

● Letter to the Editor

RATIONALE FOR THE ROUTINE APPLICATION OF LUNG ULTRASOUND IN THE MANAGEMENT OF CORONAVIRUS DISEASE 2019 (COVID-19) PATIENTS IN MIDDLE- TO LOW-INCOME COUNTRIES

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To the Editor:—

The global pandemic of coronavirus disease 2019 (COVID-19) (severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]) is an unprecedented event that is overloading health services worldwide. In México, the situation is no less worrying. When we started working with lung ultrasound (LUS) in México, 118 cases and 1 death had been registered in the country; at the time of writing of this article, 56,594 cases and 6090 deaths had been confirmed. The increase in cases and saturation of all medical services at all levels call for swift action and close attention, as well as precise diagnoses, especially in patients in respiratory distress. The scenarios in which this care will be provided will range from primary care services, such as a paramedic's swift arrival on the scene; to admission of a patient to the hospital and transport to the intensive care unit (ICU); to an increase in the demand for services; to reduced access to care and imaging studies, for both hospitalized and walk-in patients (for thorax radiography and computed tomography scans). This, together with the low level of accuracy in physical examinations that accompanies massive scenarios, calls for more rapid and efficient examination methods that allow the patient to be studied at any moment and place with a method that can be repeated as many times as necessary and with immediate results.

During the last week, authors D.B. from Italy and O.Y.A.M from México started a collaboration to introduce LUS into the management of COVID-19 patients in México, where the routine use of secondary level imaging is not always easily available and there is an unprecedented need for optimization of the allocation of resources for all health care services.

Our “transoceanic” collaboration began when, on 24 March 2020, D.B. described LUS in a confirmed COVID-19 case in Italy (Buonsenso et al. 2020a, 2020b; Musolino et al. 2020). Since then, several authors have confirmed the utility of LUS for these patients, with the main patterns described being pleural line irregularities, vertical artifacts (rare and isolated, or multiple), subpleural consolidations without bronchogram and areas of white lung. These lesions are characterized by a typical “patchy” and bilateral distribution, particularly in symptomatic patients. Colleagues from México with experience in LUS began using LUS routinely and developed a simple point-of-care ultrasound (POCUS)-based triage for COVID-19, aimed at properly allocating resources and prioritizing patients' access to main hospitals (Fig. 1).

Our POCUS triage helps professionals triage outpatients using a color-coding system based on ultrasound patterns; this system has been used before (Antúñez-Montes and Buonsenso 2020) and is currently paired (Antúñez-Montes 2020) with the lung score proposed by Soldati et al. (2020).

- **Green:** Lung POCUS traits. Normal lung, pattern A. Dry lung, presence of lines, pleural sliding. Power Doppler LUS score is 0 in most lung areas or 1 in some areas. This classification can even be completed at home by highly trained medical or paramedical personnel to recognize these abnormal patterns, which can lead to their consideration as “negative by lung ultrasound” (for non-suggestive images) these patients are at low risk and can be placed in isolation and monitored at home after taking the test.
- **Yellow:** Lung POCUS traits: Wet lung, pattern B. Two to three B-lines, pleural sliding diminished, mild pulmonary edema, regular to slightly irregular pleural line. LUS score is 1 in most areas (those with irregular and indented pleural line with vertical artifacts will have score 1) and 2 in some areas (broken pleural line, pattern of subpleural consolidation and patchy areas of white lung). These patients have a moderate risk and should be evaluated in the hospital unless accurate and frequent home medical services can be guaranteed.
- **Red:** Lung POCUS traits. Wet lung, pattern B: more than + 4 B lines. Severe to moderate alveolar, interstitial pulmonary edema; broken pleural line indicates presence of white lung, subpleural consolidations. LUS score is 2 or 3 in most areas. These patients are at high risk and should be quickly evaluated in hospital and admitted to the emergency department or ICU if dyspnea is severe and life-threatening.

This system has allowed us in México to determine severity in the pre-hospital phase by recognition of any suggestive image highly suspicious of severity. With portable or pocket devices at the patient's bedside, the scan allows us to re-evaluate, in real time, cases that have not been admitted to the hospital or to determine who needs to enter the hospital, monitoring the condition of patients at home, reducing time, money and exposure of other health care professionals to the virus (Peris et al. 2010). It also allows us to requesting computed tomography scans selectively to help reduce saturation of the medical services sector, as is currently

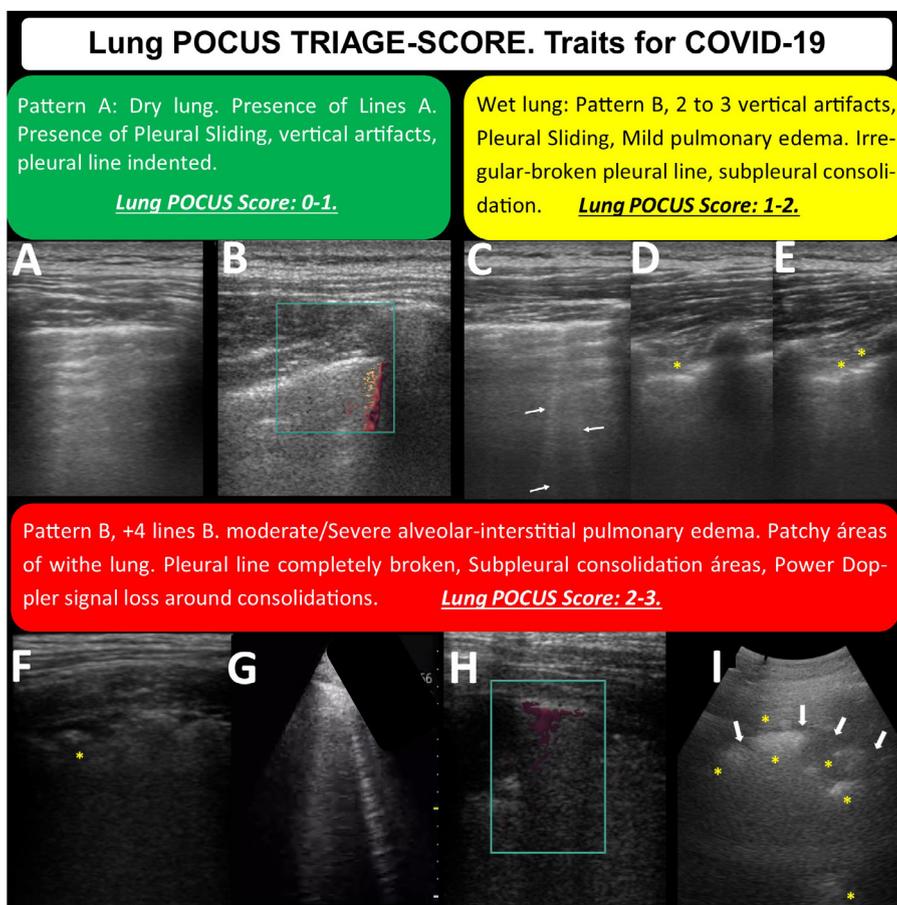


Fig. 1. Intuitive triage point-of-care ultrasound (POCUS) protocol for patients suspected or confirmed to have COVID-19. Classifications of pleural lesions and POCUS scores. Asterisks indicate an indented and ruptured pleural line (c–e). Multiple subpleural consolidations and a broken pleural line are seen (f, h, i). Multiple diffuse B-lines (vertical artifacts) are visible that start from the irregularity of the pleural line (c), a pattern of multiple vertical artifacts in a subpleural consolidation (g, h). All findings are from the middle and inferior areas from the posterior thorax.

occurring in Mexico and other countries, especially in developing economies and those without resources.

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