Coronavirus Disease 2019 (COVID-19): Prevention and Control in the Radiology Department

Rebecca Hamm, MEd, R.T.(R)(CT)

Coronavirus previously was known to have 6 strains that affect humans; the newest strain, novel coronavirus (SARS-CoV-2), is the seventh. First discovered in Wuhan City, Hubei Province, China, SARS-CoV-2 has spread to most countries across the world, including the United States. All strains of the coronavirus cause symptoms similar to those of the common cold or influenza such as fever and cough, and body aches; however, patients with COVID-19—the disease resulting from SARS-CoV-2 transmission—also present with shortness of breath. Symptoms can be mild or severe and can result in pneumonia. COVID-19 differs from previous strains because it can move deeper into the airway and cause severe respiratory distress, kidney failure, or death. A laboratory test is required to confirm a COVID-19 diagnosis. Symptoms typically appear 2 to 14 days after exposure to the virus. As a pandemic, COVID-19 is of particular concern in the health care setting, and on March 13, the president of the United States declared the COVID-19 outbreak a national emergency. The situation is rapidly evolving and changing. Health care workers, including radiologic technologists, should remain informed about the virus and share updates as they become available.

Contagion and Mortality

Epidemiologists—scientists who study diseases and their transmission—around the world are studying COVID-19 to ascertain the danger it presents to the public. However, limitations—such as the number of confirmed local cases, differing factors between geographic areas, and varied calculations—present numerous challenges. Viruses are given a rating, $R_0$, based on the number of people to whom an infected person can transmit the virus. Estimates from the World Health Organization (WHO) indicate that COVID-19 has an $R_0$ rating of 1.4 to 2.5, whereas estimates from Lancaster University indicate an $R_0$ of 3.6 to 4.0.

In regard to case-fatality rate, COVID-19 has a lower rate than severe acute respiratory syndrome (SARS), middle eastern respiratory syndrome (MERS), and measles. The studies on mortality rate of COVID-19 also are varied. The Centers for Disease Control and Prevention (CDC) estimates case-fatality rates between 0.25% and 3.0%, but rates vary substantially with age and risk factors such as heart disease, lung disease, and diabetes. For comparison, diseases with higher case-fatality rates include measles (15%), SARS (14%-15%), and MERS (34%-35%). Concerning factors are the rate of transmission and the public’s lack of immunity to the new strain of this virus. As of March 19, 2020, global COVID-19 cases surpassed 209,000, with nearly 9000 deaths—and more than 800 new deaths from the previous day.

Transmission

With the increasing number of confirmed COVID-19 cases, the CDC recommends limiting
travel, especially to “hot spots” such as Europe, South Korea, China, and Iran. The WHO estimates that 80% of cases are mild, 15% are severe and require patients to be treated with oxygen, and 5% are critical and require patients to be treated with ventilation. Although little is known regarding COVID-19’s ability to spread, information can be ascertained based on current infections and other strains of the coronavirus. COVID-19 spreads through direct person-to-person contact or contact within 6 feet; evidence also suggests transmission through contaminated air or surfaces is likely.

The virus is thought to spread through droplets in the air expelled by infected persons that are inhaled by other people. Droplet transmission can occur after an infected person has exited a room. Although the CDC currently states that it is unclear how long the air could remain infectious, a van Doremalen study showed that the virus is viable for approximately 3 hours. The virus also could be spread by someone touching an object that has been contaminated with the virus and then touching their own nose, mouth, or eyes. The van Doremalen study also investigated the viability of COVID-19 on surfaces. The study showed that the virus is still viable on surfaces for 3 to 72 hours depending on the surface material; the virus lives longest on plastic and metal surfaces.

COVID-19 investigation, including its transmission methods, is ongoing. Knowing how the virus is transmitted allows health care workers and facilities to take appropriate action to limit disease spread. In addition, knowledge of current statistics allows health care professionals to communicate accurate information to patients.

Prevention

As of mid-March 2020, no vaccine or antiviral medication is available to prevent COVID-19. Several companies are working on a vaccine for COVID-19, but the vaccine might not be available in time to assist with the current outbreak. Vaccines for similar coronavirus strains are being tested for effectiveness against the novel strain as well.

Especially because no vaccine exists, the public and health care personnel must take preventive measures. The CDC recommends that the public avoid close contact with symptomatic people and stay home when sick. To help prevent droplet spread, people should cover their coughs and sneezes with a tissue and immediately dispose of it. Another method to prevent transmission through droplets is for infected people to cover their nose and mouth with a mask; the CDC does not recommend uninfected people wear masks. Handwashing is the best method of preventing infectious diseases. People should wash their hands frequently for at least 20 seconds with soap and water. They also should avoid touching their eyes, nose, and mouth.

In addition to following recommendations for the public, health care workers can take actions to help identify COVID-19, prevent the virus from infecting others, and contain the virus.

Triage to Identify the Virus

Many of the symptoms and early indicators of COVID-19 are similar to those of other common respiratory diseases; therefore, triage is a first-level precaution. Health care workers should ask specific questions of patients to determine whether they might have contracted the novel virus. For example, asking about a patient’s recent travel history might be an effective means of determining the possibility of COVID-19 infection. As of mid-March, geographic areas that have widespread cases of COVID-19 are China, Italy, Spain, Iran, Germany, and the United States. However, because the WHO has labeled this a global pandemic and community spread is increasing, travel history alone should not determine likelihood of diagnosis. If a patient who presents with symptoms, has traveled to an area with widespread cases or has come in contact with an infected person within the past 14 days, precautions should be implemented immediately until laboratory tests can confirm or rule out COVID-19 as a diagnosis.

Precautions to Prevent Transmission

Patients with suspected COVID-19 infections should be placed at least 6 feet away from other patients and staff and given a surgical mask to wear to minimize droplet transmission. Infected patients should be moved into an airborne infection isolation room.
Staff should adhere to standard, contact, and airborne precautions, including the use of protective eye shields. These precautions can prevent known and suspected methods of transmission to protect staff. In addition, health care workers should:

- minimize entering and exiting the patient room
- keep the patient’s door shut
- when entering the patient’s room, wear appropriate personal protective equipment, which includes a gown, gloves, N95 filtering mask, and eye shield that covers the front and sides of the face
- after leaving the patient’s room, wash their hands with soap and water; if soap and water are not immediately available, a hand sanitizer with at least 60% alcohol is effective

Role of Medical Imaging

Although COVID-19 is not diagnosed with medical imaging, radiography and computed tomography can be used to determine symptom severity. Radiographic indications appear as pneumonia and consolidations in the lungs, typically on both sides. The CDC made public chest computed tomography images that demonstrate typical reported findings: “multiple areas of consolidation and ground glass opacities.”

Radiology departments should keep examinations of patients with known or suspected COVID-19 infection to a minimum and perform only those that are essential to the patient’s care. The number of people entering the patient’s room also should be kept to a minimum. Radiologic technologists should be especially careful when performing aerosol-generating examinations, or those that might cause the patient to sneeze or cough.

A mobile chest radiograph is the most likely examination to be performed in a patient’s room when he or she exhibits respiratory infection symptoms. Chest radiography protocol requires the patient to breathe in and out deeply, which might cause coughing that leads to droplets in the air. Therefore, radiographers should be cautious and wear all personal protective equipment and ensure that it fits properly. After leaving the patient’s room and ensuring that the door is shut, radiographers should remove personal protective equipment, wash or sanitize hands, and clean equipment thoroughly, paying special attention to surfaces that were in the patient’s immediate area and the objects the patient might have touched.

Although patients under airborne precautions might require a radiography examination, transporting the patient should be kept to a minimum and permitted for essential examinations only. If the patient must be transported to the radiology department, he or she should wear a surgical mask and practice proper hand hygiene. Radiologic technologists should follow all standard, contact, and airborne precautions while the patient is in the examination room. After each examination, radiology personnel must clean and disinfect the room thoroughly according to manufacturer’s instructions and facility policies, especially surfaces the patient might have touched. If there are concerns that proper respiratory etiquette was not followed according to typical airborne precautions, technologists should implement a waiting period of 3 hours to ensure that droplets will not be inhaled by staff or other patients. Alternatively, radiology personnel could wear an N95 mask or wait the recommended amount of time for the number of air changes that the room’s ventilation system requires to remove a virus such as COVID-19.

Treatment

Health care providers are managing patient symptoms using respiratory therapy, steroids, oxygen supplementation, and medications to expel mucus from the lungs. In severe cases, treatments to support organ function are necessary.

Conclusion

The medical community has a responsibility to care for patients regardless of their contagious state and the disease affecting them. With proper precautions, health care providers can limit their risk of contracting COVID-19. Facilities should remain abreast of current news and events related to COVID-19 using reliable sources such as the CDC and the World Health Organization. Facilities should adjust their policies accordingly as the number of infected people increases in the United States. Radiologic technologists should stay informed about their facility’s protocols regarding the new coronavirus strain and adhere to precautions for patients exhibiting symptoms.
Rebecca Gibson Hamm, MEd, R.T.(R)(CT), is an assistant professor for the University of Louisiana at Monroe.

References


