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**Usefulness of CURB-65, pneumonia severity index and MuLBSTA in predicting COVID-19 mortality**

Carlo Preti<sup>1,2</sup>, Roberta Biza<sup>2,3</sup>, Luca Novelli<sup>3</sup>, Arianna Ghirardi<sup>4</sup>, Caterina Conti<sup>3</sup>, Chiara Galimberti<sup>2</sup>, Lorenzo Della Bella<sup>1,2</sup>, Irdi Memaj<sup>1,2</sup>, Fabiano Di Marco<sup>2,3</sup>, Roberto Cosentini<sup>1</sup>

<sup>1</sup>Emergency Department, ASST Papa Giovanni XXIII, Bergamo

<sup>2</sup>University of Milan

<sup>3</sup>Pulmonary Medicine Unit, ASST Papa Giovanni XXIII, Bergamo

<sup>4</sup>Fondazione per la Ricerca Ospedale di Bergamo (FROM), Bergamo, Italy

**Corresponding author:** Luca Novelli MD, Pulmonary Medicine Unit, ASST Papa Giovanni XXIII, 24127 Bergamo, Italy. Tel. +39.035.29673456, Mobile: +39.339.4443927. E-mail: [lnovelli@asst-pg23.it](mailto:lnovelli@asst-pg23.it)

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This supplementary material aims to better describe and explain the three scores we investigated in our study.

### **CURB-65 pneumonia severity score**

The CURB-65 score is based upon five criteria from which its name is derived (**C**onfusion; **U**rea nitrogen; **R**espiratory rate; **B**lood pressure; age more than **65** years). Adding 1 point to each criterion, the final score ranges from 0 to 5. Patients in the low-risk group (0 or 1 point for patients older than 65 years of age without major comorbidities) have a 30-day mortality lower than 3% and should be managed as outpatients. For patients in the moderate risk group (1-2 points and 9% 30-day mortality) inpatient or outpatient treatment with close follow-up is recommended. Patients in the high-risk group (3-5 points and 14-40% 30-day mortality) need inpatient management, admission to ICU.

### **PSI Pneumonia Severity Index**

The PSI is a more complex score and it was derived and validated as part of the Pneumonia Patient Outcomes Research Team (PORT) prospective cohort study for the purpose of identifying patients with CAP at low risk for mortality. The score consists of 20 inputs, including demographic and clinical factors, coexisting diseases and laboratory and radiographic findings. Based on the final score, the patient is allocated to one of five classes: I (no predictors, 0.1% 30-day mortality), II (0.6% 30-day mortality), III (0.9% 30-day mortality), IV (9.3% 30-day mortality) and V (27% 30-day mortality). According to the assigned class, the algorithm recommends outpatient treatment (class I or II or low risk group), outpatient versus brief observational stay (class III or moderate risk group) or admission to general medical ward or ICU (class IV-V or high-risk group).

### **MuLBSTA Score**

MuLBSTA is a novel tool created in 2019 in China to assess 90-day mortality in viral pneumonia. It is a single-center, retrospective and not externally-validated score. It consists of six features: presence of multilobar infiltrate, absolute lymphocyte count  $\leq 0.8 \times 10^9/\text{ml}$ , bacterial coinfection, smoking history, systemic arterial hypertension and age  $\geq 60$  years. According to the score, mortality rate ranges from 0.47% (0 points) to 69% (20 points).

## CURB-65 score

**Supplementary Table 1.** In CURB-65 score 1 point is assigned for each criterion met.

Confusion (based upon a specific mental test or new disorientation to person, place or time)
Urea (blood urea nitrogen in the United States) >7 mmol/L (20 mg/dL)
Respiratory rate $\geq$ 30 breaths/minute
Blood pressure (systolic <90 mmHg or diastolic <60 mmHg)
Age $\geq$ 65 years

**Supplementary Table 2.** Patient management based upon CURB-65 score.

CURB-65 score	Mortality risk	Recommendation per derivation study
0	0.60%	Low risk; consider home treatment
1	2.70%	Low risk; consider home treatment
2	6.80%	Short inpatient hospitalization or closely supervised outpatient treatment
3	14.00%	Severe pneumonia; hospitalize and consider admitting to intensive care
4 or 5	27.80%	Severe pneumonia; hospitalize and consider admitting to intensive care

## PSI – Pneumonia Severity Index Score

**Supplementary Table 3.** Pneumonia Severity Index Score.

Risk factors	Points
<b>Demographic factors</b>	
Age	Age in years (-10 if female)
Nursing home resident	+10
<b>Coexisting illnesses</b>	
Neoplastic disease (active)	+30
Chronic liver disease	+20
Heart failure	+10
Cerebrovascular disease	+10
Chronic renal disease	+10
<b>Physical examination findings</b>	
Altered mental status	+20
Respiratory rate $\geq 30$ /minute	+20
Systolic blood pressure $< 90$ mmhg	+20
Temperature $< 35^{\circ}\text{c}$ or $\geq 40^{\circ}\text{c}$	+15
Pulse $\geq 125$ beats/minute	+10
<b>Laboratory and radiographic findings</b>	
Arterial pH $< 7.35$	+30
Blood urea nitrogen $\geq 30$ mg/dl (11 mmol/l)	+20
Sodium $< 130$ mmol/l	+20
Glucose $\geq 250$ mg/dl (14 mmol/l)	+10
Hematocrit $< 30\%$	+10
Partial pressure of arterial oxygen $< 60$ mmhg or an oxygen saturation of $< 90\%$ on pulse oximetry	+10
Pleural effusion on chest radiograph	+10

**Supplementary Table 4.** PSI class and mortality in the Pneumonia PORT validation cohort.

<b>Class</b>	<b>Points</b>	<b>Mortality (%)</b>
I	No predictors	0.1
II	$\leq 70$	0.6
III	71 to 90	0.9
IV	91 to 130	9.3
V	$>130$	27.0

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## MuLBSTA score

**Supplementary Table 5.** MuLBSTA score.

Variable		Points
Multilobe infiltrate	Yes	5
	No	0
Absolute lymphocyte count $\leq 0.8 \times 10^9/L$	Yes	4
	No	0
Bacterial coinfection (detected by sputum or blood culture)	Yes	4
	No	0
Smoking history	Non-smoker	0
	Former smoker	2
	Active smoker	3
History of hypertension	Yes	2
	No	0
Age $\geq 60$ years	Yes	2
	No	0

**Supplementary Table 6.** 90-day patient mortality based upon MuLBSTA score.

<b>MuLBSTA score</b>	<b>90-day mortality (%)</b>
0	0.47%
2	0.87%
3	1.18%
4	1.60%
5	2.17%
6	2.92%
7	3.93%
8	5.27%
9	7.03%
10	9.33%
11	12.27%
12	15.99%
13	20.56%
14	26.03%
15	32.36%
16	39.42%
17	46.95%
18	54.61%
19	62.07%
20	68.99%

## References

1. Lim WS, van der Eerden MM, Laing R, et al. Defining community acquired pneumonia severity on presentation to hospital: an international derivation and validation study. *Thorax* 2003;58:377.
2. Lim WS, Baudouin SV, George RC, et al. BTS guidelines for the management of community acquired pneumonia in adults: update 2009. *Thorax* 2009;64:iii1.
3. Qureshi KN, Hodkinson HM. Evaluation of a ten-question mental test in the institutionalized elderly. *Age Ageing* 1974;3:152.
4. Fine MJ, Auble TE, Yealy DM, et al. A prediction rule to identify low-risk patients with community-acquired pneumonia. *N Engl J Med* 1997;336:243.
5. Guo L, Wei D, Zhang X, et al. Clinical features predicting mortality risk in patients with viral pneumonia: The MuLBSTA score. *Front Microbiol* 2019;10:2752.

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