Title (tentative): Quantitative lung ultrasonography (QLUS) to assess functional and structural lung parenchymal derangements in acute respiratory failure.

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**Description**

**Motivation and application domain**

Acute respiratory failure is the most relevant disease in critically ill patients and the risk of death is currently too high. Any improvement in outcome is likely to have a marked effect on intensive care resource allocation. The proposed project has the ambitious aim of creating a new diagnostic method in critical ill patients.

**General objectives and main activities**

QLUS will be performed a posteriori using all single/multi-frame images stored for each hemi-thorax. In the present research project is expected to implement the software with second-order Grey Scale Texture Features, based on co-occurrence matrices. The following second-order grey scale statistical formulae will be extracted from the images: 1) entropy, to measure the degree of disorder in the distribution of intensities; 2) contrast, to measure the weighted mean differences in intensity of neighboring pixels; 3) correlation, to measures the correlation between intensities of neighboring pixels; 4) energy to describe the variety of intensities found in the image; 5) homogeneity to measure the frequency with which near-identical intensities are adjacent to each other. LUS images from each hemi-thorax will be analyzed for second-order Grey scale Texture Features individually and all together in the hypothesis to find an index of inhomogeneity of lung parenchyma.

**Training Objectives (technical/analytical tools, experimental methodologies)**

Image processing and statistical analysis of clinical data of critically ill patients. Statistical analysis will be carried out using SPSS version 20.0 (SPSS Inc; Chicago, Illinois) and the R software/environment (R Foundation for Statistical Computing, Vienna, Austria).

**Place(s) where the thesis work will be carried out:** Anestesia e Rianimazione Ente Ospedaiero Ospedali Galliera, Genova

**Additional information**

Maximum number of students: 2