

Application and Utility of the Rale Score for Assessment of Clinical Severity in Covid-19 Patients

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Abstract : Background: COVID-19 has and continues to be a strain on healthcare globally, with the number of patients requiring hospitalization exceeding the level of medical support available in many countries. As chest x-rays are the primary respiratory radiological investigation, the Radiological Assessment of Lung Edema (RALE) score was used to quantify the extent of pulmonary infection on baseline imaging. Assessment of RALE score's reproducibility and associations with clinical outcome parameters were then evaluated to determine implications for patient management and prognosis. Methods: A retrospective study was performed with the inclusion of patients testing positive for COVID-19 on nasopharyngeal swab within a single Local Health District in Sydney, Australia and baseline x-ray imaging acquired between January to June 2020. Two independent Radiologists viewed the studies and calculated the RALE scores. Clinical outcome parameters were collected and statistical analysis was performed to assess RALE score reproducibility and possible associations with clinical outcomes. Results: A total of 78 patients met inclusion criteria with the age range of 4 to 91 years old. RALE score concordance between the two independent Radiologists was excellent (interclass correlation coefficient = 0.93, 95% CI = 0.88-0.95, $p < 0.005$). Binomial logistics regression identified a positive correlation with hospital admission (1.87 OR, 95% CI= 1.3-2.6, $p < 0.005$), oxygen requirement (1.48 OR, 95% CI= 1.2-1.8, $p < 0.005$) and invasive ventilation (1.2 OR, 95% CI= 1.0-1.3, $p < 0.005$) for each 1-point increase in RALE score. For each one year increased in age, there was a negative correlation with recovery (0.05 OR, 95% CI= 0.92-1.0, $p < 0.01$). RALE scores above three were positively associated with hospitalization (Youden Index 0.61, sensitivity 0.73, specificity 0.89) and above six were positively associated with ICU admission (Youden Index 0.67, sensitivity 0.91, specificity 0.78). Conclusion: The RALE score can be used as a surrogate to quantify the extent of COVID-19 infection and has an excellent inter-observer agreement. The RALE score could be used to prognosticate and identify patients at high risk of deterioration. Threshold values may also be applied to predict the likelihood of hospital and ICU admission.

Keywords : chest radiography, coronavirus, COVID-19, RALE score

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