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Imaging AI for Chest CT to Aid in Resource Allocation During COVID-19

Evaluating the severity of pulmonary disease burden can help predict patient outcome in COVID-19 (Colombi et al. 2020; Revel et al. 2020). Quantifying lung pathology is, therefore, a crucial element in the resource and capacity management optimization of healthcare systems. The need to make a more objective decision on whether or not to send a patient home or to the ICU is growing together with the surge in COVID-19 cases.

icolung, a CE-marked AI software, objectively quantifies lung pathology on chest CT scans in COVID-19 patients in a matter of minutes. It is the first CE-marked CT AI solution, resulting from a multinational collaboration in response to the COVID-crisis. **icolung** is developed by **icomatrix**, a Belgian AI company, who leveraged their AI expertise and shifted their focus from brain to lung quantification in their fight against COVID-19. As a result, **icomatrix** is currently offering **icolung** pro bono.

The Role of CT in COVID-19

The Fleischner Society, a panel of 29 experts including 15 radiologists and 10 pulmonologists, provided the first consensus statement on the role of chest imaging in COVID-19. The Fleischner criteria describe recommendations in the form of scenarios based on disease severity, risk factors, pre-test probability, and the availability of resources. The criteria indicate the need for imaging in moderate-to-severe COVID-19 patients, independent of their COVID-19 test results. In these patients, CT can be used to confirm potential alternative pathologies in RT-PCR-negative patients and for risk-stratification in RT-PCR-positive patients (Rubin et al. 2020).

The degree of lung involvement on CT is an essential aspect of the pulmonary status as it correlates well with the severity of the disease and the outcome (Colombi et al. 2020; Revel et al. 2020). This degree is calculated by a score reflecting the percentages of affected tissue in each of the five lobes. Hence, CT allows a reliable assessment of pulmonary status to facilitate risk stratification for clinical worsening, which can support the triage of patients within the hospital.



For the quantitative assessment of affected lung tissue, AI tools are valuable. These algorithms, trained on CT images from confirmed COVID-19 cases and non-COVID-10 cases, allow for a fast, accurate, and quantitative analysis of chest CT scans. Hence, they alleviate the growing burden on radiologists, who must review and prioritize an increasing number of patient chest scans each day. With **icolung**, lung involvement can be assessed in a fast and objective way, resulting in a standardized quantitative report complemented with annotated images for the radiologist to review and use in their reporting. As a consequence, radiologists can report a more complete pulmonary status, including exact percentages of lung involvement.

“The icolung AI tool can provide a clear percentage of affected tissue, which radiologists can’t do. Of course, we still look at the scans and the radiology expertise is very important, but it’s great that this can go hand in hand with an accurate qualitative evaluation by AI,” says Professor Johan de Mey, Head of Radiology at UZ Brussels.



Prof. Dr Vandembroucke, Radiologist at UZ Brussel, Belgium.

The Impact on the Healthcare System

Quantification of lung pathology in COVID-19 patients is found to increase the specificity to predict ICU admission or death, meaning that clinicians will be able to better identify patients who can be sent home or to a non-ICU bed (Colombi et al. 2020). Pulmonologists, emergency physicians and intensive care physicians could, therefore, make a more informed treatment decision when knowing the extent of pulmonary infiltration in COVID-19 patients.

AI tools such as **icolung** can introduce consistency in this process by standardizing the quantification and returning an exact percentage of the total and regional lung pathology. This not only adds information to the CT report but can also impact workflow by speeding up the radiological reading and standardize the reporting, which is essential in a time-sensitive clinical setting.

Why is quantification for chest CT with AI so impactful? The difference between 25% versus 30% lung involvement

may have a significant impact on the outcome prediction and treatment pathway of patients, but is impossible to visually assess. AI assists in making an objective, fast and standardized call. As a result, resources can be allocated to patients who need them most!

icolung is a valuable clinical tool for the assessment of lung involvement in admitted COVID-19 patients. It assists in the risk-based stratification of COVID-19 patients and potentially can save ICU beds for those needing them most. Since **icolung** is a CE-marked medical device, it is available for clinical routine practice in the EEA, and, hence, allows for fast and reliable quantification of lung involvement with potential impact on clinical decisions. ■

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