Bibliographic Citation	PMID Link	Literature Type	Level of Evidence	Purpose	Population	Intervention and Outcome Measures	Results/Recommendations	Study Limitations
Garg M, Gupta P, Maralakunte M, et al. Diagnostic accuracy of CT and radiographic findings for novel coronavirus 2019 pneumonia: Systematic review and meta-analysis. Clin Imaging. 2021; 72:7-82.	33217674	Systematic review and meta-analysis	Low Based on low and very low evidence individual articles.	To evaluate pooled prevalence, sensitivity, and specificity of chest computed tomography (CT) and radiographic findings for novel coronavirus-2019 (COVID 19) pneumonia.	Fifty-six studies (6007 patients, age, 2.1–70 years, 2887 females, 5762 CT, 396 radiographs,) were included. Criteria for inclusion of studies were as follows: (a) Confirmed COVID-19 based on positive RT-PCR on one of the respiratory specimens (b) studies reporting the imaging findings in COVID-19 pneumonia on a baseline CT (c) the absolute numbers of patients with positive imaging findings should have been directly reported or was derivable and (d) more than ten patients should have been reported. Review articles, case series (≤10), case reports, pictorial essays, letter to the editor (on already published papers), unpublished data, conference abstracts, and proceedings on the topic of interest were excluded.	A systematic literature search was performed in PubMed and Embase to identify articles reporting baseline imaging findings of COVID-19 pneumonia. The quality of the articles was assessed using NIH quality assessment tool for case series studies. The pooled prevalence, sensitivity, specificity, and diagnostic odds ratio of imaging findings were calculated.	The mean interval between onset of symptoms and CT acquisition was 1–8 days. On CT, the pooled prevalence of ground glass opacities (GGO), GGO plus consolidation, and consolidation only was 66.9% (95% CI 60.8–72.4%), 44.9% (38.7–51.3%), and 32.1 (23.6–41.9%) respectively. Pooled sensitivity and specificity of GGO on CT was 73% (71%–80%) and 61% (41%–78%), respectively. For GGO plus consolidation and consolidation only, the pooled sensitivities/specificities were 58% (48%–68%)/ 58% (41%–73%) and 49% (20%–78%)/ 56% (30%–78%), respectively. The pooled prevalence of GGO and consolidation on chest radiograph was 38.7% (22.2%–58.3%) and 46.9% (29.7%–64.9%), respectively. The diagnostic accuracy of radiographic findings could not be assessed due to small number of studies.	The authors note a few limitations to the study. First, they evaluated the findings of only the baseline CT scan and chest radiograph, and so could not assess the pattern of disease progression. However, the inclusion of a baseline CT scan matches well with the primary aim of the meta-analysis. Second, most of the studies were retrospective and included patients with varying degrees of disease severity. Thus, the results of the meta-analysis need to be reviewed carefully.
Islam N, Salameh JP, Leeflang MM, et al. Thoracic imaging tests for the diagnosis of COVID-19. Cochrane Database Syst Rev. 2020; 11:CD013639.	33242342	Systematic review and meta-analysis	Moderate Based on low and very low evidence individual articles.	To evaluate the diagnostic accuracy of thoracic imaging (computed tomography (CT), X-ray and ultrasound) in people with suspected COVID-19.	Authors included studies of all designs, except for case-control, that recruited participants of any age group suspected to have COVID-19 and that reported estimates of test accuracy or provided data from which they could compute estimates. They ultimately included 51 studies with 19,775 participants suspected of having COVID-19, of whom 10,155 (51%) had a final diagnosis of COVID 19.	The review authors independently and in duplicate screened articles, extracted data and assessed risk of bias and applicability concerns using the QUADAS-2 domain-list. Authors presented the results of estimated sensitivity and specificity using paired forest plots, and summarized pooled estimates in tables. Authors used a bivariate meta-analysis model where appropriate, and presented the uncertainty of accuracy estimates using 95% confidence intervals (CIs).	Risk of bias was high or unclear in thirty-two (63%) studies with respect to participant selection, 40 (78%) studies with respect to reference standard, 30 (59%) studies with respect to index test, and 24 (47%) studies with respect to participant flow. For chest CT (41 studies, 16,133 participants, 8110 (50%) cases), the sensitivity ranged from 56.3% to 100%, and specificity ranged from 25.4% to 97.4%. The pooled sensitivity of chest CT was 87.9% (95% CI 84.6 to 90.6) and the pooled specificity was 80.0% (95% CI 74.9 to 84.3). There was no statistical evidence indicating that reference standard conduct and definition for index test positivity were sources of heterogeneity for CT studies. For chest X-ray (9 studies, 3694 participants, 2111 (57%) cases) the sensitivity ranged from 51.9% to 94.4% and specificity ranged from 40.4% to 88.9%. The pooled sensitivity of chest X-ray was 80.6% (95% CI 69.1 to 88.6) and the pooled specificity was 71.5% (95% CI 59.8 to 80.8). For ultrasound of the lungs (5 studies, 446 participants, 211 (47%) cases) the sensitivity ranged from 68.2% to 96.8% and specificity ranged from 21.3% to 78.9%. The pooled sensitivity of ultrasound was 86.4% (95% CI 72.7 to 93.9) and the pooled specificity was 54.6% (95% CI 35.3 to 72.6). Based on an indirect comparison using all included studies, chest CT had a higher specificity than ultrasound. For indirect comparisons of chest CT and chest X-ray, or chest X-ray and ultrasound, the data did not show differences in specificity or sensitivity.	The authors note the following: 1) we included studies that involved only symptomatic participants, as well as studies that had a mixed population (i.e. symptomatic and asymptomatic participants); 2) we did not identify reference standard conduct or definition for index test positivity as sources of variability for chest CT accuracy; 3) we could not evaluate threshold effects for studies that used scoring systems other than the CO-RADS due to the limited number of included studies that used other scoring systems; 4) due to the limited number of studies that evaluated multiple imaging modalities in the same population, we did not formally evaluate direct comparisons of different imaging tests at this stage; 5) we performed the cumulative meta-analyses and time trends analyses of chest CT accuracy estimates using a univariate model, whereas we performed all other meta-analyses in this review using a bivariate model; 6) we were not able to evaluate accuracy estimates based on specific findings of imaging tests or combinations of such findings because of the lack of data granularity reported in included studies.
Khatami F, Saatchi M, Zadeh SS, et al. A meta-analysis of accuracy and sensivity of chest CT and RT-PCR in COVID-19 diagnosis. Sci Rep. 2020; 10(1):22402.	33372194	Meta-analysis	Moderate Based on low and very low evidence individual articles.	To determine the diagnostic value of an initial chest CT scan in patients with COVID-19 infection in comparison with RT-PCR.	All relevant case-series, cross sectional, and cohort studies were selected. Inclusion criteria: observational epidemiological study design, clear report of the number of positive cases by PCR and chest CT, and the ability to calculate accuracy indicators. Exclusion criteria: case reports or not meeting one or more inclusion criteria.	Three main databases; PubMed (MEDLINE), Scopus, and EMBASE were systematically searched for all published literature from January 1st, 2019, to the 21st May 2020 with the keywords "COVID19 virus", "2019 novel coronavirus", "Wuhan coronavirus", "2019-nCoV", "X-Ray Computed Tomography", "Polymerase Chain Reaction", "Reverse Transcriptase PCR", and "PCR Reverse Transcriptase". Data extraction and analysis were performed using STATA v.14.0SE and RevMan 5.	Among 1022 articles, 60 studies were eligible for totalizing 5744 patients. The overall sensitivity, specificity, positive predictive value, and negative predictive value of chest CT scan compared to RT-PCR were 87% (95% CI 85–90%), 46% (95% CI 29–63%), 69% (95% CI 56–72%), and 89% (95% CI 82–96%), respectively. It is important to rely on the repeated RT-PCR three times to give 99% accuracy, especially in negative samples. Regarding the overall diagnostic sensitivity of 87% for chest CT, the RT-PCR testing is essential and should be repeated to escape misdiagnosis.	The authors acknowledge some limitations: (1) the specificity of CT scan was not as reliable as the sensitivity, due to the majority of studies' nature, which were case-series and the number of true negative patients in those studies were zero. (2) It has been postulated that the chance of detecting lung involvement in chest CT scan will be increased if the duration between symptom onset and initial chest CT scan rises and this duration was different among 60 studies.

Ojha V, Mani A, Pandey NN, et al. CT in coronavirus disease 2019 (COVID-19): A systematic review of chest CT findings in 4410 adult patients. Eur Radiol. 2020; 30(11):6129-6138.	[32474632]()	Systematic review	Moderate Based on low and very low evidence individual articles.	To evaluate the key imaging manifestations of COVID-19 on chest CT in adult patients by providing a comprehensive review of the published literature.	A total of 45 studies comprising 4410 patients were included. The selection criteria for articles to be shortlisted for the final review included research papers/case series with a sample size of 5 or more, and mentioning the chest CT findings of adult patients with COVID-19 infection confirmed on RT-PCR. Additional inclusion criteria were articles published in English and conducted on humans, and those which had a full text extractable. No restrictions were applied on the country of the original research. Case series with < 5 patients, case reports, editorials, systematic and pictorial reviews, and meta-analyses were excluded.	The titles and abstracts of the included articles were screened by two independent reviewers based on the inclusion criteria. Disagreements were resolved by consensus and subsequently by a senior reviewer. The studies were rated for their quality based on the National Institutes of Health (NIH) Quality Assessment Tool for Case Series Studies by two independent reviewers. Authors performed a systematic literature search from the PubMed, Google Scholar, Embase, and WHO databases for studies mentioning the chest CT imaging findings of adult COVID-19 patients.	Ground glass opacities (GGO), in isolation (50.2%) or coexisting with consolidations (44.2%), were the most common lesions. Distribution of GGOs was most commonly bilateral, peripheral/subpleural, and posterior with predilection for lower lobes. Common ancillary findings included pulmonary vascular enlargement (64%), intralobular septal thickening (60%), adjacent pleural thickening (41.7%), air bronchograms (41.2%), subpleural lines, crazy paving, bronchus distortion, bronchiectasis, and interlobular septal thickening. CT in early follow-up period generally showed an increase in size, number, and density of GGOs, with progression into mixed areas of GGOs plus consolidations and crazy paving, peaking at 10–11 days, before gradually resolving or persisting as patchy fibrosis. While younger adults more commonly had GGOs, extensive/multilobar involvement with consolidations was prevalent in the older population and those with severe disease.	1) inclusion criteria were limited to studies published in English, which is a major limitation since the initial epicenter of the outbreak was in China; 2) excluded the individual case reports which could represent some of the atypical manifestations. Since a number of included studies were limited as well as heterogeneous in terms of sample size, methodologic quality, and data availability, findings from this study should be interpreted with caution and in appropriate clinical context; 3) presence of different scanners, acquisition parameters, and the experience of the interpreting radiologists may induce some variability in the reported CT findings.
Salehi S, Abedi A, Balakrishnan S, Gholamrezanezhad A. Coronavirus disease 2019 (COVID-19): A systematic review of imaging findings in 919 patients. AJR Am J Roentgenol. 2020; 215(1):87-93.	[32174129]()	Systematic review	Moderate Based on low and very low evidence individual articles.	To complie a cohesive literature review on CT features of the 2019 novel coronavirus disease (COVID-19).	A total of 2679 records were identified After the search records were screened, 30 studies consisting of 19 case series and 11 case reports with a total of 919 patients were included in the final review.To be included in the final review, the articles needed to be published in English, include patients diagnosed with the recent coronavirus outbreak (COVID-19), and report CT findings. Studies pertaining to other coronavirus-related illnesses, such as Middle East respiratory syndrome (MERS) were excluded.	This article includes a systematic literature search of PubMed, Embase (Elsevier), Google Scholar, and the World Health Organization database. Two reviewers independently rated the quality of included studies using the National Institutes of Health Quality Assessment Tool for Case Series Studies. One of the reviewers performed the data extraction, and the other reviewer assessed the accuracy of the extracted data. When studies contained sufficient granular data, findings such as the number of involved pulmonary lobes and general pattern of lesions were combined across the studies.	Known features of COVID-19 on initial CT include bilateral multilobar ground-glass opacification (GGO) with a peripheral or posterior distribution, mainly in the lower lobes and less frequently within the right middle lobe. Atypical initial imaging presentation of consolidative opacities superimposed on GGO may be found in a smaller number of cases, mainly in the elderly population. Septal thickening, bronchiectasis, pleural thickening, and subpleural involvement are some of the less common findings, mainly in the later stages of the disease. Pleural effusion, pericardial effusion, lymphadenopathy, cavitation, CT halo sign, and pneumothorax are uncommon but may be seen with disease progression. Follow-up CT in the intermediate stage of disease shows an increase in the number and size of GGOs and progressive transformation of GGO into multifocal consolidative opacities, septal thickening, and development of a crazy paving pattern, with the greatest severity of CT findings visible around day 10 after the symptom onset. Imaging patterns corresponding to clinical improvement usually occur after week 2 of the disease and include gradual resolution of consolidative opacities and decrease in the number of lesions and involved lobes.	A number of included studies were limited in terms of sample size, data availability, and methodologic quality. Therefore, the reported findings should be interpreted cautiously within that context. Furthermore, our study was limited to the articles published in English. Considering the epicenter of COVID-19, Chinese literature should be included in future systematic reviews.