LETTERA AL DIRETTORE

Nurse Lung Ultrasound in Intensive Care Unit to monitor patients with ARDS: BLUE Vs. LUS score

Ecografia polmonare a cura dell'infermiere in Terapia Intensiva per monitorare i pazienti con ARDS: BLUE Vs. LUS score

■ TOMMASO PIANI[1], ALICE REBBELATO[2], STEFANO FABRIS[3], LUIGI VETRUGNO[4]

[1] Infermiere Coordinatore, Anestesia e Rianimazione 1, Azienda Sanitaria Universitaria Friuli Centrale

[2] Infermiera, Università degli Studi di Udine

[3] Infermiere Tutor Didattico, Università degli Studi di Udine

[4] Professore Associato Anestesiologia (MED/41), Università degli Studi di Udine

Dear Editor,

Monitoring patients with respiratory failure by measuring SpO2 alone does not express disease severity regarding how sick the lung is. Through the lung ultrasound score (LUS), it is possibly better to evaluate the patient's aeration score and follow it over time[1].

LUS is based on examining 12 thoracic regions. It is created by the sum of the scores of the 12 areas from 0 (absence of B lines) to 3 (lung consolidation). Therefore, the minimum score is zero, and the maximum is 36[1].

The LUS allows monitoring even in critical conditions such as ventilator-associated pneumonia (VAP) and acute respiratory distress syndrome (ARDS)[2].

LUS score is a tool performed by physician experts in pulmonary ultrasonography. We explore a new, simple score on 3 points on the right and 3 on the left, named BLUE score performed by a nurse from 0 to 3 as described above and over 6 BLUE point described by Lichtenstein[3].

The BLUE score may appear for nurse complex at first sight, but the objective is to recognize some images and turn them into useful numbers to give a degree of severity of the disease, like Glasgow coma scale (GCS).

Normal A-lines or less than 2 B-lines with lung sliding (score 0); moderate loss of aeration - 3 or more well-spared B-lines with lung sliding (score 1); severe loss of aeration – coalescent B-lines with lung sliding (score 2); complete loss of aeration – tissue like pattern or consolidation (score 3)[4].

Our study's primary objective was to compare the LUS performed by an expert physician and the BLUE score performed by a student nurse (3rd universiry year) after practical training by an expert physician.

The study was conducted at the University-Hospital of Udine, Italy (Prot. n° 46816) in 2019.

We use a micro convex probe, Philips™ EN Visor C 1.2 Andover ultrasound, (MA, USA), bedside probe 3.5 MHz in five patients with the acute respiratory syndrome (ARDS) and follow them over time in intensive care total 26 measurement performed. All patients were mechanically ventilated.

Figure 1 shows the clinical trend overtime with the BLUE and LUS score. LUS and BLUE score compared have similar tendencies. On day 7 they was opposite and on day 10 the BLUE score reaches the same value as the LUS. Both score undergo the same variations

in an almost proportional manner. They then continue alternating increases and decreases until they finally decrease on day 33. Set a cut-off value above 12 for the LUS score, and above 6 for the BLUE score, the BLUE score showed 45% of positive findings while LUS score 75% of positive findings meaning that the method has shown a high negative predictive value. Conversely, the positive predictive value was in favour of the LUS score. That is because the BLUE score explores a lesser number of lung regions. The study's main result is that the agreement between the two BLUE scores vs LUS scores in evaluating acute respiratory failure through ultrasound examination of the lung was only moderate k di Koen (k) = between 0.41 and 0.60; cohen's k 0.53; Concordance overall 0.85). In conclusion, the results deriving from the use of the LUS vs BLUE score have shown that an operator with adequate training may perform the score correctly; however, the two scores are not interchangeable. The BLUE score could positively impact patient monitoring in the triage setting emergency department but not in ICU, where a precise and accurate examination is required.

Figure 1. Trend between the LUS and the BLUE score over time in ARDS-ICU patients
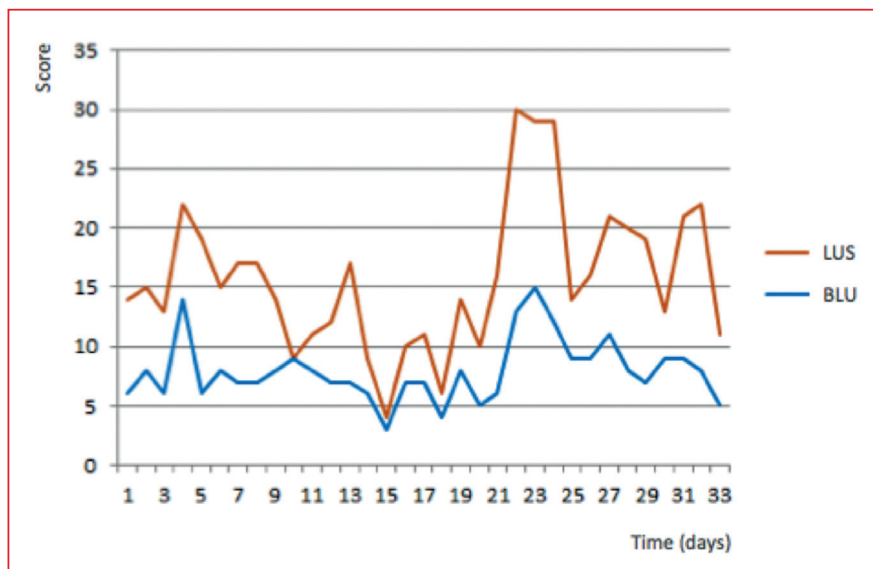
REFERENCES:

1. Bouhemad B, Mongodi S, Via G, Rouquette I. *Ultrasound for "lung monitoring" of ventilated patients.* Anesthesiology. 2015 Feb;122(2):437-47. doi: 10.1097/ALN.0000000000000558.

2. Rouby JJ, Arbelot C, Gao Y, Zhang M, Lv J, An Y, Chunyao W, Bin D, Valente Barbas CS, Dexheimer Neto FL, Prior Caltabeloti F, Lima E, Cebey A, Perbet S, Constantin JM; APECHO Study Group. *Training for Lung Ultrasound Score Measurement in Critically Ill Patients.* Am J Respir Crit Care Med. 2018 Aug 1;198(3):398-401. doi: 10.1164/rccm.201802-0227LE.

3. Lichtenstein, D.A., Mezière, G.A. The BLUE-points: three standardized points used in the BLUE-protocol for ultrasound assessment of the lung in acute respiratory failure. *Crit Ultrasound J* **3,** 109–110 (2011). https://doi.org/10.1007/s13089-011-0066-3

4. Li L, Yang Q, Li L, Guan J, Liu Z, Han J, Chao Y, Wang Z, Yu X. [The value of lung ultrasound score on evaluating clinical severity and prognosis in patients with acute respiratory distress syndrome]. Zhonghua Wei Zhong Bing Ji Jiu Yi Xue. 2015 Jul;27(7):579-84. Chinese. doi: 10.3760/cma.j.issn.2095-4352.2015.07.008.

5. Mongodi, S., Bonaiti, S., Santangelo, E., Stella, A., Vaschetto, R., Borrelli, P., Quaini, A., Grugnetti, G., Massara, A.M., Grugnetti, A.M., Mojoli, F. *Lung sliding detection by nurses: impact of a short focused theoretical training. European Respiratory Journal.* 2019; 54 (63): 1274.

AUTHOR CONTRIBUTIONS:

STUDY DESIGN:
Tommaso Piani, Alice Rebbelato, Stefano Fabris, Luigi Vetrugno.

DATA COLLECTION:
Alice Rebbelato, Luigi Vetrugno.

DATA ANALYSIS:
Tommaso Piani, Stefano Fabris, Luigi Vetrugno.

MANUSCRIPT WRITING:
Tommaso Piani, Luigi Vetrugno.