Magellan HEALTHCARE

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Advanced Imaging Digest

COVID-19 complications and outpatient imaging utilization

Introduction

Imaging plays a pivotal role in the diagnosis of some COVID-19 complications. Given the large number of individuals affected by the virus, the use of outpatient imaging to monitor these complications may increase.

Currently, the available literature for follow-up imaging of COVID-19-related complications is limited. Recommended follow-up of complications is generally determined by the actual complication, regardless of COVID-19 being the underlying cause. For example, imaging for patients with a known stroke is based on the stroke parameters, regardless of whether COVID-19 is the underlying cause. Magellan Healthcare is currently evaluating the influence that a confirmed diagnosis or suspected diagnosis of COVID-19 has as an independent risk factor and its impact on outpatient imaging utilization. For example, in patients with a known seizure history, there is potential for COVID-19 to trigger seizures in patients who are normally well controlled. In addition, there are potential drug interactions with traditional anti-seizure medications and COVID-19 related treatments. Similarly, COVID-19 may result in multiple sclerosis (MS) flares/relapse/exacerbations in patients with known MS due to post-inflammatory immune response. Other conditions for which COVID-19 may be a risk factor are listed below. We are monitoring new literature and data as they emerge.

Respiratory

Pulmonary embolism (PE)—Patients with COVID-19 have a risk for thromboembolic complications due to activation of the coagulation cascade by the virus and/or local or systemic inflammation. Risk of death is five times higher in patients with thromboembolic complications.

Magellan Healthcare clinical leaders continually review imaging trends and needs in light of current medical concerns, available literature, and society and Centers for Disease Control and Prevention recommendations and guidelines. This document is a summary of our latest findings. Please consult references for detailed information.

The incidence of PE in patients with COVID-19 who underwent CT pulmonary angiography is reported to be between 17% and 35%. The exact contribution of PE to mortality in patients with COVID-19 is still unknown due to the limited number of autopsy studies.

Patients with suspected COVID-19 and a high clinical suspicion of PE (e.g., determined on the basis of hemoptysis, unexplained tachycardia, signs and symptoms of deep venous thrombosis, or increased D-dimer levels) are already broadly included in Magellan Healthcare guidelines.

Lung disease—Most COVID-19 infections affect the respiratory system. Most patients suffer from mild-to-moderate disease/symptoms, with 5-10% progressing to acute respiratory failure.

Early literature suggests that some COVID-19 patients may have long-term respiratory complications, such as fibrosis. Parenchymal fibrotic changes, including interstitial thickening, coarse retinal patterns and parenchymal ligaments, are documented as early as three weeks after symptoms appear, regardless of whether the disease was mild, moderate or severe.

Pulmonary fibrosis changes are also likely to occur more frequently in older or immunocompromised patients. Current literature suggests that it is too early to determine which individuals who have had COVID-19 have the greatest risk of developing long-term lung abnormalities and whether these abnormalities will eventually resolve or become permanent.

At this time, there is no consensus on imaging follow-up for patients who have had COVID-19. One published approach suggests:

- An initial baseline imaging evaluation with non-contrast high-resolution CT scan (HRCT) with 6- and 12-month follow-up procedures to reassess for any lung disease.
- Imaging on a case-by-case basis, but patients with known lung disease should have scans at 6, 12, 24 and 26 months to help understand the long-term impacts.

The majority of the current literature suggests that the volume of HRCTs will initially increase until further studies define the progression of the lung parenchymal findings, which must be closely monitored and confirmed by additional studies.

Neurological

For the most part, neurological impairment in COVID-19 patients has been partially or completely reversible once the underlying disease is addressed.

Encephalopathy is extremely common in COVID-19-related infections and reported in up to 66% of patients in some studies. Therefore, it should be considered a risk factor in patients who present changes in their mental state. Change in mental state with concern for encephalitis is currently included in Magellan Healthcare guidelines for initial diagnosis and follow-up.

Stroke is often associated with COVID-19, and the initial diagnostic approach should be similar to the approach commonly used for all patients with suspected stroke.

Anosmia and **dysgeusia** have been reported as common early symptoms in patients with COVID-19 and occur in more than 80% of patients. In isolated anosmia, imaging is usually not required once the diagnosis of COVID-19 has been made due to the high association. Requiring COVID-19 testing prior to imaging is under review for guideline incorporation.

Musculoskeletal

Guillain-Barré syndrome (GBS) is a rare complication of COVID-19 with the development of muscle weakness that occurs between 5 and 10 days after the onset of infection. Recent literature suggests that MR may or may not show nerve root enhancement related to GBS. Diagnosis of GBS should follow standard diagnostic protocols (i.e., nerve conduction studies, laboratory testing, cerebrospinal fluid analysis, etc.) and be addressed regardless of the etiology.

Cardiac

COVID-19 entry into heart tissue is thought to be triggered by binding of the viral spike protein to a common receptor such as angiotensin-converting enzyme 2. Whether the actual virus entry into the tissue is due to a cytokine storm, hyper-immune response, thromboembolic event or other abnormality, the cardiac manifestations of the disease are highly prevalent and lead to significant morbidity and mortality.

Although much of the data and manifestations of COVID-19 are reported from inpatient studies, it is vital that appropriate outpatient imaging studies are considered, as patients with cardiac manifestations of disease may approach hospitals too late. For example, in Italy, although the number of reported cases of acute coronary syndrome (ACS) during the early stages of the pandemic was lower than the year before, the incidence of cardiac arrest outside the hospital increased during the outbreak.

COVID-19 appears to cause cardiovascular disorders such as myocardial injury, arrhythmias, ACS and venous thromboembolism. The mechanism of COVID-19-related myocardial injury and ACS is still under investigation, but may be systemic inflammation, cytokine increases causing plaque rupture or coronary spasms, or microthrombi. Given the prevalence and poor clinical outcomes, patients with or recovering from COVID-19 with cardiac symptoms may likely have atherosclerotic heart disease and should be tested according to The American College of Cardiology guidelines.

Heart failure—One of the most common complications of COVID-19 is heart failure. In an early Wuhan study, the incidence of heart failure across was 24% in all patients and 49% in those who died. Hyperreaction of the immune system to infections can trigger the development of stress-induced cardiomyopathy or cytokine-related myocardial dysfunction.

Given that many hospitalized patients have co-morbidities associated with heart failure, such as hypertension, diabetes or coronary disease, the prevalence may be due to undiagnosed prior cardiomyopathy, but also may be new onset due to the infection and the release of cytokines. It is simply unknown at this time.

Cardiac imaging is at the center of evaluation for recovering individuals. Generally, further study by cardiac MRI is considered the gold standard assessment and appropriate if there is continued concern for those with abnormal cardiac biomarkers like troponins, abnormal EKGs or abnormal echocardiograms, each of which is standard and appropriate for the initial study and diagnosis of myocarditis.

Multisystem inflammatory syndrome in children (MIS-C) is a Kawasaki disease-like inflammation of the heart in children and teenagers. COVID-19 infection can cause MIS-C in less than one week after onset of fever.

MIS-C in connection with COVID-19 can be associated with multi-organ injuries and primarily affects the cardiovascular system. It has also been reported to affect the gastrointestinal and genitourinary systems, reflecting an underlying multi-organ inflammatory process. While most recover, the long-term outcome of MIS-C is yet to be determined.

In the early stages of Kawasaki disease, coronary artery abnormalities can be screened by transthoracic echocardiography. Given the non-specific clinical presentation of MIS-C in connection with COVID-19, echocardiogram evaluation has played an important role in diagnosis, as patients can deteriorate rapidly if not quickly diagnosed and treated.

Conclusion

The COVID-19 pandemic has placed significant strain on the medical system, including imaging utilization. As the literature on the effects of COVID-19 complications evolves, so will the recommendations on the potential need for and duration of follow-up for these complications and the extent to which COVID-19 becomes an independent risk factor in imaging utilization.

About the authors

M. Atif Khalid, M.D., senior medical director, Magellan Healthcare

Dr. Khalid joined Magellan in 2014. As a board-certified diagnostic radiologist with a career spanning more than twenty years, he has a thorough understanding of the complexities of the U.S. healthcare system and current standards of care. In his current role, Dr. Khalid is involved in training new physicians, auditing, continuing education and policy development. His experience managing more than one hundred and eighty-five physicians performing utilization management reviews has afforded him the business acumen to be successful in many arenas of healthcare beyond just coverage of services.

Joseph Mazzie, D.O., physician clinical reviewer, Magellan Healthcare

Dr. Mazzie, a board-certified radiologist with over 19 years of experience, joined Magellan in 2014. He is a graduate of the New York Institute of Technology College of Osteopathic Medicine, where he is currently an associate professor of radiology.

Rosalind Watman, D.O., medical director, cardiology, medical specialty solutions, Magellan Healthcare

Dr. Watman, a board-certified cardiologist with over 30 years of experience, joined Magellan Healthcare in 2014 as a senior physician reviewer. In her role, she trains new physicians in the appropriate utilization of cardiac studies. She is also involved in the creation and implementation of cardiac guidelines and collaborates with health plans and providers to ensure high-quality patient care.

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