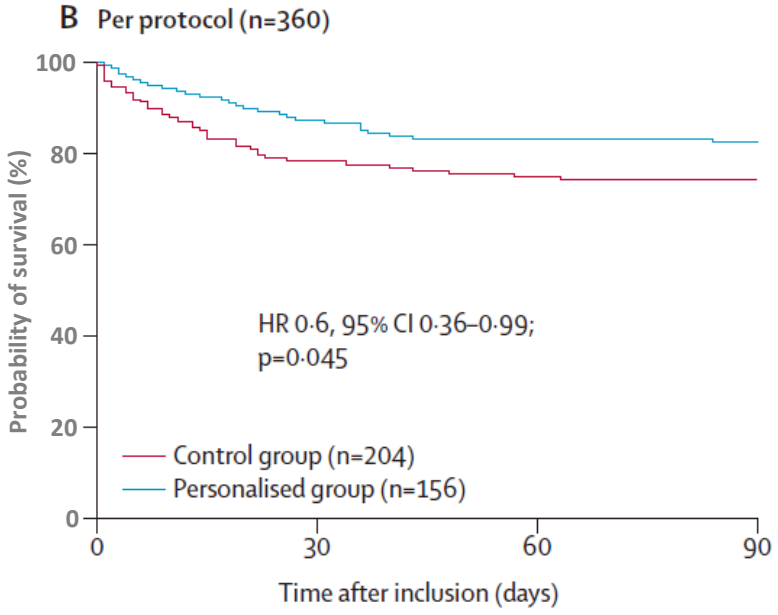
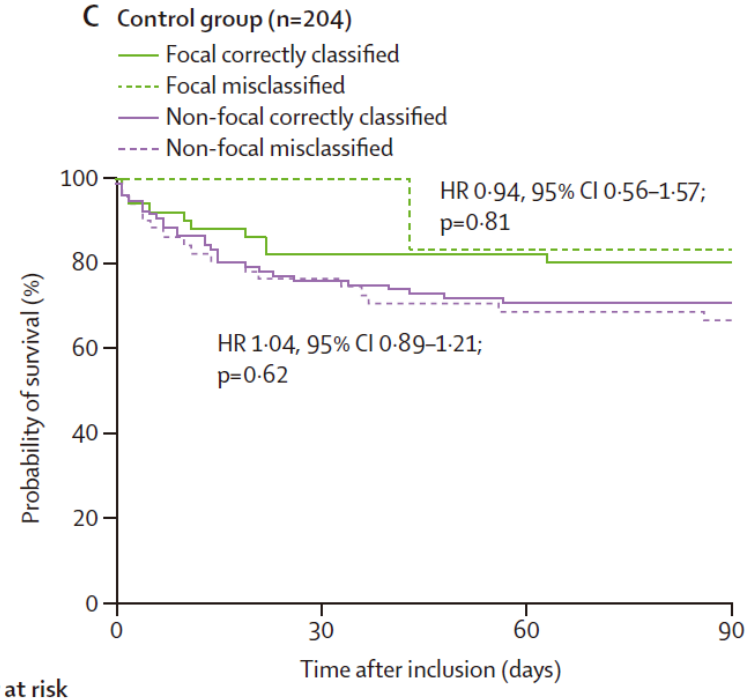
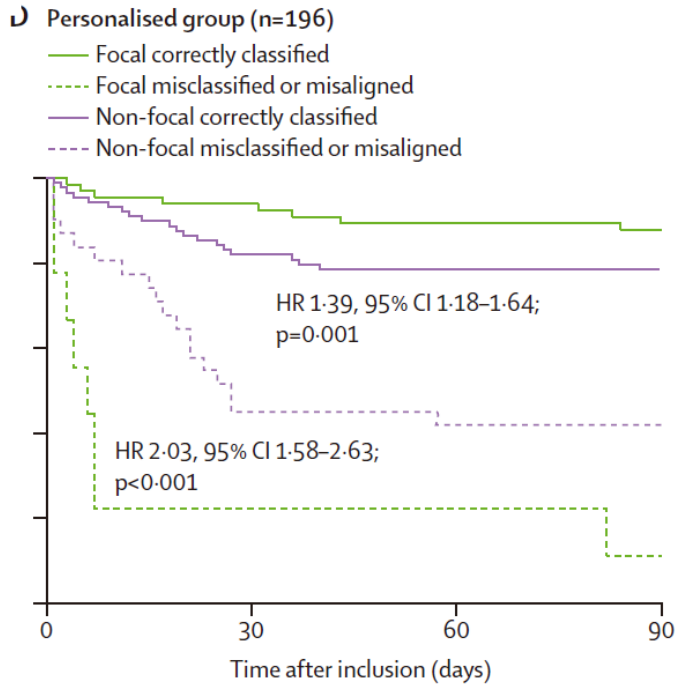
# ARDS Treatment: LIVE Study



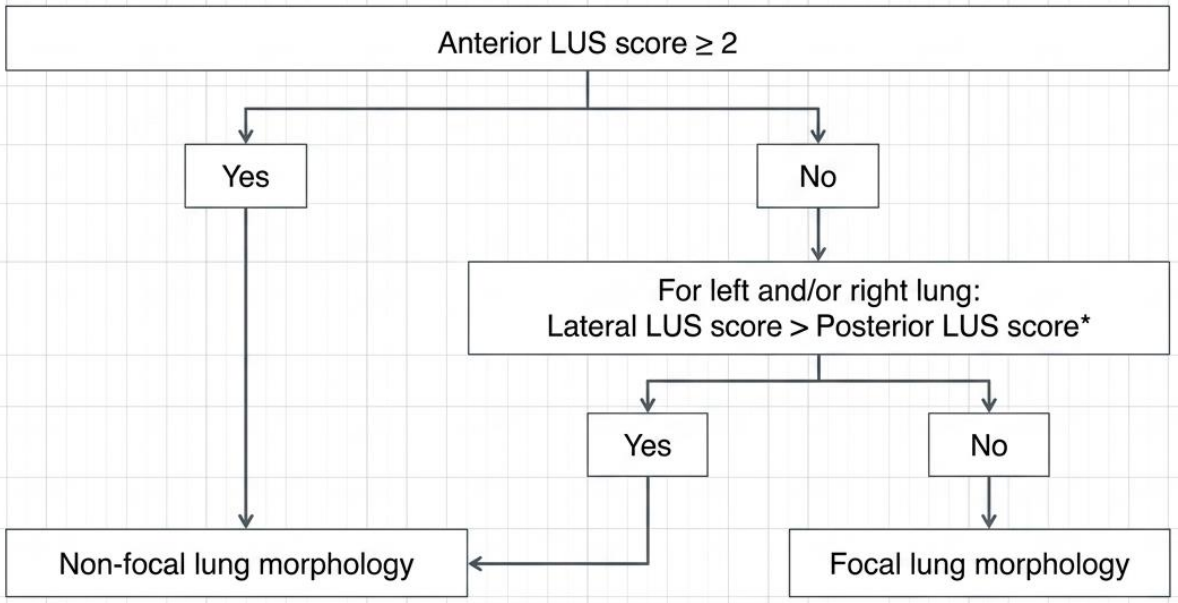



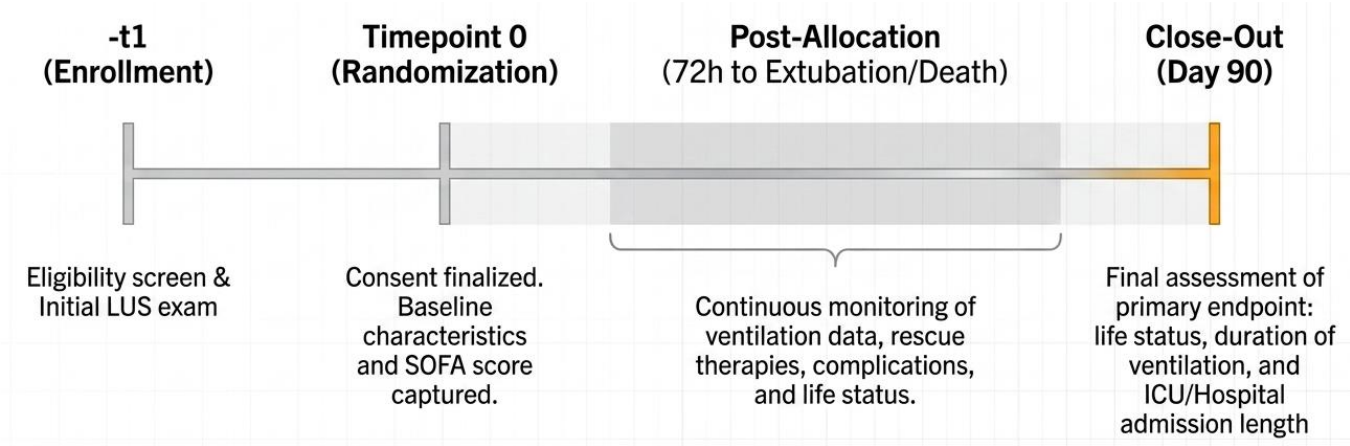

| Number at risk | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Focal correctly classified | 51 | 42 | 42 | 41 | 67 | 61 | 58 | 56 |
| Focal misclassified | 6 | 6 | 5 | 2 | 9 | 2 | 2 | 1 |
| Non-focal correctly classified | 96 | 73 | 68 | 68 | 89 | 74 | 71 | 71 |
| Non-focal misclassified | 51 | 39 | 35 | 32 | 31 | 14 | 13 | 13 |

Lancet Respir Med. 2019;7:870-880

# ARDS Treatment: The PEGASUS Trial

## Ultrasound-Guided Personalized Ventilation for ARDS




| Morphology Intervention Matrix | | |
|---|---|---|
| | **Focal ARDS** | **Non-Focal ARDS** |
| Tidal Volume | **6 to 8 mL/kg PBW** | **4 to 6 mL/kg PBW** |
| PEEP Targets | **≤ 9 cmH2O** | **≥ 15 cmH2O** |
| Recruitment Maneuvers | **Only for rescue** | **Daily** |
| Prone Positioning | **PaO2/FiO2 < 200** | **PaO2/FiO2 < 150** |

**Trials. 2024;25:308. and Intensive Care Med Exp. 2025;13:135.**

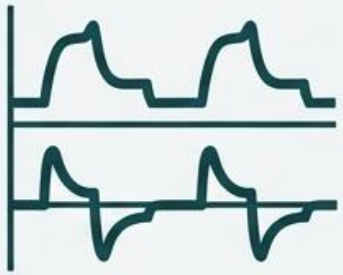
# RV Dysfunction in ARDS

## Pulmonary Vascular Effects

↑ Pulmonary vascular resistance
↓ Pulmonary arterial compliance
↑ Pulmonary vascular impedance
↑ Capillary derecruitment

Driven by: Alveolar collapse, endothelial injury, microthrombosis, hypoxic vasoconstriction.

## Ventilatory/Mechanical Factors



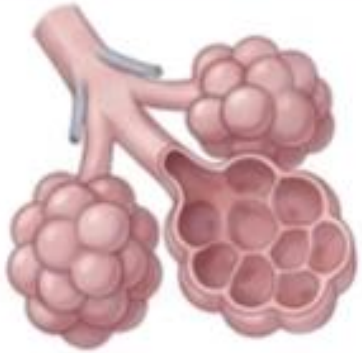
↑ Driving pressure
↑ Transpulmonary pressure
↑ PaCO2
PEEP-induced capillary compression

Acute cor pulmonale → Systemic venous congestion → Organ hypoperfusion → ↓ Oxygen delivery

Br J Anaesth. 2026:S0007-0912(26)00480-0.

# RV Dysfunction in ARDS

## Adequate PEEP (Recruitment Range)



Restoration of FRC
↓ Hypoxic vasoconstriction
↓ PVR
↑ Pulmonary blood flow
↓ RV afterload
Improved RV-PA coupling

**Result: Preserved/improved RV function and Cardiac Output.**

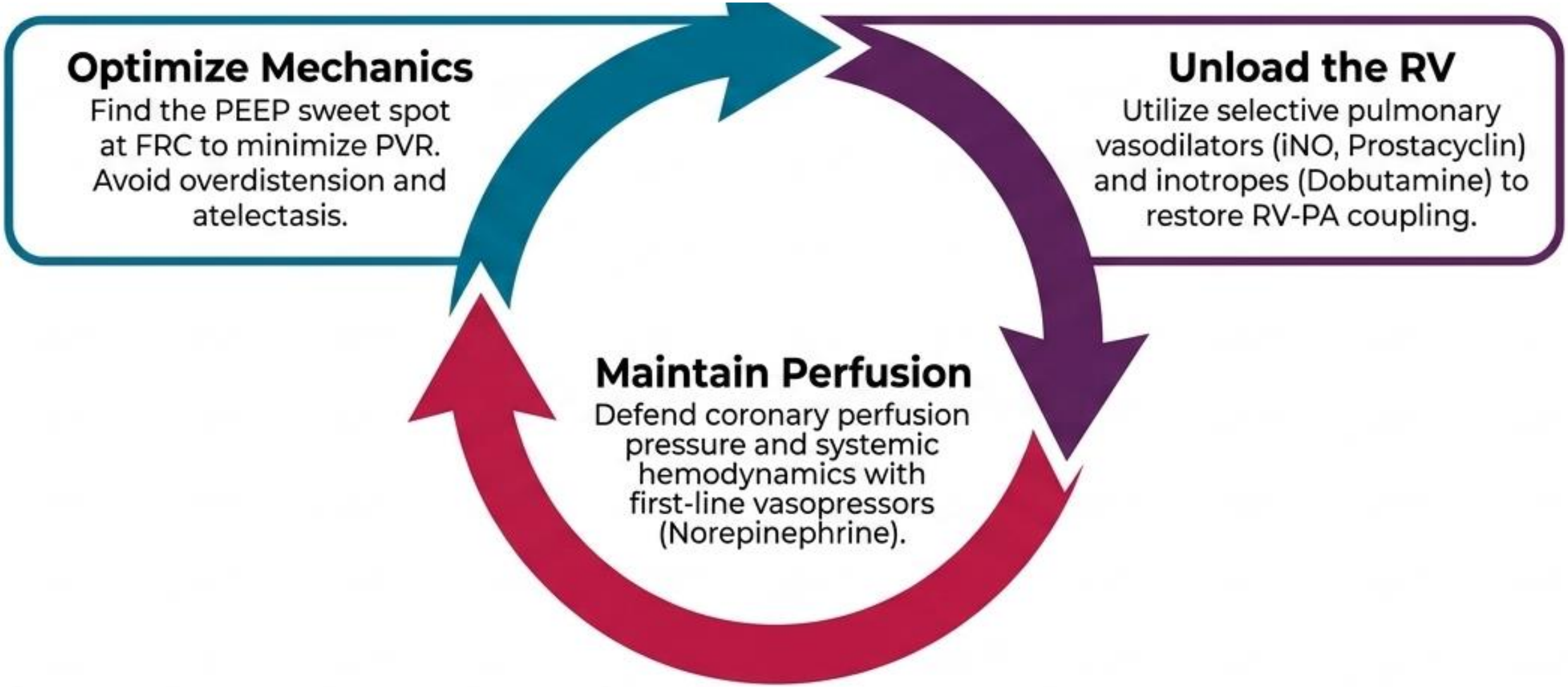
## Excessive PEEP (Overdistension Range)

Alveolar overdistension
Compression of alveolar vessels
↑ PVR
↓ Pulmonary blood flow
↑ RV afterload
RV-PA uncoupling
Dilatation & Septal shift

**Result: Impaired RV function and reduced Cardiac Output.**

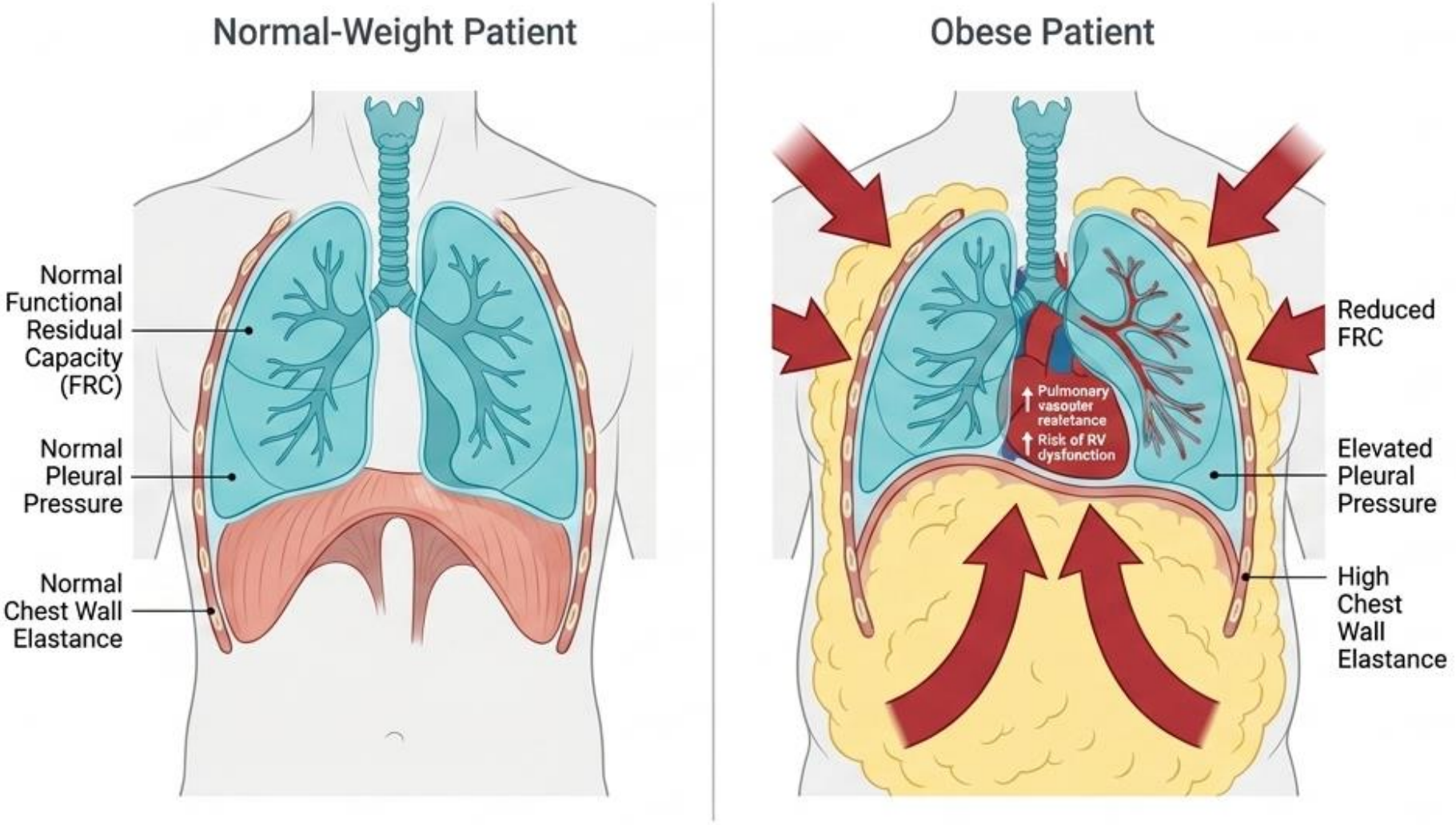
Br J Anaesth. 2026:S0007-0912(26)00480-0.

# RV Dysfunction in ARDS




Br J Anaesth. 2026:S0007-0912(26)00480-0.

# ARDS and Obesity




## Four Dimensions of Failure

**FRC:** Reduced by 5–15% for every 5 kg/m² increase in BMI. Promotes dependent airway closure.

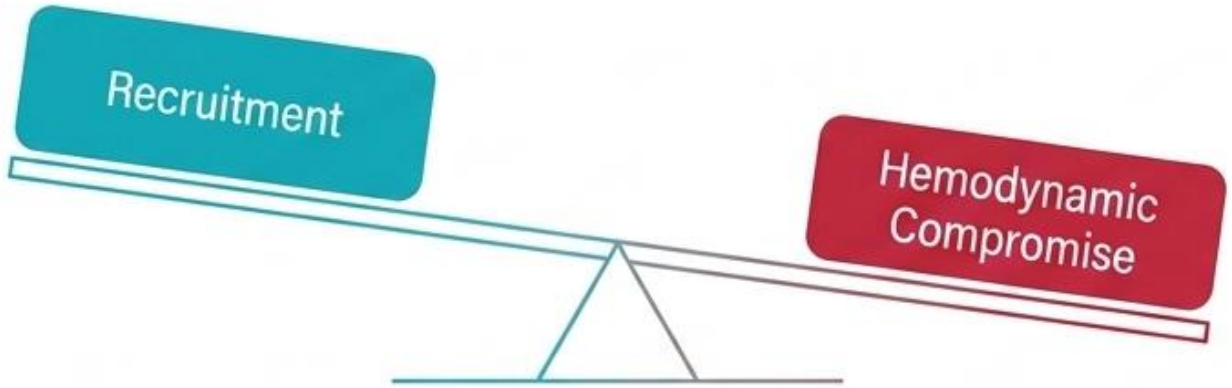
**Pleural Pressure:** Markedly elevated, collapsing dependent alveoli.

**Chest Wall Elastance:** High. The chest wall resists expansion, artificially inflating airway pressure readings.

**Right Ventricular Afterload:** Increased pulmonary vascular resistance due to collapsed vessels and hypoxic vasoconstriction risks RV dysfunction.

Intensive Care Med. 2026;52:1051-1065.

# ARDS and Obesity




## The Physiological Reality

- Standard PEEP (5–10 cmH2O) is usually insufficient to overcome the heavy pleural pressures of class III obesity.
- Consequence of Under-PEEPing: Recurrent airway closure during tidal breathing, severe atelectasis, and refractory V/Q mismatch.

## The Clinical Strategy

- Start with adequate PEEP to maintain positive transpulmonary pressure.
- Caution with Recruitment Maneuvers: While transient oxygenation improvement is possible, routine aggressive recruitment maneuvers are not supported due to the high risk of severe hemodynamic instability (impaired venous return against high intrathoracic pressure).
- Address the atelectasis as the root cause before blindly escalating FiO2 to avoid absorption atelectasis.

**Intensive Care Med. 2026;52:1051-1065.**

# ARDS and Obesity

## Lung protection requires 6–8 mL/kg PBW tidal volumes and individualized, higher PEEP titration

### Tidal Volume (VT) Selection

**PBW Indexing:** Tidal volume must always be indexed to Predicted Body Weight, calculated from patient height and sex.

**Actual Weight Error:** Lung size does not increase with body mass. Using actual weight delivers massive, injurious volumes.

**Protective Targets:** Maintain low VT of 6-8 mL/kg PBW as the cornerstone of lung protection to avoid overdistension.

### PEEP Titration Strategies

**Higher PEEP Requirement:** Standard PEEP (5–10 cmH2O) is often insufficient to counteract elevated abdominal/thoracic pressures.

**Airway Closure Prevention:** Higher PEEP is required to maintain positive transpulmonary pressure and recruit collapsed alveoli.

**Individualization:** PEEP should be titrated using esophageal pressure, electrical impedance tomography, or driving pressure.

### Recruitment Maneuvers

**No Routine Use:** Aggressive recruitment strategies (such as those in the ART trial) are not supported for routine clinical use.

**Refractory Hypoxemia:** Selectively consider recruitment maneuvers for severe, refractory hypoxemia.

**Hemodynamic Risk:** Higher intrathoracic pressure can severely impair venous return, leading to circulatory instability.

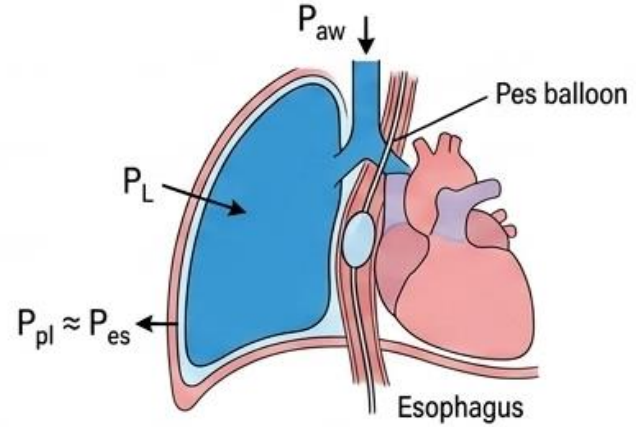
Intensive Care Med. 2026;52:1051-1065.

# ARDS and Obesity

## Advanced monitoring separates lung from chest wall

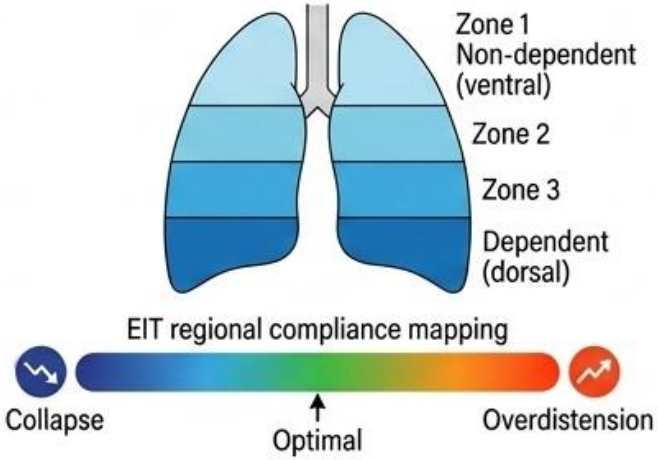
### Esophageal Pressure (Pes) Monitoring

- **Function:** Estimates regional pleural pressure.
- **Value:** Allows the clinician to calculate Transpulmonary Pressure ($P_L$) in real-time, targeting a positive end-expiratory PL to prevent collapse, and limiting end-inspiratory PL to prevent over-distension.



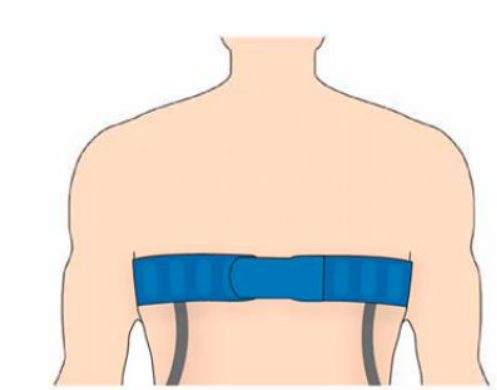

### Electrical Impedance Tomography (EIT)

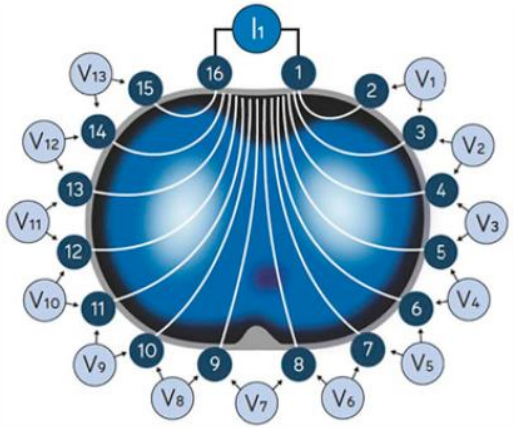
- **Function:** Non-invasive, real-time bedside imaging of regional ventilation.
- **Value:** Identifies hidden regional lung collapse (dorsal) and overdistention (ventral), guiding the exact PEEP required to balance the two.

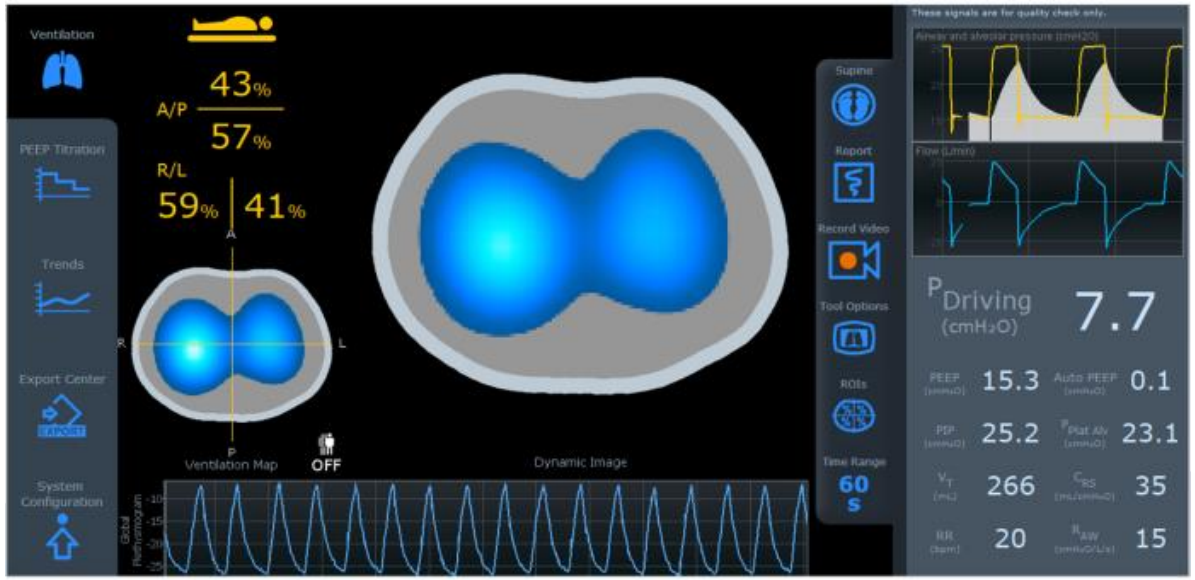


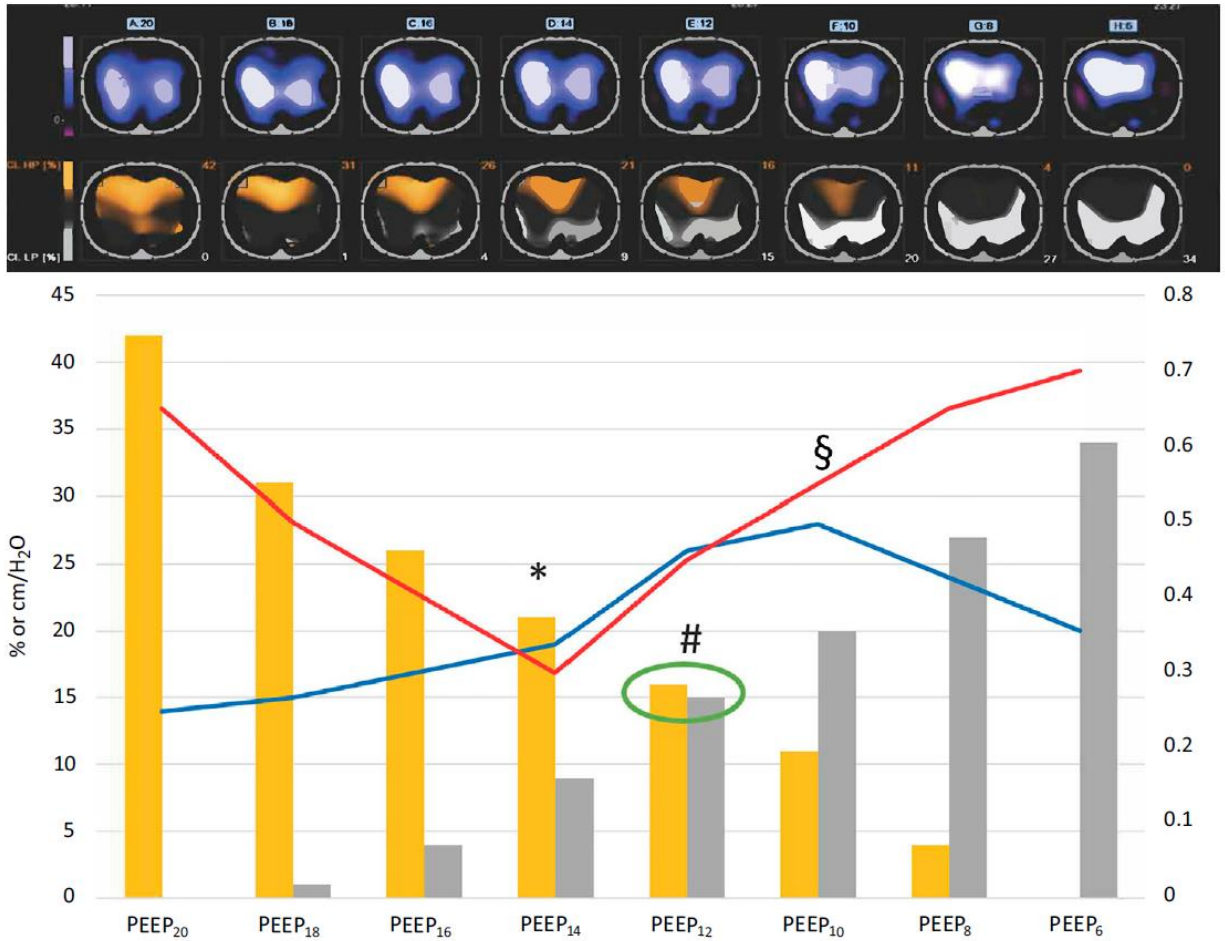

Intensive Care Med. 2026;52:1051-1065.

# Electrical Impedance Tomography (EIT)



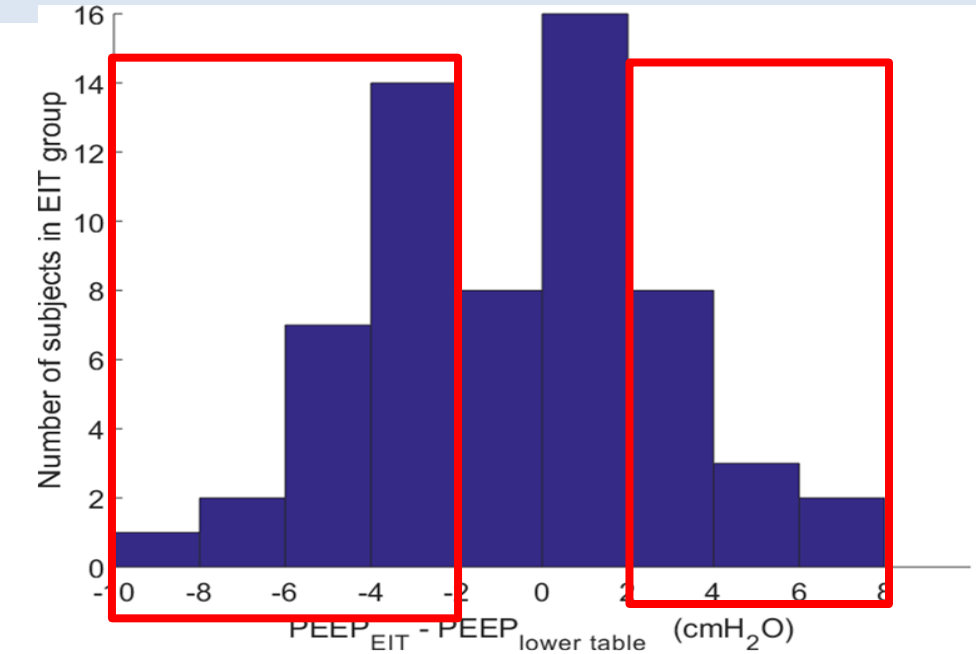


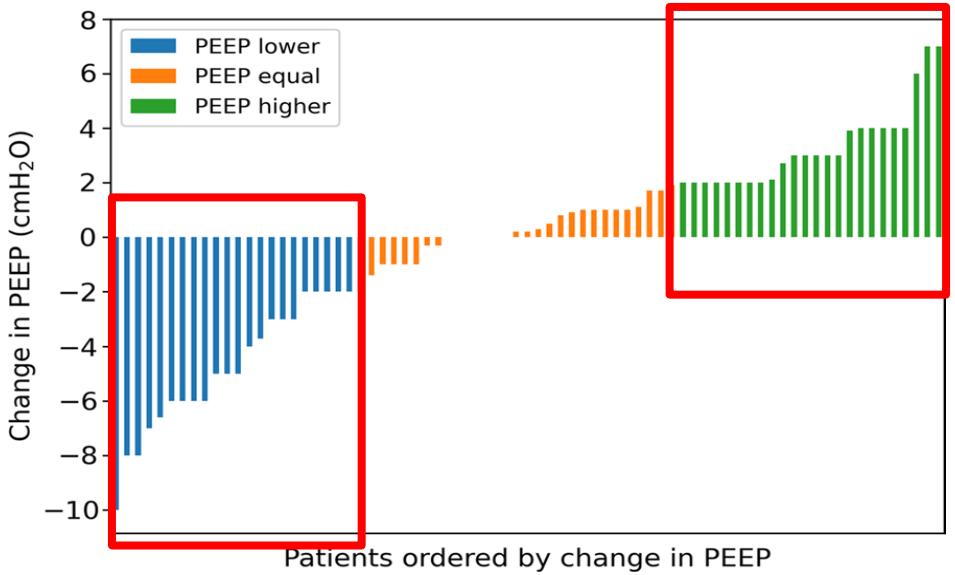




Am J Respir Crit Care Med. 2024;209:670-682

# PEEP Guided by EIT in ARDS



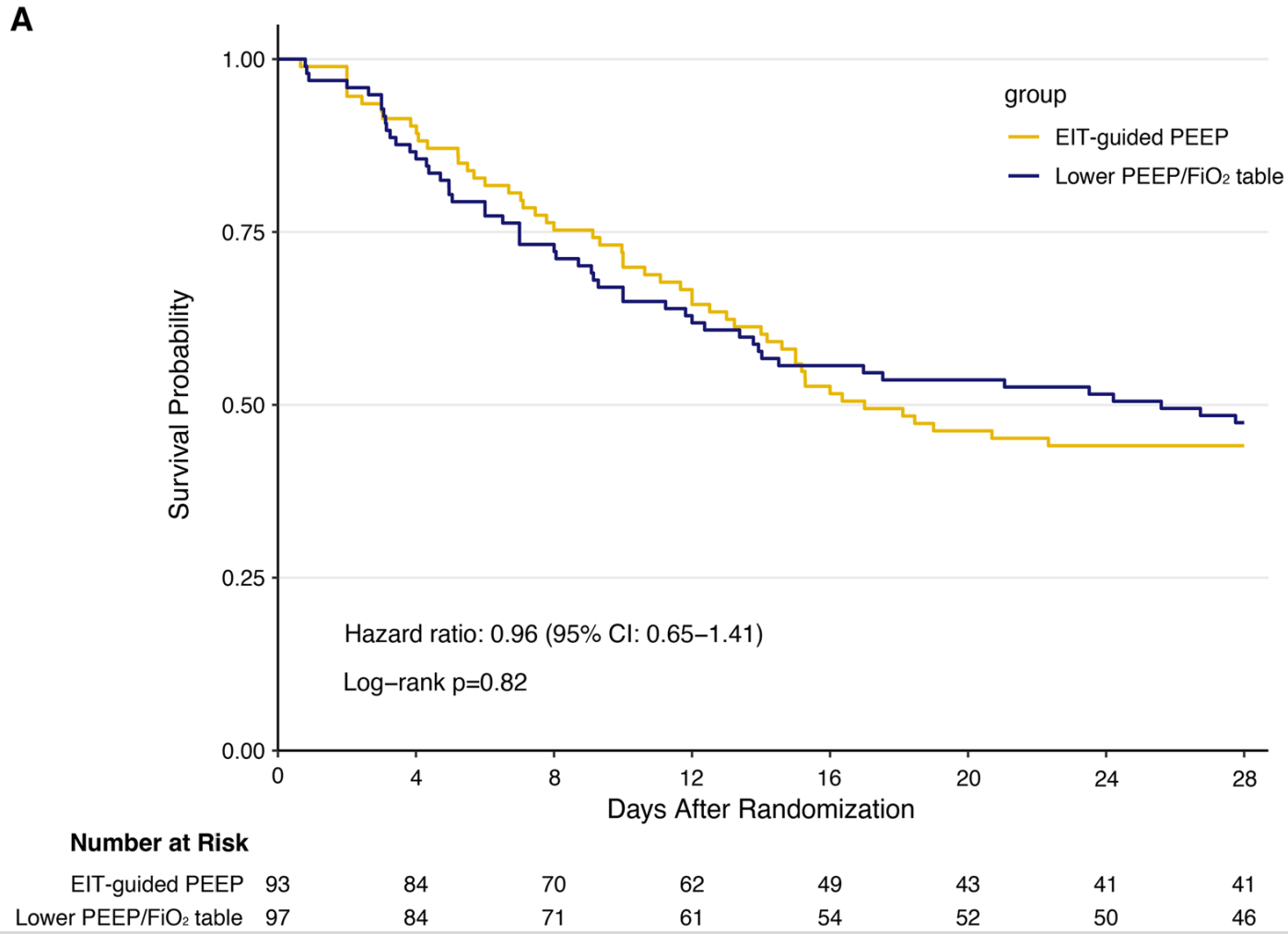




| Variables | EIT group $N=61$ | Control group $N=56$ | $p$ value |
|---|---|---|---|
| Clinical outcome | | | |
| 28-day mortality ($n$, %) | 13 (21%) | 15 (27%) | 0. 634 |
| Ventilator-free days at day 28 (D) | 14.0 (0.0, 23.0) | 18.5 (0.0, 24.0) | 0.764 |
| Length of ICU stay (D) | 13.0 (7.0, 25.0) | 10.0 (7.0, 14.8) | 0.169 |
| ΔD1 SOFA score | 0 (− 1, 1) | 0.5 (− 1, 2.75) | 0.021* |
| ΔD2 SOFA score | − 1 (− 3.5, 0) | 1 (− 2, 2) | < 0.0001* |
| Successful extubation ($n$, %) | 30 (49%) | 31 (55%) | 0.629 |
| Tracheostomy ($n$, %) | 17 (28%) | 11 (20%) | 0.409 |
| Adjuvant therapy | | | |
| Neuromuscular blocker ($n$, %) | 12 (20%) | 5 (9%) | 0.166 |
| Prone position ($n$, %) | 30 (49%) | 23 (41%) | 0.487 |
| Glucocorticoid therapy ($n$, %) | 11 (18%) | 6 (11%) | 0.390 |

*$p < 0.05$

# PEEP Guided by EIT in ARDS

## Electrical impedance tomography-guided positive end-expiratory pressure and mortality of patients with the acute respiratory distress syndrome: the EITVent randomized clinical trial




Am J Respir Crit Care Med. 2026;12:440–451

# PEEP Guided by EIT in ARDS

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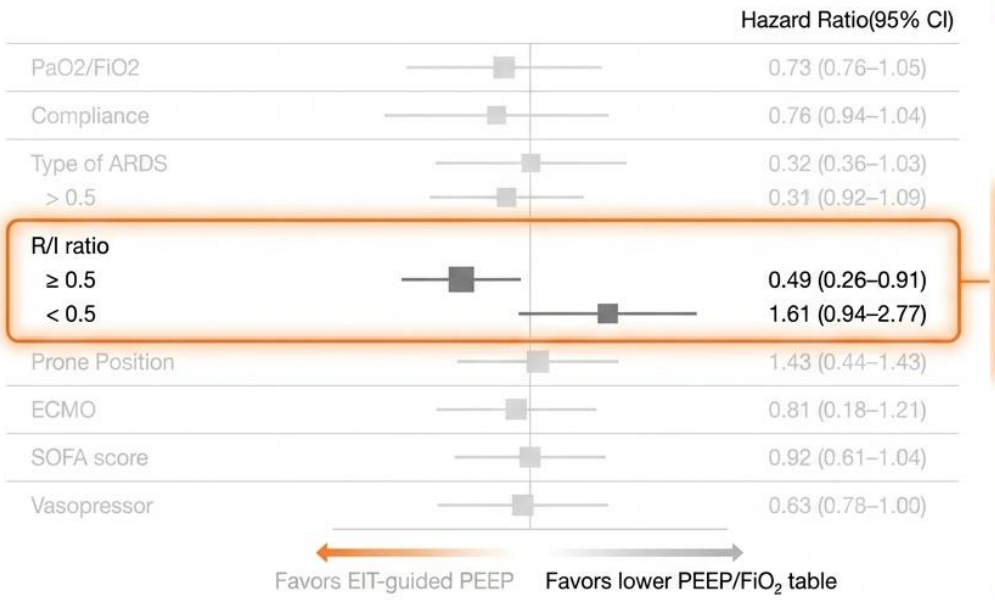



### High Recruiters (R/I ≥ 0.5)

48% Prevalence: **~48%** of the trial cohort.

Result: EIT significantly reduced mortality (**35.6%** vs **60.0%**).

Hazard Ratio: **0.49** (p = 0.024).

### Low Recruiters (R/I < 0.5)

52% Prevalence: **~52%** of the trial cohort.

Result: EIT showed a trend toward harm (73.2% vs 51.1%).

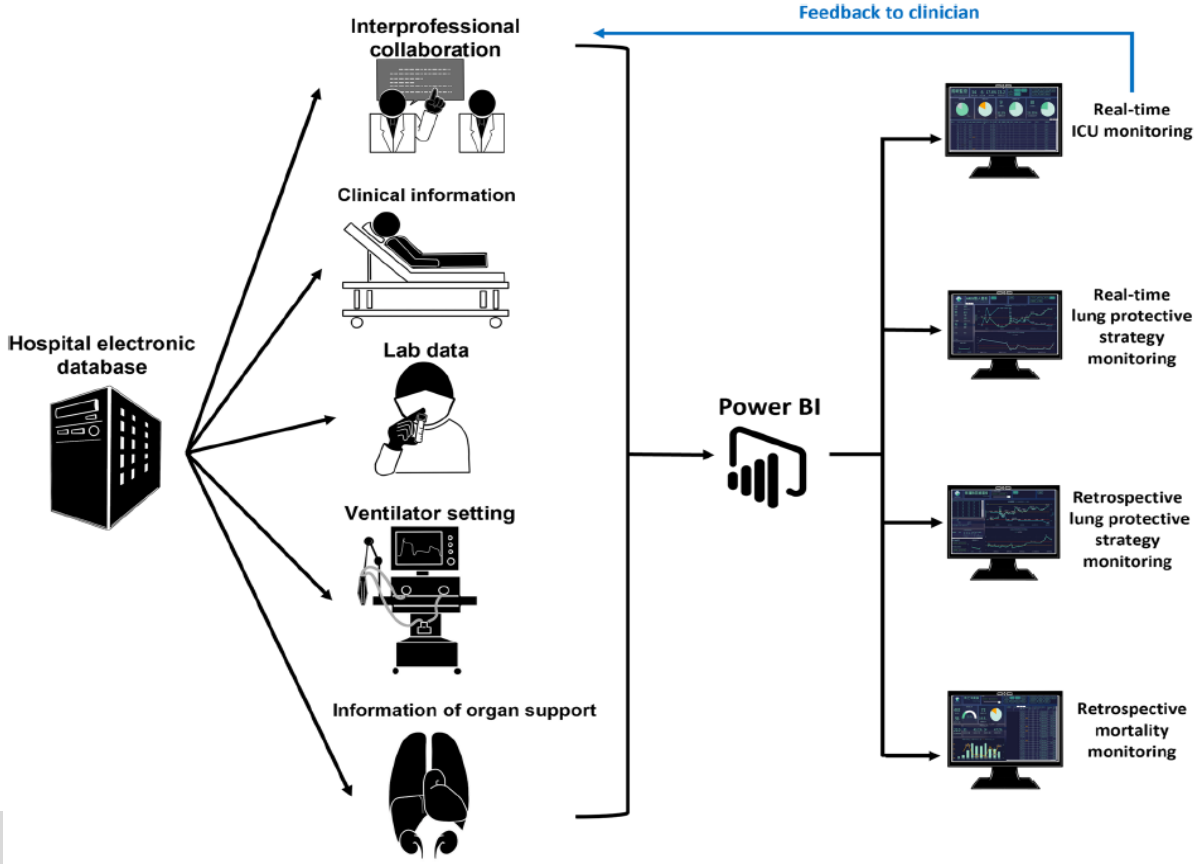
Hazard Ratio: 1.61 (Not statistically significant, but clinically concerning).

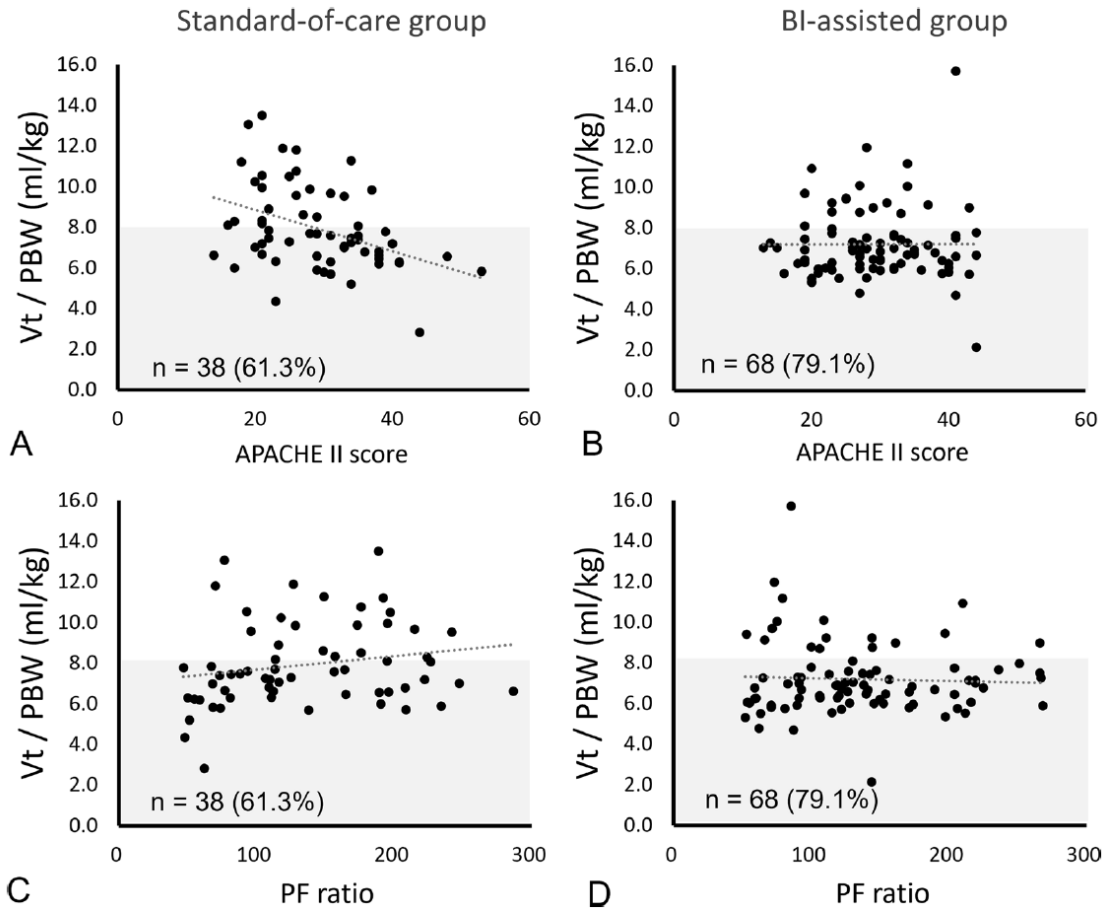
Am J Respir Crit Care Med. 2026;12:440–451

# Artificial Intelligence in ARDS

RESEARCH Open Access

## Using real-time visualization system for data-driven decision support to achieve lung protective strategy: a retrospective observational study



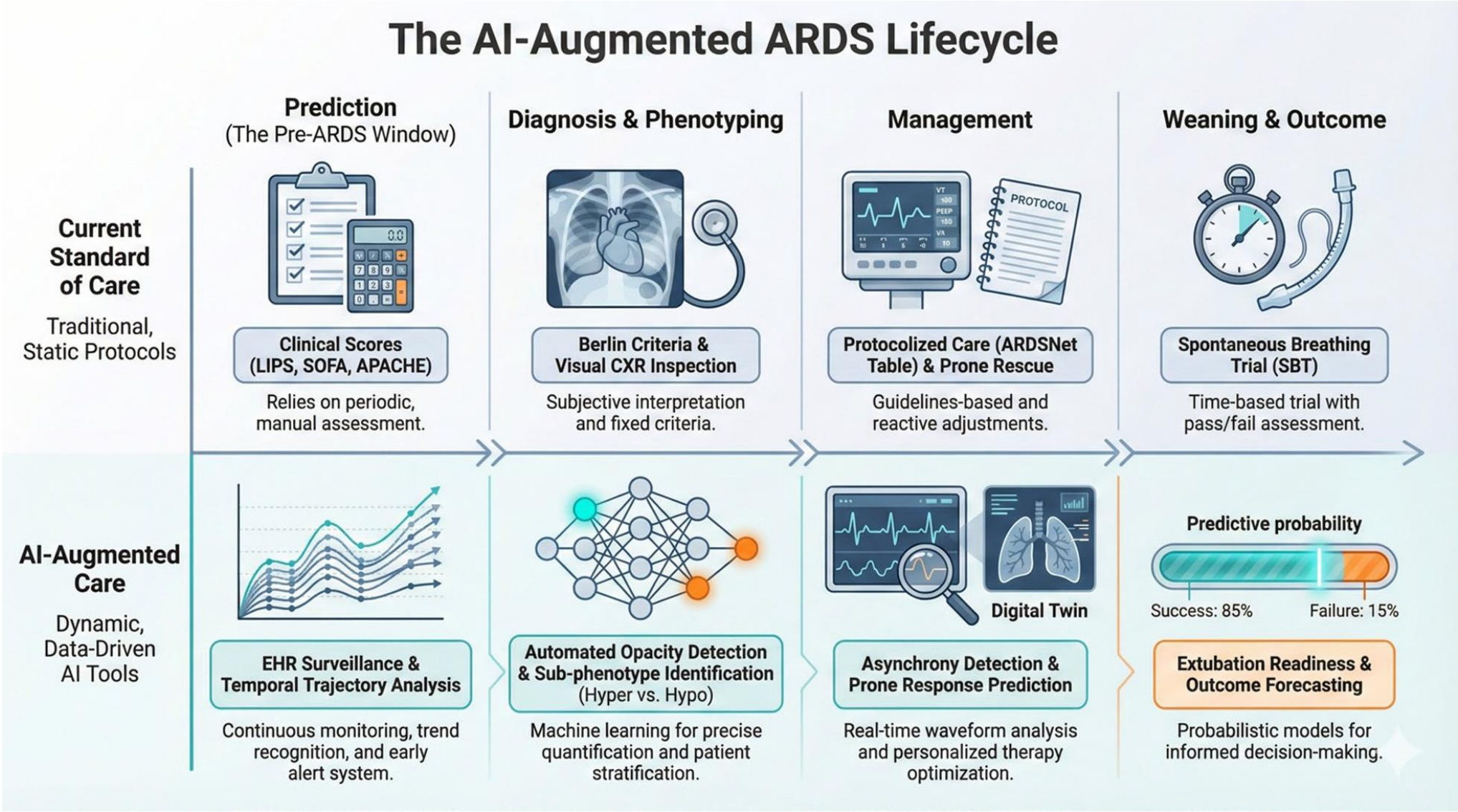




| | All (N = 148) | Standard-of-care group (N = 62) | BI-assisted group (N = 86) | *p* value |
|---|---|---|---|---|
| Duration of IMV, day | 11 (5–26) | 13 (6–26.8) | 10 (5–26) | 0.741 |
| ICU mortality | 70 (47.3%) | 36 (58.1%) | 34 (39.5%) | 0.026 |
| Hospital mortality | 84 (56.8%) | 42 (67.7%) | 42 (48.8%) | 0.022 |
| ICU LOS, day | 12 (6.3–19.8) | 13 (8–23.3) | 10 (5–15.3) | 0.055 |
| Hospital LOS, day | 26 (14–49.8) | 23 (12.8–39.3) | 28 (14.8–50.5) | 0.221 |

*IMV* invasive mechanical ventilation, *ICU* intensive care unit, *LOS* length of stay

Crit Care. 2022;26:253.

# Artificial Intelligence in ARDS




Crit Care. 2026;30:197.

# Precision Medicine for ARDS

**Prognostic Enrichment and Machine Learning**

**Predictive Enrichment**

**Heterogeneity**