ORIGINAL RESEARCH LETTER

Utility of chest radiography on admission for initial triaging of COVID-19 in symptomatic patients

To the Editor:

The number of patients with severe acute respiratory syndrome coronavirus 2 (coronavirus disease 2019 (COVID-19)) infection continues to rise globally. Physicians across specialties continue to play a pivotal role in the diagnosis and management of this disease. Early diagnosis with good sensitivity and specificity is important to cohort patients in the appropriate section of a multispecialty hospital. This is especially relevant in resource-limited settings, where triaging and isolation decisions as well as "intensity" of use of personal protective equipment, need to be taken quickly. Streamlining of workflows for rapid diagnosis and isolation, initial management, and infection prevention will matter not only to patients with COVID-19, but also to healthcare workers and other patients who are at risk from nosocomial transmission. The gold standard reverse transcriptase PCR (RT-PCR) test often takes >24 h, particularly when sent to an external centre. It is further limited by sampling issues and reduced sensitivity in actual clinical practice, in spite of its high sensitivity and specificity *in vitro* [1]. Non-contrast high-resolution computed tomography (HRCT) has repeatedly been shown to be sensitive to changes in COVID-19 pneumonia, sometimes preceding RT-PCR positivity [1–3]. However, in many parts of the world, access to computed tomography (CT) is limited, with issues like downtime due to the need for decontamination, cost, *etc.* In this setting, relatively cheap and "isolatable" portable chest radiography can play an important role in initial screening and diagnosis of COVID-19 [4].

Over a period of 6 weeks, 97 patients presented to the respiratory unit of a private healthcare facility with symptoms causing suspicion of COVID-19. A full clinical, biochemical and haematological assessment was performed on admission along with a chest radiograph. An RT-PCR test was performed on admission in 54 out of 97 patients (those with symptoms exceeding 5 days), and at day 5 of symptom onset (mean of 2.5 days after chest radiograph) in 43 patients. An external radiologist, not involved in the care of patients but aware of the date of symptom onset and the date of the chest radiograph, and blinded to all other parameters, including RT PCR, scored the images. A previously unvalidated Likert score based on radiographic features thought to be related to COVID-19 was developed to objectify the findings. This was based on the CT reporting format suggested by Simpson *et al.* [5] with the addition of one further group: Likert score 3(table 1).

Independent matching of the score with the RT-PCR result was then performed. Repeat RT-PCR tests were performed, haematological and biochemical tests continued, and bronchoscopic lavage (n=2) was implemented to exclude COVID-19 in patients with continuing suspicion and an initial negative result, in order to arrive at a definitive diagnosis.

29 out of 97 patients were diagnosed with COVID-19 based on the RT-PCR result. Chest radiography was performed at the time of presentation, which was a mean of 5.56 days (range 1–10 days) after symptom onset. There were 32 posterior–anterior, 58 anterior–posterior erect and seven anterior–posterior supine acquisitions. The sensitivity and specificity using a score of 5 plus 4 for positive diagnosis on chest

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A Likert score based on chest radiography of symptomatic patients of #COVID19 can be used as a diagnostic and triaging tool in the emergency room to help physicians identify patients with likelihood of COVID-19 and triage them appropriately https://bit.ly/3gDxzDK

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TABLE 1 Scoring of chest radiography on the probability of coronavirus disease 2019 (COVID-19) and the correlation between the Likert score and the eventual diagnosis of COVID-19

Likert score	Interpretation	CT criteria equivalent	Chest radiograph findings	RT-PCR-positive for SARS-CoV-2 (n=29)	RT-PCR-negative for SARS-CoV-2 (n=68)	Total (n=97)
1	Not COVID-19	No pneumonia features	No opacities	0	10	10
2	Unlikely to be COVID-19	Atypical appearance category on CT equivalent	Typical features absent. Presence of atypical features, such as pleural effusion, cavitation, pulmonary nodules, interstitial opacities, segmental or lobar consolidation only.	2	33	35
3	Indeterminate	Typical or indeterminate CT category plus one or more atypical criteria	Features from group 4 or 5 plus one or more features from group 2.	5	11	16
4	Likely to be COVID-19	Indeterminate category on CT equivalent and no negative criteria	Upper lobe, unilateral or peri-hilar airspace opacities, airspace opacity without a specific distribution, no atypical features.	8	9	17
5	COVID-19	Typical category on CT equivalent and no negative criteria	Bilateral, peripheral airspace opacities (both GGO and consolidation), patchy, lower lobe dominant. No negative/ atypical features.	14	5	19

Based on the high-resolution computed tomography findings described by Simpson *et al.* [5]. CT: computed tomograph; RT-PCR: reverse transcriptase PCR; SARS-CoV-2: severe acute respiratory syndrome coronavirus 2; GGO: ground-glass opacities.

radiography for COVID-19 was 75.86% (95% CI 56.5–90%) and 79.41%, respectively; and for a score of 5 plus 4 plus 3 it was 93.1% (95% CI 77–99%) and 63.2%, respectively.

Most radiology societies and the Centers for Disease Control and Prevention do not recommend the use of imaging for diagnosis or screening for COVID-19 [3]. However, in the clinical setting, HRCT has been extensively used worldwide as a diagnostic tool, given the delay of the RT-PCR result as well as its potential false-negative results. Thus far, most reports on CXR and scoring systems have been on monitoring and prognosticating patients with COVID-19 [6]. Based on this preliminary study, a Likert scale based on chest radiography of symptomatic patients can be used as a diagnostic tool in the emergency room, in conjunction with other clinical and laboratory parameters, to help physicians identify patients with a likelihood of COVID-19 and to triage them appropriately regarding isolation and containment pending the RT-PCR result. The tool can be versatile and depending on the clinical situation, the sensitivity can be increased at the cost of specificity by including the indeterminate group as positive for COVID-19 and *vice versa*. For example, in conjunction with local guidelines, patients with scores of 1 and 2 and fewer symptoms could be considered for supervised home isolation rather than hospital admission. Similarly, highly symptomatic patients with a score of 4 or 5 could have commencement of COVID-19-specific treatment pending RT-PCR result availability (specificity 79.41%). These results may, however, be influenced by the rate of community prevalence of COVID-19, as well as geographical and seasonal variations in the prevalence of other respiratory viral illnesses, and may not be generalisable to all circumstances and geography. The interval between the onset of symptoms and the performance of chest radiography also needs to be taken into consideration when analysing the chest radiograph. This scoring system needs to be further prospectively validated in larger studies. For example, the presence of linear, asymmetrical "interstitial"-looking opacities may occasionally be a radiographic feature of COVID-19 and could be considered in Likert 3 group as opposed to Likert 2. Such a scoring system could be further refined with the addition of clinical and laboratory parameters to improve diagnosis.

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Data availability: Individual participant data collected are available after deidentification immediately after publication without any end date. The data are available for researchers with a sound research proposal or by the journal editorial team. This can be obtained indefinitely by contacting the corresponding author by e-mail.

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