PHILIPPINE HEART CENTER **INCIDENT COMMAND POST**	Document Type **POLICY**	Document Code: POL-ICP-023
		Effective Date: May 2020
	Document Title **STANDARDIZED LANGUAGE AND STRUCTURED REPORTING FOR CHEST RADIOGRAPHS, CHEST ULTRASOUND AND CT SCAN STUDIES ADDRESSING COVID-19 PATIENTS**	Revision Number: 1
		Page: 1 of 6

REVISION HISTORY

Rev. No.	Review Date	Description of Change	Date of Next Review
1	May 12, 2020	ADDED CO-RADS	May 2022

Reviewed by:	**GERARDO S. MANZO, MD** Incident Commander	Approved by:	**JOEL M. ABANILLA, MD** Executive Director

I. Statement of Policy:

This shall serve as guide to standardize the interpretation of Chest Radiographs, Chest Ultrasound and CT scans in suspected or confirmed COVID-19 patients so that they are more clinically actionable either for establishing a diagnosis or for guiding management, triage, or therapy.

II. Policy Guidelines:

1. Chest Radiograph – based on RSNA Presentation: "The Chest Radiograph in the COVID-19 Pandemic: Role, Standardized Reporting and CT Correlation" published April 14, 2020.
   - 1.1. Negative – No radiographic evidence of pneumonia
     - 1.1.1. Clear lungs
     - 1.1.2. Chronic changes, such as post-surgical or post inflammatory scarring that can be confirmed as stable with comparison studies
   - 1.2. Indeterminate – Radiographic findings which are indeterminate for pneumonia (COVID-19 pneumonia or other disease may be present)
     - 1.2.1. Basilar opacities which could represent atelectasis or pneumonia
     - 1.2.2. Chronic lung disease with findings not confidently stable
     - 1.2.3. Diffuse lung disease which may represent pulmonary edema or pneumonia
   - 1.3. Focal Pneumonia (nonspecific and less typical appearance for COVID-19 pneumonia)
     - 1.3.1. Patchy focal opacity
     - 1.3.2. Lobar or sublobar consolidation
   - 1.4. Multifocal and/or bilateral pneumonia (typical appearance for COVID-19 pneumonia)
     - 1.4.1. Bilateral poorly marginated opacities especially peripheral, mid and lower lung zones, and often rounded
     - 1.4.2. Multifocal bilateral consolidation
     - 1.4.3. Diffuse bilateral airspace disease/ARDS

2. Chest Ultrasound – based on "Findings of lung ultrasonography of novel corona virus pneumonia during the 2019–2020 epidemic" published on March 12, 2020 and "Proposal for International Standardization of the Use of Lung Ultrasound for Patients With COVID-19" published on March 30, 2020.
   - 2.1. While an international standard of reporting in lung ultrasound for COVID 19 is yet to be established, an ultrasound report with an ultrasound description sheet may be generated considering the presence of these five (5) elements in the right lung and in the left lung:
     - 2.1.1. A-lines
     - 2.1.2. Pathologic B-lines
     - 2.1.3. Pleural thickening and irregularity or Subpleural Condensation
     - 2.1.4. Consolidation
     - 2.1.5. Pleural effusion

3. Chest CT Scans – based on "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." Published April 7, 2020.

3.1. Typical appearance

3.1.1. Commonly reported imaging features of greater specificity for COVID-19 pneumonia

3.1.2. Typical features are those that are reported in the literature to be frequently and more specifically seen in COVID-19 pneumonia in the current pandemic. The principal differential diagnosis includes some viral pneumonias, especially influenza, and acute lung injury patterns, particularly organizing pneumonia, either secondary, such as from drug toxicity and connective tissue disease, or idiopathic.

3.1.3. **Peripheral, bilateral, ground-glass opacities (GGO) with or without consolidation or visible intralobular lines ("crazy-paving") Multifocal GGO of rounded morphology with or without consolidation or visible intralobular lines ("crazy-paving") Reverse halo sign or other findings of organizing pneumonia (seen later in the disease).**

3.1.4. Sample language: "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."

3.2 Indeterminate appearance

3.2.1 Nonspecific imaging features of COVID-19 pneumonia

3.2.2 Indeterminate features are those that have been reported in COVID-19 pneumonia but are not specific enough to arrive at a relatively confident radiological diagnosis. An example would be diffuse GGO without a clear distribution. This finding is common in COVID-19 pneumonia but occurs in a wide variety of diseases such as acute hypersensitivity pneumonitis, Pneumocystis infection, and diffuse alveolar hemorrhage, which are difficult to distinguish by imaging alone.

3.2.3 Absence of typical features AND Presence of: Multifocal, diffuse, perihilar, or unilateral GGO with or without consolidation lacking a specific distribution and are non-rounded or non-peripheral. Few very small GGO with a non-rounded and non-peripheral distribution

3.2.4 Sample language: "Imaging features can be seen with (COVID-19) pneumonia, though are nonspecific and can occur with a variety of infectious and noninfectious processes."

3.3 Atypical appearance

3.3.1 Uncommonly or not reported features of COVID-19 pneumonia

3.3.2 Atypical appearance are those that are reported to be uncommon or not occurring in COVID-19 pneumonia and are more typical of other diseases such as lobar or segmental consolidation in the setting of a bacterial pneumonia, cavitation from necrotizing pneumonia, and tree-in-bud opacities with centrilobular nodules, as can occur with a variety of community acquired infections and aspiration.

3.3.3 Absence of typical or indeterminate features AND Presence of: Isolated lobar or segmental consolidation without GGO Discrete small nodules (centrilobular, "tree in-bud" Lung cavitation Smooth interlobular septal thickening with pleural effusion.

3.3.4 Sample language: "Imaging features are atypical or uncommonly reported for (COVID-19) pneumonia. Alternative diagnoses should be considered."

3.4 Negative for pneumonia

3.4.1 No features of pneumonia

3.4.2 Negative for pneumonia implies that there are no parenchymal abnormalities that could be attributable to infection. Specifically, GGO and consolidation are absent. Importantly, there may be no findings on CT early in COVID-19. Conversely, CT has been reported to be more sensitive than RT-PCR earlier in the course of the disease, although this result may change with local RT-PCR test characteristics.

3.4.3 No CT features to suggest pneumonia.

3.4.4 Sample language: "No CT findings present to indicate pneumonia. (Note: CT may be negative in the early stages of COVID-19.)

4. COVID-19 Reporting and Data System (CO-RADS).
Developed by the Dutch Radiological Society (NVvR) for standardization in assessing the suspicion for pulmonary involvement of COVID-19 on a scale from 1 (very low) to 5 (very high). CO-RADS was evaluated using 105 chest CT scans who had undergone RT-PCR testing with moderate to severe symptoms. The interpretation of CO-RADS needs to include laboratory tests, clinical findings, and the duration and severity of symptoms. CO-RADS is YET TO BE RECOMMENDED by the Philippine College of Radiology.

4.1. CO-RADS 1

Very low level of suspicion for pulmonary involvement by COVID-19

4.1.1. Normal CT

4.1.2. CT findings of unequivocal non-infectious etiology Mild or severe emphysema, perifissural nodules, lung tumors, or fibrosis.

4.2. CO-RADS 2

Low level of suspicion for pulmonary involvement by COVID-19 based on CT findings in the lungs that are typical of infectious etiology that are considered not compatible with COVID-19.

4.2.1. Bronchitis, infectious bronchiolitis, bronchopneumonia, lobar pneumonia, and pulmonary abscess.

4.2.2. Features include tree-in-bud sign, a centrilobular nodular pattern, lobar or segmental consolidation, and lung cavitation.

4.3. CO-RADS 3

Equivocal findings for pulmonary involvement of COVID-19 based on CT features that can also be found in other viral pneumonias or non-infectious etiologies.

4.3.1. Perihilar ground-glass, homogenous extensive ground glass with or without sparing of some secondary pulmonary lobules, or
4.3.2. Ground glass together with smooth interlobular septal thickening with or without pleural effusion in absence of other typical CT findings.
4.3.3. Small ground glass opacities that are not centrilobular
4.3.4. Not located close to the visceral pleura
4.3.5. Contains patterns of consolidation compatible with organizing pneumonia without other typical findings of COVID-19.

4.4. CO-RADS 4
High level of suspicion for pulmonary involvement by COVID-19.

4.4.1. Showing some overlap with other (viral) pneumonias.
4.4.2. Not located in contact with the visceral pleura or are located strictly unilaterally
4.4.3. Are in a predominant peri-bronchovascular distribution, or
4.4.4. Are superimposed on severe diffuse pre-existing pulmonary abnormalities.

4.5. CO-RADS 5
Very high level of suspicion for pulmonary involvement by COVID-19.
Mandatory features:
4.5.1. Ground-glass opacities, with or without consolidations, in lung regions close to visceral pleural surfaces, including the fissures.
4.5.2. Multifocal bilateral distribution.
4.5.3. Peripheral location and vicinity to the minor or major fissure.

4.6. CO-RADS 6
4.6.1. Proven COVID-19. Positive RT-PCR test for virus-specific nucleic acid.

5. As this COVID-19 pandemic is evolving and unpredictable, these policies are subject to revision as required.

References:

1. The Chest Radiograph in the COVID-19 Pandemic: Role, Standardized Reporting, & CT Correlation. https://www.youtube.com/watch?v=aSxOcyRd-bU

2. Peng QY, Wang XT, Zhang LN, Chinese Critical Care Ultrasound Study Group. Findings of lung ultrasonography of novel corona virus pneumonia during the 2019–2020 epidemic. Intensive care medicine. 2020 Mar 12:1.

3. Soldati G, Smargiassi A, Inchingolo R, Buonsenso D, Perrone T, Briganti DF, Perlini S, Torri E, Mariani A, Mossolani EE, Tursi F. Proposal for international standardization of the use of lung ultrasound for COVID-19 patients; a simple, quantitative, reproducible method. Journal of Ultrasound in Medicine. 2020 Mar 30.

4. Simpson S, Kay FU, Abbara S, Bhalla S, Chung JH, Chung M, Henry TS, Kanne JP, Kligerman S, Ko JP, Litt H. 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. Radiology: Cardiothoracic Imaging. 2020 Mar 25;2(2):e200152.

5. Prokop M, van Everdingen W, van Rees Vellinga T, Quarles van Ufford J, Stöger L, Beenen L, Geurts B, Gietema H, Krdzalic J, Schaefer-Prokop C, van Ginneken B. CO-RADS–A categorical CT assessment scheme for patients with suspected COVID-19: definition and evaluation. Radiology. 2020 Apr 27:201473.