INTERIM GUIDELINES FOR RADIOLOGY PRACTICE DURING COVID-19 PANDEMIC

Version-1

NEPAL RADIOLOGISTS’ ASSOCIATION
April 17, 2020
नेपाल मेडिकल काउन्सिल
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श्री अज्ञानमु
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काठमाडौँ

विषय : निर्देशिका अनुमोदन बारे।

उपरोक्त विषयमा मिति २०७७ बैशाख फागुण १७ गते बुधबार बसेको नेपाल मेडिकल काउन्सिलको पूर्णावेदनको निर्णायनसारि त्यस एसोसिएशनबाट निर्माण भएको निर्देशिका सम्बन्धमा प्रस्तुत भएको Interim guidelines for radiology practice during COVID-19 pandemic २०२० लाई प्रस्तुत गरिएको ध्यान र उल्लेखित विवरण वस्त्रोंको अनुमोदन गरिएको जानकारी मारुः


dr. कुमारप्रसाद अधिकारी
राजयोग
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For Nepal Radiologists’ Association:
Contributed by:

Contributed by:
Prof. Ram Kumar Ghimire, HoD, DoRI, Medicity Hospital; Adviser, NRA
Prof. Dan Bahadur Karki, Chair, DoRI, Patan Hospital, PAHS; President, NRA
Dr. Anamika Jha, DoRI, TU Teaching Hospital, IOM; General Secretary, NRA

Supported by:
Dr. Kalpana Rai, DoRI, Nepal Army Hospital; Member, NRA
Dr. Krishna Budhathoki, HoD, DoRI, SDNTC; Joint Secretary, NRA
Dr. Krishna Prasad Adhikary, Registrar, NMC; Chairman, Helping Hand Hospital
Dr. Manindra Shrestha, DoRI, Kathmandu Model Hospital; Joint Treasurer, NRA
Prof. Narayan Bikram Thapa, HoD, DoRI, KMC, KU; Vice-chairman, NMC
Dr. Prakash Kayastha, DoRI, TU Teaching Hospital, IOM; Vice President, NRA
Dr. Prakash Sharma, DoRI, Manipal Medical College; Member, NRA
Dr. Sundar Suwal, DoRI, TU Teaching Hospital, IOM; Treasurer, NRA
Dr. Surya P. Sapkota, DoRI, Bharatpur Hospital; Member, NRA
Prof. Swoyam Prakash Pandit, DoRI, Bir Hospital, NAMS; Immediate Past President NRA

Language editor: Sewa Bhattarai

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Need for the guidelines

Nepal is not untouched by COVID-19 pandemic, although there are only sporadic cases and to date very few cases of community transmission of this disease have been identified. COVID-19 is primarily spread via respiratory droplets produced when an infected person coughs or sneezes, which are exaggerated in the aerosol generating procedures, putting those around at higher risk of infection. It is easily transmitted from the infected person during incubation, symptomatic and convalescent period. Transmission rate is very high compared to other diseases. There is a need for radiology professionals to be prepared to face the challenges posed by COVID-19 pandemic, so that the disease can be contained and diagnosed, and appropriate radiology services can be provided throughout this period and in future with appropriate safety precautions.

The health and safety of radiologists, allied professionals, health care workers and patients are of primary importance. There are a limited number of health care professionals in Nepal, and they need to be in perfect health to be able to provide services during this crisis. There may be asymptomatic patients or health care providers who can potentially spread the disease. Notably, most of the COVID-19 patients found to date in Nepal are asymptomatic. So, minimum universal precautions should be taken while performing all radiological investigations.

RTPCR is the valid test conducted to find COVID 19 in a patient. Radiology has a limited role in the management of COVID-19 patients or in modifying the outcome of the disease. However, there are specific conditions where radiology plays a vital role. Various articles have been published in the last few months highlighting the logistic, technical, diagnostic and safety issues of treating COVID 19. It is essential to utilize this knowledge and know-how in our national context, so that we can provide uniform radiology services throughout Nepal.

Aim of the guidelines

While supporting the care of patients with COVID 19, we must follow appropriate practices in the radiology department with the following aims:

1. To limit exposure to the virus.
2. To determine best use of imaging.
3. To protect staff.
4. To maintain uninterrupted radiology department operations.

General recommendations

During COVID-19 epidemic/pandemic period we should follow the following general recommendations:

- Rescheduling diagnostic tests and procedures which are not urgent. This needs to be decided by the clinician and radiologist.
- Social distancing needs to be maintained at all times within the radiology department. Only one or minimum number of accompanying persons must be allowed.
- Departments should work with local clinicians to ensure the following relevant clinical information on all imaging requests:
  - Suspicion of COVID 19
  - Infection risk: impacts on how, where and when patients are imaged
  - Raised white cells count/lymphopaenia: usually present in COVID-19
• CRP: unusual to be COVID-19 +ve if CRP is normal
• Relevant respiratory history
• Smoking history

Follow the recommended precautions while performing respective procedures for suspected or confirmed COVID-19 patients.

Follow the basic precautions while doing procedures like sonography or interventions which bring the radiologist or allied staff close to patients with other diagnoses. The reporting radiologist who does not come in contact with patients may maintain the basic recommended precautions, i.e. hand hygiene, clean workplace, mask and social distancing.

Use of portable X-ray
Portable radiography units must be used in ambulatory care facilities when chest X-rays are considered medically necessary for a patient diagnosed with COVID-19. Dedicated portable x-ray machine is preferable for isolation ward with suspected or diagnosed patients of COVID 19. The surfaces of these machines can be easily cleaned, avoiding the need to bring patients into radiography rooms, which will need more extensive cleaning and also increase risk of transmission to any other patient.

Following precautions MUST be taken while performing Chest X Ray of a suspected or diagnosed COVID-19 patient:

• Portable X-ray, preferably dedicated to isolation ward, must be used to limit the movement of patients and to limit infection.
• Radio technician / technologist should wear Cat I PPE.
• X-ray Cassette must be double bagged in plastic envelop before handing over to clinician/ nurse.
• Clinician caring for the patient within the room positions the patient and cassette.
• Radiographer makes sure the cassette is in proper position and takes the radiograph.
• Clinician slides out the cassette from outer envelope without touching inner envelope and transfers the cassette to the radiographer.
• To avoid contamination of the x-ray unit and cassette, radiographer avoids touching the patient.
• Portable radiography machine must be cleaned by radiographer twice with disinfectant for subsequent use.
• If the fixed X-ray machine is to be used for other general patients, clean the surfaces of room and equipment using hospital approved methods.
• After x-ray, the room downtime is typically between 30 min to 1 hour for room decontamination with passive air exchange.
• The X-ray cassettes coming in contact with patients need to be disinfected each time.
• Communicate x-ray findings and dispatch report as soon as possible. Use recommended x-ray reporting format for COVID-19 suspected or diagnosed cases (Appendix-1).

Use of CT scan
Center for Disease Control, Fleishner Society, British thoracic Imaging Society and ACR currently do not recommend x-rays and CT scan to screen for or as a first-line test to diagnose COVID-19. Provision of diagnostic imaging services to large numbers of patients suspected or confirmed to have
COVID-19 during an outbreak can be challenging, as each study is prolonged and complicated by the need for strict adherence to infection control protocols.  

Therefore, criteria are set for imaging of chest as follows (as recommended by multinational consensus statement from the Fleishner Society):

- Imaging is not indicated for patients with mild features of COVID-19 unless they are at risk for disease progression. (Mild features mean no significant pulmonary dysfunction or damage, e.g., absence of hypoxemia, no or mild dyspnea. Risk factors for disease progression are age >65 years and presence of comorbidities, e.g., cardiovascular disease, diabetes, chronic respiratory disease, hypertension, immune-compromised). However, when COVID-19 test results are unavailable, patients with moderate-to-high pre-test probability should be initially treated as if COVID-19 testing is positive, and treated as negative in low pre-test probability.

- Pre-test probability is defined by the background prevalence of disease as estimated by observed transmission patterns and could be modified by individual’s exposure risk. (Low = sporadic transmission; Medium = clustered transmission; High = community transmission)

- Imaging is indicated for patients with moderate to severe clinical features of COVID-19 regardless of COVID-19 test results (Moderate to severe features include evidence of significant pulmonary dysfunction or damage).

- Imaging is indicated for patients with COVID-19 with evidence of worsening respiratory status.

- In a resource constrained environment where access to CT is limited, chest x-ray may be preferred for patients with COVID-19 unless features of respiratory worsening warrant the use of CT.

- CT is indicated in patients with functional impairment and/or hypoxemia after recovery from COVID-19.

- COVID-19 testing is indicated in patients incidentally found to have findings suggestive of COVID-19 on a CT scan.

- Adequate appropriate infection control procedures should be followed before scanning subsequent patients.

Following precautions MUST be taken while performing CT scan of a suspected or diagnosed COVID-19 patient:

- As transport is essential, patients should wear a surgical mask when travelling to and out of CT facility.

- Care personnel should take care of personnel precaution (Use PPE, i.e., full body cover, double layer gloves, N-95 respirator and shoe cover).

- Use PPE, i.e., full body cover, double layer gloves, N-95 respirator and shoe cover, if technologist will be exposed during positioning.

- Before transferring patient to CT room, cover CT couch with plastic sheet, which should be disposed immediately after the procedure.

- To avoid contamination, don’t allow accompanying clinicians and transferring personnel to enter CT console room.

- Communicate CT findings and dispatch report as soon as possible. Use recommended CT reporting format for COVID-19 suspected or diagnosed cases (Appendix-2).
• Clean the surfaces of room and equipment using hospital approved methods and dispose sheet used for CT couch covering.
• Seal the CT room with tape and plastic covering (doors and vents).
• Implement hydrogen peroxide vapor decontamination.
• After imaging, the room downtime is typically between 30 minutes to 1 hour for room decontamination with passive air exchange. It’s better to do CT in cluster if there are many confirmed patients requiring CT scan, and if possible, as the last patient of the day.

Use of Sonography
There is no valid role of sonography in screening and diagnosis of COVID-19 patient. Unnecessary modalities will only cause avoidable exposure to others, including the healthcare professionals, and increase risk without any benefits. Both ACR and BTSI recommend only chest X-ray and rarely CT scan for the investigation of COVID-19 patient. Ultrasound of the patients is needed in different situations which could be divided into 2 groups.

Group I Ultrasound needed in highly suspected (in isolation) or diagnosed COVID-19 patients. If there is a significant impact of sonography on the management of these cases, sonography could be done. Following precautions MUST be taken while performing sonography:
• Radiologist should use category I PPE.
• Use portable USG, preferably dedicated to isolation ward, to avoid patient transport.
• Before entering the patient room, cover the probe including cord with plastic sheath. Put more gel within the sheath.
• Cover the USG control panel with plastic cover.
• Patient must be wearing mask.
• Ask other staff & clinician to manipulate the control panel (to avoid contaminating the USG unit).
• Determine the specific goal of sonographic examination after discussion with treating physician and their expectations before the scan.
• Perform the sonography with adequate precautions, limiting contamination to as low as possible and spending minimal possible time.
• Clean the probe with the sheath with disinfectant wipes prior to removal of the sheath.
• Clean the USG unit with hospital approved method.
• Dispose the PPE appropriately.
• Take general precaution (hand washing before and after the procedure).

Group II Ultrasound needed in general patients in this particular time of pandemic of COVID-19 and its recovery period.
Meticulous and justified use of the radiological modalities is suggested during the pandemic for general and non COVID 19 patients, because of the risk of unknown carriers.
Following precautions MUST be taken while performing sonography:
• Spread out appointment time to avoid crowding in the waiting area.
• Patient must wear surgical mask. Only one patient is allowed to enter the USG room and only one support person if needed.
• No additional staff should be in the room.
• Bed should be covered with disposable paper/plastic and should be changed after every patient.
• Radiologist must wear surgical cap.
• Wear surgical or N95 mask depending upon institutional policy and availability.
• Wear gown or work uniform.
• Avoid wearing watch, bracelets or rings and keep mobile phone in a sealed plastic cover.
• Use disposable gloves and discard after every patient.
• Hand hygiene before and after every patient.
• Use plastic cover over the control panel (keyboard/TGC knobs etc).
• The probe should be covered with disposable covers (plastic wrap used to wrap food or gloves could be used for it) for each patient. Or it can be used after wiping with disinfectant. Probes should be kept on the side other than the patient’s bed.
• Control panel must be cleaned regularly as per the company recommendation.
• Reduce scanning time if possible.

Recommendation for interventional radiology
Interventional radiologists are involved in aerosol generating procedure. Therefore, they need special precaution during the interventional procedure for general patients during this COVID 19 pandemic and its recovery period. We suggest following precautions which are in keeping with the Society of Interventional Radiology:
• Defer/delay procedure and pursue alternative treatment options whenever the procedure is not urgent.
• If an aerosol generating procedure must be done, in a COVID-19 positive or suspected patient, appropriate PPE (category I) which includes N-95 mask or higher level respirator, sterile gloves, eye protection (face shield or goggles), disposable water proof gown and disposable surgical cap is needed.
• If an aerosol generating procedure must be done in other patients, then standard procedure attire should be worn which includes – surgical mask (preferably N-95), sterile gloves, protective eyewear, disposable sterile gown and disposable surgical cap.

The aerosol generating procedures include procedures which may cause increase in coughing/sneezing. They include- Lung biopsy, thoracocentesis, pleural drains, chest tube for pneumothorax, bronchial artery embolization, procedures involving NG tube, gastrostomy, jejunostomy, gastro-jejunostomy tube placements, GI stent placement.

Recommendation for well-functioning of the Radiology Department during COVID-19 pandemic
• Use screeners at the radiology reception desk as far as possible.
• Deep clean the scanner and room after imaging and allow for passive air exchange.
• Use appropriate precautions for patients who are undergoing aerosol-generating procedures.
• Issue a moratorium on travel for all employees.
• Maintain supply of masks and other personal protective equipment.
• Provide infection control tutorials, especially to CT, ultrasound, and interventional technologists.
• Establish a coronavirus crisis management team that oversees the department's preparedness.
• Develop a plan for separate urgent care sites for treating coronavirus patients.
• Put social distancing measures into place: Allow staff to work from home, create isolated reading rooms onsite, and use video conferencing for meetings wherever possible. Do not allow staff to rotate between facilities.
• Create a plan to handle surge if the healthcare system is burdened by increased patient volume and imaging needs.
• Create a backup call schedule to cover for ill staff.

**Universal Precautions to be taken at radiological facilities**
At the moment COVID-19 is a pandemic and gradually the number of cases will go down. However, the cases may remain in sporadic and epidemic form throughout the year and subsequent years to come. In this context there is a need to modify our behavior and daily clinical practices so as to prevent cross contamination and spread of infectious diseases of any form. The following universal precautions are recommended for the safety of patients and medical professionals and to reduce the rate of cross contamination and spread of the disease.

- These recommendations are applicable to all health care personnel working in radiology facilities including radiologist, technologist, radiographers and other care personnel.
- Use hospital scrubs (staff dress) while at work to avoid bringing infection to your family and home.
- Avoid wearing watch, bracelets or rings and keep mobile phone in a sealed plastic cover.
- Necessary use of mask during patient examination and procedure.
- Make sure of mandatory use of mask by patients and visitors, who come for radiological investigation and procedure.
- Use disposable top gloves to examine each individual patient and dispose it (including after performing ultrasonography).
- Wrap the sonography probe with plastic wrapper (like food wrapper) before the procedure. Clean the wrapped probe with disinfectant and dispose wrapper immediately at the end of procedure before taking off the gloves.
- Use plastic covers for control panels of medical equipment (CT, MR, x-ray, Sonography) and dispose it every day, or multiples times a day as required.
- Use disposable bed covers for each patient if examination (USG, CT, fluoroscopy) is to be done in lying position. (Cloth bed sheets can be changed after each case, if they are properly washed after every use).
- Use disposable paper towels to wipe the gel (cloth towel can be used if properly washed after every use).
- Practice intermittent hand washing or use sanitizer.
References
2. COVID-19: British Society of Thoracic Imaging (BTSI) statement and Guidance; 11, March 2020
4. Maya Galperin-Aizenberg, MD, Ana S. Kolansky, MD et al; University of Pennsylvania, Department of Radiology, Cardiothoracic Division; The chest radiograph in COVID 19 pandemic: Role, Standardized reporting and CT Correlation. April,2020
7. S Simpson (ed.); Radiological society of North America expert consensus statement on reporting chest CT findings related to COVID-19. Endorsed by Society of Thoracic Radiology, the American College of Radiology, and RSNA. March 25, 2020
# Appendix -1

## Chest X Ray reporting findings and format:

<table>
<thead>
<tr>
<th>Category</th>
<th>Association with COVID 19</th>
<th>CXR finding</th>
<th>Suggested reporting Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>No CXR features of Pneumonia</td>
<td>Clear lung or chronic changes confirmed stable with comparison studies</td>
<td>No radiographic evidence of pneumonia (CX-NP)</td>
</tr>
<tr>
<td>Indeterminate for pneumonia</td>
<td>COVID 19 pneumonia and/or other disease processes may be present</td>
<td>Pneumonia not confidently seen. Basilar opacities which could represent pneumonia or atelectasis,</td>
<td>Radiographic findings are indeterminate for pneumonia, COVID 19 pneumonia or other disease may be</td>
</tr>
<tr>
<td></td>
<td></td>
<td>chronic disease with possible new findings, interstitial disease which could be pneumonia or pulmonary</td>
<td>present (CX-IP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>edema</td>
<td></td>
</tr>
<tr>
<td>Focal Pneumonia</td>
<td>Can be seen in COVID 19 pneumonia but less typical</td>
<td>Unilateral focal pneumonia, other patchy opacity, bilateral disease may be present but not detected on</td>
<td>Focal pneumonia (can be seen in COVID-19 pneumonia, but non-specific) (CX-FP)</td>
</tr>
<tr>
<td>Multifocal pneumonia</td>
<td>Typical appearance of COVID 19 pneumonia</td>
<td>Bilateral patchy opacities with mid to lower lung zone predominance, often peripheral and rounded,</td>
<td>Multifocal and bilateral pneumonia (typical appearance for COVID 19 pneumonia) (CX-MP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bilateral multifocal consolidation with or without interstitial thickening or diffuse air space</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>disease</td>
<td></td>
</tr>
</tbody>
</table>

*The chest radiograph in COVID 19 pandemic: Role, Standardized reporting and CT Correlation. -Maya Galperin-Aizenberg, MD, Ana S. Kolansky, MD, University of Pennsylvania, Department of Radiology, Cardiothoracic Division*
Appendix -2

HRCT of chest in suspected /diagnosed COVID-19 and its reporting format
Volume scan obtained in HRCT mode.

Findings

1. Typical Appearance
   - Thin-section axial images of the lungs show bilateral, multifocal rounded and peripheral
ground glass opacities with superimposed interlobular septal thickening and visible intralobular
lines (“crazy-paving”). Involvement of … lobes seen.
   - Thin-section axial images of the lungs show peripheral, bilateral, ground glass opacities with or without
consolidation or visible intra-lobular lines (“crazy-paving”)
   - Reverse halo sign is also seen.
   - Area/s of consolidation seen with air bronchogram in ….

2. Intermediate Appearance
   - Thin-section axial images of the lungs show multifocal, diffuse, perihilar or unilateral ground
glass opacities with or without consolidation lacking a specific distribution and are non-rounded or non-peripheral.
   - Thin-section axial images of the lungs show few very small ground glass opacities with a non-rounded and non-peripheral distribution.

3. Atypical appearance
   - Thin-section axial images of the lungs show absence of typical or indeterminate features of
COVID-19 pneumonia and presence of Isolated lobar or segmental consolidation without
ground glass opacities
   - Discrete small nodules (centrilobular, “tree-in-bud”)
   - Lung cavitation
   - Smooth interlobular septal thickening seen with minimal/small/moderate/large, right/left/bilateral pleural effusion.

4. Negative for pneumonia:
   - Both lungs show normal attenuation and normal parenchymal architecture. No evidence of
bronchiectasis on either side. No tramline shadows. No septal or fissural thickening on either
side. No cystic or bullous lesion on either side. No cavitating lesion. Trachea and major bronchi
are normal. No pleural thickening or pleural effusion on either side.
   - No CT features to suggest pneumonia.

Impression
Typical appearance
   - In this suspected /proven case of COVID-19 infection commonly reported imaging features of
COVID-19 pneumonia are present. Other processes such as influenza pneumonia and organizing
pneumonia, as can be seen with drug toxicity and connective tissue disease, can cause a similar
imaging pattern.
Intermediate appearance
• In this suspected/proven case of COVID-19 infection ……. (Findings). These imaging features can be seen with (COVID-19) pneumonia, though are nonspecific and can occur with a variety of infectious and noninfectious processes.

Atypical
• In this suspected /proven case of COVID-19 infection ……. (Findings) These imaging features are atypical and are uncommonly reported for COVID-19 pneumonia. Alternative diagnoses should be considered.

Negative for pneumonia
• In this suspected / proven case of COVID-19 infection no CT findings present to indicate pneumonia (Note: CT may be negative in the early stages of COVID-19).

Note:
Clinical correlation is a MUST as the same pattern may be seen in many other lung disease. There are no typical features suggestive of COVID-19 pneumonia.

**Radiologists must keep updated about the Xray and CT imaging features of the COVID-19 pneumonia as various updated studies are now available on the web.**
Appendix-3  
Differentiating non-COVID-19 and COVID-19 pneumonia in HRCT with sensitivities

Compared to non-COVID-19 pneumonia, COVID-19 pneumonia is more likely to have:
- Peripheral distribution (80% vs. 57%, p<0.001)
- Ground-glass opacity (91% vs. 68%, p<0.001)
- Fine reticular opacity (56% vs. 22%, p<0.001)
- Vascular thickening (59% vs. 22%, p<0.001),

But less likely to have a:
- Central & peripheral distribution (14.% vs. 35%, p<0.001)
- Pleural effusion (4.1 vs. 39%)
- Lymphadenopathy (2.7% vs. 10.2%, p<0.001)