Role of Imaging patients with Suspected or Confirmed Covid-19 Infection in ED/In-patient and Ambulatory Settings

Situation:

No guidelines exist for enhancing the safety process for imaging patients with suspected or confirmed COVID-19 infection. There also remains lack of clarity on the role of chest imaging.

Background:

The goal of imaging in COVID-19 patients is to provide high level care while minimizing risks to healthcare staff and other patients. For in-patients and ED patients some radiology exams can be performed portably (US, radiographs, head CT, minor procedures), other exams require patient transport off the floor (MR, CT, Nuclear Medicine, Fluoroscopy, IR).

Assessment:

The transport of suspected/confirmed COVID-19 patients for imaging should be minimized. As such, ensuring appropriate imaging utilization is necessary. For ED and in-patients, portable alternatives to off floor imaging should also be used whenever possible. The use of chest imaging should follow best practice guidelines. Any non-critical imaging or procedure should be deferred until COVID-19 diagnosis is either confirmed (and patient recovers from their illness) or excluded.

Recommendation:

1. For in-patients and ED patients, all imaging requests (excluding radiographs) for patients with pending or confirmed COVID-19 will be approved by a radiologist whenever possible. For out-patients, medical necessity of any imaging test should be determined by the ordering provider and/or radiologist. COVID test results are not necessary to proceed with indicated ED imaging orders.
2. From 8am to 5pm approval will be sought by the relevant radiology technologist before performing the study (Appendix A, B, C for technologist work-flow).
3. After normal business hours, the technologist may need to discuss case with relevant working/on call radiology teams.
4. Best practice guidelines should be followed for a) chest imaging (Appendix D) and b) technologist use of PPE (Appendix E).
5. Radiology COVID Call Center has been established to assist in Radiology related questions for Yale New Haven Health. Call center number is 475-246-9660. Hours are currently 7am-7pm seven days a week.
Appendix A: Ultrasound and X-Ray ED and In-Patient Tech workflow for CONFIRMED or SUSPECTED COVID-19 cases. All studies should be PORTABLE whenever possible.
Appendix B: CT/MRI/Nuc/Fluoro ED and In-Patient workflow for CONFIRMED or SUSPECTED COVID-19 cases

Order for radiology exam that CANNOT be performed portable

For MRI, CT, Nuc Med, Fluoroscopy, and invasive procedures on inpatients/ED

*Note* Expected that radiographs and ultrasounds will rarely have to be performed in diagnostic radiology department

Radiologist contacts clinical team

Discuss the exam to determine medical necessity with a radiologist

Equipment in the patient closest to the patient unit should be used to limit travel time

Discuss transport with nurse. Precautions need to be taken during transport to minimize spread.

*Face mask may be used instead of N95 depending on supply availability.

Before entering the imaging room, proper PPE must be put on. Proper PPE currently includes:
- N95 Mask
- Gown
- Gloves
- Face shield (or any type of eye protection)

Confirm patient wearing face mask (if they can tolerate) before performing exam

Properly take off all PPE before exiting the imaging room. Reuse select PPE per most current hospital protocol

If the patient wears their face mask properly throughout their entire stay in our imaging room, the room can be used again after proper disinfection of all imaging equipment and surfaces

If a patient mask was not utilized, or has been deemed compromised during any part of the exam, the room must be cleaned and left vacant for a specified time (1 hour for most rooms, shorter for some CT scanners)
Appendix C: NON-“HOT-SITE” OUT-PATIENT work-flow for technologist/front-desk staff

Screening:
In the last month, have you been in contact with someone who was confirmed or suspected to have COVID-19, including outside the US.

OR
Do you have ANY of the following:
- Fever > = 100F or 37.8 C
- New cough
- New shortness of breath
- New sore throat
- New chills
- New loss of smell or taste

OR
Have you been advised to stay home by a medical professional due to illness that might be COVID-19

Some sites can offer temp. check at front desk.

Screener notifies technologist

Tech confirms with referring provider (or responsible radiologist when needed) on medical necessity of exam

Route to designated “hot” site where staff will use appropriate PPE

Proper PPE includes:
- N95 (or face mask based on availability)
- Gown
- Gloves
- Face shield or Googles

Technologist performs imaging.

*If the patient wears the face mask properly throughout their entire stay in our imaging room, the room can be used again after proper disinfection of equipment and surfaces. If the patient has NOT worn the face mask throughout the procedure, the room will need to be left vacant for a specified time (1 hour for most rooms, shorter for CT suites).

If possible, obtain patient’s cell phone number or phone in the waiting room. Use phone communication whenever possible.

For the safety of patients and staff, the patient will not be permitted to proceed with the appointment, and should return to his or her car. They patient can contact the responsible clinician for further guidance. If patient does not have a responsible clinician or PCP, instruct to call contact Yale COVID-19 Call Center 203.688.1700.

Proceed as routine visit. Staff and patient should wear face mask. Disinfect room and all patient surfaces after.
Appendix D.1:

Role of Chest Radiographs (CXR):

CXR plays a role in the imaging management of pneumonia in immunocompetent patients, despite known low sensitivity.

*Any CXR of a suspected or confirmed COVID infection should be done portably for ED or In-Patient.*

- CXR should NOT be obtained to rule out COVID infection
  - A normal CXR does not rule out the possibility of COVID. CXR is reported to have 25-60% sensitivity in detecting pneumonia for these patients. Ground glass opacities commonly seen with COVID can be occult on CXR.
- CXR should only be obtained when absolutely necessary and xrays should be minimized when possible (e.g. for line placement, get one film after all lines placed).
- Examples of indications for CXR
  - Initial baseline imaging for a COVID Suspect or Known patient being admitted
  - To evaluate for complicated pneumonia (cavitation, effusions, etc)
  - To assess ETT placement after intubation or after line placement if concerned for malposition
  - When change in clinical status raises concern for possible superimposed pulmonary process

Role of Chest CT:

Chest CT plays a role in the imaging work-up of immunocompetent patients with pneumonia, mainly to detect complications such as cavitation, intra-parenchymal abscess and empyema. The role of CT in patients with suspected viral pneumonia is controversial.

Following recent statements by the American College of Radiology (ACR) and the Society of Thoracic Radiology (STR), CT is considered indicated in the following situations involving patients with suspected or confirmed COVID-19 infection:

1. CT should NOT be used to screen for or as a first-line test to diagnose COVID-19. It may play a role in helping triage and make management decisions in select cases where PCR test is negative, chest xray is negative and clinical suspicion for COVID remains high.
2. CT may be indicated in patients with positive COVID PCR testing AND suspicion for complications such as cavitation, intra-parenchymal abscess and empyema not adequately assessed via portable CXR.
Appendix D.2 - Current ADULT in-patient COVID treatment guide

YNHHS Initial Treatment Algorithm for Hospitalized ADULTS with Non-Severe* COVID-19

Disclaimer: There are no FDA-approved treatments for COVID-19, supportive care is standard of care. Limited treatment data are available and clinical judgment is warranted - Algorithm last updated 4/13/20.

Patient with confirmed POSITIVE SARS-CoV-2 by PCR
*If mechanically ventilated or on ECMO, proceed to Severe algorithm

A-Presence of:
- Oxygen saturation ≤ 93% on room air or on chronic O2 supplementation if ≤ 93% see box B

B-Presence of:
- Fever and/or signs & symptoms of respiratory disease (e.g., cough, dyspnea) OR
- Chest X-Ray showing lung opacities

START TREATMENT (see treatment below)

Supportive Care & EVERY 4 HOUR OXYGEN MONITORING
- Evaluate for Clinical Trials (YNHHS.com)

If Oxygen saturation ≤ 93% on room air

RESPIRATORY FAILURE, INCLUDING MECHANICAL VENTILATION AND ECMO PLUS CONFIRMED POSITIVE SARS-CoV-2 BY PCR

TREATMENT
- Start Hydroxychloroquine x 5 days
- Assess Clinical Trial Eligibility (YNHHS.com)

Does patient have:
- Age ≥ 60 OR
- BMI ≥ 30 OR
- Diabetes (HgbA1c ≥ 8.0) OR
- Chronic heart disease/HTN OR
- Chronic lung disease OR
- Immunosuppressed?

START TREATMENT

COVID-SPECIFIC TESTS
1) Baseline & every 12 hours: CRP, D-dimer, troponin (troponin X unless more testing is clinically indicated)
2) Baseline & every 24 hours: CBC with differential, CMP, Ferritin, Procalcitonin, INR, fibrinogen, PT/PTT, Mg
3) Baseline & ICU transfer: Cytokine panel
4) Baseline EKG, and if not on telemetry, daily EKG x 3 (see Appendix 3 for recommendations)
5) Repeat Chest X-Ray, if clinical deterioration (CRD not indicated for discharge or to document clinical improvement)

Cardiac:
- Monitor electrolytes: Replete Mg ≥ 2.0, K ≥ 4
- Baseline EKG and monitor telemetry closely for QRS Prolongation (Appendix 3 for recommendations)
- Caution combining CCB prolonging medications
- If significantly elevated troponin or EKG abnormalities and/or hemodynamic instability, consider POCUS for LV function assessment and cardiology consult

Hematology:
- If D-dimer ≤ 5 mg/L, all patients should receive standard prophylactic anticoagulation unless contraindicated*
- If D-dimer > 5 mg/L; use weight-based intermediate prophylactic anticoagulation unless contraindicated*
- If confirmed VTE or high clinical suspicion, start therapeutic dose anticoagulation unless contraindicated*
- If sudden and unexplained change in O2 OR new asymmetrical upper or lower extremity edema, consider venous U/S of affected extremity
- If Ferritin > 2000 or D-dimer > 10000, consider Hematology consult at discretion of primary team

*See Appendix 4 for dosing recommendations

Algorithm reviewed by YNHHS SAS and YNHHS/YSM Ad-Hoc COVID-19 Treatment Team
Appendix D.3- Current adult URI work-up for out-patients

ADULT OFFICE TRIAGE for Patient Calls w/ Respiratory Symptoms – DO NOT BRING PT INTO OFFICE

START: Telephone Triage

If Pt has Moderate/Severe Symptoms

Asymptomatic COVID exposure

Nursing or clinician: Review exposure

Minor respiratory symptoms
- Sore throat
- Hoarse voice
- Cough

Moderate Symptoms
- Breathing okay
- Does not feel well overall
- Coughing
- Headache or sore throat
- Loss of smell or taste
- Chest pain/tightness

URI, Fever & Cough
COVID Suspect
- Home isolation minimum 7 days and ≥ 3 days symptom resolution
- Symptomatic tx
- Consider treatment for influenza or bacterial infection only if highly suspected

ADVISE FOR ALL SYMPTOMATIC PATIENTS:
- Self monitor per CDC
- Call back for fever or respiratory symptoms
- We do not recommend testing at this time
- Exposures/recommendations:
  - Work exposure: HCW - monitor for symptoms and continue to work
  - Household exposure: Self isolate x 14 days, monitor for symptoms

ADVISE FOR ALL SYMPTOMATIC PATIENTS:
- Self isolate per CDC
- Call back for worsening
- Advise against emergency room or walk-in
- We do not recommend testing at this time
- (inadequate supplies)
- Home isolation minimum 7 days, and ≥ 3 days resolution of symptoms in the absence of test results

Severe Symptoms
- Unable to get out of bed
- Dyspneic (RR > 25)
- Chest pain
- Tachycardic (HR > 110)
- Difficulty completing sentence
- Confused

- Needs ED and hospital admission
- Call before sending to inform "COVID suspect" can self transport
- If ambulance needed must inform "COVID suspect"

Negative COVID Test
- Home isolation
- 7 days & ≥ 3 day resolution
- Symptom management
- Call back for worsening

Positive COVID Test
- Home isolation 14 days and ≥ 3 day resolution of symptoms
  (assess for safety) & resolution of cough
- Symptom management
- Regular patient outreach
  See COVID positive-pathway

SIM COVID AMBULATORY GUIDELINE 3/29/20
* Aligned with CDC guidelines as of 3/29/20
Appendix E

Guidance for PPE use can be found at

- [https://vimeo.com/397424618/5e69e27680](https://vimeo.com/397424618/5e69e27680)
- [Radiology.yale.edu](http://Radiology.yale.edu)

**CLICK HERE FOR FULL PPE GUIDANCE POLICY INCLUDING REUSE PROCEDURES**

References:


4. YNHHS Covid Resource Website