

Validation of PaO₂:FiO₂ for predicting hospital mortality in critically ill patients with acute hypoxaemic respiratory failure: a retrospective binational registry-based study

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Table 1S - Patient outcomes

Characteristic	Overall	Acute respiratory failure category			
		None (PFR > 300)	Mild (PFR 200 - 300)	Moderate (PFR 100-200)	Severe (PFR < 100)
Hospital mortality	57,052 (8.6)	15,797 (4.9)	14,291 (7.9)	18,247 (14)	8,717 (31)
ICU mortality	38,681 (5.9)	9,138 (2.8)	8,897 (4.9)	13,212 (10)	7,434 (26)
ICU length of stay	3.33 (5.57)	2.60 (4.19)	3.23 (5.32)	4.64 (7.13)	6.35 (9.50)
ICU length of stay	1.89 (0.96 - 3.70)	1.63 (0.90 - 2.88)	1.92 (0.98 - 3.67)	2.79 (1.46 - 5.15)	3.48 (1.54 - 7.43)
Hospital length of stay)	15 (86)	14 (87)	15 (84)	16 (88)	17 (76)
Hospital length of stay	9 (5 - 15)	8 (4 - 14)	9 (5 - 16)	10 (6 - 17)	10 (4 - 19)

PFR - PaO₂:FiO₂ ratio; ICU - intensive care unit. Results expressed as n (%), mean (standard deviation), or median (interquartile range).

Table 2S - Subgroup comparisons

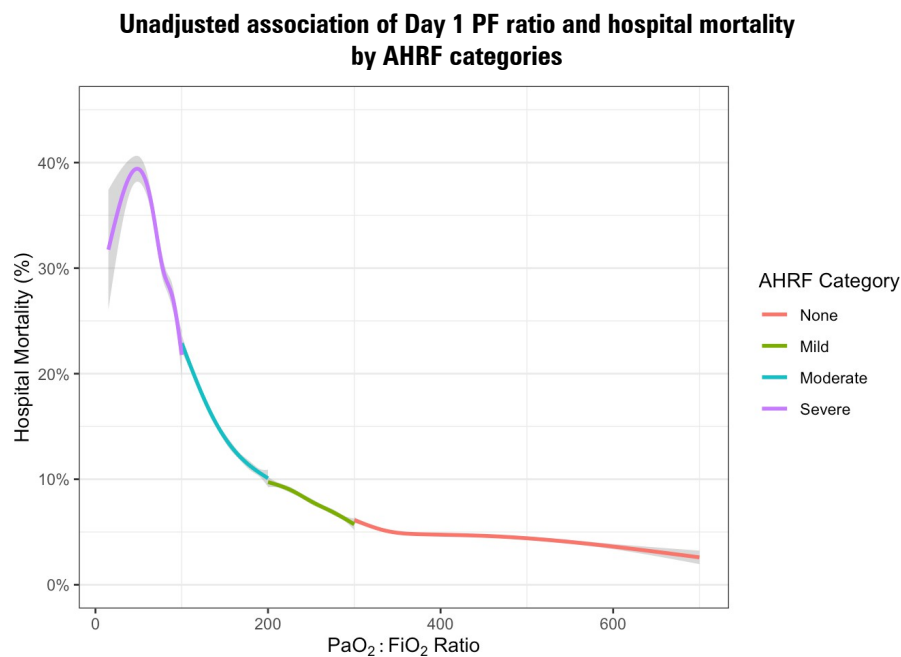
Comparison	AUC 1 versus AUC 2	p value
Day 1 IPPV		
Yes versus No	0.628 versus 0.701	< 0.001
IPPV any time		
Yes versus No	0.627 versus 0.698	< 0.001
NIV any time		
Yes versus No	0.622 versus 0.668	< 0.001
ECMO any time		
Yes versus No	0.516 versus 0.675	< 0.001
Cardiac versus neurosurgery	0.62 versus 0.641	0.008
Cardiac versus postoperative	0.62 versus 0.647	< 0.001
Cardiac versus medical	0.62 versus 0.644	< 0.001
Cardiac versus sepsis	0.62 versus 0.661	< 0.001
Neurosurgery versus postoperative	0.641 versus 0.647	0.326
Admission diagnosis		
Neurosurgery versus medical	0.641 versus 0.644	0.587

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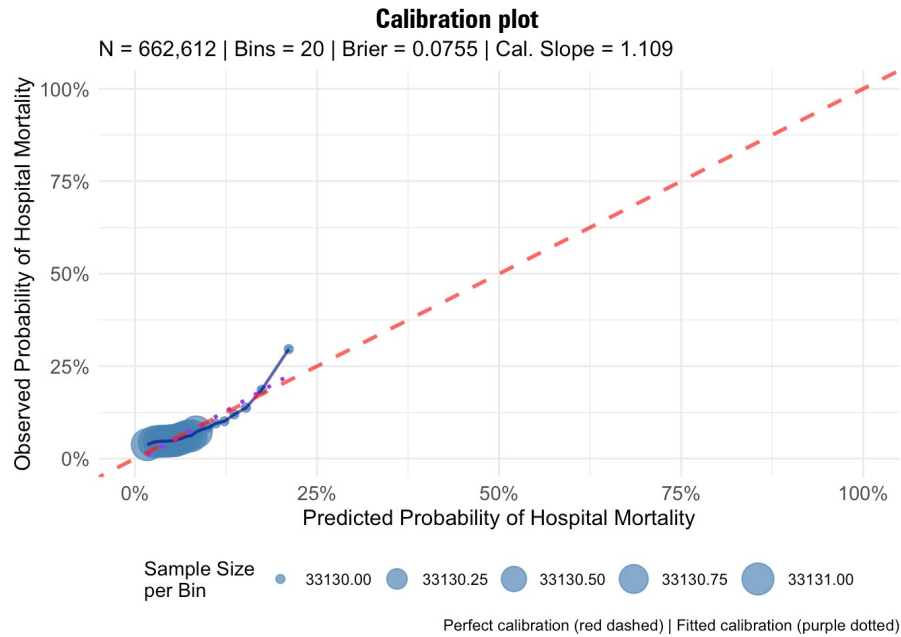
Neurosurgery <i>versus</i> sepsis	0.641 <i>versus</i> 0.661	0.001
Postoperative <i>versus</i> medical	0.647 <i>versus</i> 0.644	0.422
Postoperative <i>versus</i> sepsis	0.647 <i>versus</i> 0.661	0.006
Medical <i>versus</i> sepsis	0.644 <i>versus</i> 0.661	< 0.001
APACHE 3 score		
> 50 <i>versus</i> ≤ 50	0.626 <i>versus</i> 0.613	0.01
Age categories		
Age < 44 <i>versus</i> age 45 - 64	0.704 <i>versus</i> 0.675	< 0.001
Age < 44 <i>versus</i> age 65 - 84	0.704 <i>versus</i> 0.67	< 0.001
Age < 44 <i>versus</i> age > 84	0.704 <i>versus</i> 0.67	< 0.001
Age 45 - 64 <i>versus</i> age 65 - 84	0.675 <i>versus</i> 0.67	0.116
Age 45 - 64 <i>versus</i> age > 84	0.675 <i>versus</i> 0.67	0.309
Age 65 - 84 <i>versus</i> age > 84	0.67 <i>versus</i> 0.67	0.96
Sex		
Male <i>versus</i> female	0.671 <i>versus</i> 0.684	< 0.001
Frailty		
Fit/Well <i>versus</i> mild frailty	0.687 <i>versus</i> 0.667	< 0.001
Fit/well <i>versus</i> moderate/severe frailty	0.687 <i>versus</i> 0.638	< 0.001
Mild frailty <i>versus</i> moderate/severe frailty	0.667 <i>versus</i> 0.638	< 0.001
Treatment limitations		
Yes <i>versus</i> no	0.624 <i>versus</i> 0.680	< 0.001

AUC - area under curve; IPPV - invasive positive pressure ventilation; NIV - noninvasive ventilation ECMO - extracorporeal membrane oxygenation; APACHE - Acute Physiology and Chronic Health Evaluation.



PF ratio - PaO₂:FiO₂ ratio; AHRF - acute hypoxaemic respiratory failure.

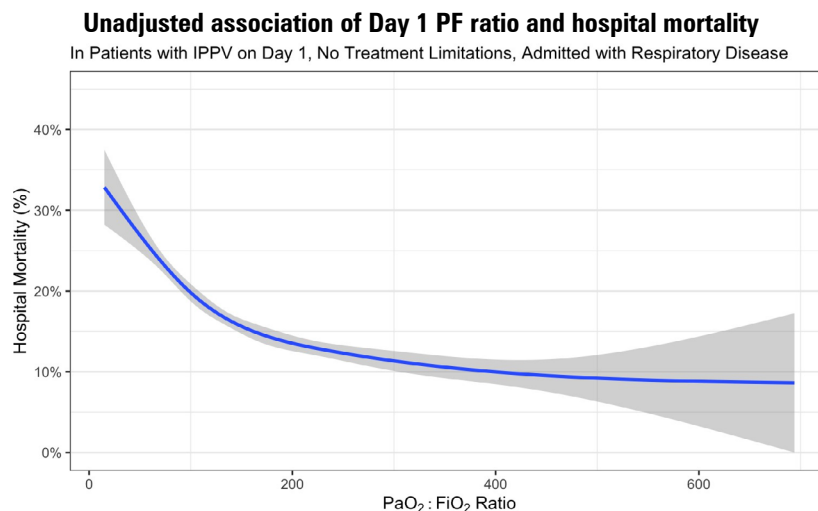
Figure 1S - Hospital mortality by acute hypoxaemic respiratory failure category.



Metric	Value	Interpretation
Brier score	0.0755	Lower better (0 = perfect)
Calibration slope	1.1090	Should $\approx$ 1.0
Mean calibration error	0.0161	Lower better
Max calibration error	0.0850	Lower better

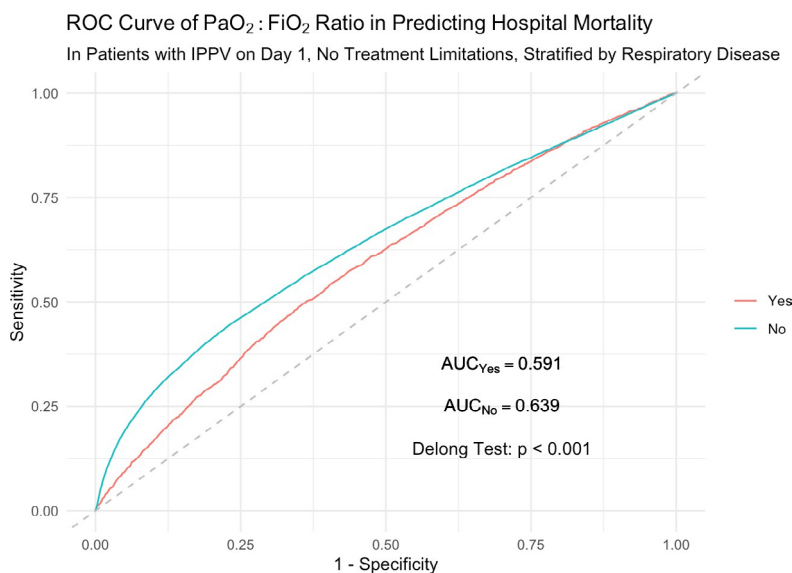
Figure 2S - Calibration.

The calibration performance of $\text{PaO}_2:\text{FiO}_2$ ratio was excellent, as the Brier score was low (0.0755), the calibration slope was close to 1.0 (1.109), and visual inspection of the calibration plot showed reasonable adherence to the diagonal. However, the discrimination performance was modest. The area under the receiver operator curve showed fair discrimination but was not strong. The Youden's index was 0.267, indicating moderate optimal performance at the cutoff value. Hence, the $\text{PaO}_2:\text{FiO}_2$ ratio has good calibration with modest discrimination. This is interpreted such that the $\text{PaO}_2:\text{FiO}_2$ ratio can predict hospital mortality accurately (i.e. good calibration) but has limited ability to separate high-risk from low-risk patients (i.e., modest discrimination). This is reflected in the likelihood ratios, where both the positive and negative test provide only a slight increase or decrease in probability, and is in the "minimal clinical impact" range.



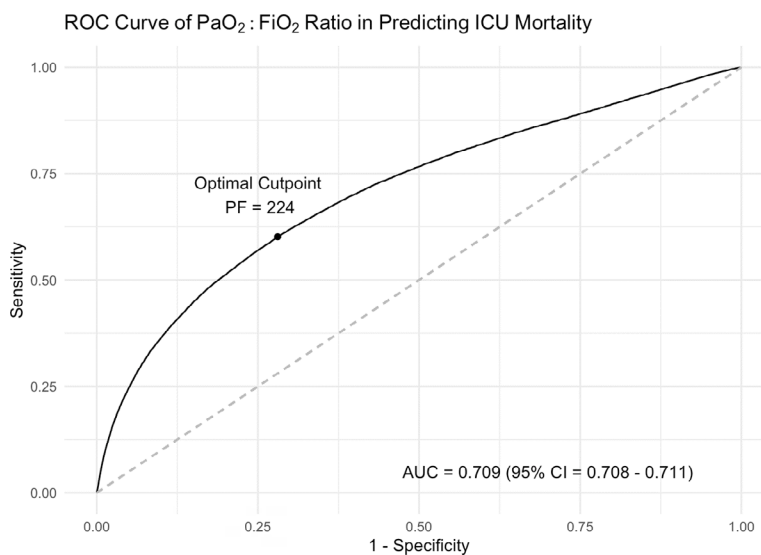
PF ratio - $\text{PaO}_2:\text{FiO}_2$ ratio; IPPV - invasive positive pressure ventilation.

Figure 3S - Unadjusted association between day $\text{PaO}_2:\text{FiO}_2$ ratio and hospital mortality in patients requiring invasive ventilation on Day 1 of intensive care unit admission with a respiratory diagnosis and no treatment limitations.



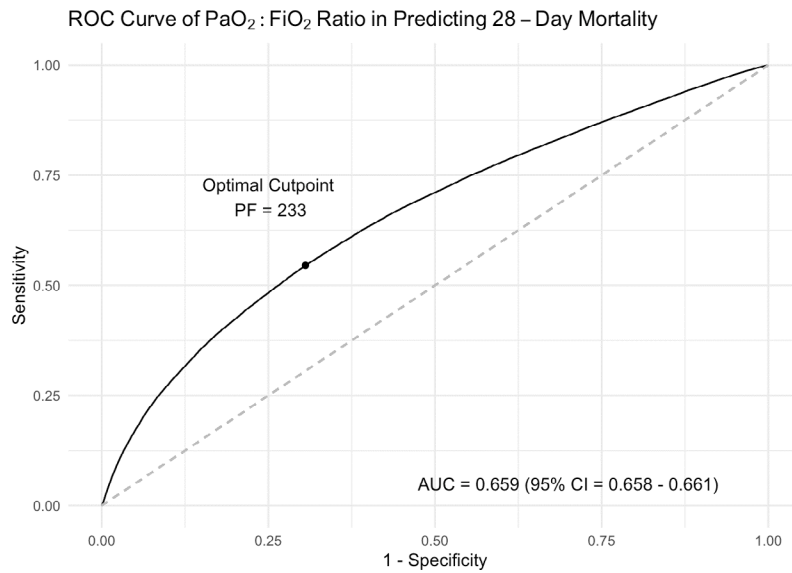
ROC - receiver operating characteristic; IPPV - invasive positive pressure ventilation AUC - area under the curve.

Figure 4S - Receiver operating characteristic curve of $\text{PaO}_2 : \text{FiO}_2$ ratio in predicting hospital mortality: patients receiving invasive ventilation of Day 1 of intensive care unit admission with respiratory diagnosis and no treatment limitations.



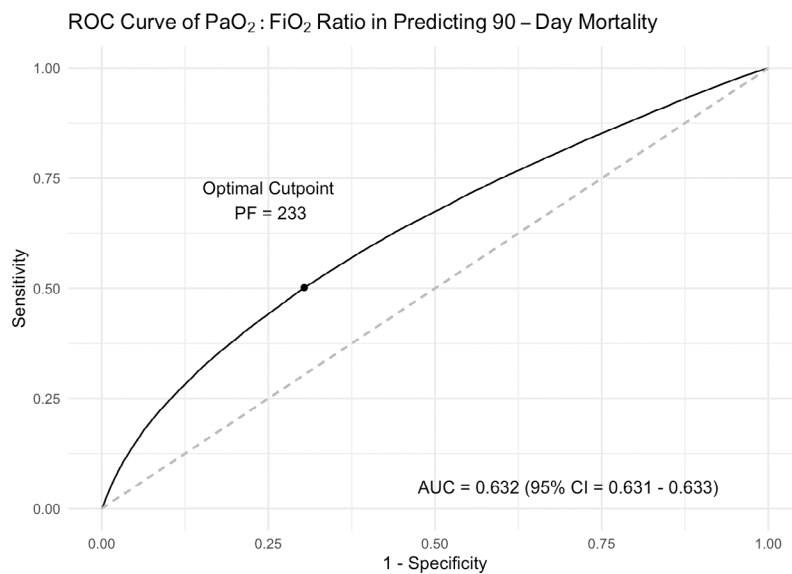
ROC - receiver operating characteristic; ICU - intensive care unit; AUC - area under the curve.

Figure 5S - Receiver operating characteristic curve of $\text{PaO}_2 : \text{FiO}_2$ ratio in predicting intensive care unit mortality.



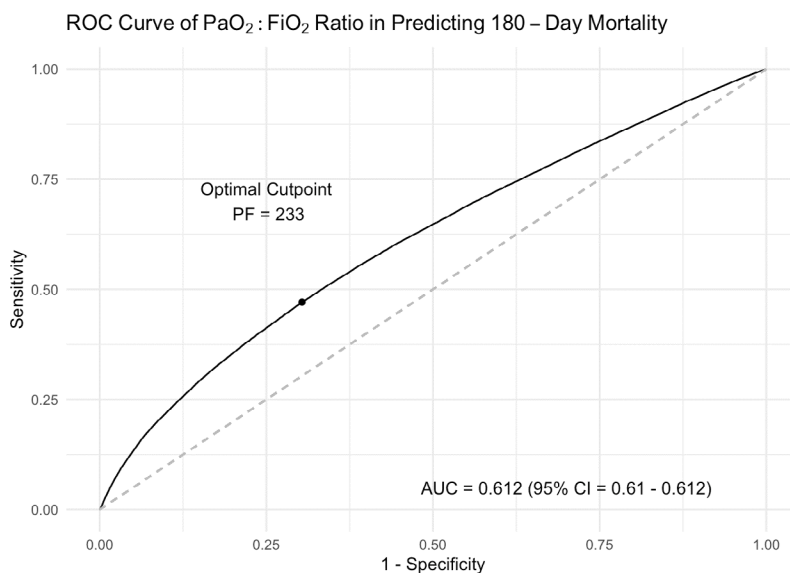
ROC - receiver operating characteristic; AUC - area under the curve.

Figure 6S - Receiver operating characteristic curve of $\text{PaO}_2:\text{FiO}_2$ ratio in predicting Day 28 mortality.



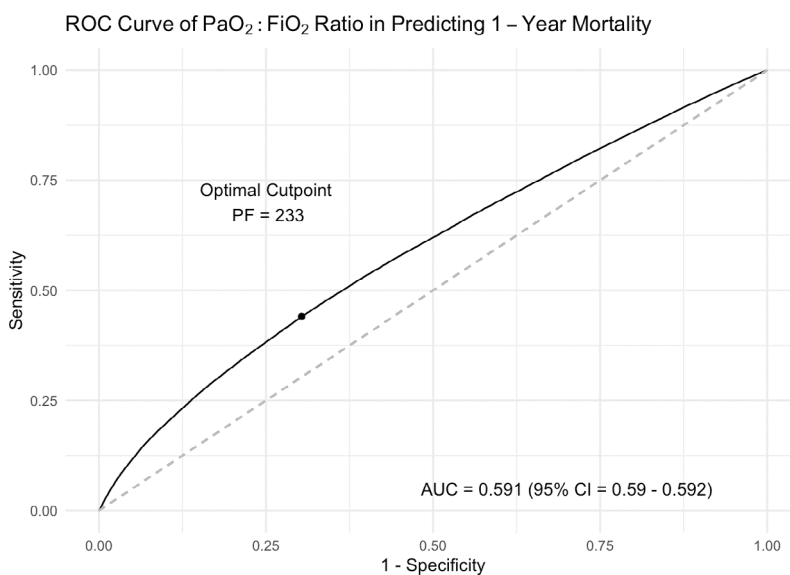
ROC - receiver operating characteristic; AUC - area under the curve.

Figure 7S - Receiver operating characteristic curve of $\text{PaO}_2:\text{FiO}_2$ ratio in predicting Day 90 mortality,



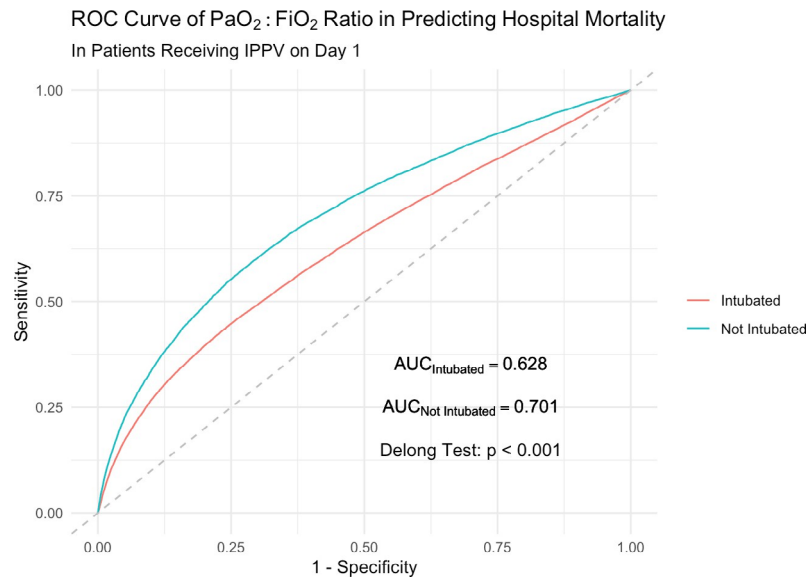
ROC - receiver operating characteristic; AUC - area under the curve.

Figure 8S - Receiver operating characteristic curve of PaO₂:FiO₂ ratio in predicting Day 180 mortality.



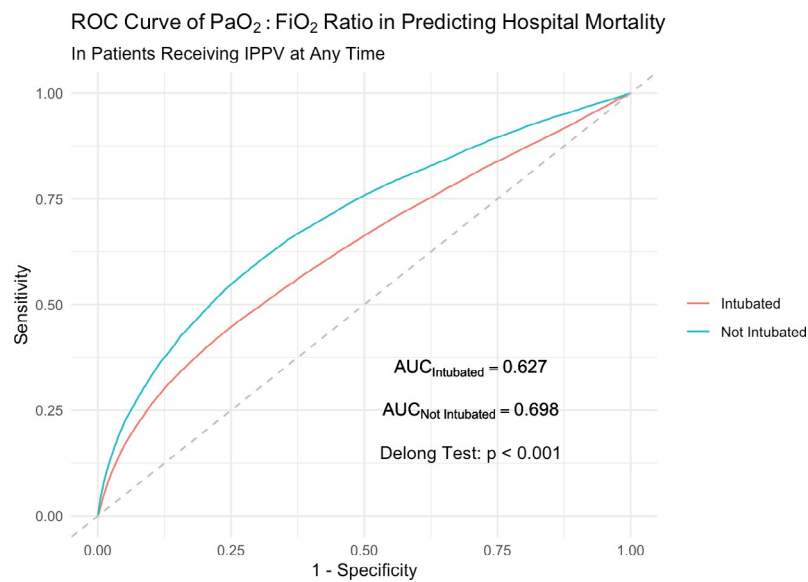
ROC - receiver operating characteristic; AUC - area under the curve.

Figure 9S - Receiver operating characteristic curve of PaO₂:FiO₂ ratio in predicting 1-year mortality.



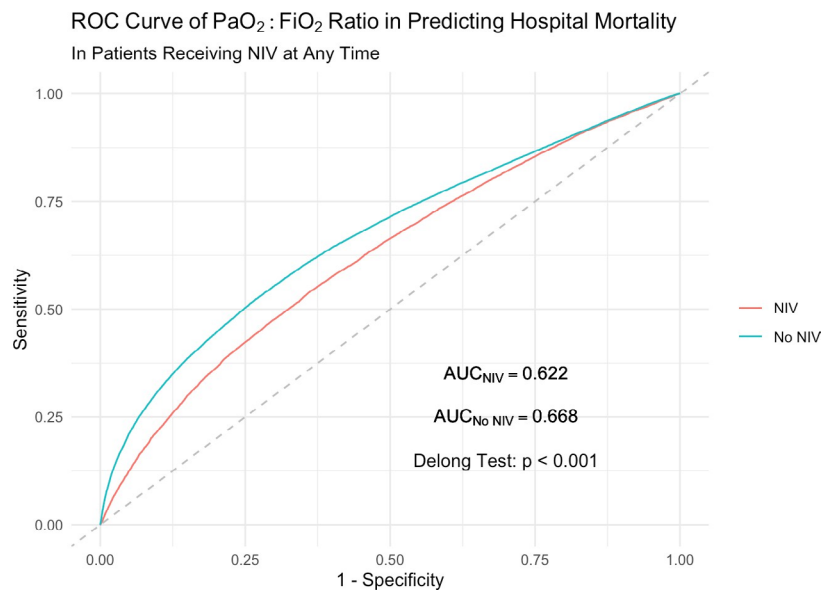
ROC - receiver operating characteristic; IPPV - invasive positive pressure ventilation; AUC - area under the curve.

Figure 10S - Receiver operating characteristic curve of $\text{PaO}_2:\text{FiO}_2$ ratio in predicting hospital mortality by day 1 intubation status.



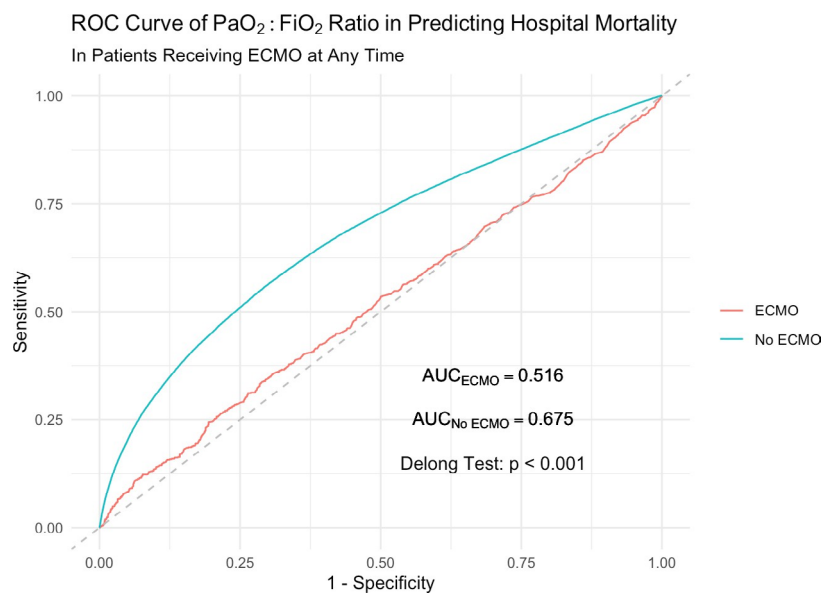
ROC - receiver operating characteristic; IPPV - invasive positive pressure ventilation; AUC - area under the curve.

Figure 11S - Receiver operating characteristic curve of $\text{PaO}_2:\text{FiO}_2$ ratio in predicting hospital mortality by intubation status.



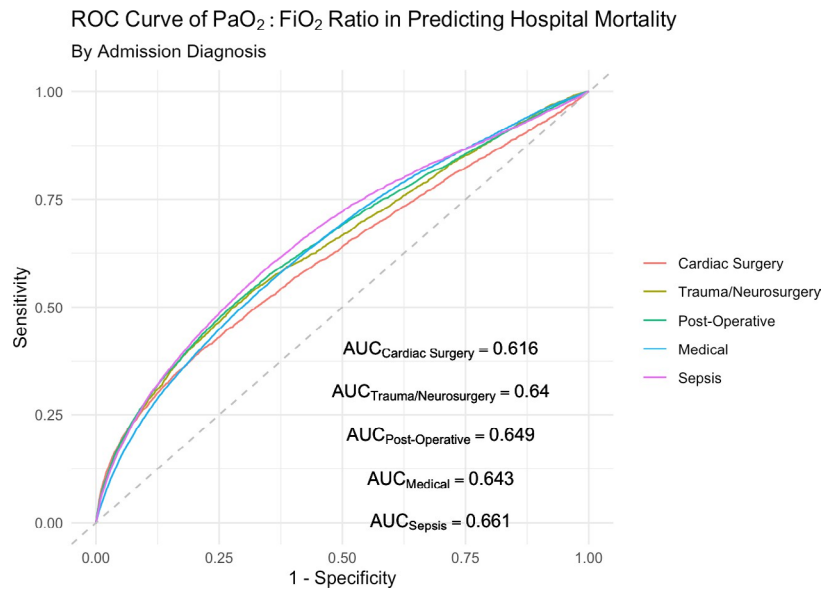
ROC - receiver operating characteristic; NIV – noninvasive ventilation; AUC - area under the curve.

Figure 12S - Receiver operating characteristic curve of $\text{PaO}_2 : \text{FiO}_2$ ratio in predicting hospital mortality by requirement for non-invasive ventilation.



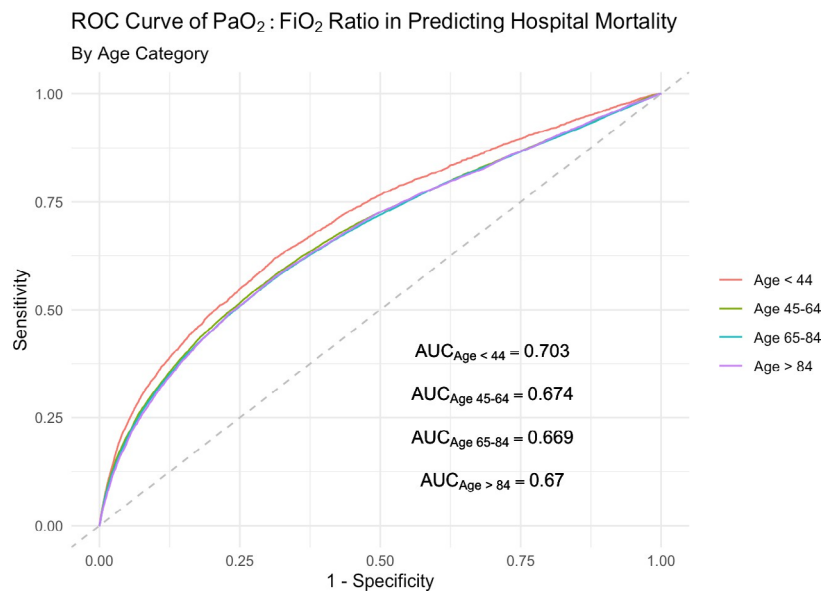
ROC - receiver operating characteristic; ECMO - extracorporeal membrane oxygenation; AUC - area under the curve.

Figure 13S - Receiver operating characteristic curve of $\text{PaO}_2 : \text{FiO}_2$ ratio in predicting hospital mortality by requirement for extracorporeal membrane oxygenation.



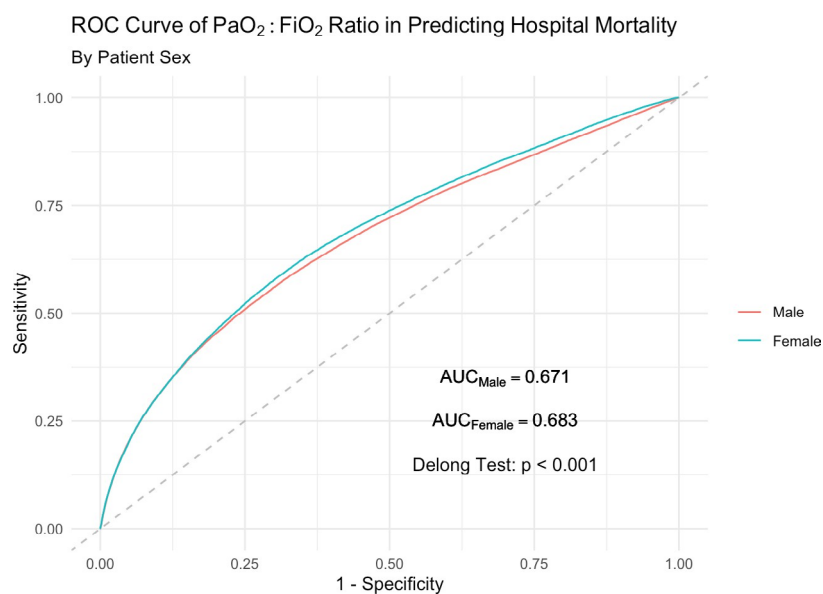
ROC - receiver operating characteristic; AUC - area under the curve.

Figure 14S - Receiver operating characteristic curve of $\text{PaO}_2:\text{FiO}_2$ ratio in predicting hospital mortality by admission diagnostic category.



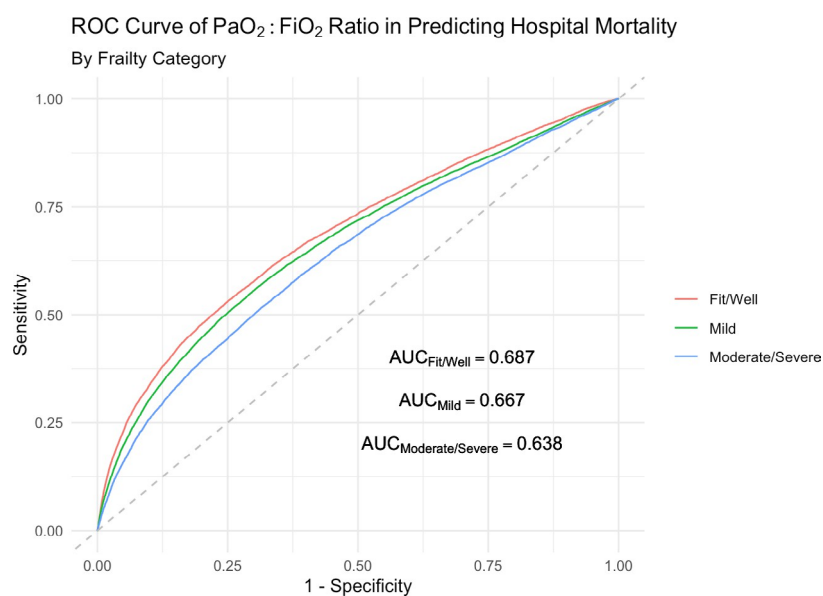
ROC - receiver operating characteristic; AUC - area under the curve.

Figure 15S - Receiver operating characteristic curve of $\text{PaO}_2:\text{FiO}_2$ ratio in predicting hospital mortality by age group.



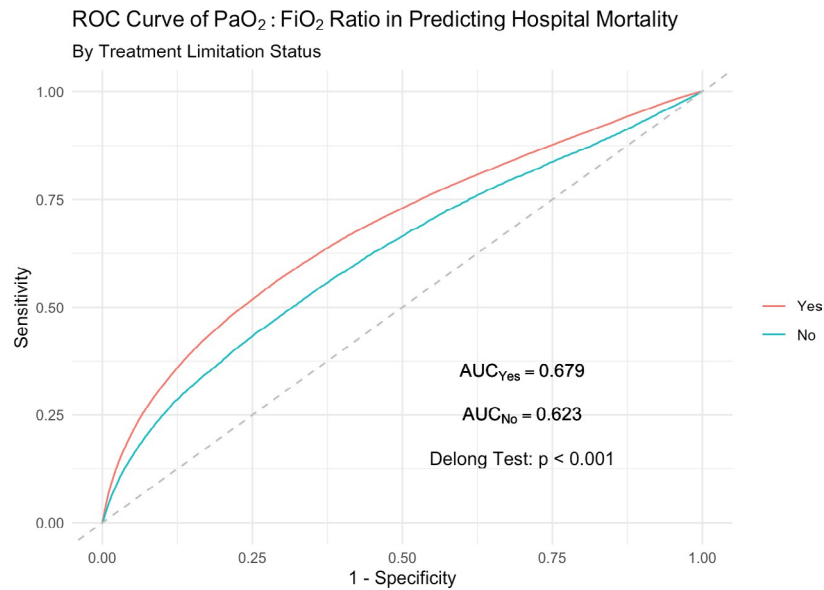
ROC - receiver operating characteristic; AUC - area under the curve.

Figure 16S - Receiver operating characteristic curve of PaO₂:FiO₂ ratio in predicting hospital mortality by sex.



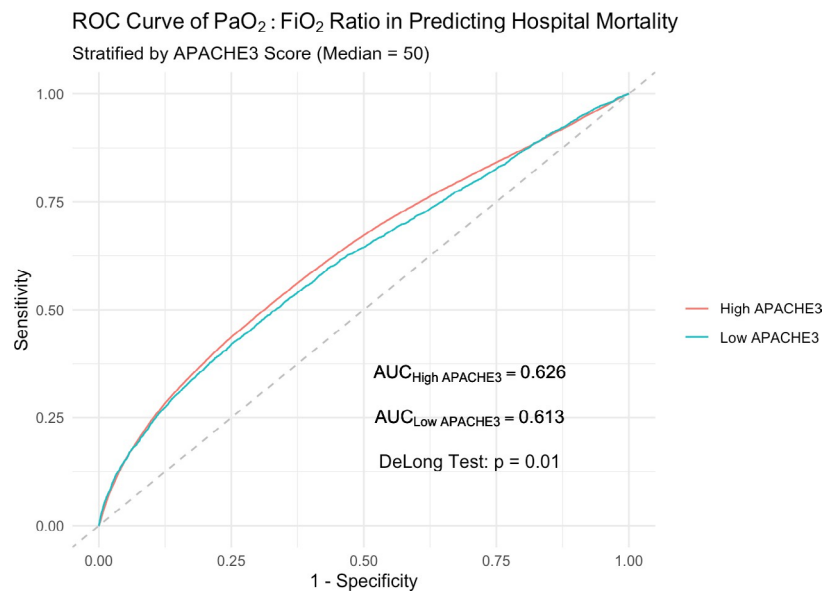
ROC - receiver operating characteristic; AUC - area under the curve.

Figure 17S - Receiver operating characteristic curve of PaO₂:FiO₂ ratio in predicting hospital mortality by frailty category.



ROC - receiver operating characteristic; AUC - area under the curve.

Figure 18S - Receiver operating characteristic curve of $\text{PaO}_2:\text{FiO}_2$ ratio in predicting hospital mortality by treatment limitations status.



ROC - receiver operating characteristic; APACHE - Acute Physiology and Chronic Health; AUC - area under the curve.

Figure 19S - Receiver operating characteristic curve of $\text{PaO}_2:\text{FiO}_2$ ratio in predicting hospital mortality by APACHE-3 score.