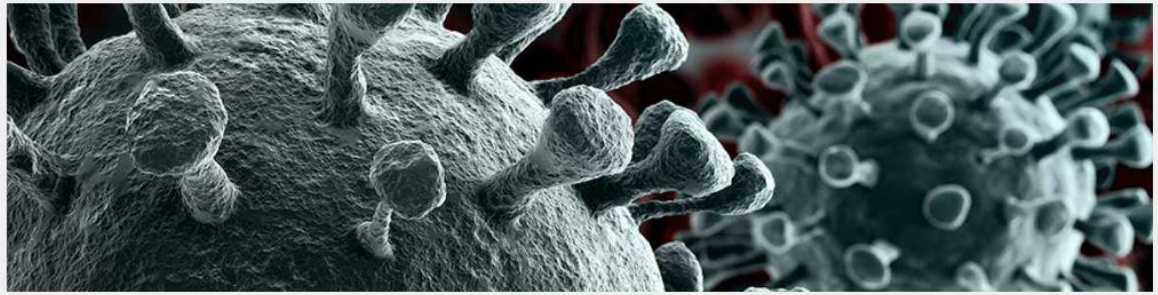
COVID e Cuore



12 GIUGNO 2020

MODALITÀ DI VENTILAZIONE NELL'INSUFFICIENZA RESPIRATORIA DEL COVID-19

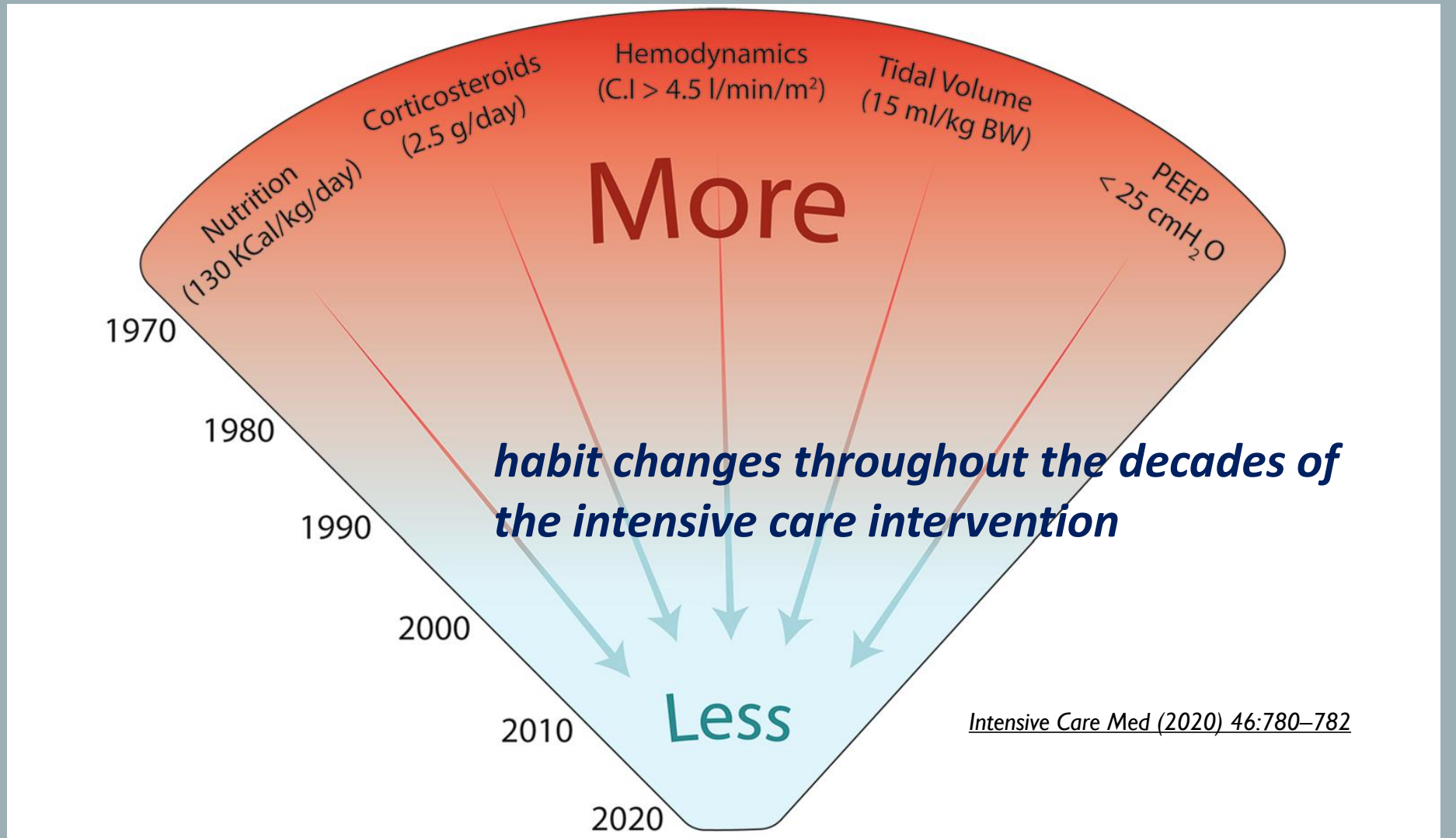
ADRIANO PERIS

ARDS

ICU INCIDENCE: 10%
UNADJUSTED MORTALITY: 35%

THE BERLIN DEFINITION 2012

1. ONSET WITHIN 1 WEEK
2. KNOWN CLINICAL
3. BILATERAL OPACITIES LOBAR/LUNG COLLAPSE OR NODULES



habit changes throughout the decades of the intensive care intervention

Intensive Care Med (2020) 46:780–782

Nutrition
(25 KCal/kg/day)

Corticosteroids
(200 mg/day)

Hemodynamics
(C.I. > 2.4 l/min/m²)

Tidal volume
(6 ml/kg PBW)

PEEP
(< 16 cmH2O)

WHAT INTENSIVIST CONSIDERS

RESPIRATORY FAILURE NOT FULLY EXPLAINED BY CARDIAC FAILURE OR FLUID OVERLOAD

DECREASED LUNG COMPLIANCE AND REGIONAL **H**ETEROGENEITY OF AERATION AND TISSUE INJURY

CATEGORIES OF SEVERITY ARDS

MILD: 200 < P:F RATIO≤ 300
MODERATE: 100 < P:F RATIO ≤ 200;
SEVERE: P:F RATIO ≤ 100

THE KIGALI MODIFICATION
INCLUDING
SPO2)-TO-FIO2 RATIO
CHEST ULTRASOUND (*A USEFUL ADAPTATION IN LOW-RESOURCE SETTING*)

ventilazione in COVID-19

EVEN THOUGH IT CAN MEET THE ARDS BERLIN DEFINITION THE COVID-19 PNEUMONIA IS A SPECIFIC DISEASE WITH PECULIAR PHENOTYPES.

DISSOCIATION BETWEEN THE SEVERITY OF THE HYPOXEMIA AND THE MAINTENANCE OF RELATIVELY GOOD RESPIRATORY MECHANICS.

THE PRESENCE OF TWO TYPES OF PATIENTS ("NON-ARDS," TYPE 1, AND ARDS, TYPE 2) WITH DIFFERENT PATHOPHYSIOLOGY.

HOW DO PHENOTYPES WORK?

- Phenotype 1 : clinical syndrome characterized by less severe inflammation and shock.
- Phenotype 2 : high plasma levels of inflammatory biomarkers, severe shock and metabolic acidosis

hyperynflamm/hypoinflamm. :
PEEP have different impacts on outcomes, including mortality, ventilator-free days, and organ failure-free days

Hyperinflammatory Subphenotypes

-Higher IL-8 / TNFr1 and lower serum bicarbonate levels: mortality is lower with the fluid liberal strategy (Famous, 2017)

-Higher values of TNFr1 receptor 1and interleukin-6 (IL-6), lower platelet counts, more vasopressor (Calfee,2018)

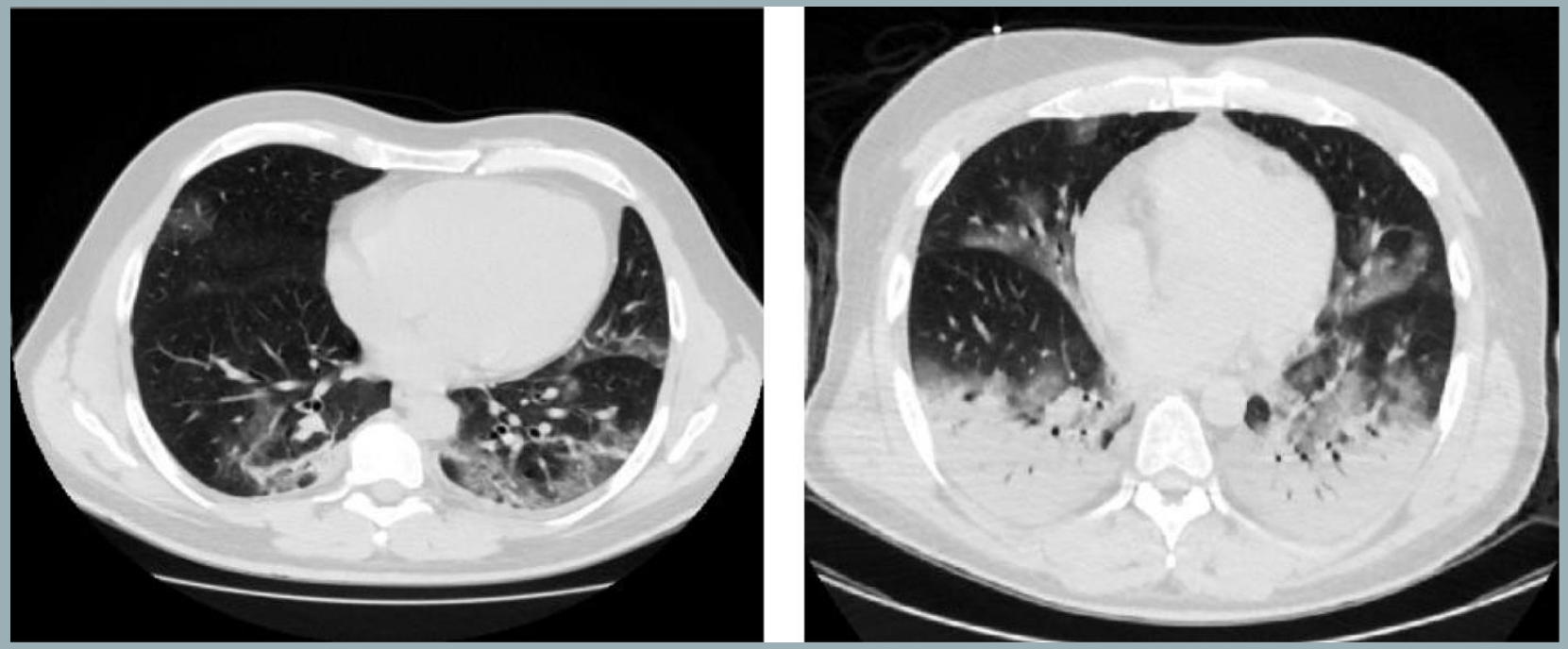
COVID-19 DOES NOT LEAD TO A "TYPICAL" ACUTE RESPIRATORY DISTRESS SYNDROME

Type I (normal compliance)

PEEP : kept lower in high pulmonary compliance
Tidal volume not limited at 6 ml/kg
Respiratory rate snot exceed 20 /M
Patients should be left "quiet"

Type II (low compliance)
Standard treatment for severe ARDS should be applied (lower tidal volume, prone positioning, high PEEP)

Type 1:
Near normal pulmonary compliance
with isolated viral pneumonia



Type 2:
Decreased pulmonary compliance

If the CT scan is not available, the respiratory system compliance and possibly the response to PEEP are the only imperfect surrogates we may suggest.

If respiratory distress is present, endotracheal intubation should be strongly considered to avoid/limit the transition from type 1 to type 2 by self-induced lung injury (NIV/CPAP!).

VENTILATORY STRATEGIES

- Lower tidal volumes (initial 6 mL/kg) : reduction in overdistention cause of volutrauma and barotrauma (Brower, 2000)
- "open lung" ventilation strategy (high PEEP) prevents derecruitment and improves lung mechanics, oxygenation, and inflammatory markers (Kacmarek, 2016)
- No benefit of high PEEP over low PEEP when low tidal volumes and limitations of plateau pressure (Brower, 2004)
- Lung recruitment maneuver and PEEP titration , versus an empirical PEEP strategy, increased 28-day mortality (Cavalcanti, 2017)

PRONE POSITIONING

- Distribution of perfusion to the lung and recruitment of collapsed lung units: functional shunt
- Increases the functional size of the lung, thereby reducing the risk of volutrauma/barotrauma
- Mortality benefit (32.8% versus 16.0% 28-day mortality) in early the prone position (<48 hours after ARDS onset) maintained until gas exchange is significantly improved (GuŽrin , 2013)

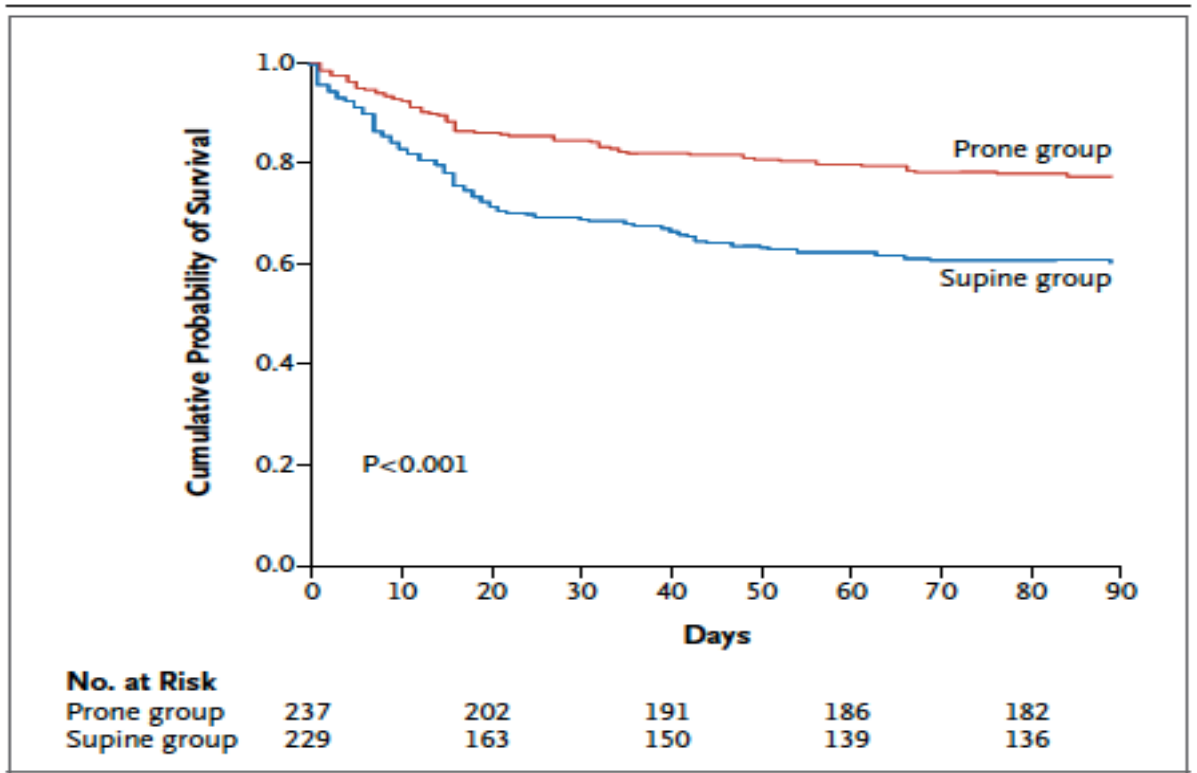


Figure 2. Kaplan–Meier Plot of the Probability of Survival from Randomization to Day 90.

NEUROMUSCOLAR BLOCKADE (NMB)

- NMB reduces the risk of volutrauma and barotrauma, and a reduction in end-expiratory derecruitment: mortality benefit in PF<150 (Papazian, 2010)
- Recent randomized trial showed no benefit to NMB (Moss, 2019)

It is reasonable to use NMB in patients in whom ventilator synchrony cannot otherwise be achieved, but there are no data to support routine use

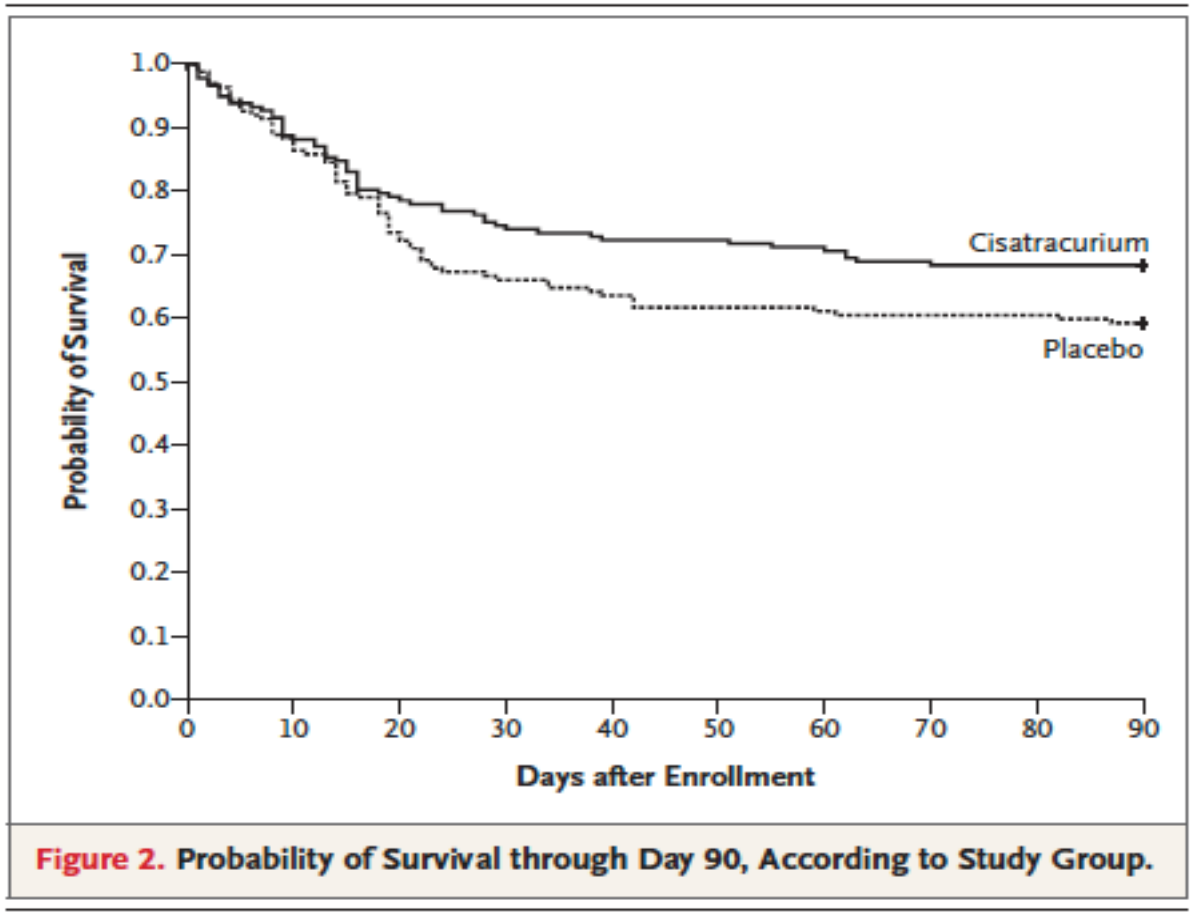


Figure 2. Probability of Survival through Day 90, According to Study Group.

STEROIDS

INCREASED RATE OF MORTALITY COMPARED WITH THE PLACEBO GROUP (STEINBERG, 2006)

HIGHER RATE OF ACHIEVING UNASSISTED BREATHING BY DAY 28 (80% VERSUS 50%) AND A LOWER RATE OF HOSPITAL MORTALITY (20% VERSUS 33%) (MEDURI, 2016)

STEROIDS MAY REDUCE 3-MONTH MORTALITY, BUT EVIDENCE IS LOW (COCHRANE DB AND LEWIS, 2019)

UNDIAGNOSED INFLAMMATORY LUNG DISEASE : PNEUMONIA?

AT PRESENT, STEROIDS ARE NOT RECOMMENDED FOR ROUTINE USE

(MICRO)THROMBOSIS AND D-DIMER LEVELS

- THROMBOSIS AND ASSOCIATED ISCHEMIC EVENTS ARE VERY COMMON
- CHECK OF COAGULATION PARAMETERS, D-DIMER LEVELS, (IN BOTH THE TYPE I AND THE TYPE 2)
- ANTICOAGULATED WHEN INDICATED.

NITRIC OXIDE

Oxygenation response to NO is variable

The COVID-19 pneumonia appears to interfere with the vascular regulation up to complete loss of vascular tone to vasoconstricting or vasodilating agents.
We still do not have enough evidence to understand when and on which patients it should be applied.
Nitric oxide should not work in fully vasoplegic patients (type 1) but possibly works in patients in which pulmonary hypertension is more likely (type 2)

ECMO (RESCUE THERAPIES)

- Significant improvement in survival without severe disability at 6 months in patients transferred to a specialist centre for consideration for ECMO treatment (Peek, 2009)

- EOLIA Trial: not significant difference in mortality between ; "cross over" to ECMO if failed standard interventions

- Best outcomes on ECMO are those who have few other organ failures and who are early in their illness (<7 days) , early transferred to an ECMO-C (Combes, 2018)

COVID-19 PATIENTS (ICU EMERGENCY –CAREGGI TEACHING HOSPITAL

Table 1 Clinical Characteristics of the study population

Number	47
Age (mean±SD, years)	63±11
SAPSII	46 ±16
Comorbidities (n.%)	
Hypertension	41 (87%)
Cardiovascular disease	11 (23%)
Diabetes	15 (32%)
Respiratory support	
Non invasive	12 (25%)
Invasive	35 (75%)
PEEP cmH2O (median, range)	12 (8-18)
TV (median, range) ml	570 (160-710)
P/F (median, range)	115 (69-264)
Prone position (n, %)	31 (65%)
ECMO	**11 (23.4%)**
Transferred from peripheral hospitals (n.%)	10(21.3%)
LOS (median, range) days	15 (3-42)
In ICU mortality (n.%)	13 (27.6%)

SD: standard deviation, SAPS: simplified acute physiologic score, ECMO: extracorporeal membrane oxygenation, TV: tidal volime, PEEP: positive end expiratory pressure, LOS: length of stay, ICU: intensive care unit.

LUNG AND CARDIAC ULTRASOUND in COVID-RELATED ARDS
Peris,Lazzeri, in prss)

COVID-19 PATIENTS (ICU EMERGENCY –CAREGGI TEACHING HOSPITAL

Ultrasound findings on ICU admission.

	Non invasive ventilation	Mechanical ventilation	
Number	12	35	
Age (mean ±SD)	58 ±9	65 ±11	0.053*
SAPS II	26 ±14	53± 9	0.001*
LUS			
LUS score	20 ±5	25 ± 4	<0.001*
Subpleural consolidations (n.%)	11 (92%)	31 (88.5%)	0.418#
Consolidations (n.%)	0	16 (46%)	0.021#
TTE			
LV ejection fraction (%)	59.5 ± 9	53± 9	0.050*
RV wall thickness (mm, mean ± SD)	5.2± 0.4	5.6± 0.5	0.025*
SPAP (mmHg, mean ± SD)	46.5± 4	52±6	<0.01*
TAPSE (mm)	22 ± 1	21± 0.2	0.136*

*= student *t* test; #:chi square

LV: left ventricle, RV:right ventricle, sPAP: systolic pulmonary arterial pressure: TAPSE: tricuspid plane systolic annular excursion; PE: pericardial effusion,

LUNG AND CARDIAC ULTRASOUND in COVID-RELATED ARDS
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PROGRAMS

- Precise classification of patients, paired with an understanding of their underlying disease process, may increase the likelihood of identifying beneficial therapies (ultrasounds approach; COVID-19 vs H1N1; ..)

:

- Clinical syndrome of ARDS contains distinct subphenotypes and should prompt future studies aimed at further elucidating these subphenotypes with comprehensive clinical and biological data.

- Given the differential response to treatment by subphenotype; this area of research has the potential to directly inform future controlled trials of novel treatments for ARDS.