



FATTORI PREDITTIVI DI OUTCOME NEGATIVO NELLA MALATTIA CRITICA DA COVID-19

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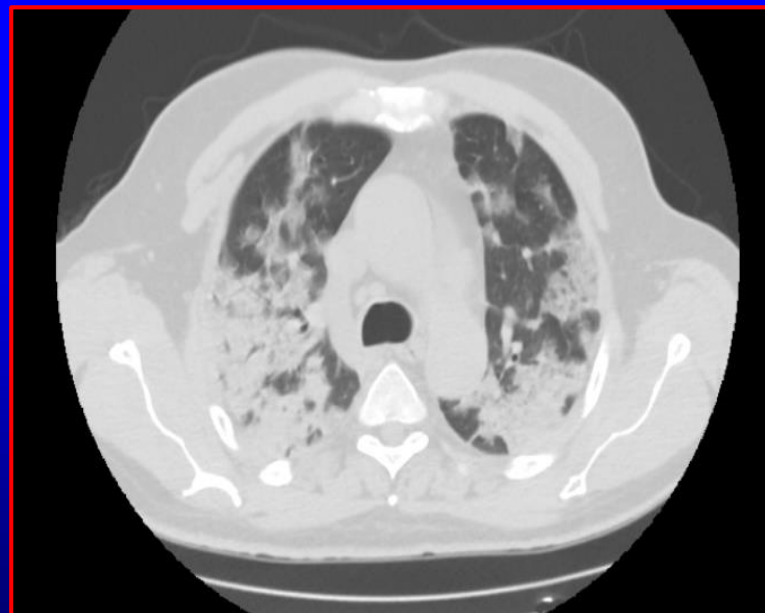
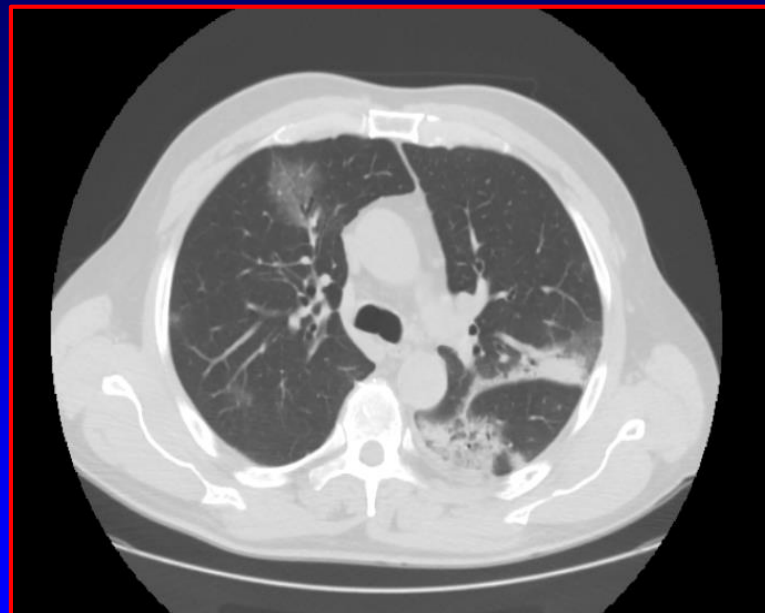
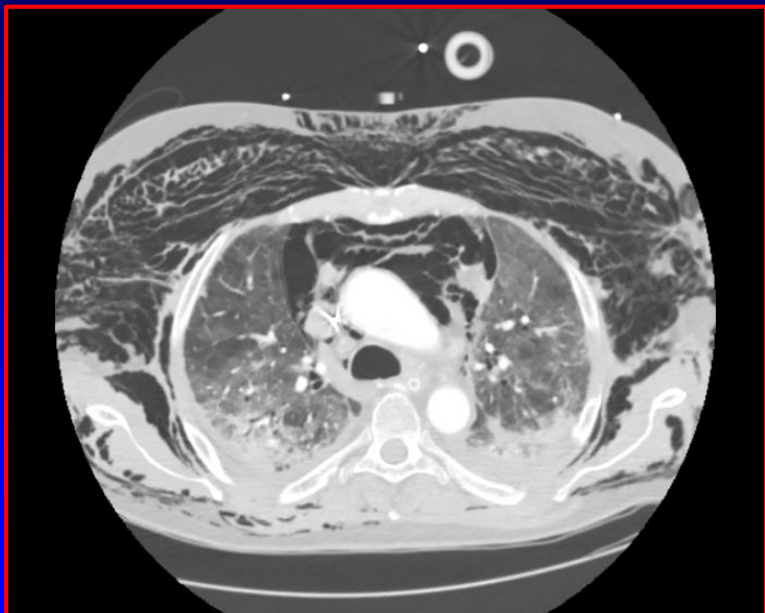


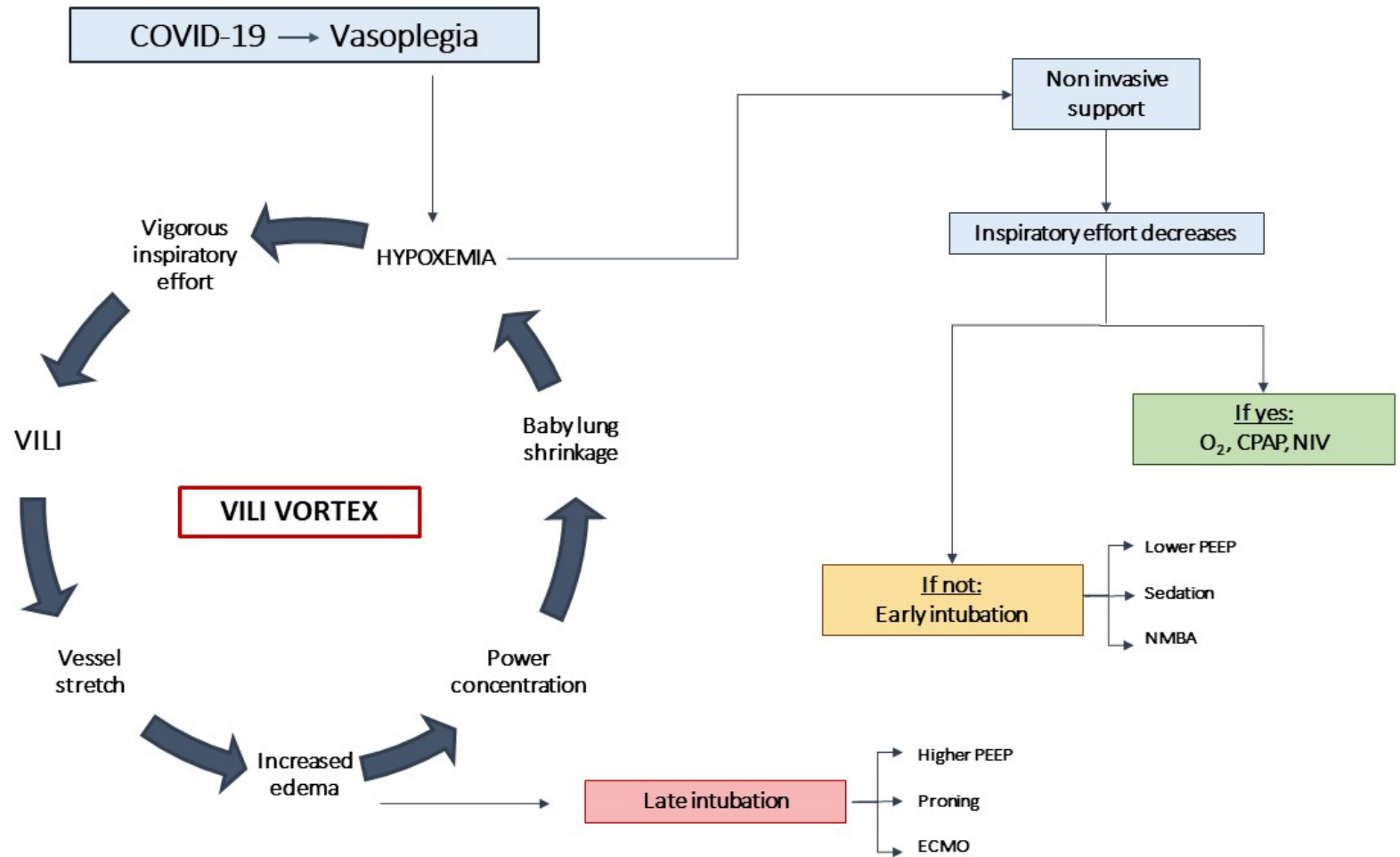
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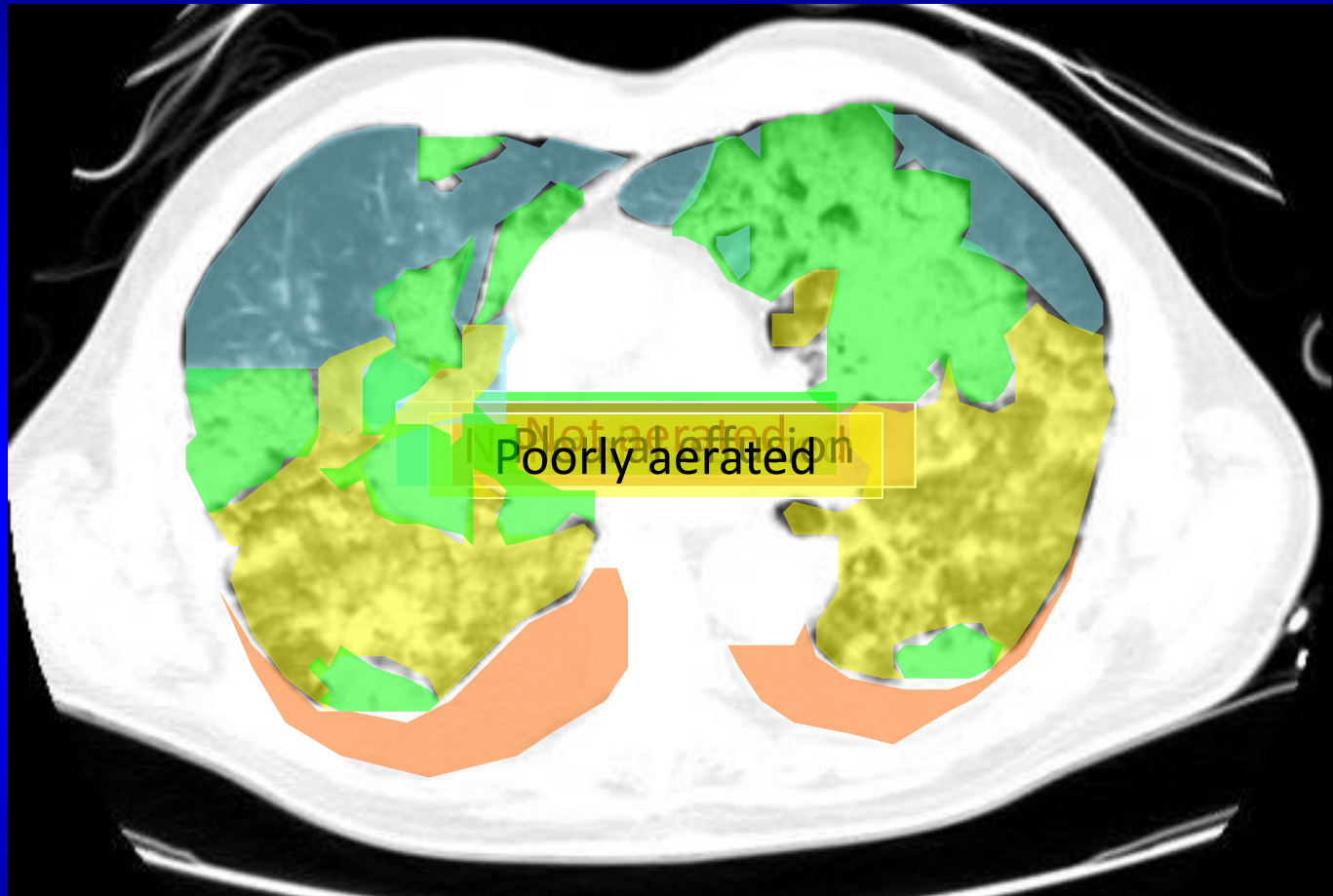


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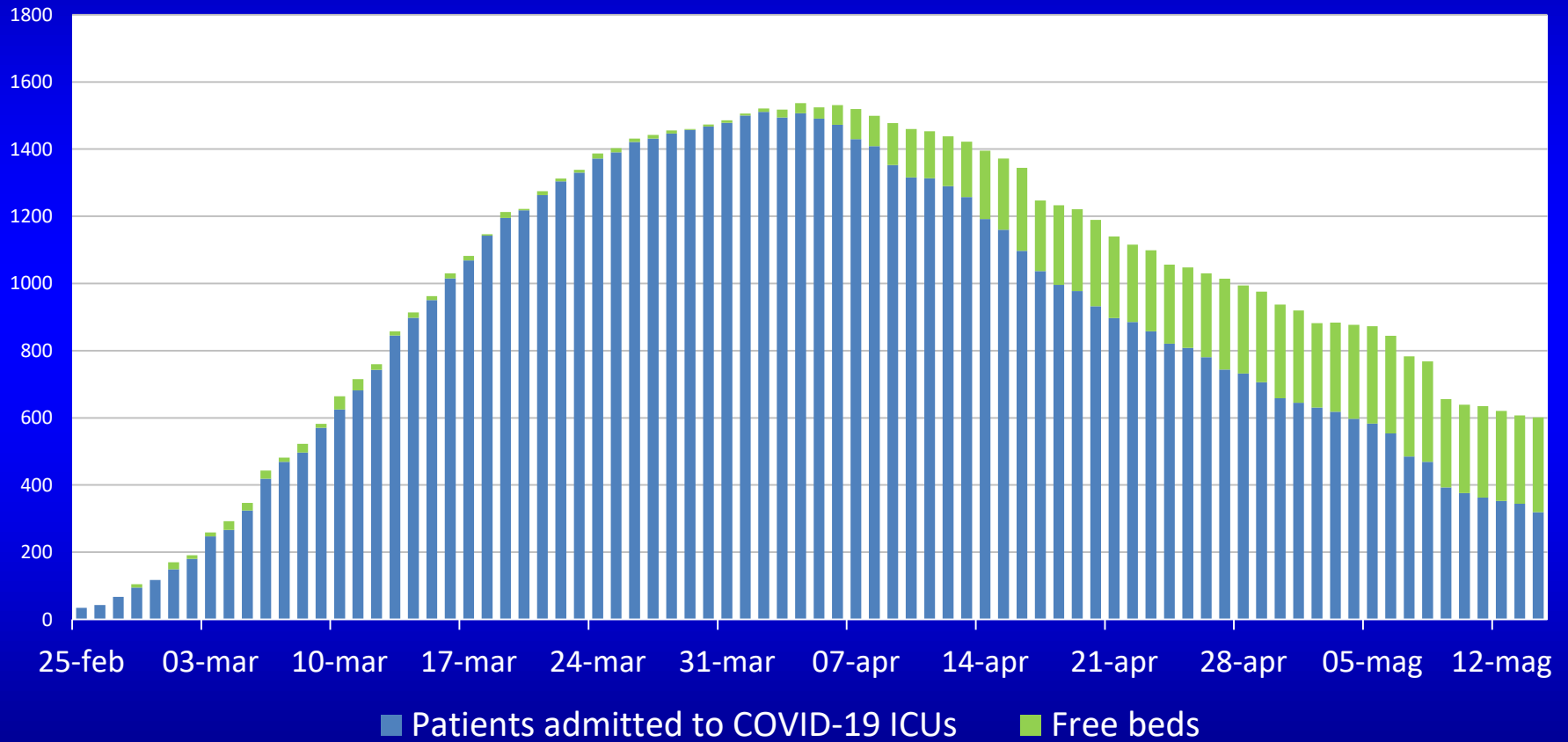
Intensive Care Medicine, 2020

Risk Factors Associated With Acute Respiratory Distress Syndrome and Death in Patients With Coronavirus Disease 2019 Pneumonia in Wuhan, China

Table 4. Bivariate Cox Regression of Factors Associated With ARDS Development or Progression From ARDS to Death

Patient characteristics and findings	ARDS		Death	
	HR (95% CI)	P value	HR (95% CI)	P value
Clinical characteristics				
Age (≥ 65 vs < 65), y	3.26 (2.08-5.11)	$< .001$	6.17 (3.26-11.67)	$< .001$
Highest patient temperature (≥ 39 °C vs < 39 °C)	1.77 (1.11-2.84)	.02	0.41 (0.21-0.82)	.01
Comorbidities				
Hypertension (yes vs no)	1.82 (1.13-2.95)	.01	1.70 (0.92-3.14)	.09
Diabetes (yes vs no)	2.34 (1.35-4.05)	.002	1.58 (0.80-3.13)	.19
Laboratory findings				
Hematologic				
Neutrophils, 10^9 /mL	1.14 (1.09-1.19)	$< .001$	1.08 (1.01-1.17)	.03
Biochemical				
Total bilirubin, mg/dL	1.05 (1.02-1.08)	.001	1.07 (1.02-1.12)	.003
Urea, mM	1.13 (1.09-1.18)	$< .001$	1.13 (1.06-1.20)	$< .001$
LDH, 100 U/L	1.61 (1.44-1.79)	$< .001$	1.30 (1.11-1.52)	.001
D-dimer, μ g/mL	1.03 (1.01-1.04)	$< .001$	1.02 (1.01-1.04)	.002

Patients admitted to COVID-19 ICUs



Baseline Characteristics and Outcomes of 1591 Patients Infected With SARS-CoV-2 Admitted to ICUs of the Lombardy Region, Italy

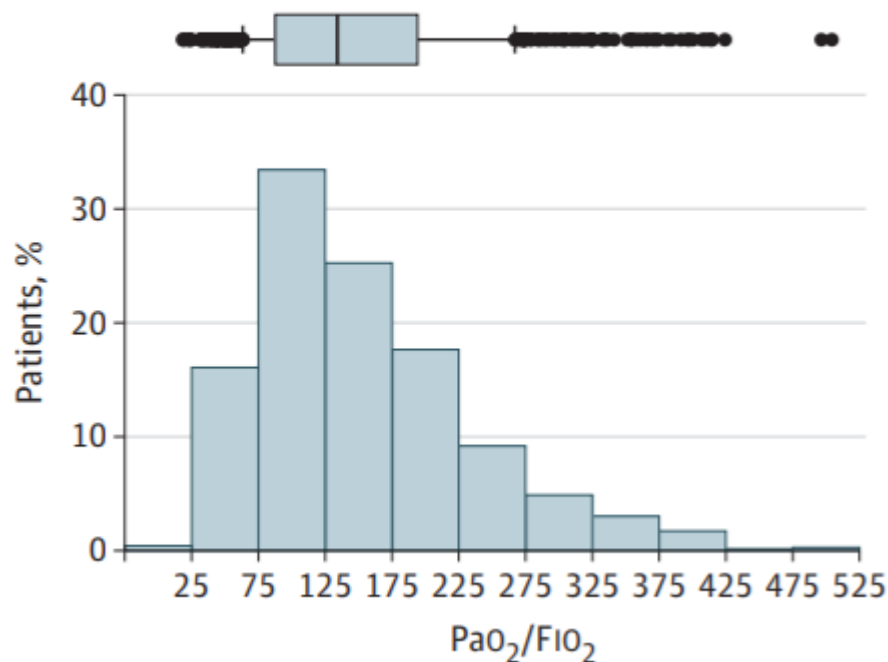
Giacomo Grasselli, MD; Alberto Zangrillo, MD; Alberto Zanella, MD; Massimo Antonelli, MD; Luca Cabrini, MD; Antonio Castelli, MD; Danilo Cereda, MD; Antonio Coluccello, MD; Giuseppe Foti, MD; Roberto Fumagalli, MD; Giorgio Iotti, MD; Nicola Latronico, MD; Luca Lorini, MD; Stefano Merler, MS; Giuseppe Natalini, MD; Alessandra Piatti, MD; Marco Vito Ranieri, MD; Anna Mara Scandroglio, MD; Enrico Storti, MD; Maurizio Cecconi, MD; Antonio Pesenti, MD; for the COVID-19 Lombardy ICU Network

Study population	No. (%)
Age, median (IQR), y	63 (56-70)
Males	1304 (82)
Comorbidities, N with data	1043
<i>Hypertension</i>	509 (49)
<i>Cardiovascular disease</i>	223 (21)
<i>Hypercholesterolemia</i>	188 (18)
<i>Diabetes type 2</i>	180 (17)
Respiratory support	1300
<i>Invasive mechanical ventilation</i>	1150 (88)
<i>Non invasive ventilation</i>	137 (11)
PEEP cmH₂O, median (IQR)	14 (12-16)
FiO₂ %, median (IQR)	70 (50-80)
PaO₂/FiO₂ ratio, median (IQR)	160 (114-220)
Prone position N/total (%)	240/875 (27)

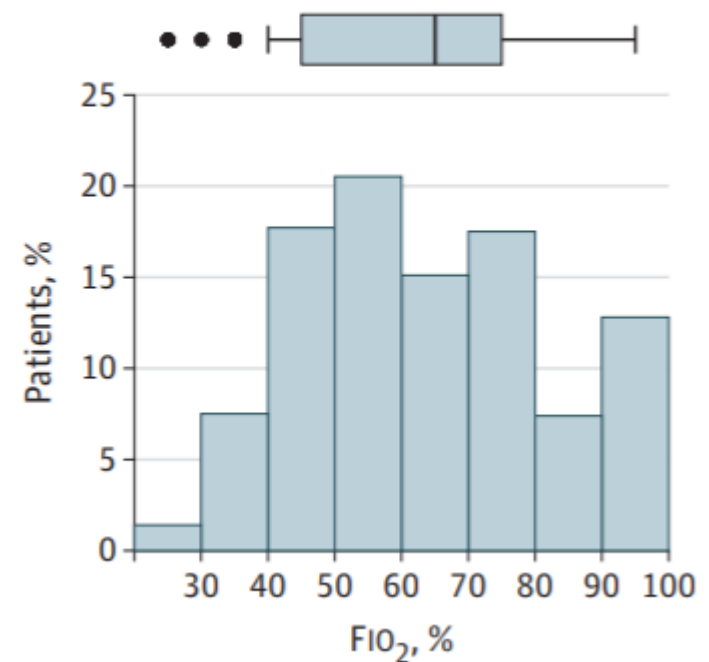
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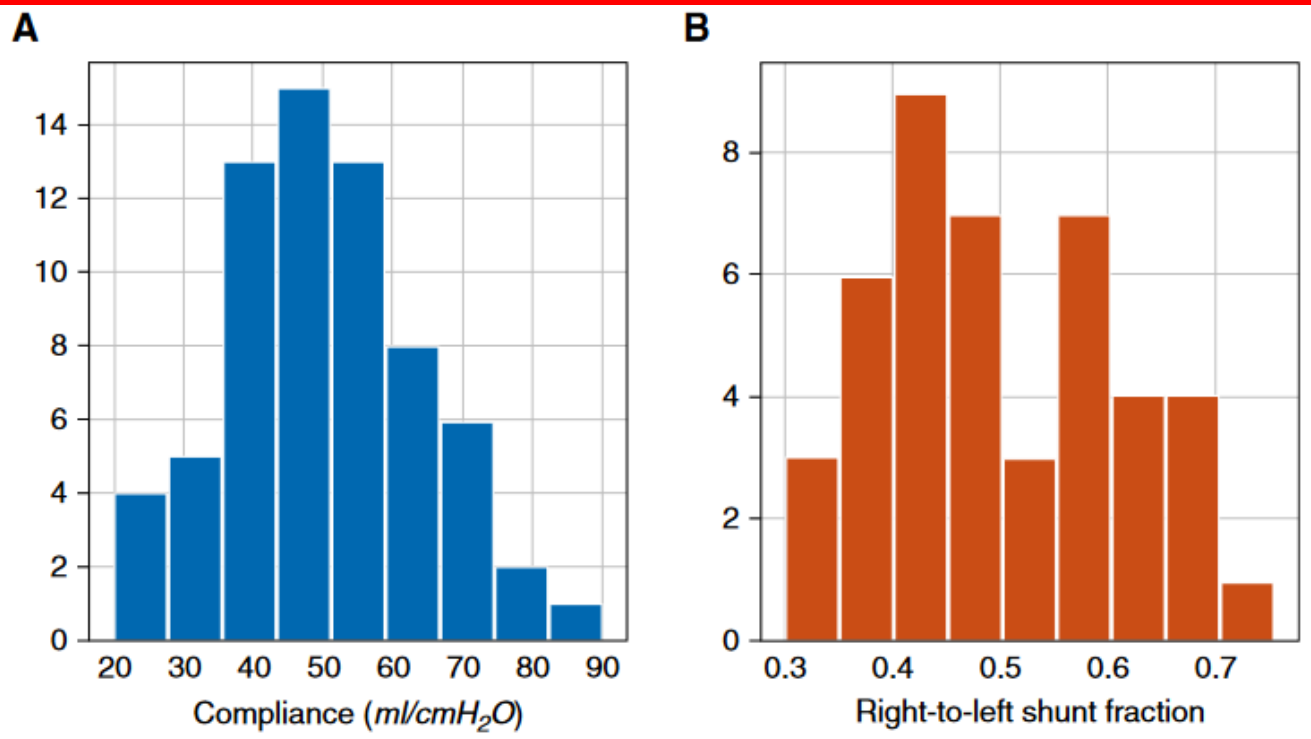
B $\text{PaO}_2/\text{FiO}_2$ ratio (n = 781)



C FiO_2 (n = 999)



COVID-19 Does Not Lead to a “Typical” Acute Respiratory Distress Syndrome

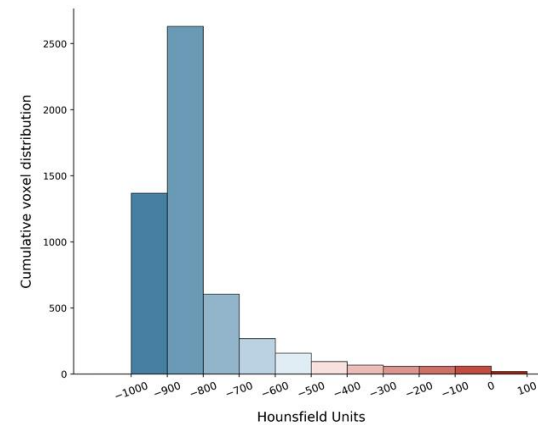


COVID-19 pneumonia: different respiratory treatments for different phenotypes?

A



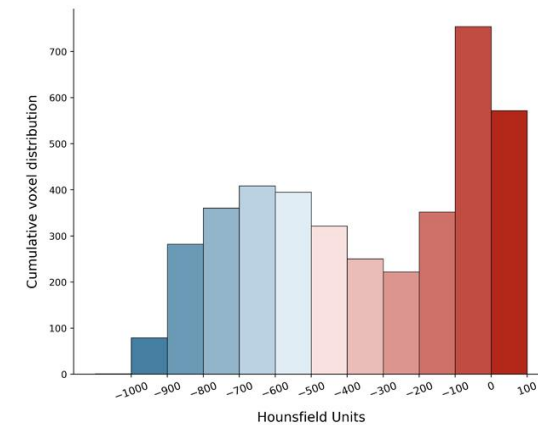
$\text{PaO}_2/\text{FiO}_2$
95 mmHg



B



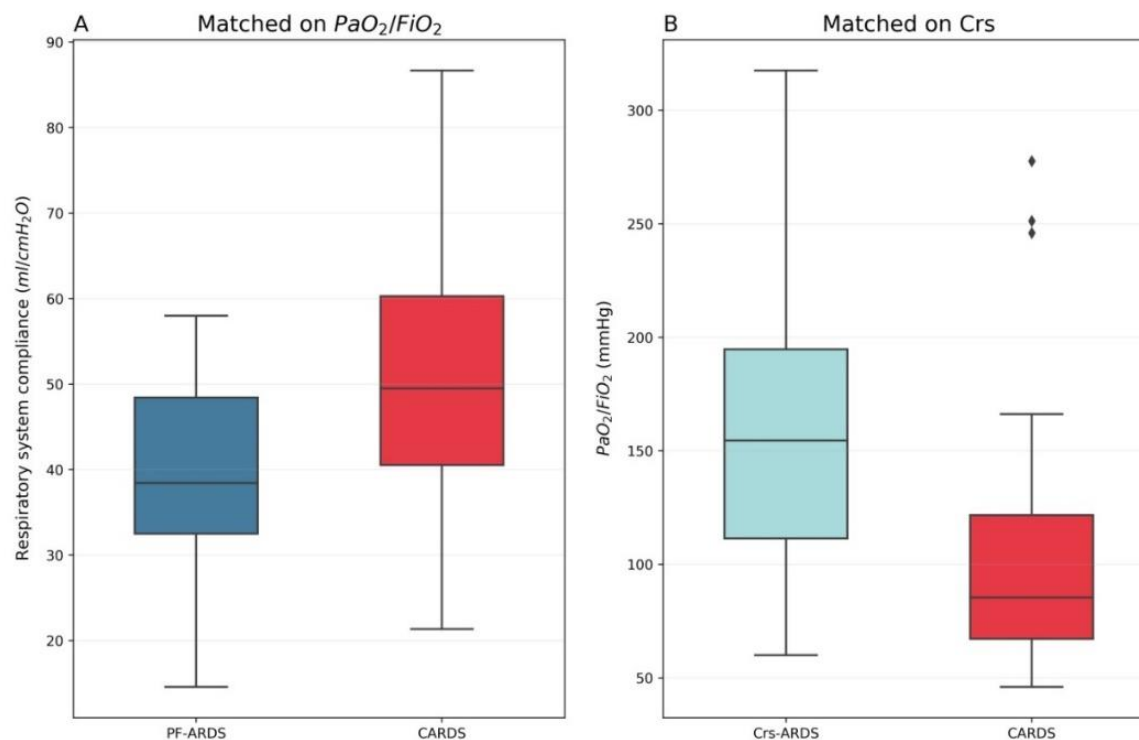
$\text{PaO}_2/\text{FiO}_2$
84 mmHg





Physiological and quantitative CT-scan characterization of COVID-19 and typical ARDS: a matched cohort study

Davide Chiumello¹, Mattia Busana², Silvia Coppola¹, Federica Romitti², Paolo Formenti¹, Matteo Bonifazi², Tommaso Pozzi¹, Maria Michela Palumbo², Massimo Cressoni³, Peter Herrmann², Konrad Meissner², Michael Quintel², Luigi Camporota⁴, John J. Marini⁵ and Luciano Gattinoni^{2*} 





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	PF-ARDS (n = 32)	p value	COVID-19 (n = 32)	p value	Crs-ARDS (n = 32)
Gas exchange					
FiO ₂	0.74 ± 0.22	0.66	0.72 ± 0.18	< 0.001*	0.51 ± 0.15
PaO ₂ /FiO ₂ (mmHg)	106.3 ± 59.4	0.99	106.5 ± 59.6	< 0.001*	160.0 ± 62.0
PaCO ₂ (mmHg)	50.9 ± 13.6	0.027*	44.7 ± 7.1	0.60	45.8 ± 9.9
Tidal volume (ml/kg IBW)	7.5 ± 1.6	0.52	7.7 ± 0.9	0.07	8.4 ± 1.9
Respiratory rate (bpm)	16.8 ± 3.9	0.014*	18.7 ± 2.0	< 0.001*	15.7 ± 3.6
Minute ventilation (l/min)	8.18 ± 2.21	0.002*	9.82 ± 1.85	0.001	8.30 ± 1.76



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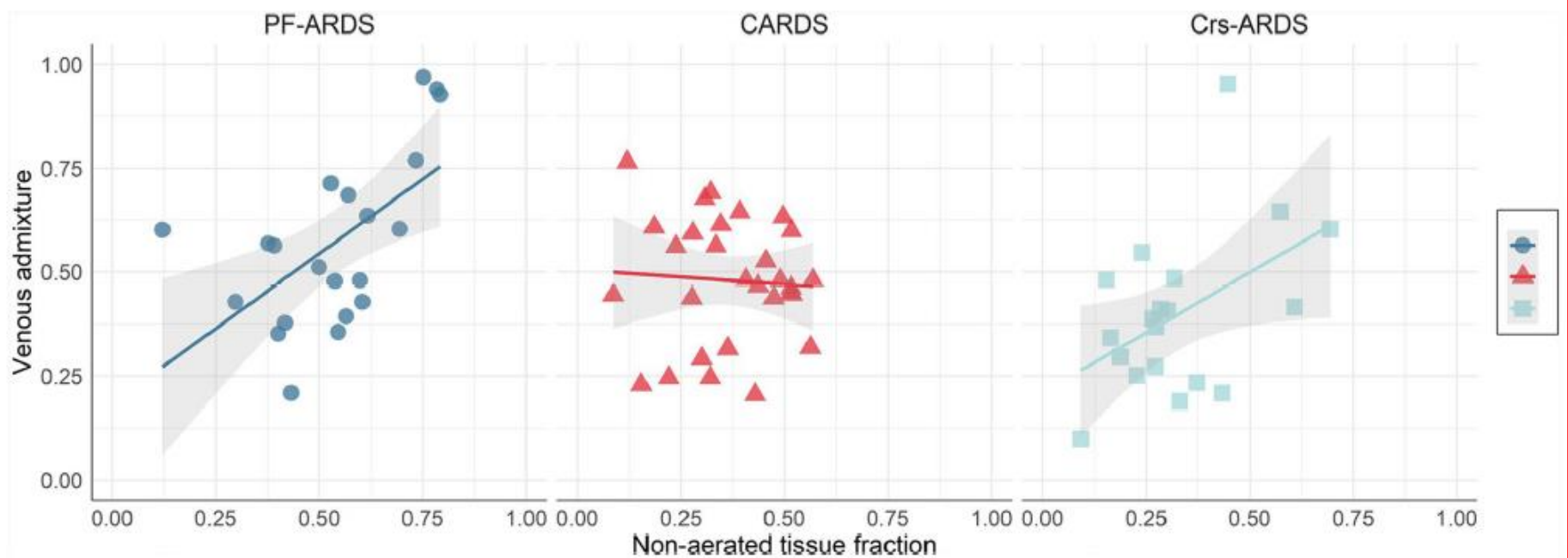
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CT scan	PF-ARDS (n = 32)	p value	COVID-19 (n = 32)	p value	Crs-ARDS (n = 32)
Lung weight (g)	1729 ± 705	0.35	1596 ± 385	0,12	1409 ± 538
Lung gas volume (ml)	930 ± 644	<0.001	1670 ± 791	0.043	1301 ± 627
Hyperinflated tissue (g)	2.85 ± 7.68	0.08	7.68 ± 13	0.47	4,80 ± 18,0
Normally aerated tissue (g)	287 ± 154	<0.001	475 ± 185	0.14	412 ± 150
Poorly aerated tissue (g)	479 ± 250	0.48	522 ± 196	0,07	426 ± 418
Non-aerated tissue (g)	960 ± 567	0.002	591 ± 293	0.8	566 ± 475



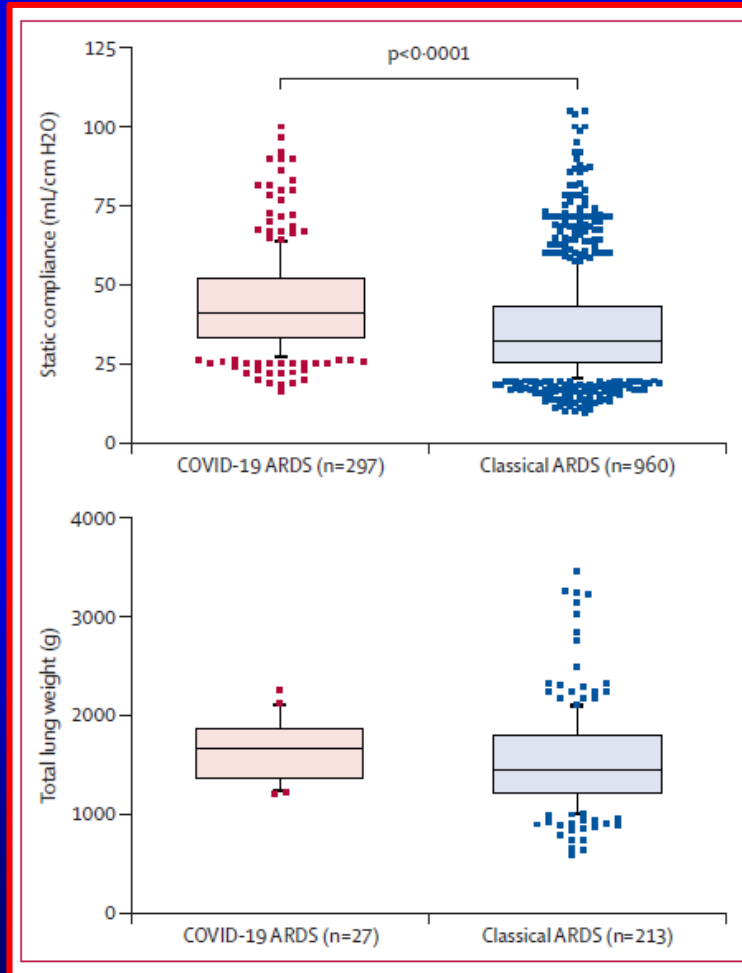
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Pathophysiology of COVID-19-associated acute respiratory distress syndrome: a multicentre prospective observational study

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Table S2. Values of compliance across the three classes of severity of ARDS

	N	Mild ARDS (P/F 300-200)	Moderate ARDS (P/F 200-100)	Severe ARDS (P/F < 100)
COVID-19 ARDS	297	43 (37-53)	42 (33-51)	40 (32-53)
“Classical” ARDS (References 5, 19)	960	37 (28-53)	32 (25-42) * •	28 (22-37) * # •
“Classical” ARDS – pneumonia subset (References 5, 19)	534	37 (27-50)	31 (25-42) § •	28 (22-39) * •

* p<0.0001 vs. Mild (same cohort)

p=0.005 vs. Moderate (same cohort)

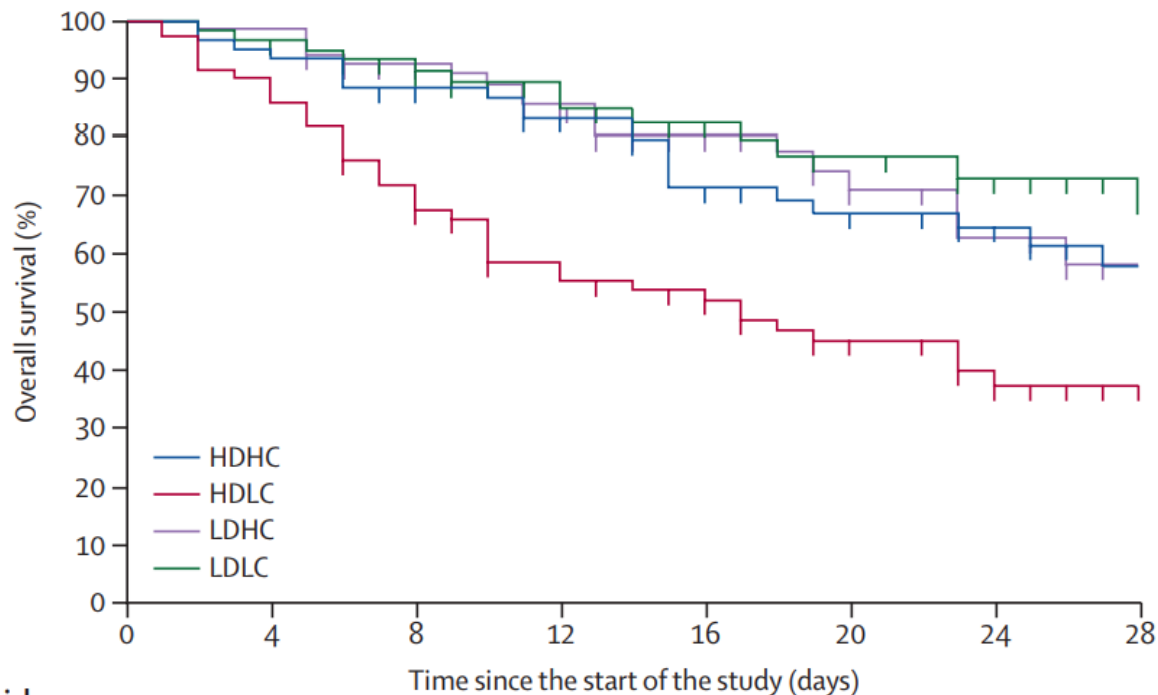
§ p=0.002 vs. Mild (same cohort)

n.s. between cohorts in mild class

• p<0.0001 vs. Covid-19

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Number at risk
(number censored)

HDHC	63 (2)	58 (1)	53 (3)	47 (6)	35 (3)	30 (4)	25 (7)	16 (6)
HDLC	71 (0)	64 (1)	50 (3)	38 (3)	32 (3)	24 (7)	15 (5)	9 (2)
LDHC	67 (0)	66 (4)	58 (7)	47 (8)	36 (12)	22 (4)	15 (3)	11 (11)
LDLC	60 (0)	58 (6)	50 (9)	39 (7)	29 (5)	22 (3)	18 (6)	12 (11)

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	Hazard ratio (95% CI)
Class	
High D-dimers, low compliance	1 (ref)
High D-dimers, high compliance	0.448 (0.230–0.873)
Low D-dimers, high compliance	0.420 (0.215–0.818)
Low D-dimers, low compliance	0.386 (0.152–0.985)
Sex	
Female	1 (ref)
Male	1.803 (0.679–4.788)
Age	1.048 (1.002–1.095)*
PaO ₂ /FiO ₂	0.996 (0.992–1.000)*

Clinical characteristics and day-90 outcomes of 4244 critically ill adults with COVID-19: a prospective cohort study

COVID-ICU Group on behalf of the REVA Network and the COVID-ICU Investigators*

	No.	All patients (<i>n</i> = 4244)	90-day status		<i>P</i> value
			Alive (<i>n</i> = 2946)	Death (<i>n</i> = 1298)	
Age, years,	4244	63 (54–71)	61 (52–69)	68 (59–74)	< 0.001
Body mass index, kg/m ²	3935	28 (25–32)	29 (26–32)	28 (25–32)	0.006
≥ 30 kg/m ²		1607 (41)	1167 (42)	440 (37)	0.004
SAPS II score	3935	37 (28–50)	34 (27–46)	44 (33–58)	< 0.001
SOFA score at ICU admission	3676	5 (3–8)	4 (3–8)	7 (4–10)	< 0.001
Treated hypertension	4197	2018 (48)	1310 (45)	708 (55)	< 0.001
Known diabetes	4196	1167 (28)	704 (24)	463 (36)	< 0.001
Immunodeficiency ^a	4192	314 (7)	178 (6)	136 (11)	< 0.001
Long-term corticosteroids ^b	4178	178 (4)	94 (3)	84 (7)	< 0.001
First symptoms to ICU admission, days	4007	9 (6–12)	9 (7–12)	8 (5–11)	< 0.001

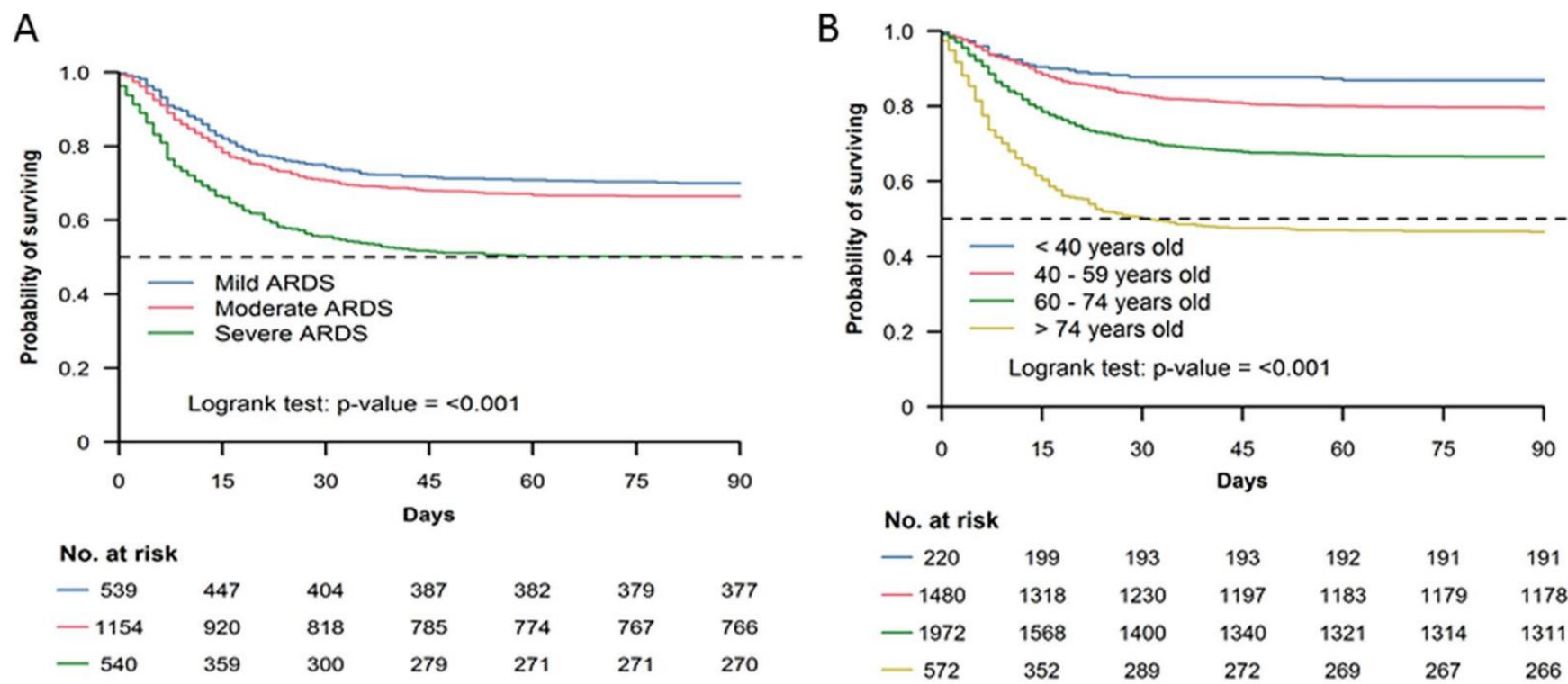
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			Alive (<i>n</i> = 2946)	Death (<i>n</i> = 1298)	
During the first 24 h in ICU ^b					
Standard oxygen therapy	4157	1219 (29)	927 (32)	292 (23)	< 0.001
High-flow oxygen	4096	786 (19)	584 (21)	202 (16)	< 0.001
Noninvasive ventilation	4109	230 (6)	134 (5)	96 (8)	< 0.001
pH	4003	7.41 (7.34–7.46)	7.43 (7.36–7.47)	7.38 (7.30–7.44)	< 0.001
PaCO ₂ , mmHg	4004	40 (35–46)	39 (35–45)	41 (35–49)	< 0.001
PaO ₂ /FiO ₂ ⁱ	3080	154 (103–222)	162 (112–227)	134 (90–205)	< 0.001
Lymphocyte count, × 10 ⁹ /L	3481	0.8 (0.6–1.2)	0.8 (0.6–1.2)	0.8 (0.5–1.1)	< 0.001
Platelet count, × 10 ⁹ /L	3867	224 (167–291)	230 (176–299)	205 (151–271)	< 0.001
Total bilirubin, μmol/L	3029	10 (7–14)	10 (7–14)	10 (7–16)	0.210
D-dimers, μg/L	1697	1600 (897–3690)	1450 (843–3212)	2200 (1127–5516)	< 0.001

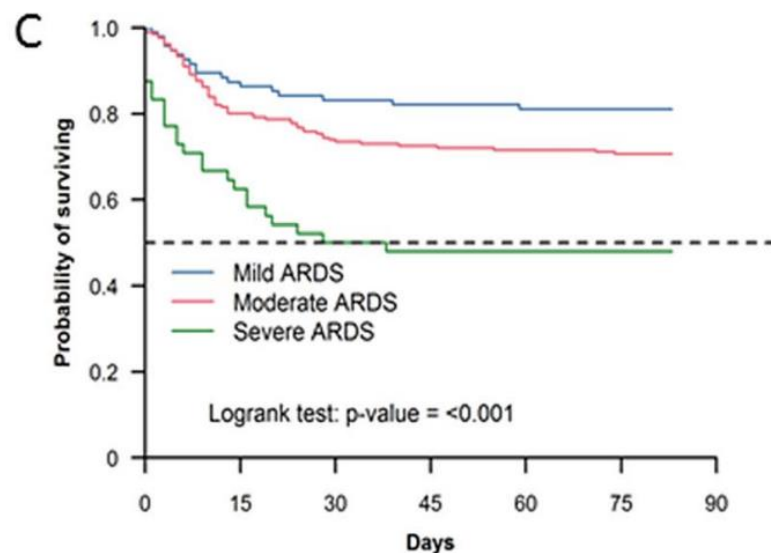
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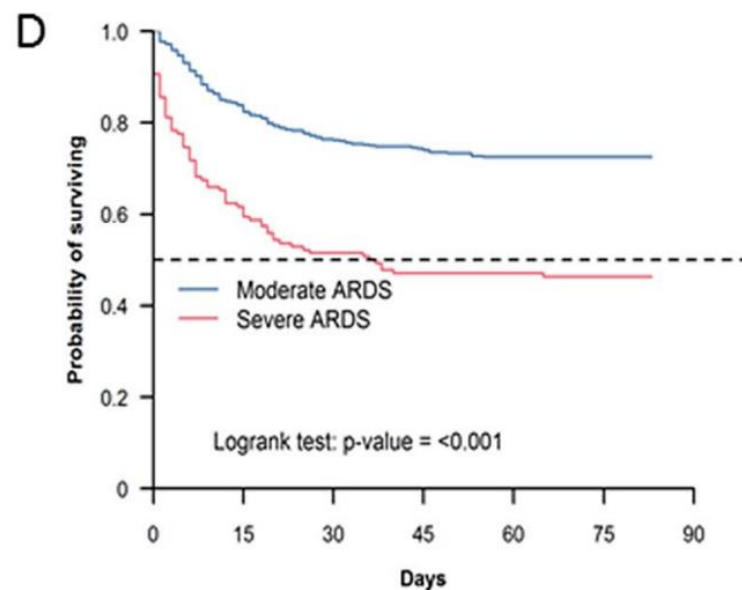
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No. at risk

— 95	83	79	78	77	77	0
— 211	169	156	153	151	149	0
— 48	30	24	23	23	23	0



No. at risk

— 487	408	372	362	353	353	0
— 138	85	71	65	65	64	0

Role of total lung stress on the progression of early COVID-19 pneumonia

Silvia Coppola¹, Davide Chiumello¹, Mattia Busana², Emanuele Giola¹, Paola Palermo², Tommaso Pozzi¹, Irene Steinberg², Stefano Roli¹, Federica Romitti², Stefano Lazzari², Simone Gattarello², Michela Palumbo², Peter Herrmann², Leif Saager², Michael Quintel^{2,3}, Konrad Meissner², Luigi Camporota⁴, John J. Marini⁵, Stefano Centanni⁶ and Luciano Gattinoni^{2*} 

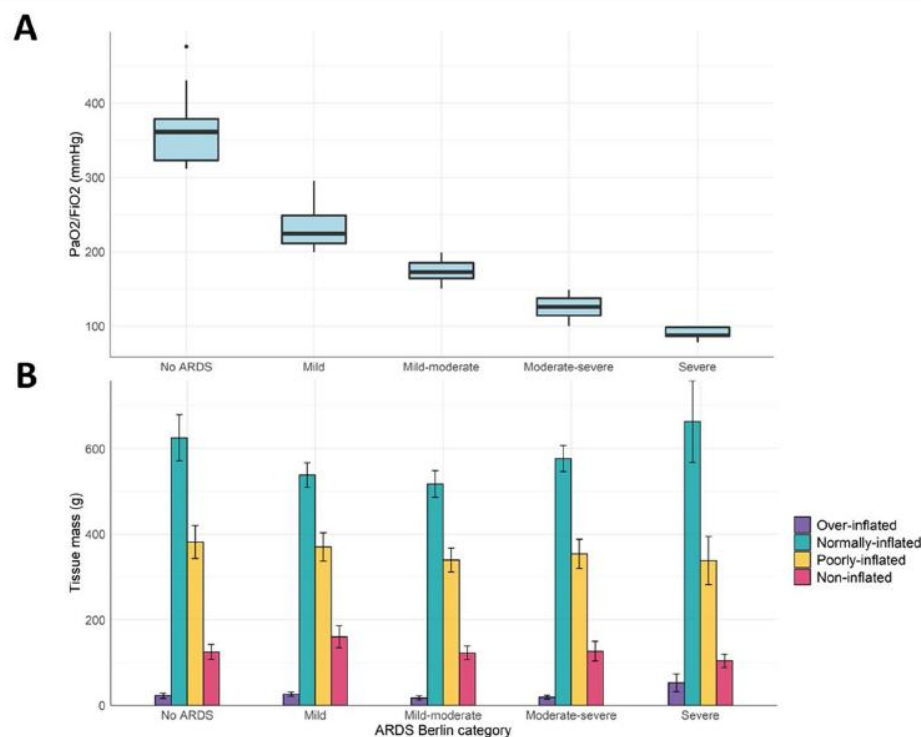


Fig. 1 Panel A: PaO₂/FiO₂ ratio measured at day 1 in the non-CARDS and CARDS subgroups ($p < 0.001$). Panel B: lung computed tomography features at day 1 as evaluated by the quantitative analysis in the five subgroups (over-inflated tissue, $p = 0.30$; normally inflated tissue, $p = 0.31$; poorly inflated tissue, $p = 0.91$; non-inflated tissue $p = 0.74$). The PaO₂/FiO₂ ratio decreased across the subgroups by ~300 mmHg, while the associated anatomical features were nearly identical.

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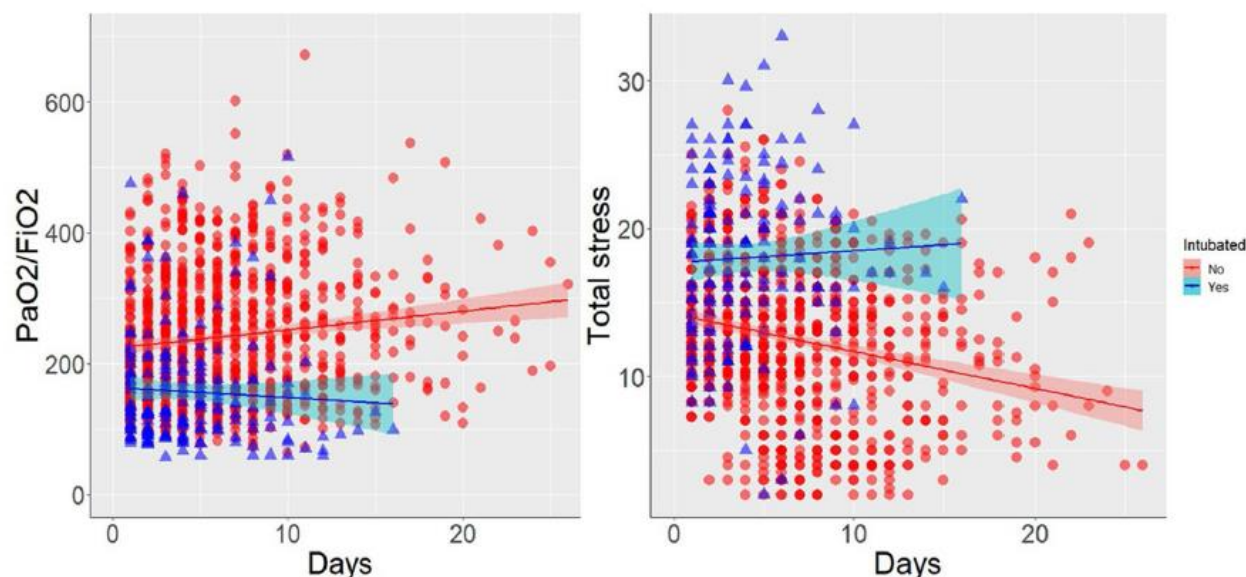
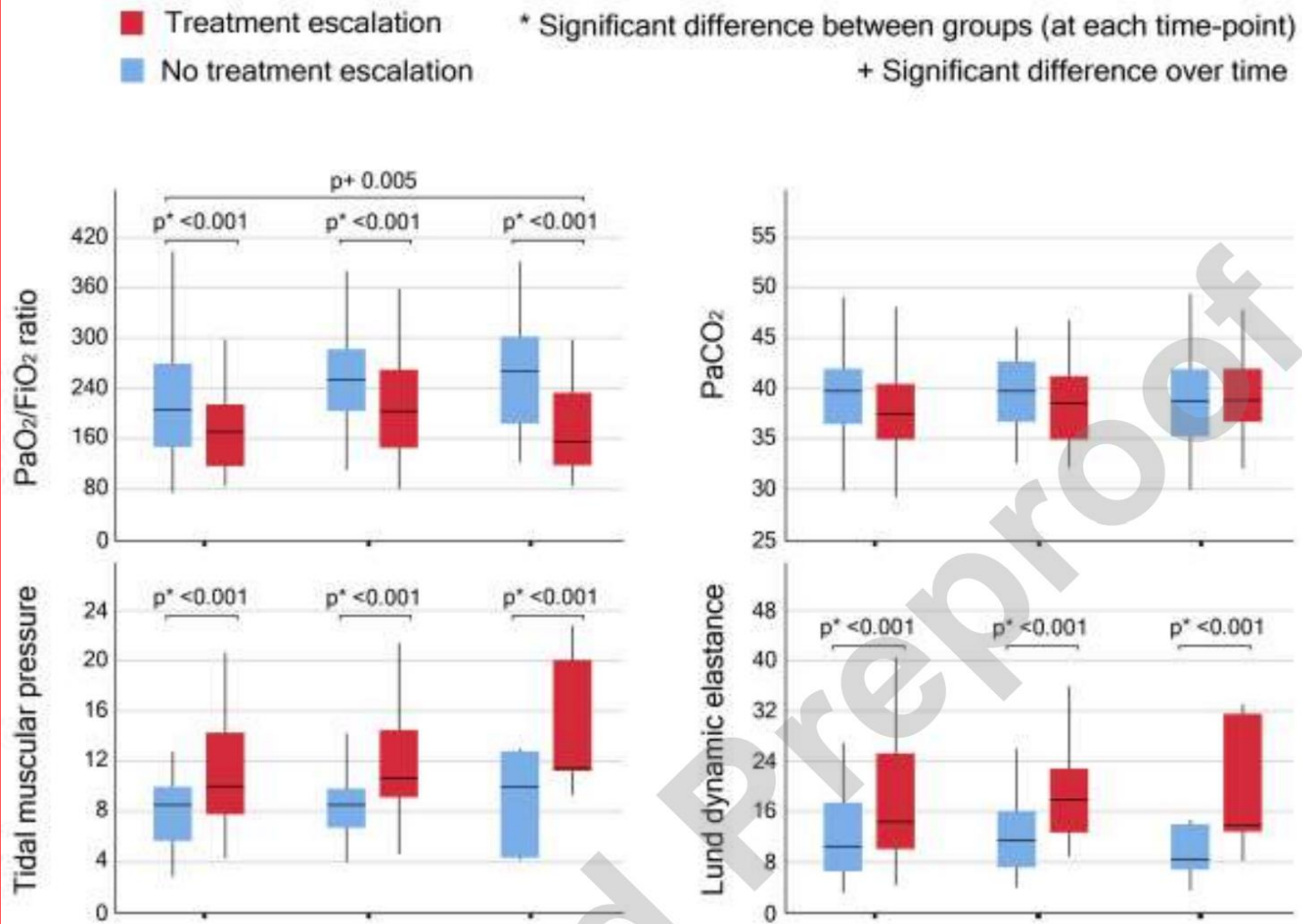


Fig. 2 Left panel: daily time course of the $\text{PaO}_2/\text{FiO}_2$ ratio, in the single patient, with positive outcome (red color) and negative outcome (blue color). Right panel: daily time course of the total lung stress, in the single patient, with positive outcome (red color) and negative outcome (blue color)

Mechanical power ratio and respiratory treatment escalation in COVID-19 pneumonia: a secondary analysis of a prospectively enrolled cohort

Simone Gattarello, MD, PhD, Silvia Coppola, MD, Elena Chiodaroli, MD, Tommaso Pozzi, MD, Luigi Camporota, MD, Leif Saager, MD, Davide Chiumello, MD, Luciano Gattinoni, MD,



Non-invasive respiratory support in the management of acute COVID-19 pneumonia: considerations for clinical practice and priorities for research

Sampath Weerakkody, Pietro Arina, James Glenister, Sam Cottrell, Giacomo Boscaini-Gilroy, Mervyn Singer*, Hugh E Montgomery*

Panel 1: Predictors of NIRS failure

A variety of predictors of NIRS success (ie, survival) or failure (ie, death or need for subsequent invasive mechanical ventilation) have been identified in multivariable and univariate analyses. Frequently reported factors associated with treatment failure are listed.

Multivariable analyses

- Older age
- Presence, number, or type of comorbidities
- Illness severity on admission to hospital or ICU (eg, higher SOFA or APACHE score)
- Worse oxygenation on admission to hospital
- Worse respiratory function before NIRS (measured by $\text{PaO}_2/\text{FiO}_2$, $\text{SpO}_2/\text{FiO}_2$, or ROX index)
- Response in respiratory variables to NIRS (change in $\text{PaO}_2/\text{FiO}_2$, $\text{SpO}_2/\text{FiO}_2$, ROX index, or respiratory rate)
- Higher circulating concentration of C-reactive protein

Univariate analyses

- Older age
- Male sex
- Presence, number, or type of comorbidities
- Illness severity on admission to hospital or ICU (eg, higher SOFA or APACHE score)
- Worse oxygenation on hospital admission
- Higher respiratory rate
- Worse respiratory function before NIRS (measured by $\text{PaO}_2/\text{FiO}_2$, $\text{SpO}_2/\text{FiO}_2$, or ROX index)
- Response in respiratory variables to NIRS (change in $\text{PaO}_2/\text{FiO}_2$, $\text{SpO}_2/\text{FiO}_2$, ROX index, respiratory rate, or minute ventilation)
- Inflammatory markers (C-reactive protein, lactate dehydrogenase, D-dimer, interleukin-6, lymphopenia, or procalcitonin)

APACHE=Acute Physiology and Chronic Health Evaluation. FiO_2 =fraction of inspired oxygen. NIRS=non-invasive respiratory support (continuous positive airway pressure, bilevel positive airway pressure, or high-flow nasal oxygen). PaO_2 =partial pressure of arterial oxygen. ROX index=respiratory rate and oxygenation index ($\text{SpO}_2/\text{FiO}_2$ ratio divided by respiratory rate). SOFA=Sequential Organ Failure Assessment. SpO_2 =pulse oximetry oxygen saturation.

Conclusions

CARDS and ARDS could be different in terms of respiratory compliance and pathophysiology of hypoxemia.

It is fundamental to monitor during the hospital stay
the hypoxemia and the inspiratory effort