

**STANDARD OPERATING PROCEDURE (SOP) FOR PERFORMING  
RADIOLOGICAL PROCEDURES FOR SUSPECTED, PROBABLE AND  
CONFIRMED COVID-19 PATIENT**

**A. MOBILE X-RAY:**

- Request made manually or online.
- The ward staff shall call and inform the imaging personnel of the examination to be performed.
- An appropriate time is determined for the examination to be carried out.

**1. Pre-examination Preparation**

**1.1. Registration**

- All requests for radiological exam shall be pre-registered prior to receiving the patient.

**1.2. The Radiographer**

- The radiographers have to abide by the precautions outlined by the Infection Control Guidelines on the necessary steps to limit COVID-19 transmission. (It is recommended to have a core number of radiographers trained for this exercise).

**1.3. Lead gowns**

- To clean on both sides (front and back).
- To be worn before the Radiographers wear the personal protective equipment (PPE).

**1.4. Mobile x-ray Machine**

- To clean the mobile x-ray machines especially the wheels.

**1.5. X-Ray cassettes**

- Clean on both sides (front and back)
- Cover the cassette with two layers of disposable plastic bags.

**1.6. Anatomical Markers**

- Clean on both sides
- To place the anatomical marker onto the first/inner plastic layer.

**1.7. Donning of PPE**

- According to type of precaution (ventilated/oxygen requirement or non-ventilated).
- Donning at the designated area.

**2. Performing the examination**

- The radiographer shall be assisted by a ward staff in:-
  - a. opening the door/s if a patient in a room
  - b. help in positioning the patient for the x-ray examination

**3. Post examination**

**3.1.** The radiographers shall be assisted by a ward staff in: -

- Removal of the cassette from under the patient
- Removal of the cassette from the contaminated plastic bags (outer/second layer)
  - o *Dispose this bag into the yellow clinical waste bin*
- Opening of the exit door/s if patient in a room.

**3.2.** Remove the outer layer glove

**3.3.** Place cassette/detector at mobile machine or trolley

**3.4.** Disinfect the mobile X-ray machine

- by the radiographers as per recommendation before doffing.
- at designated area
- wipe the mobile x-ray machine with disinfectant wipes or as per manufacturer recommendation.
- wheels to roll over the sticky mat or an alcohol soaked cloth

**3.5.** Doffing of PPE

**3.6.** Remove the anatomical marker and disinfect anatomical marker

**3.7.** Remove the inner/first later plastic cassette/detector cover

**3.8.** Wipe the cassette/detector

**3.9.** Process the image

**B. MOBILE ULTRASOUND**

The hospital authorities should assign or acquire one machine for mobile ultrasound examination purposes.

**1. Pre procedure machine preparation**

- 1.1. Clean the ultrasound machine before and after the procedure.
- 1.2. Advice to cover especially the monitor, keyboard and/or touch screen with a transparent plastic sheet.
- 1.3. Cover the ultrasound probe.

**2. Performing examination**

- 2.1. Donning of PPE in pairs before performing the examination.
- 2.2. Print images (if required) at clean area.

**3. Post Procedure**

- 3.1. Remove the probe cover, keyboard cover, monitor cover, outer layer apron then outer layer glove (in this sequence).
- 3.2. Wheels to roll over the sticky mat or an alcohol soaked cloth.
- 3.3. Doffing of PPE at designated area.

**C. SPECIAL EXAMINATIONS (CT/MRI)**

1. Receive order of examination either online or manual.
2. Cases shall be scheduled at a later part of day preferably after completion of elective list.
3. Wherever possible, use a separate access route to the department.
4. The case shall be pre-registered before being called.
5. Accepting Radiologist to inform Radiographer in charge.
6. The patient shall only be sent to the examination after being called by the radiology personnel to minimize contact time in Radiology Department.
7. Radiographer in charge to inform :
  - 7.1. Ward (time of procedure and accompanying personnel)
  - 7.2. Security guard to clear and mark the pathway
  - 7.3. Hospital concession company: for terminal cleansing

- 8.** Provide good ventilation (i.e. open doors and windows) if the examination room is not under negative pressure.
- 9.** Patient status and accompanying staff
  - 9.1.** Ventilated or on Oxygen mask
    - HCW: Doctor, Staff nurse, Medical Assistant
    - PPE: N95 mask, isolation gown (fluid-repellent long-sleeved gown), gloves, face shield/goggle, head cover, boot cover/shoe cover (ONLY when anticipating spillage and vomiting)
  - 9.2.** Non-ventilated (patient able to wear surgical mask).
    - HCW: Staff nurse
    - PPE: Surgical mask, isolation gown (fluid-repellent long-sleeved gown), gloves, face shield/goggle, boot cover/shoe cover (ONLY when anticipating spillage and vomiting)
- 10.** Radiology preparation
  - 10.1.** Staff :
    - 2 Radiographer (1 in clean and 1 contaminated area)
    - 1 Medical officer (MO)
    - 1 Radiologist
  - 10.2.** Remove non essential equipment from the examination room.
  - 10.3.** To cover the contact surfaces of equipments in the examination room with plastic cover or sheet (contact surfaces include: gantry control panel, monitor, contrast injector and examination couch).
  - 10.4.** To load IV contrast media into injector before patient's arrival (if needed).
- 11.** Radiographer in clean area to call ward to send patient.
  - 11.1.** Patient to use designated route/lift to radiology department
- 12.** Check and verify patient preparation / consent
  - 12.1.** Recheck blood results, last meal, allergy etc
  - 12.2.** Check patients particulars and consent given if appropriate
- 13.** Performing procedure
  - 13.1.** To perform as per protocol

**13.2.** If IV contrast is required, MO in-charge to check IV line injection need to wear the appropriate PPE.

**13.3.** Accompanying staff to assist in patient transfer.

**14. Post Procedure**

**14.1.** Radiographer in Clean area to inform security guard that patient is going back to the ward.

**14.2.** If case with contrast injection, the radiographer in contaminated area will remove the injector line in full PPE.

**14.3.** Accompanying staff to assist in transferring the patient.

**14.4.** Radiographer in contamination area to remove the equipment covers and to clean the machines.

**14.5.** Doffing at the designated area.

**14.6.** Hospital cleaner to perform terminal cleaning of the Room (\*according to patient's status i.e. suspected/probable/confirmed COVID-19/on oxygen/ventilated etc).

**D. SPECIAL EXAMNATIONS (ANGIOGRAPHY)**

**1.** Receive order of examination either online or manual.

**2.** Cases shall be scheduled at a later part of day preferably after completion of elective list.

**3.** Wherever possible, use a separate access route to the department.

**4.** The case shall be pre-registered before being called.

**5.** Accepting Radiologist to inform Radiographer in Charge.

**6.** The patient shall only be sent to the examination after being called by the radiology personnel to minimize contact time in Radiology Department.

**7.** Radiographer in charge to inform (\*):

**7.1.** Ward (time of procedure and accompanying personnel)

**7.2.** Security guard to clear and mark the pathway

**7.3.** Hospital concession company : for terminal cleansing

**8.** Provide good ventilation (i.e. open doors and windows) if the examination room is not under negative pressure.

**9.** Patient status and accompanying staff

- 9.1.** Ventilated or on Oxygen mask
  - HCW: Doctor, Staff nurse, Medical Assistant
  - PPE: N95 mask, isolation gown (fluid-repellent long-sleeved gown), gloves, face shield/goggle, head cover, boot cover/shoe cover (ONLY when anticipating spillage and vomiting)
- 9.2.** Non-ventilated (patient able to wear surgical mask).
  - HCW: Staff nurse
  - PPE: Surgical mask, isolation gown (fluid-repellent long-sleeved gown), gloves, face shield/goggle, boot cover/shoe cover (ONLY when anticipating spillage and vomiting).
- 10.** Radiology preparation :
  - 10.1.** Staff :
    - 2 Radiographers (1 in clean and 1 in contaminated area)
    - 1 Medical officer or Fellow
    - 2 staff nurses (1 assist, 1 runner)
    - 1 Interventional Radiologist
    - Anaesthesiology team (for ventilated / GA cases)
  - 10.2.** Remove non essential equipment from the examination room.
  - 10.3.** To cover the contact surfaces of equipments in the examination room with plastic cover or sheet. (contact surfaces includes: table or remote control panel, monitor, contrast injector and examination couch).
  - 10.4.** To load IV contrast media into injector before patient's arrival (if needed).
- 11.** Radiographer in clean area to call ward to send patient
  - 11.1.** Patient to use designated route/lift to radiology department
- 12.** Check and verify patient preparation / consent
  - 12.1.** Recheck blood results, last meal, allergy etc
  - 12.2.** Check patients particulars and consent given if appropriate
- 13.** Performing procedure
  - 13.1.** To perform as per protocol
  - 13.2.** Accompanying staff to assist in the patient transfer

**14. Post Procedure**

- 14.1. To monitor patient in angiography suite for complications and manage if present, prior to transfer back to the ward.
- 14.2. Radiographer in Clean area to inform security guard that patient is going back to the ward.
- 14.3. If case with contrast injection, the radiographer in contaminated area will remove the injector line in full PPE.
- 14.4. Accompanying staff to assist in transferring the patient.
- 14.5. Radiographer in contaminated area to remove the equipment covers and to clean the machine/s.
- 14.6. Doffing at the designated area.
- 14.7. **Hospital cleaner to perform terminal cleaning of the Room (\*according to patient's status i.e. suspected/probable/confirmed COVID-19/on oxygen/ ventilated etc.).**

**\*\* Hand hygiene with alcohol rub must be performed before and after each step during doffing post procedure.**

**E. INFECTION PREVENTION & CONTROL (IPC) MEASURES DURING RADIOLOGICAL PROCEDURES**

1. To limit exposure of staff and patient to COVID-19 infection:
  - a. Training on infection prevention and control including appropriate personal protective equipment (PPE)
  - b. Point of entry screening of patient for elective cases
  - c. Monitoring well-being of radiology staff.
  - d. Hybrid working team to ensure sustainable radiology operation.
  - e. Skeleton (minimum number) staff to work per modality.
2. Implementing SOP for suspected, probable or confirmed COVID-19 patient
  - a. The hospital authorities to recommend the flow of the patient from the ward to the Radiology Department.
  - b. The security guards must be involved to manage the patient flow.

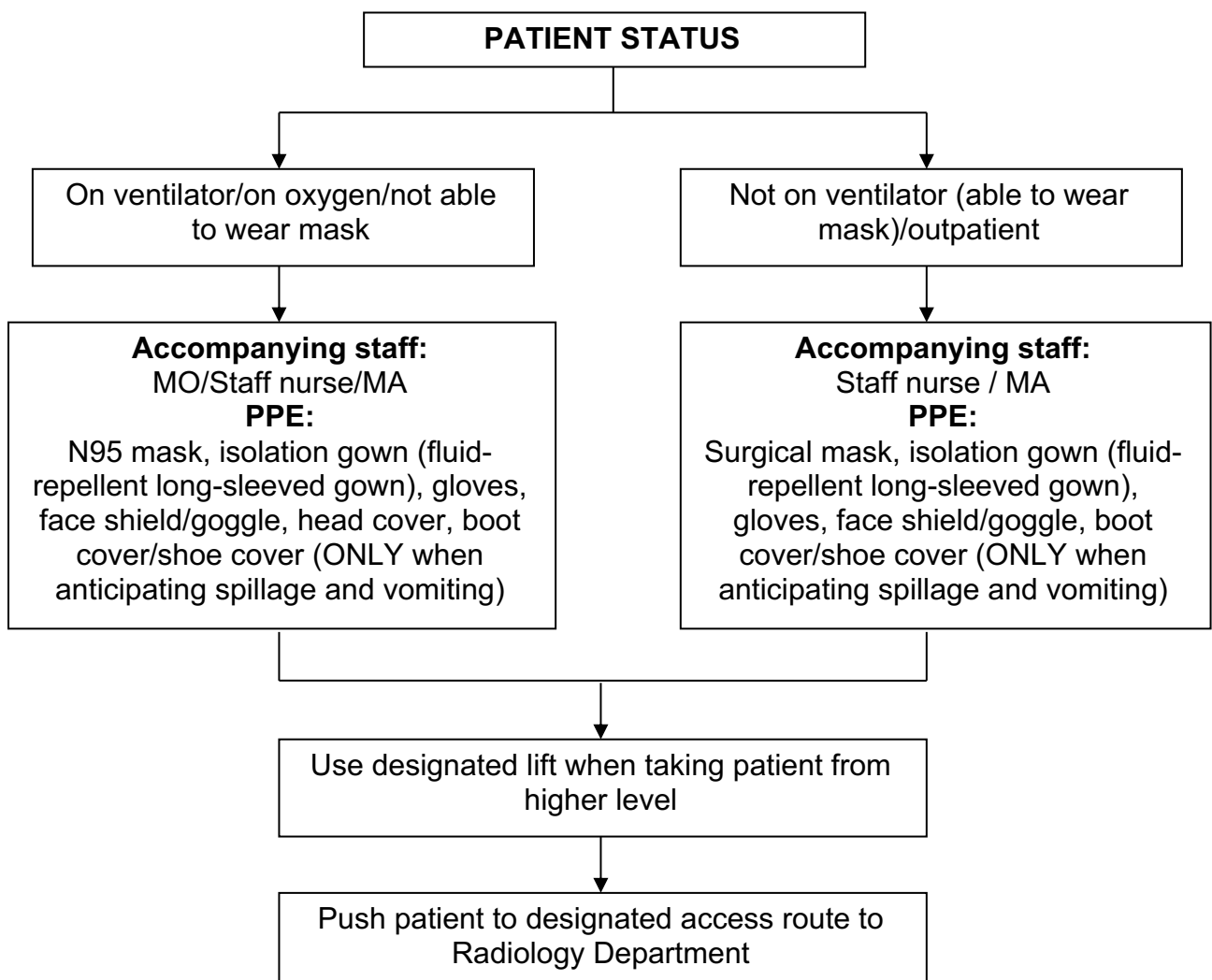
- c. All requests for radiological exams shall be pre-registered prior to receiving case.
  - d. The primary team staff shall call and inform the radiology personnel of the exam to be performed.
  - e. Wherever possible, the exam shall be performed in a designated location.
  - f. General radiography and ultrasound shall be done at the bedside to minimize patient movement
  - g. For special examination (CT/MRI/Angio), the suspected, probable or confirmed COVID-19 patient shall be scheduled at later part of the day after completion of non-infectious cases.
- 3. Reducing potential transmission from suspected, probable or confirmed COVID-19 patient
  - a. Wherever possible the entrance to the Radiology Department is preferably through a different access.
  - b. Patient shall only be sent to Radiology Department upon receiving a call from radiology staff to minimize contact time in Radiology Department.
  - c. Patient should be taken back from Radiology Department to the respective wards as soon as the examination is completed.
  - d. The suspected, probable or confirmed COVID-19 patient should wear a surgical mask during transport in and out of the Radiology Department
  - e. The radiology personnel shall take all necessary infection control precaution in accordance with Infection Control guideline. They should wear appropriate personal protective equipment depending on the status of the patients either airborne or droplets precaution.
  - f. The Radiology personnel in charge of modality shall allow sufficient time off for disinfection of equipment in between the cases.
  - g. Disinfection of CT scanner gantries, MRI gantries, angiography machines, ultrasound machine including probes, blood pressure cuffs, the image viewing station mouse and keyboards, and other tools after every contact with suspected, probable or confirmed COVID-19 patient shall be carried out. The Radiology department staff should contact vendors to identify the best disinfectant to be used for each piece of equipment.
  - h. The modalities used in the management of suspected, probable or confirmed COVID-19 patient apart from general radiography depends on the availability of equipment at the local set up.



- i. A multidisciplinary committee at local level shall convene to outline the guidelines for radiology personnel to prevent the virus from spreading through human-to-human contact and the department equipment.
- j. Ideally all radiological examinations should be performed in negative pressure rooms/Airborne Infection Isolation Room (AIIR).

## WORKFLOW OF SENDING SUSPECTED, PROBABLE OR CONFIRMED COVID-19 PATIENT TO RADIOLOGY DEPARTMENT

- Preparedness of patient and examination room
- Patient shall only be send to Radiology Department upon receiving a call from radiology staff to minimize contact time in Radiology Department. (if possible to delay after Office Hour to minimize contact with non essential staff)
- Alert Security Floor
- Provide good ventilation (i.e open doors and windows) if the examination room is not under negative pressure.



<b>PPE FOR ATTENDING RADIOLOGY STAFF IN RADIOLOGY DEPARTMENT</b>		
Ventilated/on Oxygen/not able to wear mask	Staff handling patient In examination room  <b>Outside examination room Staff Outside / Counter</b>	: N95 mask, isolation gown (fluid-repellent long-sleeved gown), gloves, face shield/goggle, head cover, boot cover/shoe cover (ONLY when anticipating spillage and vomiting) : Surgical mask
Non Ventilated (able to wear mask)	Staff handling patient In Examination room  Staff monitor control panel <b>Outside CT room Staff outside / Counter</b>	: Surgical mask, isolation gown (fluid-repellent long-sleeved gown), gloves, face shield/goggle, boot cover/shoe cover (ONLY when anticipating spillage and vomiting) : Surgical mask : Surgical mask

#### END OF PROCEDURE

Send Patient back to ward & Call Hospital Concession company

- Terminal cleaning by Dedicated cleaner
- Cleaner to enter the room after 45 minutes downtime for passive air exchange

<b>PPE FOR ATTENDING RADICARE AND RADIOLOGY WORKER POST PROCEDURE IN EXAMINATION ROOM</b>		
Ventilated patient/on oxygen/not able to wear mask	1) Terminal cleaning (Concession company) - wall and floor 2) Radiographer - disinfect equipment	N95 mask, isolation gown (fluid-repellent long-sleeved gown), gloves, face shield/goggle, head cover, boots/closed shoe
Non ventilated patient/able to wear mask	1) Terminal cleaning (Concession company) - wall and floor 2) Radiographer - disinfect equipment	Surgical mask, isolation gown (fluid-repellent long-sleeved gown), gloves, face shield/goggle, boots/closed shoe
	*Radiographer to clean the equipments in the Examination Room, monitors, keyboard in control room (frequently touched surfaces). Machine/ equipment shall be cleaned using alcohol wipe, while monitor/ultrasound probe to use non alcohol wipe	

Figure 1: Schematic of CT suite in the setting of the patient infected with SARS-CoV-2. CT computed tomography, SARS-CoV-2 severe acute respiratory syndrome coronavirus 2

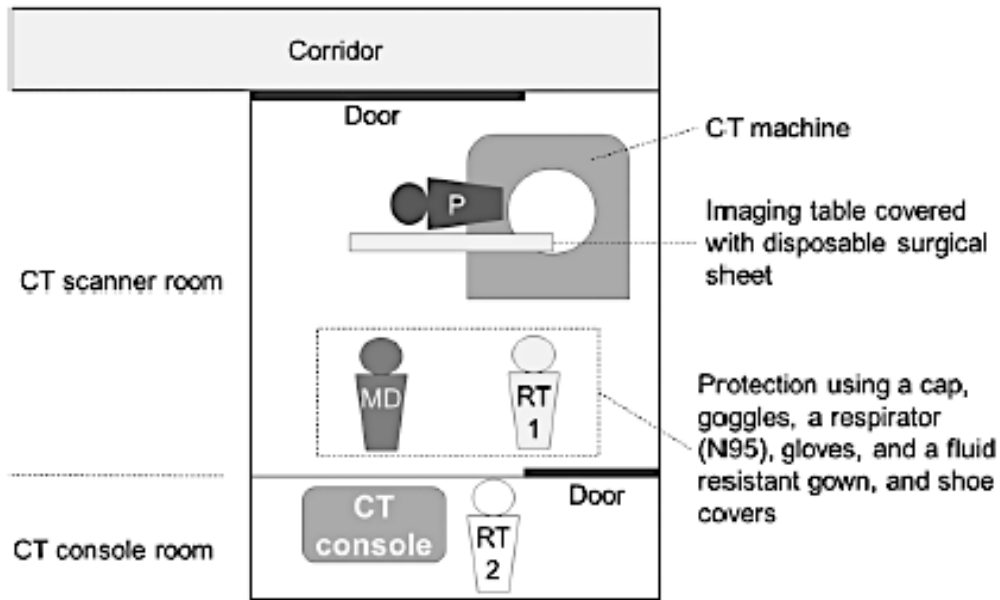


Figure 2: Process and staff distribution in the CT scanner and console rooms during CT examination of the patient infected with SARS-CoV-2. RT radiologic technologist, P patient, MD medical doctor, CT computed tomography, SARSCoV- 2 severe acute respiratory syndrome coronavirus 2

	CT scanner room	CT console room
Stand-by	RT1	RT2
Patient Arrival & Setting	P, MD, RT1	RT2
After Setting	P, MD, RT1 RT1 & MD remove and discard PPE, and leave scanner room.	RT2
Scanning	P	MD, RT1, RT2 RT1 & MD put on new PPE. RT2 performs CT scan.
After Scanning & Leaving	P, MD, RT1	

## Radiological Criteria for COVID-19

Suspected case with chest imaging showing findings suggestive of COVID-19 as following will be considered as **probable case** :

A suspect case with chest imaging showing findings suggestive of COVID-19 disease:

- Chest radiography : hazy opacities, often rounded in morphology, with peripheral and lower lung distribution

### OR

- Chest CT : multiple bilateral ground glass opacities, often rounded in morphology, with peripheral and lower lung distribution

### OR

- Lung Ultrasound : Pleural irregularities, B lines (multifocal, discrete or confluent, consolidative/subpleural consolidation with or without airbronchogram at bilateral/patchy distribution mainly posterior and inferior.

## References:

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