

**Title:**

*“Correlation between hypoxemia and lung ultrasound score in patients presenting to an emergency department with interstitial syndrome”*

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## Abstract

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### Introduction:

The objective of this physiological study was to assess the presence of a correlation between the Lung UltraSound Score (LUSS) and the ratio between arterial partial pressure of oxygen ( $\text{PaO}_2$ ) and the fraction of inspired oxygen ( $\text{FiO}_2$ ), in patients with dyspnea.

### Method:

This prospective, multicentre, physiological study took place between April and August 2021 in the emergency departments of four centers in Belgium. Adult patients suffering from dyspnea, aged over 17 years and for whom an arterial blood gas analysis was considered indicated by the physician in charge were eligible for inclusion. Patients were excluded if lung Point of Care UltraSound (PoCUS) was not feasible for anatomical reasons, if they were known to suffer from chronic obstructive pulmonary disease or any other condition responsible for chronic interstitial syndrome (IS). In case the patient met inclusion criteria and after signing consent, an independent investigator, blind to patient history and clinical examination, performed a lung PoCUS to calculate the LUSS within 10 minutes of the arterial blood gas sampling. To calculate the LUSS, the thorax was virtually divided into 12 thoracic zones. For each zone, a score from 0 to 3 was determined according to the severity of IS. Patients with a LUSS  $<2$  were empirically considered to have no IS and were therefore secondarily excluded. Correlation between LUSS and  $\text{PaO}_2/\text{FiO}_2$  was determined using Pearson correlation.

### Results:

162 adult patients were included. A statistically significant negative linear correlation between LUSS and  $\text{PaO}_2/\text{FiO}_2$  was found (correlation coefficient,  $-0.4860$  [95% CI,  $-0.5956$  to  $-0.3587$ ];  $P < 0.0001$ ).

**Discussion:** Our data provide evidence of a statistically significant negative linear correlation between LUSS and  $\text{PaO}_2/\text{FiO}_2$  for patients presenting in the emergency department with dyspnea and with a lung IS diagnosed using PoCUS. Given the representativeness of  $\text{PaO}_2/\text{FiO}_2$  for hypoxemia and the fact that hypoxemia indicates IS severity, our findings suggest that LUSS could contribute to the evaluation of IS severity. A strength of this study is that IS was of multiple origin. The final diagnosis was however based on the emergency department discharge diagnosis rather than adjudicated at patient's follow up which could be seen as a limitation. If the correlation is confirmed by future studies that include patient follow-up for diagnosis and LUSS measures, a non-invasive approach using LUSS could decrease the need for ABG analysis in patients who do not require repeated measurement of ABG values other than  $\text{PaO}_2$ , and thereby improve patient comfort.