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Early View

Correspondence

Covid-19: Opacification score is higher in the right lung and right lung involvement is a better predictor of ICU admission

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Dear Editor,

The global response to COVID-19 has resulted in a wealth of research. The accrual of data through electronic health records (EHR) facilitates the efficient interrogation of datasets. Indeed, many issues of relevance to the COVID-19 response have been explored in this way, the impact of ethnicity or ACE inhibition on outcomes, to name but two (1, 2).

Large teaching hospitals in the capital were at the forefront of the UK COVID-19 outbreak in the United Kingdom with over a thousand patients admitted in under one month. Research teams mobilised quickly to understand this new and unprecedented disease. We extracted data from our EHR to build a risk score that predicted critical care admission or death. The model included demographics, laboratory data and chest radiographic (CXR) severity (3).

The extent of CXR abnormality was scored using an adapted radiographic assessment of lung oedema for COVID-19, as proposed by Wong et al (4). The severity score attributes a number between 0–4 to each lung depending on extent of consolidation or ground-glass opacification as follows: 0 = no disease, 1 = <25% extent, 2 = 25–49%, 3 = 50–75%, 4 = >75%).

Admission CXRs on 1,389 consecutive patients admitted with COVID-19 were evaluated. The first 200 radiographs were assessed by two independent scorers: there was high (90.5%) inter-rater concordance. Subsequent review of between lung scores demonstrated moderate agreement ($r = 0.72$; $\kappa=0.52$).

A polychoric correlation comparing the degree of opacification by lung showed significant differences ($p<0.0001$). The striking differences were in the most severe categories. The right lung was more likely to be assigned the maximum extent score of 4: 11% versus 6% in the left lung. In addition, opacification of the right lung was a stronger predictor of admission to critical care or die (see figure). This finding has not been reported previously or with other imaging modalities. We acknowledge important limitations in our work. We did not account for projectional image quality (e.g. anterior or posterior views). The scoring was done by acute physicians rather than radiologists.

The explanation for the apparent differential lung involvement in COVID-19 is unclear. If the finding is confirmed, it may offer insights into the pathobiology of COVID-19 in the lungs. The explanation may lie in anatomy: the right lung is anatomically larger than the left, with a larger main bronchus diameter and more segmental bronchi, possibly increasing viral delivery to respiratory epithelial surfaces. Conversely, it is also possible that the lung scoring is subject to perception bias with the cardiac silhouette distracting from left lung abnormalities. To our knowledge asymmetrical radiographic involvement in interstitial lung disease has not been previously reported.

As a research group with an interest in machine learning, it is interesting to reflect on the power of human observation. We look forward to this pattern being explored in other cohorts using tools such as volumetric CT.

References

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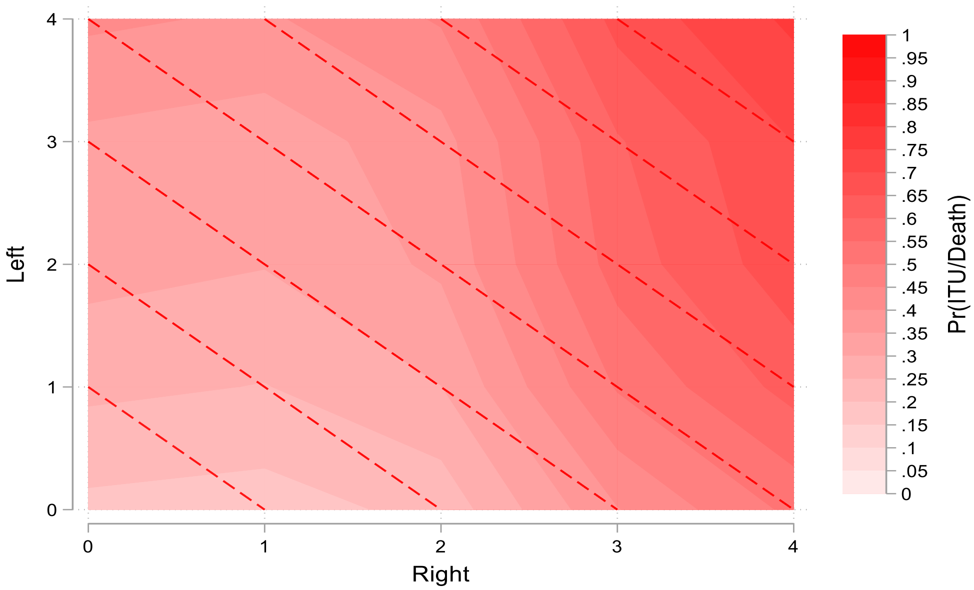
Figure.

a. Radiological severity scores for left and right lung. **b**. A heat map of the predictive value of severity scoring for the left and right lung. Darker colour corresponds to a higher probability of a critical care admission or death (Pr(ITU/Death).**c**. An example Chest X-ray showing greater opacification in the right lung field.

a.

Radiological Severity Score (L)	Radiological Severity Score (R)					
	0	**1**	**2**	**3**	**4**	**Total**
0	218	129	25	7	5	384
1	100	227	79	31	11	448
2	19	76	98	52	28	273
3	7	21	36	78	53	195
4	3	4	8	20	54	89
Total	347	457	246	188	151	1,389

b.



c.