The American College of Nuclear Medicine Guidance on Operating Procedures for a Nuclear Medicine Facility During COVID-19 Pandemic

Mark Tulchinsky, MD, FACNM, FSNMMI,* and Saabry Osmany, MD, FACNM, FAMS‡‡

Abstract: The novel coronavirus 2 pandemic is causing widespread disruption in everyday life necessitating urgent and radical adaptations in operating procedures at nuclear medicine facilities. The potential for causing severe illness, COVID-19, calls for strict observance of preventive measures aimed to mitigate the spread of the virus. The threat of COVID-19 is particularly serious as there is no vaccine and no specific antiviral therapy. Further complications are introduced by shortages of personal protective equipment for healthcare workers who have direct contact with patients and effective testing to identify infected patients, raising the need for delaying some testing and therapies. Certain vulnerable segments of the general population have been identified (advanced age and certain comorbidities), which should heighten further their preventive efforts. Therefore, this guidance is intended to be operationalized depending on a facility’s specific needs and local disease prevalence.

Key Words: coronavirus, coronavirus identified in 2019, COVID-19, severe acute respiratory syndrome coronavirus 2, SARS-CoV-2, pneumonia, viral, COVID-19–associated pneumonia, single photon emission computed tomography, computed tomography, nuclear medicine, tomography, x-ray computed, clinical practice guideline, infectious disease

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COVID-19 is a propagated outbreak caused by a recently emerged coronavirus’ SARS-CoV-2. The person-to-person transmission occurs by respiratory droplets, aerosol, and through contact with contaminated surfaces. The virus is especially perilous because of a relatively high virulence and secondary attack rate (27%–44%), as well as a long residence on surfaces and in aerosolized droplets. Therefore, it is of utmost importance to implement the recommended interventions for mitigation of spread by distancing at work and social settings, reduction of patient traffic at a facility, screening of the patients for COVID-19 symptoms, and exposure risk assessment. This document also aims to assist in developing standard operating procedures for managing a patient under investigation (PUI) for COVID-19. During the COVID-19 pandemic, scheduling of examinations should be judicious, equipment disinfection should be practiced before each patient, medical service sustainability should be optimized, all aerosol-generating tests must be avoided, and time of staff-patient contact should be minimized for each test in order to contain the contagion. Teleconsultations may help reduce exposure where possible. This operating procedure guidance is not a replacement but a narrative and an addition to other guidance and position statements issued by other relevant organizations.

PURPOSE

This document aims to provide specialty-centered guidance for nuclear medicine facilities during COVID-19 epidemic/pandemic. It is not intended to provide guidance for general public, third-party payers, or for governmental regulatory entities.

GLOSSARY

2019-nCoV—This name was provisionally given to the virus discovered in 2019, a novel coronavirus, which first caused an outbreak of the viral illness in Wuhan, China. The name was later abandoned and replaced by the permanent designation (see below).2

Case Fatality Rate (CFR)—It is the proportion of deaths from the disease compared with the total number of people diagnosed with the disease for a certain period.

Close Contact—Defined as being within approximately 6 feet of a COVID-19 patient without personal protective equipment or having unprotected direct contact with the secretions or excretions from a patient with confirmed COVID-19.

COVID-19—A disease caused by a coronavirus that was first identified in December of 2019 in Wuhan, China, and caused by SARS-CoV-2 (see the definition below). The manifestations are flu-like respiratory symptoms of various severity.

COVID-19 Associated Pneumonia (C-19AP)—Pneumonia that results from SARS-CoV-2 infection and represents a more advanced stage of COVID-19 illness.

Healthcare Personnel (HCP)—All paid and unpaid persons (excluding clinical laboratory personnel) serving in healthcare settings who have the potential for direct or indirect exposure to patients or infectious materials, including body substances; contaminated medical supplies, devices, and equipment; contaminated environmental surfaces; or contaminated air.

High-Risk Patients (HRP)—Patients uncovered during screening as traveled to epicenters of COVID-19 or in close contact with a PUI or a patient confirmed of COVID-19, in the past 14 days.

Nuclear Medicine Facility (NMF)—A physical site where nuclear medicine is practiced and typically includes the imaging space(s), reception space(s), patient waiting space(s), a “hot lab,” and so on.

Nuclear Medicine Physician (NMP)—A physician licensed to practice nuclear medicine at an NMF.

Patient Confirmed of SARS-CoV-2 Infection (PCSI)—Symptomatic or asymptomatic patient with a positive confirmatory laboratory or imaging test for SARS-CoV-2 infection.
Patient Under Investigation for COVID-19 (PUI)—Patient with symptoms of viral influenza-like illness but not tested with laboratory or imaging modalities.

Personal Protective Equipment (PPE)—Equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses.

Primary Care Provider (PCP)—A qualified healthcare provider managing a patient who was referred to an NMF for testing and/or therapy.

Propagated Outbreak—An outbreak that does not have a common source, but instead spreads person to person.

SARS-CoV-2—The name permanently designated to the novel severe acute respiratory syndrome coronavirus of the species SARS-CoVs.

Secondary Attack Rate—A measure of the frequency of new cases of a disease among the contacts of known cases.

Suspicious Incidental Findings (SIF)—Incidental identification of findings on a localizing CT that includes the chest, which are suspicious for C-19AP.

Transmission of Infection—Any mode or mechanism by which an infectious agent is spread through the environment or to another person. There are 2 types of transmission—direct and indirect.

Virulence—The proportion of persons with clinical disease, who after contracting the infection become severely ill or die.

GUIDING PRINCIPLES DURING COVID-19 PANDEMIC

1. Nuclear medicine examinations are necessary for contemporary medical management. They should be scheduled at the earliest possibility but require judicious balancing of risks associated with a test or a treatment postponement versus associated risks of exposure to SARS-CoV-2 by patients and personnel.

2. SARS-CoV-2 is highly virulent and causes a relatively high CFR.

3. Because SARS-CoV-2 can be transmitted by asymptomatic hosts, extensive precautions and strict adherence to standard operating procedures aimed at contagion risk mitigation are required.

4. Patients with a diagnosis of cancer, especially during the treatment, are more susceptible to contracting SARS-CoV-2 and likely to have poorer COVID-19 outcomes than similar patients without cancer.

5. Among patients with COVID-19, the CFR increases with advancing age, rising sharply staring at the age of 50 years.

6. The facts and understandings about SARS-CoV-2, COVID-19, and C-19AP are rapidly evolving, requiring constant vigilance for new knowledge that may necessitate dynamic updates to this document.

RECOMMENDATIONS

Facility-Focused

1. It is recommended to have an institution- or a facility-tailored consideration for the following general items.

   a. Screening approach to identify cases for isolation as a PUI and for processing HRP through systematic evaluation with on-site designated staff members.

   b. Identifying designated isolation area(s) for evaluating PUIs in order to safely determine their most appropriate disposition.

   c. Identifying designated personnel (eg, infectious disease consultant on-call, etc) for reporting a PUI encounter and for deciding on testing feasibility in HRP.

   d. Acquiring, distributing, and maintaining sufficient supplies for deliberate SARS-CoV-2 prevention (eg, hand sanitizers, masks, PPE, etc).

   e. Identifying contacts for reaching environmental health personnel for deep cleaning/disinfection of potentially infected areas and surfaces.

   f. Identifying practicable sanitation procedures and its frequency for the HCP.

   g. Reviewing as soon as possible and before the next patient enters the imaging suite all localizing CT images that include a whole or part of a chest for C19AP SIF, which were present in about 9% of routine PET/CTs at the peak of pandemic.

   i. CT images should be viewed promptly in a lung window.

   ii. Edge enhancement could improve SIF visualization on a localizing CT.

   h. Identifying a set of SIFs that should trigger the PUI procedure.

   i. Understanding PUI procedure and how to activate it is paramount and should include notification of designated personnel and isolation of a PUI.

   j. PUI encounter handling personnel varies among NMFs and commonly includes an infectious disease consultant, individual(s) responsible for deep cleaning and disinfection of areas (environmental health personnel), contacts, and equipment.

   k. Knowing who is responsible for completing/submitting state required forms to a Department of Health and ensuring their participation in handling a PUI.

   l. Planning, implementing, and monitoring staff safety training, including the PUI handling, while following all of the relevant Federal, State, and institutionally mandated guidelines and regulatory reporting.

2. Develop a site-specific standard operating procedure for minimizing patient volume and direct contact duration with patients by optimizing examinations, postponing elective studies whenever possible, as appropriate for and commensurate with local factors.

3. Establishing service continuity plan with the aim of reducing the risk of NMP staffing falling below operational and going out of service due to SARS-CoV-2 infection.

   a. Separating NMPs at an NMF into at least two or, preferably, 3 units/teams, working separately, 1 week at a time, to avoid staff cross-contamination with SARS-CoV-2.

   b. If a unit consists of more than 1 NMP, one should have a physical presence on site to supervise radiopharmaceutical administrations and respond to medical emergencies, while another/other member(s) should be interpreting examinations from home, using a Tele-Nuclear-Medicine station, or from an isolated room(s) on site.

4. Avoid use of ventilation scintigraphy, especially based on aerosolized liquids, since they may hasten transmission of SARS-CoV-2.
a. Consider perfusion scintigraphy in combination with chest x-ray or SPECT/CT protocol using corresponding interpretation criteria.

5. Minimizing contact time with patients with known or suspected COVID-19 or a potential for droplet contamination.
   a. Shortening imaging time whenever possible, such as selecting appropriate patients for stress-only myocardial perfusion scintigraphy.
   b. Arranging all patient-care meetings and consultations as virtual whenever possible.
   c. Rescheduling elective exams for when the daily numbers of new positive COVID-19 cases are on a steady trend of decline.
   d. Using flat keyboards for optimal disinfection after individual use.
   e. When a nuclear medicine test is the most optimal of available options for answering a clinical question, and it cannot be substituted by a test with a shorter staff–patient contact, consider scheduling it as the last case of the day for all known PUIs or PCSIs.

6. Minimize in-person meetings with colleagues, instead communicating by phone, e-mail, or videoconference whenever possible.

Patient-Focused
1. Place reminder notice throughout NMF to improve adherence to social distancing and wearing of personal masks, including waiting rooms and the registration areas.
2. Consultations with patients, such as evaluation and preparation for radiopharmaceutical therapy, should be performed using Health Insurance Portability and Accountability Act–compliant telemedicine methods.
3. Provide to the patient and/or guardian as much information as possible for answering a clinical question, and it cannot be substituted by a test with a shorter staff–patient contact, consider scheduling it as the last case of the day for all known PUIs or PCSIs.

Healthcare Personnel-Focused
1. Maximize protection for HCP
   a. For engaging with a PUI and PCSI, it is recommended to wear the full PPE.
   b. For the staff injecting patients with confirmed or suspected COVID-19, a face shield, isolation gown, disposable gloves, and shoe covers are recommended.
   c. For engaging with patients unlikely to be infected, protective measures should be based on local circumstance and the prevalence of COVID-19.
   d. Avoid close contact, except when unavoidable (eg, cannulation).
   e. In assigning HCPs to specific roles at an NMF, a risk-adapted approach is recommended with consideration given to the significantly higher case-fatality rates from COVID-19 among older people and those with chronic diseases.
   f. Because of rapidly evolving COVID-19 evidence, vigilant monitoring of emerging knowledge is necessary, including those provided on the ACNM Web site.

CT FINDINGS
1. Chest CT findings are not diagnostic of COVID-19 or C-19AP. It is not recommended as a screening examination though the findings can be suggestive in the appropriate clinical context.
2. The earliest findings are ground-glass opacities (GGOs), which are usually peripheral, subpleural, and bilateral, but they can be unilateral in rare cases, involving a right lung more often than the left.
3. Chest CT findings are variable and can be negative, particularly in early stages of C-19AP.
4. The patterns of chest CT findings in C-19AP follow typical progression that have been well described in the expert consensus statement.
5. Chest CT findings of C-19AP can appear similar to findings seen in atypical pneumonias, especially other viral pneumonias. The diagnostic performance of CT in discriminating C-19AP from other viral pneumonias has been reported as moderate.
   a. Some findings are more common in C-19AP as compared with other viral pneumonias, including a peripheral distribution (80% vs 57%, P < 0.001), ground-glass opacity (91% vs 68%, P < 0.001), and vascular thickening (58% vs 22%, P < 0.001).
   b. Calling C-19AP by US-trained radiologists out of a mixture of chest CT cases with atypical pneumonias had a sensitivity of 73% to 93% and specificity of 93% to 100%.

CONCLUSIONS
The recommendations provided in this position statement are based on the current best practices narrated from current literature, as well as publications from the World Health Organization and the Centers for Disease Control and Prevention. They are geared to practices common with the membership of the American College of Nuclear Medicine. The knowledge about this novel virus is evolving rapidly and even the essential principles may occasionally change. Therefore, frequent updates may be needed to this and other related guidelines. Although the outlined principles are generalizable, their practical applications and implementation are dependent on prevalence dynamics of COVID-19 at specific locations and resources available to individual NMFs.

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