ATS Highlights 2025:
Critical Care Assembly Early Career Professionals

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Tell us about yourself.

I am a Principal Respiratory Therapist, Head of the department, passionate about Acute Respiratory Distress Syndrom (ARDS) and mechanical ventilation research.

Tell us about your research.

My current research focuses on a novel classification system, the P/FP ratio, to accurately classify the severity of oxygenation in ARDS patients, regardless of the intubation status. This improved classification system aims to facilitate timely and appropriate rescue treatment interventions, ultimately leading to improved patient outcomes and reduced mortality rates.

Where do you see yourself in 5 years?

Contribute more insights for the next definition of ARDS in classifying the severity of oxygenation and validated with multinational prospective Randomized Controlled Trials.

How has the Critical Care Assembly contributed to your career?

I am new to Critical Care Assembly. I hope to have friendship, opportunity, collaboration and great mentorship to advance my research.

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"PEEP-adjusted P/F Ratio" in Acute Respiratory Distress Syndrome: A Call for Further Enhancement of Global Definition

The Pa_{O2}/FI_{O2} (P/F) ratio and its alternative oxygen saturation as measured by pulse oximetry (Sp_{O2})/FI_{O2} (S/F) ratio are regarded as standards in classifying the severity of oxygenation and subsequent management of acute respiratory distress syndrome (ARDS). However, a major limitation of the current P/F ratio–based classification system is that it does not take positive end-expiratory pressure (PEEP) into consideration. This means that patients with the same FI_{O2} may have different Pa_{O2} values and therefore different P/F ratios while receiving conventional oxygen therapy, high-flow nasal cannula (HFNC), or mechanical ventilation with different PEEP settings.

In mechanically ventilated patients, however, PEEP levels up to 24 cm H_2O are often applied, and variation in practice can then result in different amounts of recruitment, P/F or S/F ratios, and therefore apparent severity of illness for the same patient. For example, a patient with recruitable lungs, given an FI_{O2} of 0.6 and PEEP of 10 cm H_2O, may have a P/F ratio of 95 mm Hg; however, when the PEEP is increased to 18 cm H_2O while maintaining the same FI_{O2}, the P/F ratio may increase to 155 mm Hg and the P/FP ratio to 86 mm Hg/cm H_2O. Evidently, a simple increase in PEEP setting has altered the deemed severity of illness from severe to moderate, and a clinician might abort the neuromuscular blockade or proning on the basis of the P/F ratio as recommended (3, 4) but not on the basis of P/FP ratio. Furthermore, HFNC generates a minimum PEEP effect of 3–5 cm H_2O that is proportional to the delivered flow. This makes it more efficient than standard oxygen therapy. The P/FP ratio with the correction factor of 10 may be a promising tool for classifying the severity of ARDS in patients receiving HFNC or noninvasive ventilation. However, further research is needed to confirm its accuracy and reliability before it can be used as an intubation criterion from the oxygenation point of view.

Although the P/FP ratio has been shown to have a greater predictive validity of mortality than the P/F ratio in intubated patients, further prospective studies are needed to better classify the severity of ARDS in any patient, regardless of their intubation status, and to decide on thresholds for initiation, continuation, and termination of rescue treatment in mechanically ventilated patients. To this end, the P/FP ratio appears to be a promising candidate.

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P/FP ratio: incorporation of PEEP into the PaO_2/FiO_2 ratio for prognostication and classification of acute respiratory distress syndrome

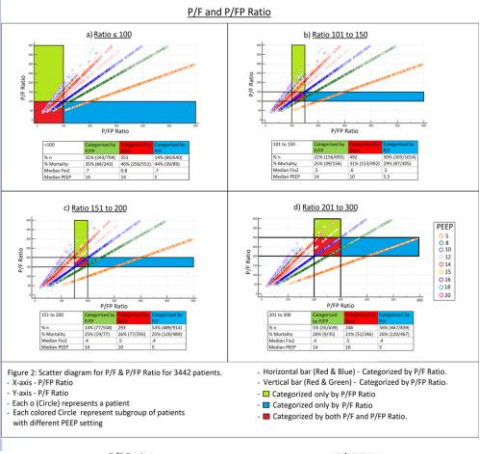
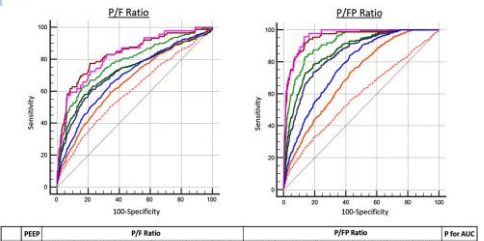


Figure 2: Scatter diagram for P/F & P/FP Ratio for 3442 patients.
- X-axis - P/FP Ratio
- Y-axis - P/F Ratio
- Each o (Circle) represents a patient
- Each colored Circle represent subgroup of patients with different PEEP setting

- Horizontal bar (Red & Blue) - Categorized by P/F Ratio.
- Vertical bar (Red & Green) - Categorized by P/FP Ratio.
- Categorized only by P/FP Ratio
- Categorized only by P/F Ratio
- Categorized by both P/F and P/FP Ratio.



PEEP	P/F Ratio						P/FP Ratio						P for AUC
	AUC	95% CI	Sensitivity	Specificity	Cuts-off	Youden Index	AUC	95% CI	Sensitivity	Specificity	Cuts-off	Youden Index	
≥5	0.599	0.578-0.620	50.8	65.5	≤135	0.163	0.584	0.563-0.605	55.8	57.4	≤160	0.133	NS
>5	0.659	0.637-0.681	59.5	65.5	≤135	0.250	0.710	0.691-0.730	73.0	57.4	≤160	0.305	< 0.001
>8	0.691	0.667-0.715	64.8	65.5	≤135	0.303	0.775	0.757-0.793	84.3	57.2	≤162	0.415	< 0.001
>10	0.721	0.689-0.753	60.7	77.7	≤116	0.384	0.847	0.828-0.867	73.6	80.6	≤102	0.543	< 0.001
>12	0.730	0.694-0.767	58.1	82.4	≤107	0.405	0.869	0.849-0.890	73.3	85.9	≤87	0.592	< 0.001
>14	0.783	0.742-0.824	62.1	84.1	≤104	0.462	0.918	0.899-0.936	83.2	86.1	≤87	0.693	< 0.001
>16	0.834	0.786-0.883	77.5	78.7	≤114	0.563	0.952	0.932-0.971	92.1	86.1	≤87	0.782	< 0.001
>18	0.828	0.765-0.891	83.0	68.1	≤131	0.511	0.963	0.947-0.978	95.7	86.8	≤85	0.825	< 0.001

Background: The current Berlin definition of acute respiratory distress syndrome (ARDS) uses the PaO_2/FiO_2 (P/F) ratio to classify severity. However, for the same P/F ratio, a patient on a higher positive end-expiratory pressure (PEEP) may have more severe lung injury than one on a lower PEEP.

Objectives: We designed a new formula, the P/FP ratio, incorporating PEEP into the P/F ratio and multiplying with a correction factor of 10 [$(PaO_2*10)/(FiO_2*PEEP)$], to evaluate if it better predicts hospital mortality compared to the P/F ratio post-intubation and to assess the resultant changes in severity classification of ARDS.

Results: Out of 3,442 patients, 1,057 (30.7%) died. The AUC for mortality was higher for the P/FP ratio than the P/F ratio for PEEP levels > 5 cmH_2O: 0.710 (95% CI 0.691–0.730) versus 0.659 (95% CI 0.637–0.681), $P < 0.001$. Improved AUC was seen with increasing PEEP levels; for PEEP ≥ 18 cmH_2O: 0.963 (95% CI 0.947–0.978) versus 0.828 (95% CI 0.765–0.891), $P < 0.001$. When the P/FP ratio was used instead of the P/F ratio, 12.5% and 15% of patients with moderate and mild ARDS, respectively, were moved to more severe categories, while 13.9% and 33.6% of patients with severe and moderate ARDS, respectively, were moved to milder categories. The median PEEP and FiO_2 were 14 cmH_2O and 0.70 for patients reclassified to severe ARDS, and 5 cmH_2O and 0.40 for patients reclassified to mild ARDS.

Conclusions: The multifactorial P/FP ratio has a greater predictive validity for hospital mortality in ARDS than the P/F ratio. Changes in severity classification with the P/FP ratio reflect both true illness severity and the applied PEEP strategy.

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