

Supplementary Online Content

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eTable 1. Characteristics of Study Cohort (n =137) Compared With Those Who Were Excluded (n=62)

eTable 2. Fitted Regression Models and Covariates for the Factors Associated With Agreement Between PaCO₂ and EtCO₂

eTable 3. Positive Predictive Values, Negative Predictive Values, Sensitivity and Specificity by Using PaCO₂-EtCO₂ Difference in PICU Day 1 and Its Association With Subsequent Pediatric Acute Respiratory Distress Syndrome (PARDS) Development Between 1-7 days After PICU Admission

eFigure 1. Example Sampling of PaCO₂, EtCO₂ and Systolic Blood Pressure (SBP)

eFigure 2. Histogram of the Number of PaCO₂-EtCO₂ Pairs Per Patient

eFigure 3. Passing and Bablok Regression Plot of PaCO₂ and EtCO₂

eFigure 4. Deming Regression Plot of PaCO₂ and EtCO₂

eFigure 5. Bland-Altman Plots of PaCO₂ and EtCO₂ Stratified by Age in Years

eFigure 6. Side-by-Side Boxplots of PaCO₂-EtCO₂ Differences Stratified by Patient

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Characteristics of Study Cohort (n =137) Compared With Those Who Were Excluded (n=62)

	Study Cohort	Excluded
n	137	62
Age (yr), n (%)		
< 1	8 (5.8)	11 (17.7)
1 - 4	32 (23.4)	13 (21.0)
5 - 9	21 (15.3)	6 (9.7)
10 - 14	15 (10.9)	9 (14.5)
15 - 18	61 (44.5)	23 (37.1)
Male sex, n (%)	103 (75.2)	38 (61.3)
Mechanism, n (%)		
Motor vehicle crash	46 (33.6)	20 (32.3)
Fall	30 (21.9)	19 (30.6)
Struck by vehicle	31 (22.6)	10 (16.1)
Abusive TBI	7 (5.1)	8 (12.9)
Sport/recreation	11 (8.0)	4 (6.5)
Gunshot	12 (8.8)	0 (0.0)
Other	0 (0.0)	1 (1.6)
Head Abbreviated Injury Scale (AIS), median (IQR)	5.00 [4.00, 5.00]	4.00 [4.00, 5.00]
Chest Abbreviated Injury Scale (AIS), median (IQR)	3.00 [2.00, 3.00]	3.00 [2.00, 3.00]
Injury Severity Score (ISS), median (IQR)	30.00 [25.00, 38.00]	26.00 [17.00, 33.00]
Polytrauma, n (%)	67 (48.9)	19 (30.6)
ED admit Glasgow Coma Scale score, median (IQR)	3.00 [3.00, 6.00]	3.00 [3.00, 6.00]
ED Glasgow Coma Scale (motor), median (IQR)	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]
PICU admit Glasgow Coma Scale score, median (IQR)	6.50 [3.00, 8.00]	10.00 [8.00, 13.00]
Discharge Glasgow Coma Scale score (motor), median (IQR)	6.00 [6.00, 6.00]	6.00 [6.00, 6.00]
Any surgery, n (%)	74 (54.0)	48 (77.4)
Craniotomy, n (%)	46 (33.6)	10 (16.1)
Intracranial pressure monitoring, n (%)	62 (45.3)	10 (16.1)
Experienced brain herniation, n (%)	63 (46.0)	15 (24.2)
Discharge survival, n(%)	103 (75.2)	57 (91.9)
TBI = Traumatic Brain Injury, GCS = Glasgow Coma Score, ED = Emergency Department		

eTable 2. Fitted Regression Models and Covariates for the Factors Associated With Agreement Between PaCO₂ and EtCO₂

Covariates for OR of PARDS within 24 hours of PICU admission, head injury severity, chest injury severity, maximum non-head non-chest injury severity

	Estimate	Lower Limit	Upper Limit
Intercept	0.335426	0.060519	1.859078
PARDS within 24 hours of PICU admission	0.199728	0.078236	0.509883
PaCO ₂ -EtCO ₂ pair during hypotension	1.118286	0.571751	2.187255
severe chest injury	1.434578	0.809199	2.543272
1 – 4 years of age	1.466849	0.447627	4.806787
5 – 9 years of age	1.097218	0.30676	3.924523
10 – 14 years of age	1.789781	0.504194	6.353345
15 – 18 years of age	1.593966	0.513088	4.951838
severe head injury	1.494089	0.415851	5.368037
severe non head, non chest injury	1.14226	0.660425	1.975633

Covariates for OR of PARDS 1 – 7 days after PICU admission

	Estimate	Lower Limit	Upper Limit
Intercept	0.238089	0.02787	2.033937
PARDS 1-7 days after PICU admission	1.224181	0.611668	2.450055
PaCO ₂ -EtCO ₂ pair during hypotension	1.228887	0.578263	2.611549
severe chest injury	1.579863	0.831677	3.001127
1 – 4 years of age	1.347879	0.41099	4.420489
5 – 9 years of age	1.172141	0.321375	4.275111
10 – 14 years of age	2.093238	0.584019	7.502574
15 – 18 years of age	1.607609	0.51561	5.012333
severe head injury	1.967799	0.3209	12.06681
severe non head, non chest injury	1.068462	0.606541	1.882167

Covariates for OR of Hypotension status of PaCO₂-EtCO₂ pair with fixed effect

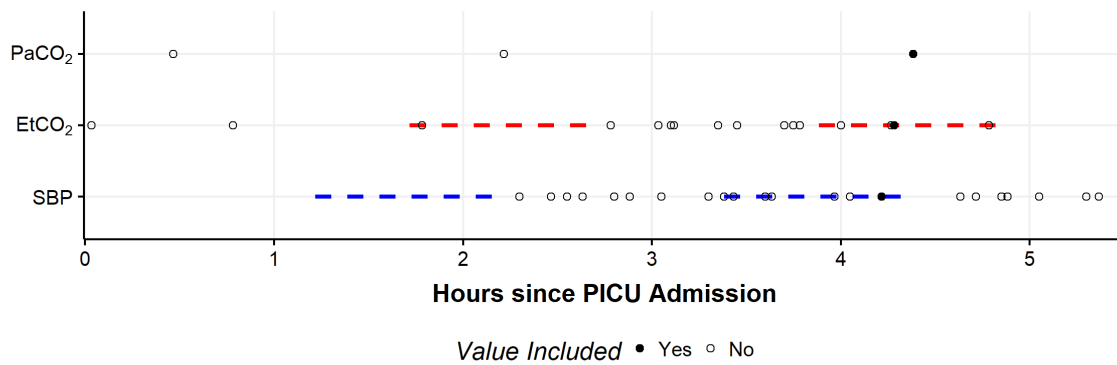
	Estimate	Lower Limit	Upper Limit
PaCO ₂ -EtCO ₂ pair during hypotension	0.675	0.3024	1.507

eTable 3. Positive Predictive Values, Negative Predictive Values, Sensitivity and Specificity by Using PaCO₂-EtCO₂ Difference in PICU Day 1 and Its Association With Subsequent Pediatric Acute Respiratory Distress Syndrome (PARDS) Development Between 1-7 days After PICU Admission

Paired data points for this table were from patients who had not developed PARDS within the first 24 hours.

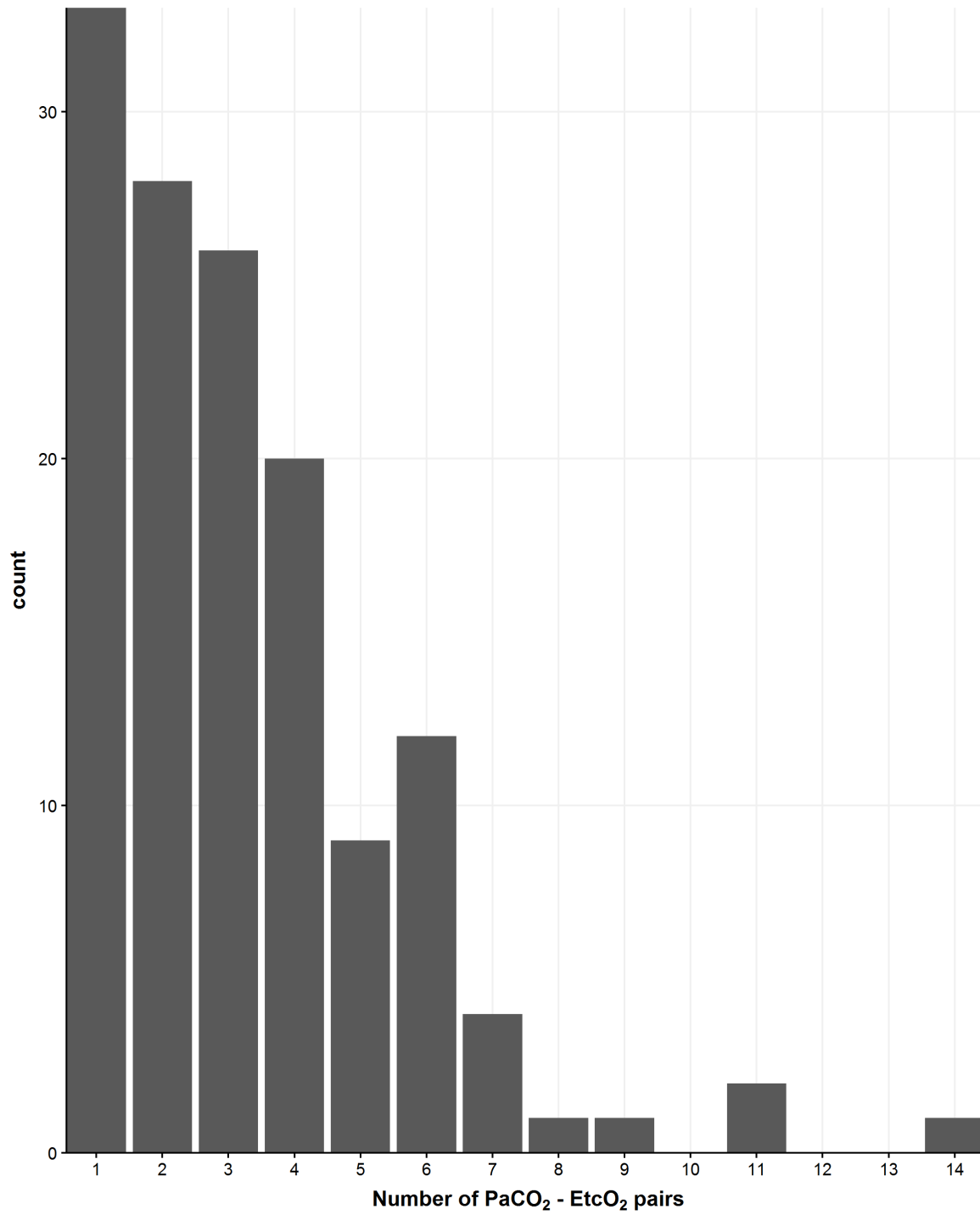
PaCO₂ – EtCO₂ difference cutoff (mmHg)	TP / FP / FN / TN	PPV	NPV	Sensitivity	Specificity
≥1	76 / 129 / 16 / 157	0.37	0.91	0.83	0.55
≥2	71 / 96 / 21 / 190	0.43	0.90	0.77	0.66
≥3	66 / 80 / 26 / 206	0.45	0.89	0.72	0.72
≥4	55 / 53 / 37 / 233	0.51	0.86	0.60	0.81
≥5	40 / 34 / 52 / 252	0.54	0.83	0.43	0.88
≥6	34 / 26 / 58 / 260	0.57	0.82	0.37	0.91
≥7	29 / 18 / 63 / 268	0.62	0.81	0.32	0.94
≥8	19 / 14 / 73 / 272	0.58	0.79	0.21	0.95
≥9	15 / 11 / 77 / 275	0.58	0.78	0.16	0.95
≥10	7 / 10 / 85 / 276	0.41	0.76	0.08	0.97
TP = true positive, FP = false positive, FN = false negative, TN = true negative, PPV = positive predictive value, NPV = negative predictive value					

eFigure 1. Example Sampling of PaCO₂, EtCO₂ and Systolic Blood Pressure (SBP)



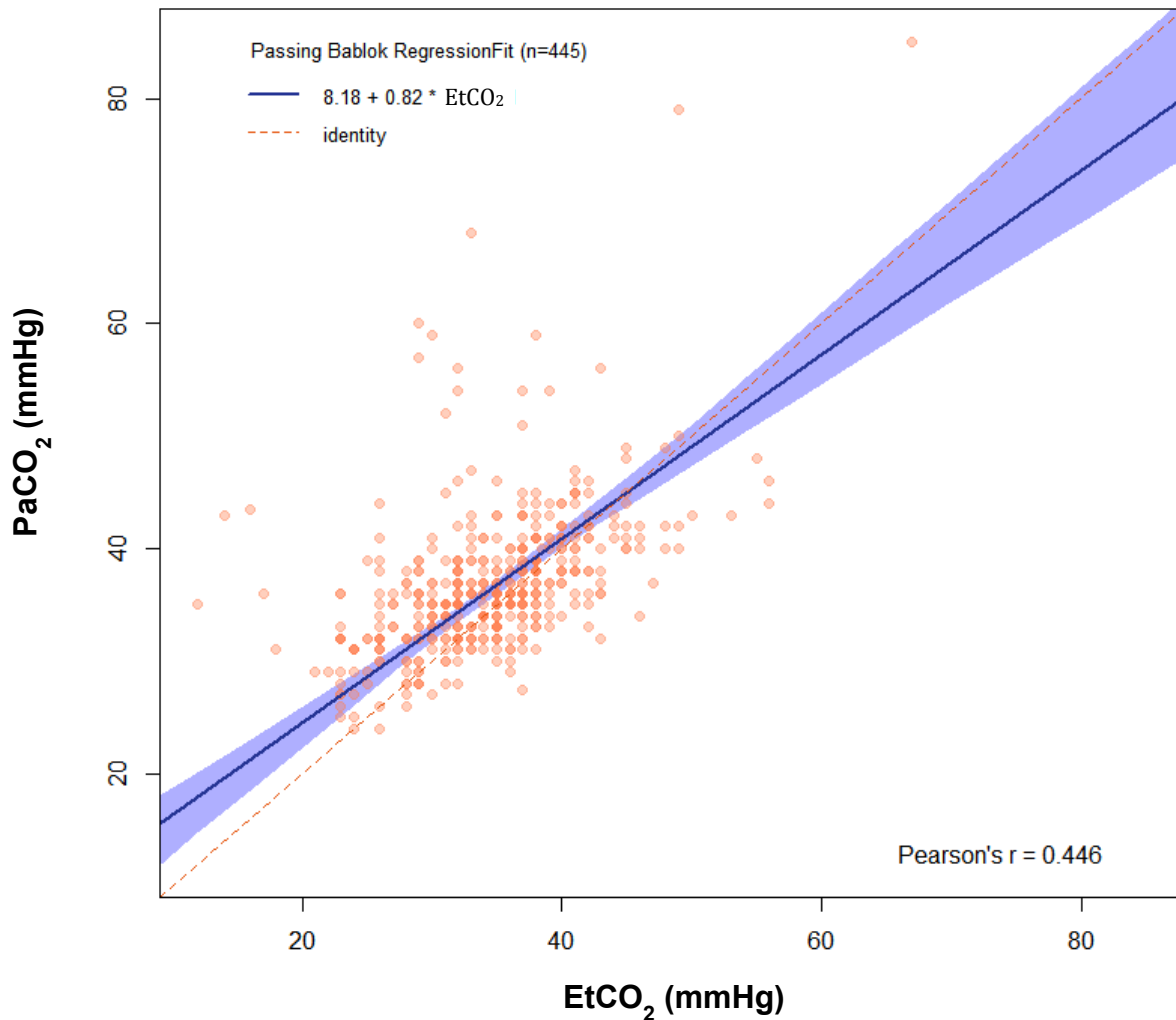
Plot shows all PaCO₂ (n = 3), EtCO₂ (n = 31) and systolic blood pressure values (n = 30) for one patient during the first 5 hours of PICU admission. PaCO₂ was aligned to the most proximally recorded EtCO₂ within 30 minutes before or after the time of blood draw (example ranges highlighted in red). PaCO₂ was aligned to the most proximally recorded SBP value 0 to 60 minutes prior to the time of blood draw (example ranges highlighted in blue). PaCO₂ values that were not able to be paired with both an EtCO₂ value and an SBP value were not included in final analysis. In this example, two PaCO₂ values were discarded (unfilled circles) as they were unable to be paired with a SBP value. In our study, of the 62 patients who were excluded, 25 patients lacked a recorded EtCO₂ value, 17 patients lacked an EtCO₂ recorded within 30 minutes of a PaCO₂ value, and 20 patients lacked SBP data within 60 minutes prior to a PaCO₂ value.

eFigure 2. Histogram of the Number of PaCO₂-EtCO₂ Pairs Per Patient



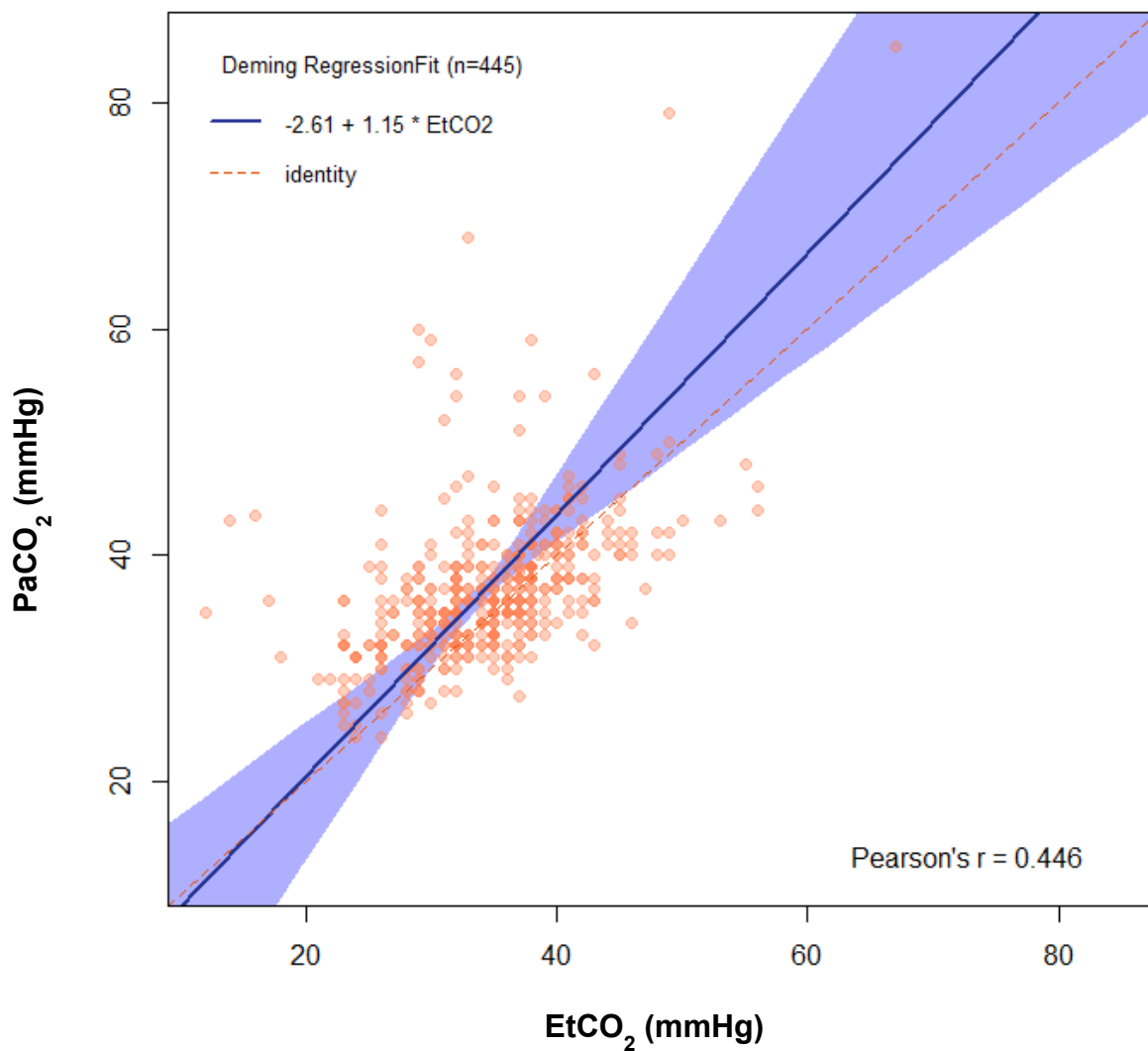
Data represents 445 PaCO₂-EtCO₂ pairs for 137 patients.

eFigure 3. Passing and Bablok Regression Plot of PaCO₂ and EtCO₂



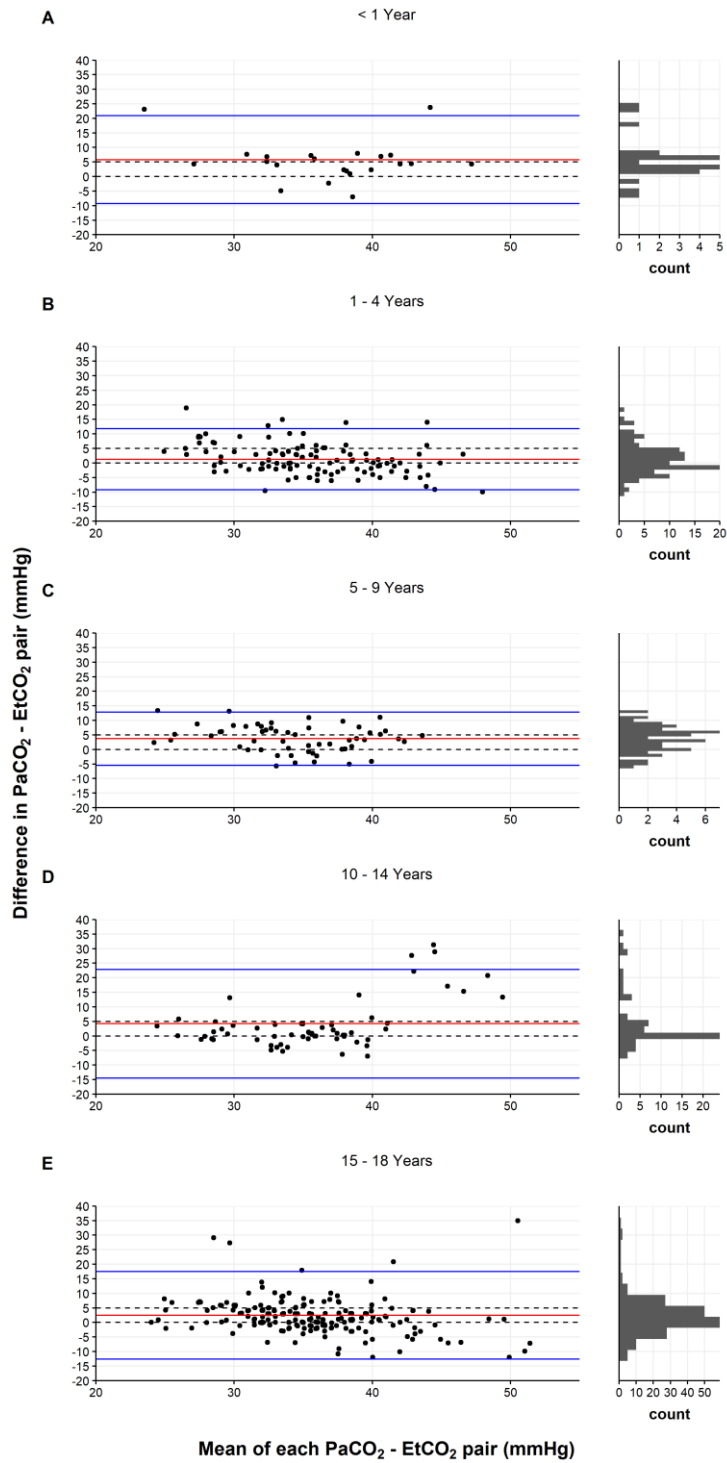
Red dots represent the 445 PaCO₂ - EtCO₂ pairs for 137 unique patients. Blue line represents the fitted Passing and Bablok regression line. Red dotted line indicates a theoretical fitted Passing and Bablok line with no absolute constant difference between measures (intercept of zero), and no proportional difference between measures (slope of one). EtCO₂ demonstrated the highest degree of interchangeability with PaCO₂ at 45.44mmHg; with a proportional difference of 0.81mmHg (95% CI 0.72 – 1.00) of PaCO₂ per 1mmHg of EtCO₂.

eFigure 4. Deming Regression Plot of PaCO₂ and EtCO₂



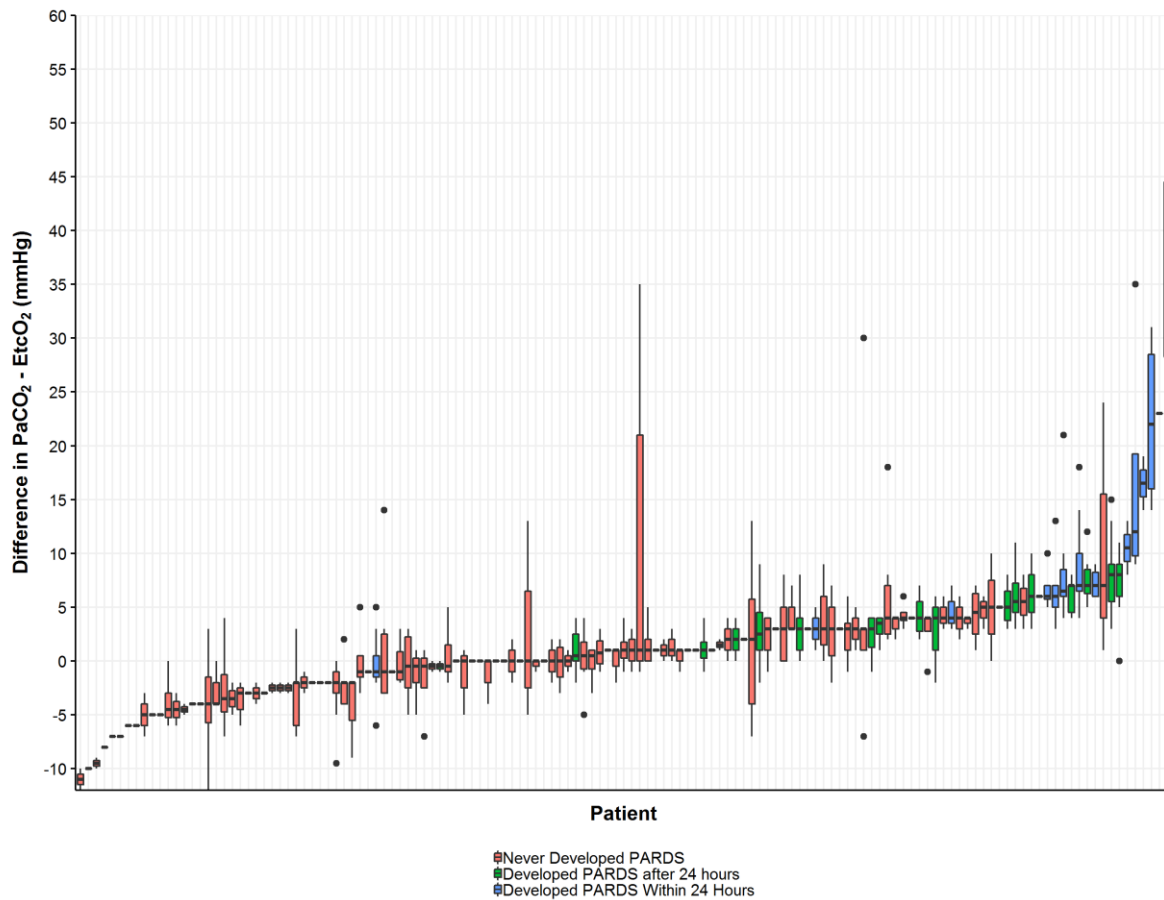
Red dots represent the 445 PaCO₂ - EtCO₂ pairs for 137 unique patients. Blue line represents the Deming regression line. Red dotted line indicates a theoretical fitted Deming line with no absolute constant difference between measures (intercept of zero), and no proportional difference between measures (slope of one).

eFigure 5. Bland-Altman Plots of PaCO₂ and EtCO₂ Stratified by Age in Years



Bias (average PaCO₂-EtCO₂ difference) is represented by the red line. The limits of agreement are represented by the blue lines and adjusted for repeated measures. *A priori* limits of acceptable agreement are represented by the dashed lines. Corresponding marginal histograms describe distribution of values between pairs. 5A contains 23 paired PaCO₂-EtCO₂ pairs for 8 patients, 9 (39%) of these pairs had EtCO₂ values within 5mmHg of paired PaCO₂. 5B contains 113 paired PaCO₂-EtCO₂ pairs for 32 patients, 44 (39%) of these pairs had EtCO₂ values within 5mmHg of paired PaCO₂. 5C contains 56 paired PaCO₂-EtCO₂ pairs for 21 patients, 19 (34%) of these pairs had EtCO₂ values within 5mmHg of paired PaCO₂. 5D contains 60 paired PaCO₂-EtCO₂ pairs for 15 patients, 29 (48%) of these pairs had EtCO₂ values within 5mmHg of paired PaCO₂. 5E contains 193 paired PaCO₂-EtCO₂ pairs for 61 patients, 86 (45%) of these pairs had EtCO₂ values within 5mmHg of paired PaCO₂.

Figure 6. Side-by-Side Boxplots of PaCO₂-EtCO₂ Differences Stratified by Patient



Plotted data represents all 445 PaCO₂-EtCO₂ pairs obtained within 24 hours of Pediatric Intensive Care Unit (PICU) admission for 137 PEGASUS program patients. Center horizontal line indicates median PaCO₂-EtCO₂ difference for each patient value. Top and bottom of the boxes represent 75th percentile and 25th percentile of PaCO₂-EtCO₂ difference for each patient, whiskers represent the median plus and minus 1.5 times the interquartile range. Circles represent all values beyond the median + 1.5 times the interquartile range. Colors represent the timing of Pediatric Acute Respiratory Distress Syndrome (PARDS) development, with those who never developed PARDS in red (n = 101, pairs = 286), those who developed PARDS after 24 hours from PICU admission (n = 22, pairs = 92), and those who developed PARDS within 24 hours from PICU admission (n = 14, pairs = 67).