Table 4
Laboratory, Imaging, RT-PCR, and Antigen test common and severe findings. Adapted from [2, 48, 108, 109, 113–116, 118]

	Early stage of infection/Common findings	Late stage/severe cases of infection/severe findings
Laboratory findings	Lymphopenia, elevated AST, LDH, muscle enzymes [108], CRP, and ESR [48]. Procalcitonin values are normal [48, 109].	Elevated D-dimer, reduced lymphocyte counts with altered laboratory values indicating multi-organ failure. High levels of ALT and AST [48, 108, 109, 113]. IL-6 induces gene expression and the release of CRP [114]. IL-6 is part of the host defense mechanism to combat infections and tissue injuries. When expressed excessively while fighting SARS-CoV-2, it can trigger a severe acute systemic inflammatory response, cytokine storm [115]. Studies have shown that serum levels of IL-6 and CRP can evaluate severity of disease, predict the need for mechanical ventilation and estimate prognosis in COVID-19 patients [114–116].
Imaging studies	Bilateral, diffuse, patchy ground-glass opacities with or without consolidations in a peripheral, posterior, or lower lung zone distribution [108, 109]. Studies revealed that a slight majority of patients had a negative CT during the first two days of symptom onset, with a ground-glass opacity usually developing between day 0 and 4 after the beginning of symptoms, and peaking between day 6–13 [110].	Lymphadenopathy and pleural effusion have been reported more rarely. Other studies report that the sensitivity of chest CT to reflect SARS-CoV-2 infection in suspected patients accurately, was 97% based on RT-PCR positivity, and 75% based on negative RT-PCR results. These findings showed that chest CT is a sensitive test to confirm SARS-CoV-2 infection in conjunction with RT-PCR [2].
A negative CT should not be used to exclude the possibility of COVID-19 infection in its early stages. On the contrary, the use of CT is recommended in clinical management and screening of incidental findings that are potentially attributable to COVID-19 [110]. Available data regarding these CT findings are limited, such that new patterns may emerge with further studies [112]. Some studies suggest that over 20% of patients with COVID-19 may have coexistent infections, which can obscure the relationship of CT findings to the disease process [110].		
RT-PCR	Main clinical laboratory diagnostic test in COVID-19 detection [2]. RT-PCR from a respiratory specimen is currently the most accurate test to screen and diagnose an active COVID-19 infection. Not all tests are equivalent, however, and as such their acceptance on approved test lists is critically important [110]. The CDC recommends the collection and testing of an upper respiratory specimen, with nasopharyngeal being the preferred route. An oropharyngeal sample, nasal mid-turbinate swab, and an anterior nares specimen are acceptable alternatives when the sampling of a nasopharyngeal swab is not possible.	For patients receiving invasive mechanical ventilation, a lower respiratory tract aspirate or bronco-alveolar lavage sample should be collected and tested [112]. The sample requires storage at 2–8°C for up to 72 h after collection. If testing or shipping is delayed, the specimen should be stored at –70°C or lower [112, 117]. The positive rate of RT-PCR for throat swab samples in early stages of COVID-19 has been unacceptably low at 60% [118]. In a study of 51 patients, the positivity rate for a single respiratory swab was still just 70%, but adding a second test elevates this to 94%, and a third test increasing that to 98% [118]. Thus, at least two and if possible three, independent RT-PCR analyses are recommended to confirm COVID-19 diagnosis.
Antigen testing	COVID-19 IgM/IgG rapid testing using blood samples revealed a reduced sensitivity in detecting infection, and often less than 20%. The majority of patients testing positive for COVID-19 by RT-PCR would have tested negative using the rapid serological assay alone, highlighting the potential for misdiagnosis of COVID-19 using the latter assay in isolation [110, 111]. The rapid antigen tests are thus not recommended for screening active COVID-19 infections but rather for monitoring those exposed to COVID-19 previously, and regardless of recovery.	

ALT, Alanine aminotransferase; AST, Aspartate aminotransferase; CRP, C-Reactive protein; CT, computed tomography; ESR, Erythrocyte sedimentation rate; LDH, lactate dehydrogenase; RT-PCR, Reverse transcription-polymerase chain reaction.

tions is supportive care. In patients presenting with hypoxia or respiratory failure, despite supplemental oxygenation and worsening dyspnea, the use of mechanical ventilation should be considered. Extracorporeal membrane oxygenation should be used as a last resort [2, 7, 14], identifying specific clinical characteristics of critical COVID-19 patients may improve outcome [119].

Mechanical ventilation

Mechanical ventilation is recommended with lower than normal tidal volumes (4 to 6 ml/kg predicted body weight) and lower inspiratory pressures, reaching a plateau pressure <28 to 30 cm H_2O. The positive end-expiratory pressure (PEEP) must be high to maintain the driving pressure (Pplat-PEEP)