

Radiology Departments Preparedness Plan for COVID-19

Objectives:

- Set up policies and procedures That assure the optimum utilization of radiological services during COVID-19 outbreak.
- Define the role of radiological investigations in diagnosing and/or follow up COVID-19 patient
- Ensure population, patient and staff safety.
- Assure safe, accessible, and high quality radiological services.

General Considerations:

- Postpone all screening/non-urgent exams and procedures until situation resolved and reschedule cases in alignment with hospital administration accordingly.
- Outpatient radiological imaging and procedures should be reserved for urgent cases and cases where imaging might alter patient management.
- RT-PCR is the gold standard for diagnosing COVID-19. Therefore, imaging should not be used as a primary tool of diagnosis or confirmation of the disease due to low specificity compared to RT-PCR.
- Imaging patients with suspected/confirmed COVID-19 should only be considered for emergent situations or when it might alter patient management. Precaution measures of contact, droplet and/or airborne infection should be taken accordingly depending on patient status as per MOH/infection control policies.
- Patients known/suspected to have COVID-19 who may need non-urgent imaging and/or procedure should be delayed until considered non-contagious.

Measures to Ensure Health of Radiology Personnel and Patients:

1. Limiting patient risk:

- All patients and visitors are screened at the entrance of the hospital.
- All patients presenting to the radiology department should wear masks.
- Apply screening at radiology front desk for outpatients coming from home as another screening site to assure safety. Patients should be screened for fever, cough, shortness of breath, recent history of travel abroad or to endemic area in KSA and/or contact with confirmed positive cases . Screening should follow the updated surveillance guideline of suspected and confirmed cases. (This action meant for patients whom their imaging/procedure cannot be post ponded).
- Outpatients who present with respiratory symptoms should have their studies cancelled and direct communication with ED should be performed to guarantee patient delivery. Take into consideration infection control precautions as per patient condition. (This action meant for patients whom their imaging/procedure cannot be post ponded).

2. Limiting exposure:

- Limit access to radiology department, including examination rooms and reporting areas (minimize traffic) and apply tele-communication between departments.
- Minimize number of staff per examination room during procedures, only required staff for the procedure should be involved.
- Avoid group gathering and group meetings and apply virtual meetings when needed.
- Ensure spacing between staff (more than one meter or any updated emerging guidelines from MOH regarding spacing) and provide single use of workstation per radiologist as much as possible.
- Quarantine of radiologists and staff who have had history of contact with confirmed COVID-19 patients, as per MOH guidelines, until they are considered clear to permit to work as per updated MOH guidelines
- Consider applying remote access from home providing adequate diagnostic setup (e.g. connectivity and diagnostic workstations).
- Implement all precaution measures when frontline radiology staff interact with suspected/confirmed COVID-19 cases including PPE, as per infection control regulations.
- Ensure all department employees are aware of and able to perform recommended infection control protocols.
- Delivery of tutorials on infection control procedures for respiratory infections should be performed and guaranteed in alignment with infection control policies and hospital administration.
- Radiology housekeepers should perform deep cleaning of all radiology offices and radiology workstations at the end of each day.

Imaging of suspected/known cases of COVID-19:

- Follow infection control measures and precaution policies before, during and after each exam.
- Portable radiographic machines should be used to limit transportation of patients.
- Dedicated portable x-ray machine for isolation wards (one for each ward) should be assigned, to minimize the risk of spread of infection. Also, when available, use cassette/detector single use/disposable covers to minimize risk of spread of infection. Otherwise, precaution measures of infection control measures should be followed.
- All cases requested for static machines and/or advanced imaging/procedure, (e.g. CT scan, MRI, IR, etc...), the referring physician should discuss the case with a radiology consultant/head of the department before sending the patient for imaging.
- It should be highlighted that the patient is suspected or confirmed COVID-19.
- If a patient needs to be transported to the radiology department, it is the responsibility of the team caring for the patient to coordinate with the hospital infection control unit who will advise on appropriate safe transport and to arrange with the radiology team for appropriate time of transportation. The patient should wear a surgical mask during transport to and from the department.
- The patient should be directly taken into the modality room without delay and should not be waiting in general waiting areas of the department.
- The modality scan area should be clear of other patients and/or unnecessary staff. Any loose items/equipment should be cleared.
- A medical waste bin needs to be available in the room.

Certain measures for suspected/known COVID-19 cases undergoing Computed Tomography (CT):

1. If applicable, assign one CT scan room for known/suspected COVID-19 cases, taking into consideration infection control measures and precautions prior to, during and after the examination including patient, staff and equipment measures.
2. It should be highlighted that the patient is suspected or confirmed COVID-19.
3. Transportation from/to radiology department: This is the responsibility of the team caring for the patient and needs to be coordinated with the hospital infection control department who will advise on appropriate safe transport. The patient should wear a surgical mask and any other measures suggested from infection and control department during transport to and from the department.
4. The patient should be directly taken into the CT scan room with no delay and should not stop at the waiting area inside the department.
5. The CT scan room should be clear of any other patients. Also any loose items/equipment should be cleared. A medical waste bin needs to be available in the room.
6. Patients should be wearing a mask during imaging and procedures.
7. Radiology staff should wear the necessary PPE. Ideally there should be 3 staff caring for the patient, 2 wear PPE to have contact with patient and 1 to remain non-contact. Any individual not wearing PPE should be > 1 meter from the patient.
8. Clean disposable sheets should be placed between the CT table and the patient.
9. Only essential staff (one nurse and one physician) accompanying the patient will be allowed to remain in the CT control room while the patient is imaged. If the staff is not accompanying the patient in the procedure room, they have to remove their PPE before sitting in the control room/waiting area and to be given a new PPE to wear before taking the patient out of imaging/procedure room.
10. All other staff of the team should wait out of the CT control area.
11. Once scan is completed, all staff wearing PPE will re-enter the room and transfer the patient from CT table to bed.
12. Exit route should be cleared to allow for quick exit from the scanner.
13. All radiology staff should remove all PPE and dispose in medical waste bin. Wash hands thoroughly.
14. Deep cleaning of the room is performed after each patient and should be done immediately. These surfaces need to be either washed with soap and water or decontaminated, (as per MOH COVID-19 updated guidelines for equipment, should be disinfected as per manufacturer recommendations).
15. Room cleaning should be performed by trained staff under supervision of infection control unit/environmental health services.
16. If the patient has a risk of airborne infection, the room downtime after imaging is typically 1 hour for room decontamination and passive air exchange, approval of infection control is required.
17. Air exchange processes (HEPA filters) are not employed due to patient masking, approval from infection control is required.

Certain measures for suspected/known COVID-19 cases undergoing Ultrasound Exam (US):

1. If an ultrasound exam is needed to be performed, a portable ultrasound machine should be used and the examination performed bedside.
2. The requesting team should call the radiology front desk and inform that patient is “high risk” or confirmed COVID 19 and coordinate on appropriate time of imaging.
3. All attempts should be made for performing the procedure during the end of the afternoon to avoid secondary patient and staff exposure.
4. The study needs to be approved by a radiologist on call.
5. Appropriately trained technologist/radiologist should perform the study.
6. Patients should wear a mask during imaging and procedures.
7. Radiology staff wears the necessary PPE. Airborne/contact precaution will be used when imaging patients. Follow patient room isolation protocol.
8. After performing ultrasound, place all PPE in medical waste bin.
9. Put on clean gown and gloves and do deep cleaning of the machine and ultrasound probes is performed after each patient.
10. Wash hands before leaving the area.

Certain measures for suspected/known COVID-19 cases undergoing intervention radiological procedures:

1. All procedures should be discussed with the interventional radiologist who will approve the procedure if needed. It should be highlighted that the patient is suspected or confirmed COVID-19.
2. Infection risks should be taken into account when justifying procedure requirement.
3. Decide on time of imaging: All attempts should be made for performing the procedure during the end of the afternoon to avoid secondary patient and staff exposure.
4. If applicable, assign 1 interventional suite for all suspected or confirmed cases of COVID-19.
5. If a patient needs to be transported to/from the radiology department. This needs to be coordinated with the hospital infection control department who will advise on appropriate safe transport. The patient should wear a surgical mask during transport to and from the department.
6. The patient should be directly taken into the IR suite without delay and should not be waiting in general waiting areas of the department.
7. The IR suite should be clear of any other patients. Also any loose items/equipment should be cleared. A medical waste bin needs to be available in the room.
8. If applicable, patients should wear a face mask during imaging and procedures.
9. Radiology staff wears the necessary PPE.
10. Clean disposable sheets should be placed between the table and the patient.
11. All staff of the referring team should wait out of the IR control area.
12. Minimize number of anesthesia staff to the minimum, if their presence is required.
13. Once the procedure is done and the patient leaves the IR suite, all radiology staff should remove all PPE and dispose in medical waste bin. Wash hands thoroughly.

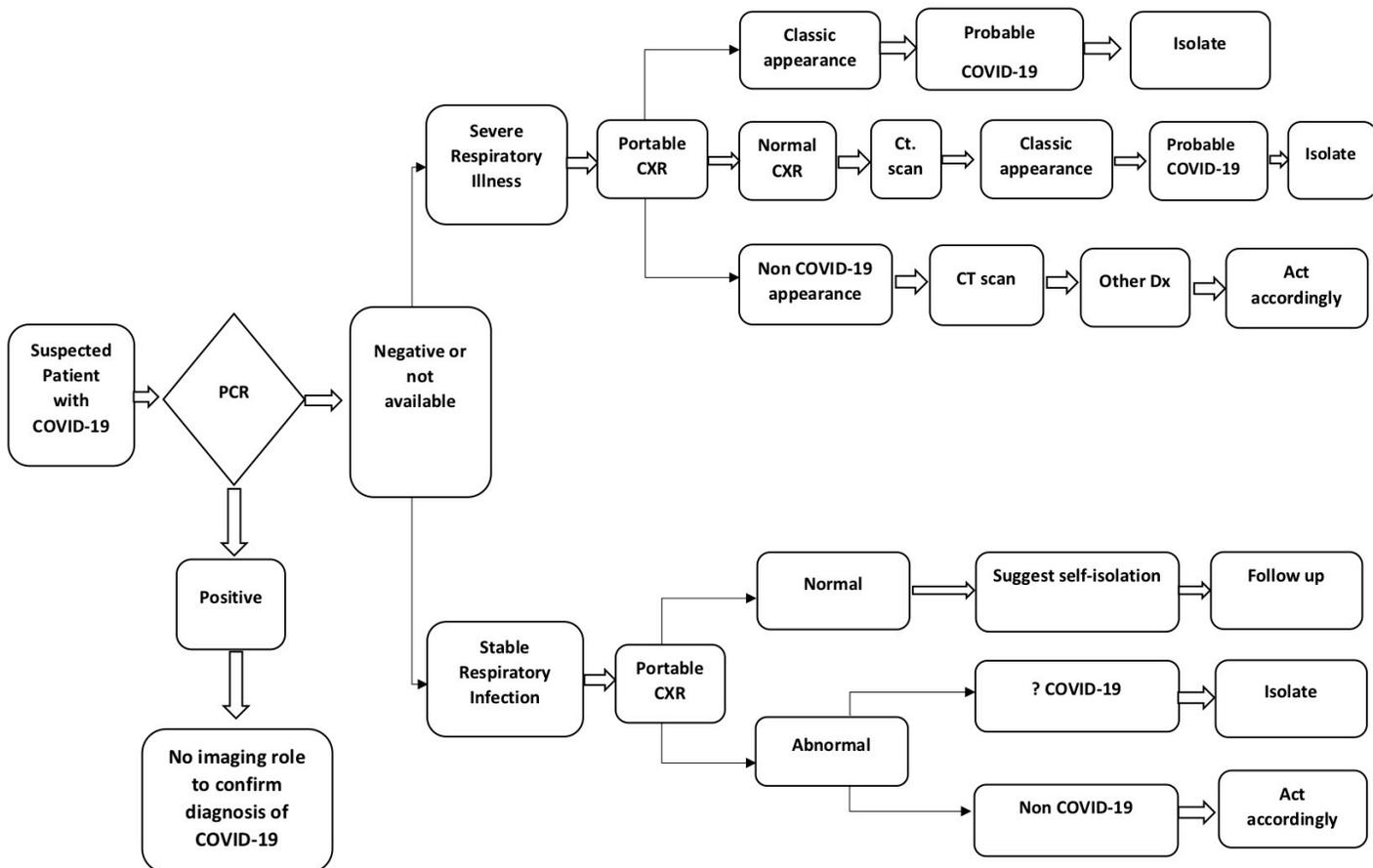
14. Deep cleaning of the room is performed after each patient. Surfaces need to be either washed with soap and water or decontaminated, (as per MOH COVID-19 updated guidelines for equipment, should be disinfected as per manufacturer.
15. Room cleaning should be performed by trained staff under supervision of infection control unit/environmental health services.
16. If the patient has a risk of airborne infection, the room downtime after imaging is typically 1hour for room decontamination and passive air exchange, approval of infection control is required.
17. Air exchange processes (HEPA filters) are not employed due to patient masking, approval from infection control is required.

Certain measures for suspected/known COVID-19 cases undergoing Magnetic Resonance Imaging (MRI):

1. All MRI studies deemed necessary on suspected or confirmed COVID-19 patients should be discussed with the radiology consultant. It should be highlighted that the patient is suspected or confirmed COVID-19.
2. If alternative imaging modalities can be performed to answer the clinical question, then this is highly advised. Infection risks should be taken into account when justifying scan requirement.
3. Ensure that all equipment/material used are MRI compatible.
4. If patient is on ventilator, then ensure that they are MRI compatible.
5. Assign an MRI machine, when possible, for all suspected or confirmed cases of COVID-19.
6. Decide on time of imaging. All attempts should be made for performing the MRI during the end of the afternoon to avoid secondary patient and staff exposure.
7. If a patient needs to be transported to/from the radiology department: This is the responsibility of the team caring for the patient and needs to be coordinated with the hospital infection control department who will advise on appropriate safe transport. The patient should wear a surgical mask during transport to and from the department.
8. Surgical masks contain metal wires and are not appropriate for MRI.
9. Radiology staff should wear the necessary PPE.
10. Once the procedure is done and the patient leaves the MRI suite, all radiology staff should remove all PPE and dispose in medical waste bin. Wash hands thoroughly.
11. Deep cleaning of the room is performed after each patient. These surfaces need to be either washed with soap and water or decontaminated. (as per MOH COVID-19 updated guidelines for equipment, should be disinfected as per manufacturer, contact vendor for appropriate materials to use in MRI).
12. Room cleaning should be performed by trained staff under supervision of infection control unit/environmental health services.
13. If the patient has a risk of airborne infection, the room downtime after imaging is typically 1hour for room decontamination and passive air exchange.
14. Air exchange processes (HEPA filters) should not be used if they are not MRI compatible.

The role of imaging for patients suspected to have COVID-19 in case of lack of RT-PCR or other proved alternatives:

Taking into consideration that RT-PCR is the gold standard method for diagnosing COVID-19. However, if it shall happen the lack of the viral testing and no other proven and/or higher specificity method for diagnosis and/or no other proven protocol could be implemented and where imaging might alter patient management, the following role of imaging could be suggested to help in diagnosis considering the fact that until today CT-scan although of high sensitivity but is of low specificity in diagnosing COVID-19:



Training on imaging findings of COVID-19

There are numerous recently published articles on imaging findings of COVID-19 and radiologists should be familiar with their appearance for early and expedited diagnosis and management

Yueying Pan, Hanxiong Guan, Shuchang Zhou, Yujin Wang, Qian Li, Tingting Zhu, Qiongjie Hu, Liming Xia. Initial CT findings and temporal changes in patients with the novel coronavirus pneumonia (2019-nCoV): a study of 63 patients in Wuhan, China. (2020) European Radiology. doi:10.1007/s00330-020-06731-x - Pubmed

Shi H, Han X, Jiang N, Cao Y, Osamah A, Gu J, Fan Y, Zheng C. (2020) Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study. [online] thelancet.com 24 February 2020. Available at: [https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(20\)30086-4/fulltext#figures](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(20)30086-4/fulltext#figures).
[https://doi.org/10.1016/S1473-3099\(20\)30086-4](https://doi.org/10.1016/S1473-3099(20)30086-4)

Tao Ai, Zhenlu Yang, Hongyan Hou, Chenao Zhan, Chong Chen, Wenzhi Lv, Qian Tao, Ziyong Sun, Liming Xia. Correlation of Chest CT and RT-PCR Testing in Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases. (2020) Radiology. doi:10.1148/radiol.2020200642 - Pubmed

Wei Zhao, Zheng Zhong, Xingzhi Xie, Qizhi Yu, Jun Liu. Relation Between Chest CT Findings and Clinical Conditions of Coronavirus Disease (COVID-19) Pneumonia: A Multicenter Study. (2020) American Journal of Roentgenology. doi:10.2214/AJR.20.22976 - Pubmed

Kooraki S, Hosseiny M, Myers L, Gholamrezanezhad A. Coronavirus (COVID-19) Outbreak: What the Department of Radiology Should Know. (2020) Journal of the American College of Radiology : JACR. doi:10.1016/j.jacr.2020.02.008 - Pubmed

Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA.
<https://pubs.rsna.org/doi/pdf/10.1148/ryct.2020200152>

Youtube Video summarizing the CT findings of COVID-19 may be found here

<https://www.youtube.com/watch?v=Ac9ZqwII0TM&t=299s>

References:

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2. Kooraki S, Hosseiny M, Myers L, Gholamrezanezhad A. Coronavirus (COVID-19) Outbreak: What the Department of Radiology Should Know. J Am Coll Radiol 2020.
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5. ACR Recommendations for the use of Chest Radiography and Computed Tomography (CT) for Suspected COVID-19 Infection. 2020. 2020, at <https://www.acr.org/Advocacyand-Economics/ACR-Position-Statements/Recommendations-for-Chest-Radiographyand-CT-for-Suspected-COVID19-Infection.>)
6. Canadian Society of Thoracic Radiology and the Canadian Association of Radiologists' Statement on COVID -19. Canadian Association of Radiologist and Canadian Society of Thoracic Imaging, 2020. at [https://car.ca/cstr/.](https://car.ca/cstr/))
7. Dai WC, Zhang HW, Yu J, et al. CT Imaging and Differential Diagnosis of COVID-19. Can Assoc Radiol J 2020:846537120913033.