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COVID-19: The Importance of Multidisciplinary Approach

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To the Editors and our worldwide colleagues,—It is clear in these challenging times that creativity, endurance, and thoughtful application of knowledge is needed in all aspects of life. In radiology, the care for the needs of patients and the assurance of the safety of healthcare professionals involved in the imaging process has changed dramatically for many practices. Similarly, in thoracic imaging in particular, our differential diagnosis for nonspecific parenchymal opacities has certainly changed. The role of thoracic imaging for determination of the diagnosis and prognosis for COVID-19 patients is still unclear, although our knowledge/experience increases every day and there is certainly potential for quantitative imaging, machine learning/artificial intelligence tools to improve the sensitivity and specificity of imaging (1). However, we should remember the lessons learned over the history of radiology: expert radiologist interpretation, multidisciplinary evaluation, and consensus-based management decision-making are all needed to handle disease and optimize outcomes (2). The optimal triage of potential COVID-19 patients into specific treatment wards may leverage imaging as one component, but as with many pulmonary diseases such as interstitial lung disease and lung cancer, the multidisciplinary appraisal of patient-specific imaging, clinical, social, and financial aspects of management must be considered. Triage of a patient to a COVID-19 treatment ward based on imaging findings indeterminate but atypical for COVID-19 infection can be an endangerment to that patient, as recently underlined by the Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19 (3). Conversely, recognition of characteristic imaging features on radiography or CT in a patient with nonspecific or atypical clinical presentation can appropriately escalate care and expedite the protection of healthcare providers and the public (4). Multidisciplinary review of information and expert discussion for COVID-19 cannot be as unhurried as a typical tumor board or interstitial lung disease management discussion, but we purport that this dialog among colleagues with a shared purpose is equally if not more important for COVID-19. Each healthcare system obviously has unique challenges, and the volume and rapidity of the needed conversations can become overwhelming but cannot be dismissed.

In Pisa, Italy, we are near the epicenter of the Italian COVID-19 outbreak. Based on the pluriannual experience gained on multidisciplinary discussion of interstitial lung disease and lung cancer, being aware of the importance of a correct interpretation of chest CT findings on the management of the patients, we have engaged a process to facilitate review of imaging findings by a subspecialty thoracic radiologist, review with clinicians including pulmonary medicine and infectious disease specialist and discussion with the patient before management decisions are made. We aim to manage incidental findings of typical COVID-19 appearance in patients undergoing thoracic imaging for malignancy staging and to help confidently rule out COVID-19 in patients with nonspecific symptoms and imaging features inconsistent with COVID-19 in order to avoid patients incorrect and potentially dangerous COVID-19 treatment.

At Mayo Clinic, the prevalence of COVID-19 remains relatively low but there is great need to continue to provide care for the typically complex problems and carry on with semi-urgent procedures for patients who travel to Mayo Clinic while assuring the safety of care providers. Therefore, the thoracic imaging subspecialty group, infectious disease specialists, pulmonologists and surgeons developed an “advanced screening program” where patients who needed semi-urgent surgery would have a low-dose chest CT after a negative COVID-19 PCR to further reduce the chance of false-negative test results (5). Three thoracic radiologists reviewed each case with parenchymal findings indeterminate or suggestive of COVID-19 (3) and coordinated discussion of the consensus review with the care providers was used to determine whether surgery would proceed or be delayed based on patient-specific factors.

Not all healthcare institutions have the burden of Italy or the resources of Mayo Clinic. But we cannot forget the lessons learned from the multidisciplinary and expert sub-specialty review in the optimized management of each patient. For each suspected COVID-19 patient or those with suspicious imaging findings incidentally discovered, reach out to a colleague. Discuss with experts in thoracic radiology. Determine consensus with clinicians. Although some radiologists work remotely, we must maintain our value as active members of the patient care team. The pandemic demands this approach, as we have learned from other diseases many times previously.

DECLARATION OF COMPETING INTEREST

Dr. Bartholmai declares personal fees from Promedior, LLC, and from Imbio, LLC, outside the submitted work. Mayo Clinic has received grants from NIH/NHLBI, fees from Imbio, LLC, and Boehringer Ingelheim outside the submitted work. In addition, Dr. Bartholmai has a patent for SYSTEMS AND METHODS FOR ANALYZING IN VIVO TISSUE VOLUMES USING MEDICAL IMAGING pending to Mayo Clinic. The other authors of this manuscript declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Chiara Romei has made substantial contributions to conception and design, has drafted the submitted article, revised it critically and substantially for important intellectual content; has provided final approval of the version to be published; has agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Annalisa De Liperi has made substantial contributions to conception and design, has revised the submitted article critically and substantially for important intellectual content; has provided final approval of the version to be published; has agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Brian J. Bartholmai has made substantial contributions to conception and design, has drafted the submitted article, revised it critically and substantially for important intellectual content; has provided final approval of the version to be published; has agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or

integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Neri E, Miele V, Coppola F, et al. Use of CT and artificial intelligence in suspected or COVID-19 positive patients: statement of the Italian Society of Medical and Interventional Radiology. *Radiol Med* 2020; 1–4. doi:[10.1007/s11547-020-01197-9](https://doi.org/10.1007/s11547-020-01197-9).
2. Raghu G, Remy-Jardin M, Myers JL, et al. Diagnosis of idiopathic pulmonary fibrosis. An official ATS/ERS/JRS/ALAT clinical practice guideline. *Am J Respir Crit Care Med* 2018; 198:44–68.
3. Simpson S, Kay FU, Abbara S, et al. Radiological Society of North America Expert Consensus Statement on reporting chest CT findings related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA. *J Thorac Imaging* 2020. doi:[10.1148/ryct.2020200152](https://doi.org/10.1148/ryct.2020200152).
4. Inui S, Fujikawa A, Jitsu M, et al. Chest CT findings in cases from the cruise ship “Diamond Princess” with coronavirus disease 2019 (COVID-19). *Radiol Cardiothorac Imaging* 2020. doi:[10.1148/ryct.2020200110](https://doi.org/10.1148/ryct.2020200110).
5. Dangis A, Gieraerts C, De Bruecker Y, et al. Accuracy and reproducibility of low-dose submillisievert chest CT for the diagnosis of COVID-19. *Radiol Cardiothorac Imaging* 2020. doi:[10.1148/ryct.2020200196](https://doi.org/10.1148/ryct.2020200196).

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