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# A Path to New Normal of Nuclear Medicine Facilities: Considerations for Reopening

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**ABSTRACT**

The stormy clouds of the coronavirus disease 2019 outbreak caused a rapidly spreading epidemic still hanging over the sphere. Any steps to transition toward a new normal should be guided by health authorities, together with economic and societal considerations. There are various items mainly falling into three classifications, including patient worry, clinical demand, and economic recession. Social distancing, lay-offs, and decreased number of patients with health insurance may lead to a prolonged period to retrieve normalcy. To return to a new normal, an individualized management model should be developed for each laboratory based on staff, instruments, services, crowding, physical space, hospital base unit, or outpatient clinic. Continuous training of different occupational staffs is among the key parameters in maintaining this readiness. The proposed response model should have internal and systemic integrity as well as coherence among the included items in two intra- and inter-unit management categories, namely thinking globally and acting locally.

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## Planning for New Normal of nuclear medicine facilities

The stormy clouds of coronavirus disease 2019 (COVID-19) caused a rapidly spreading epidemic still hanging over the sphere. The effect of this virus has made all our lives dark (1). Positively, many countries are inching toward the peak now, and things are also quite worrisome there. Individuals should continue their protection in this regard. The main point is how much and how long people have to endure. The health authorities should find the answers to recognize when, under what conditions, and how individuals can contemplate a safe transition through a slow shift. As we ponder transition, complexity and uncertainty remain ahead, which means that people are entering a long period requiring perseverance and patience. In short, individuals can adapt themselves or die.

The phrase "new normal" was overused even before scientific societies admitted that the COVID-19 pandemic was going to be a serious matter (2). Departments confront dual challenges of conducting examinations during stay-at-home safety orders and scheduling which will not be similar to the past normal. Given the fact that asymptomatic transmission is the Achilles' heel of approaches to deal with the COVID-19 pandemic, it is becoming more challenging to classify cases into various risk categories .

Accordingly, it is a time considering all of the patients referring to nuclear medicine imaging laboratories as possible infected cases of COVID-19; therefore, sustainable and enhanced universal safety precautions are likely to become the new normal (3-5). Preparedness is the only answer; nevertheless, the rates of nuclear imaging have significantly reduced in many laboratories. Once the current restrictions are relaxed, individuals should positively embrace the new normal (6, 7).

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Any steps to transition toward a new normal should be guided by health authorities, together with economic and societal considerations. In the path of the new normal, the laboratories should pay attention to the reports, such as the guidance of the American College of Radiology, American Society of Nuclear Cardiology (ASNC), European Association of Nuclear Medicine, and Society of Nuclear Medicine and Molecular Imaging, pursue the emerging clinical and paramedical data, follow up the trends and orders, and coordinate with the local health system. Therefore, nuclear medicine practitioners should manage a new culture of safety, adapt to new processes, and embrace new opportunities, especially telehealth and value-based health care .

On the other hand, new patients experience a culture of safety, proper screening, scheduling, triage, personal protective equipment (PPE), creative workflow, online preregistration, and waiting rooms (8, 9). A key point that should be considered is that when we are clarifying for the patients and trying to get concerned, it is advised to obtain verbal consent and document it.

### *Diagnostic Tests for SARS-CoV-2*

Information on diagnostic tests for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is still developing. In addition, an impeccable acceptance of the nature of the tests and explanation of their findings are important (10). Figure 1 depicts complete information about the contingency period based on the severity of symptoms or symptom-based strategy. This chart shows that this period is 14 days for asymptomatic cases. Additionally, for patients with mild or moderate symptoms without hospital admission, the duration is considered 21 days after infection or 14 days after presenting symptoms. Moreover, in patients with severe (hospitalized) or very severe (requiring intensive care unit stay) cases, the period is 25 days after infection or 21 days following presenting symptoms. From an administrative point of view, this chart is not only useful for infected patients but also helpful for the assessment of infected staff in terms of returning to work.

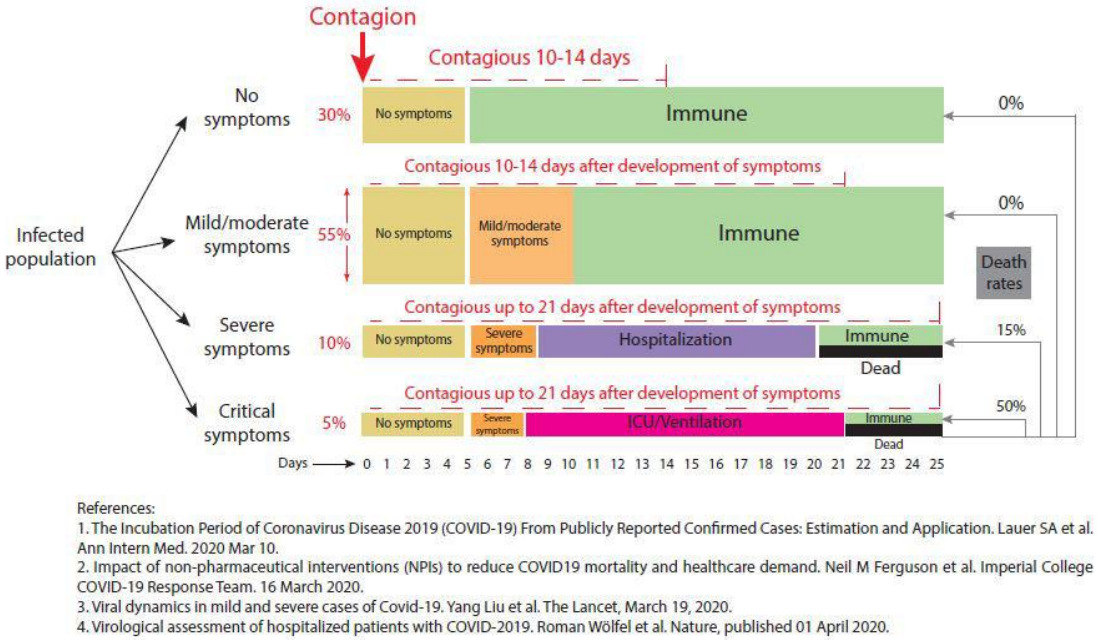


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**Figure 1.** Relationship between contingency period and severity of symptoms (designed by Ramy Rahmé, MD specialized in Clinical Hematology, a former post-doctoral fellow in the Department of Hematology at Saint Louis Hospital, AP-HP, Paris)

To date, the most commonly used and reliable test for the diagnosis of COVID-19 has been the reverse transcription-polymerase chain reaction (RT-PCR) using nasopharyngeal swabs or other upper respiratory tract specimens, including throat swab or, more recently, saliva. The measurement of the host immune response to SARS-CoV-2 is another method indirectly detecting COVID-19 infection. Therefore, patients with mild to moderate symptoms need to undergo this serological test. It is vital for this group due to their delayed diagnosis after the first 2 weeks of disease onset. It is also becoming a significant tool to identify the evaluation extension of COVID-19 in society and detect individuals with potentially “protected” from infected (10). This

serologic test, along with the PCR, is recommended for the staff regarding the six-grade scale (Figure 2).

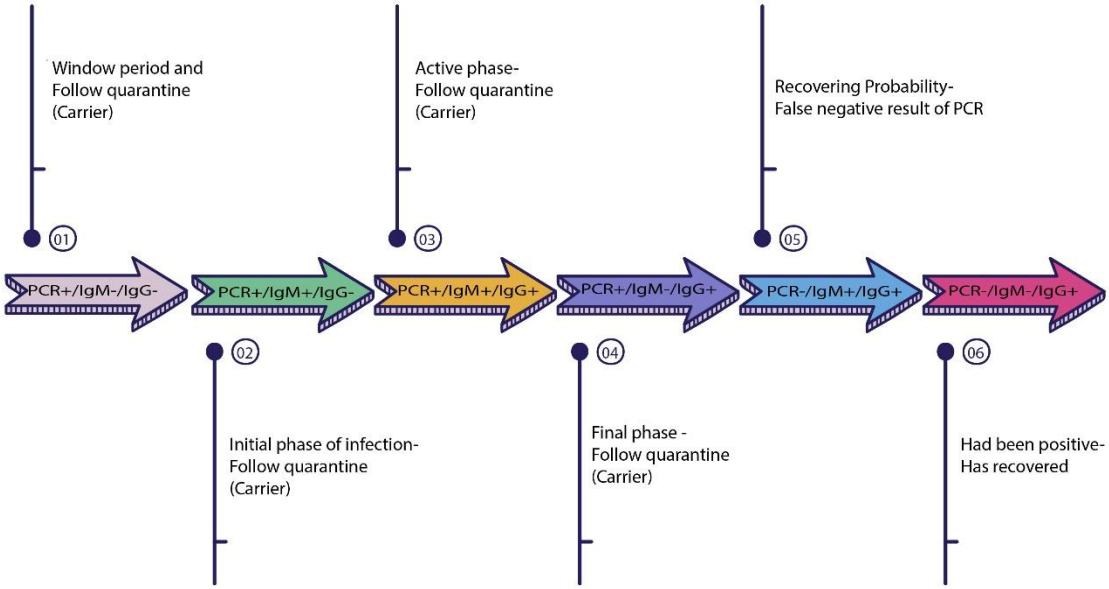


**Figure 2.** Different diagnoses of COVID-19 using reverse transcription-polymerase chain reaction (RT-PCR) and serological tests

These universal strategies lead to a comprehensive understanding of the situation of COVID-19, characterizing and managing hospital isolation functions and bed assignments, intuiting neonatal care, and guiding the utilization of PPE to protect health care careers (11). Getting into more details of the estimated variation over time in diagnostic tests for the detection of SARS-CoV-2 infection is beyond the scope of this report. Nevertheless, if any staff had only immunoglobulin G antibody against COVID-19, called shield immunity by researchers, it is not considered immunity against the virus .

What is required is the safe return of workers to work while keeping the risk of contamination as low as possible. In accordance with the results of recent studies, antiviral antibodies against SARS-CoV-2 could be protective up to 4 months after the diagnosis. In addition, it does not imply that a recovered person is immune to reinfection with the SARS-CoV-2 virus; consequently, staff should repeat RT-PCR to ensure of remaining negative. Therefore, they should follow protective and new normal policies and continuously check themselves (12).

Moreover, it has been confirmed that some people have a higher risk of mortality from COVID-19, including elderly people with chronic conditions, such as hypertension, diabetes, renal dysfunction, cardiopulmonary conditions, and obesity. Likewise, the risk of mortality among individuals with diabetes increases nearly three times rather than that of the general population. Accordingly, such an important strategy is required for the return-to-workplace of health workers with major occupational and additional personal risks during this pandemic .

All of the functions in the community should be tailored toward decreasing the spread of the disease. More details are required for further interpretation of occupation-specific risks, such as data on accessibility and effectiveness of PPE according to the worker's role. Universal testing of patients and staff members in the health care system will be also required. The key framework presented in a prospective study carried out by Larochelle assists clinicians to decide whether the infected staff continue or not continue working (13).

### *Internal management*

Internal management mostly focused on physical spaces, manpower, and equipment briefly shown in Figure 3 (14-16). Psychological support is another important issue for increasing resilience. The COVID-19 pandemic causes feelings of worry and distress among health workers; however, it is not true for all health workers. Some of them are scared of becoming infected due to taking care of children and transmitting the infection. On the other hand, some are less worried in this regard.

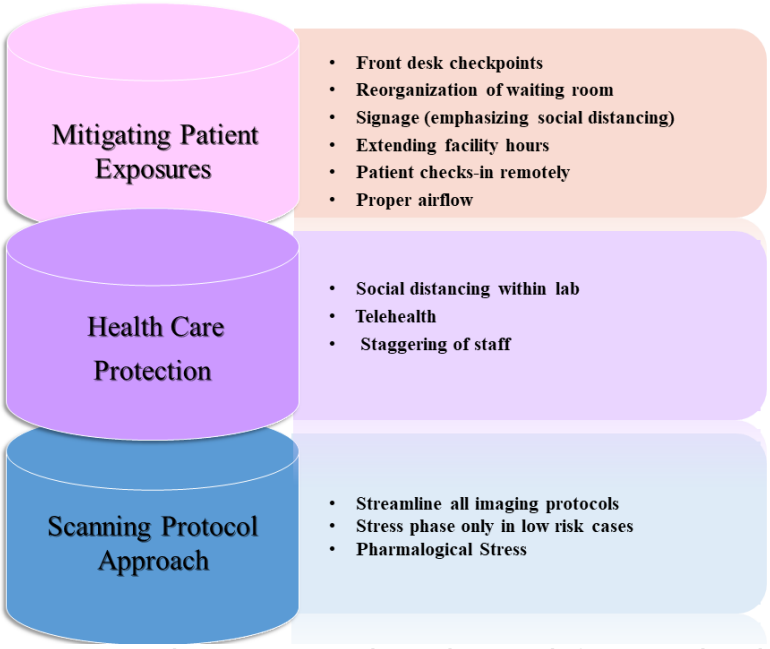


**Figure 3.** Internal management in nuclear medicine mostly focusing on physical spaces, manpower, and equipment

A key point is that overcoming this problem is time-consuming, and working in the COVID-19 pandemic is not a quick run, it is a marathon! Another issue that should be concentrated on is internal management in terms of mitigating patient exposure, health care protection, and scanning protocol approach which were properly presented in previous studies and some webinars hold by ASNC and International Atomic Energy Agency (IAEA), including the fundamental facts.

The next worrisome issue about staff is the second wave of SARS-COV-2 infection in fall or winter. In this regard, the injection of the seasonal influenza vaccine is necessary for the reduction of health care utilization. Simultaneously, there is a possible recurrence peak of the COVID-19 pandemic, especially in a high-risk population.

### *Impact of COVID-19 on medical education and research*

One of the profound impacts of the COVID-19 pandemic is the effect on medical education and research that may permanently change the educational system. Continued virtual case review with trainees and/or case review while maintaining social distancing and extension of virtual multidisciplinary conferences, meetings, and educational conferences are alternative options in this regard (17). In accordance with the research in the era of the COVID-19 pandemic, even after institutions reverse shutdowns, social distancing policies should be pursued for several months to prevent a subsequent wave of infection. Thesis closures doubtfully led to the loss of valuable data. Honestly, noncritical research activities almost shut down .

### *Revenue concerns*

As previously mentioned, there are a number of concerns. To what extent this outbreak could affect the future of nuclear medicine studies? In this regard, there are various items mainly classified as patient worry, clinical demand, and economic recession. Social distancing, lay-offs, and decreased number of patients with health insurance may lead to a prolonged period to return to normalcy. Some physicians estimate that this process may take 6 to 12 months .

In addition to the above-mentioned three parameters, which are almost common in different medical fields, one more specific item in nuclear medicine facilities is the adequacy of supplies either radioisotope or cold kits. The main bottleneck in obtaining radioisotopes is international air transport providing a significant amount of required radioisotopes to laboratories under a new normal situation. A classified proposal concerning the urgent need for cargo for current and future pandemic should be formulated .

Furthermore, telehealth appointments may be useful for the encouragement of patients to re-engage in nuclear imaging studies. Some laboratories suppose that there will be a high request for scheduling appointments when stay-at-home demands are relaxed. Trying to reschedule several months of imaging appointments will probably result in prolonged waiting time, which may deter many patients (18,

19). Due to the possibly extended period of the COVID-19 pandemic, the semi-urgent and non-urgent cases should be opt-out of the schedule for the next time with a low chance of returning. In this situation with the consideration of the backlog, the definition of a new lexicon may be a solution .

Some institutes prioritize patients into a three- or four-category scale. Urgent appointments are scheduled as planned, and semi-urgent appointments are scheduled on a case-by-case basis. Non-urgent appointments were rescheduled based on geographic location adjusted for ongoing changes of the outbreak leading to the next revenue concerns (8, 14). Private practices as some small businesses focus on aspects, such as getting loans; however, academic practices as highly matrixed organizations pursue three main aims, including clinical care, education, and research. Nuclear medicine facilities should have the task force participating in all stakeholders' training and operational leadership. Supplements' principles and guidelines should be established to reach along with patient safety, tracking process, sanitizing, employee health, and storing drugs and consumables. If it is not possible to establish guidelines, making a contract with other organizations/partners is an alternative option (20).

To return to a new normal, an individualized management model should be developed for each laboratory based on staff, instruments, services, crowding, physical space, hospital base unit, or outpatient clinic. Continuous training of different occupational staffs is one of the key parameters in maintaining this readiness. The proposed response model should have internal and systemic integrity as well as coherence among the included items in two intra- and inter-unit management categories, namely thinking globally and acting locally.

## Conflicts of interest

The authors declare that there is no conflict of interest.

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