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

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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