http://ejournal.seaninstitute.or.id/index.php/healt
Jurnal eduhealth, Volume 14, No 02, 2023
E-ISSN. 2808-4608

# Thorax Photo Analysis Of Covid 19 Patients In West Java Province Mental Hospital

**Kiagus Roy**
nstalasi Radiologi Rumah Sakit Jiwa Provinsi Jawa Barat

ARTICLE INFO

***Keywords:***
*Covid 19,*
*Chest Photo,*
*Patient*

Email :
roy.kahaj@gmail.com

ABSTRACT

The Corona Virus or commonly called Covid 19 began to spread and shocked the world at the end of 2019. And entered Indonesia in early 2020 with various clinical symptoms that appeared. Starting from a mild cough, fever with high temperatures, shortness of breath to pneumonia and respiratory failure. Symptoms of the Covid 19 virus are categorized into 4 aspects consisting of mild, moderate, severe to critical symptoms. One way to diagnose a patient with the corona virus is to do a chest X-ray. This is one of the diagnoses that is carried out as a preventive way to evaluate the airway, lung parenchyma to blood vessels and heart. In addition to evaluating the pleura, mediastinum and also the chest wall. This research was carried out using a qualitative method with a literature review approach to patients at the West Java Provincial Mental Hospital. This research was conducted at the West Java Province Psychiatric Hospital and found a relationship between clinical symptoms and chest photo images of Covid 19 patients at the West Java Mental Hospital.



## 1. INTRODUCTION

The world was in an uproar with the outbreak of the Corona Disease virus or also known as Covid 19 in Wuhan, China at the end of 2019. The virus finally entered Indonesia in early 2020 which forced people to change their lifestyle. The new normal era has finally come where Indonesian people must reduce their activities and gather in crowds. Even the public must use masks and hand sanitizers to prevent the spread of the Covid 19 virus[1].

In March 2020 the World Health Organization or WHO stated that the Covid 19 virus was called a global pandemic[2]. This is due to the fact that the virus has spread and very quickly infects almost all inhabitants of the earth through human contact with other humans. It was recorded that there were around 177 regions and also 6 continents that were affected by the virus very quickly. Even in January 2021, a year after WHO declared a global pandemic, there were already 103 million people affected by positive cases of Covid 19. And there were around 2.2 million cases of death.

The spread of the virus that is very fast has clinical symptoms from the corona virus patient in general. It is classified that there are 4 types of symptoms of the Covid 19 virus which consist of mild, moderate, severe and also critical. According to a report from Zhang, patients with mild and moderate symptoms account for about 80% of all Covid 19 patients. While the rest are patients with severe and critical symptoms.

One indication of these symptoms is to carry out a diagnostic method, namely a chest photo which is usually done to evaluate the respiratory tract and also the lung parenchyma. In addition, this method is used to evaluate blood vessels, the mediastinum of the heart and the pleura and also the chest wall[3]. While the standard in diagnosing patients infected with the corona virus is by carrying out RT – PCR or Reverse Transcriptase – Polymerase Chain Reaction tests, evaluating with chest photos has a role in assisting the diagnosis of patients suspected of being infected with the corona virus. According to[4], assessment of disease progression and identification of complications that may occur.

The process of evaluating and analyzing chest photos to present information related to clinical symptoms with the appearance of these chest photos. In addition, doing this analysis can provide insight into the knowledge of clinical symptoms as a picture of the thorax photos of these patients.

## 2. METHODS

Covid 19 is a virus that comes from the Coronacridae virus family which has a ring-like shape with spines around the ring when observed using an electron type microscope. The surface of the virus has thorns whose function is to carry out attacks and also bind to living cells and try to attack the virus. This coronavirus can cause the common cold and also quite severe illness, like the virus that used to make a big pandemic, though not as big as Covid 19, which is called MERS or Middle East Respiratory Syndrome. And this virus is sometimes called SARS or Severe Acute Respiratory Syndrome.

This virus has a source from animals, especially bats as the spreader of the virus. While the word corona itself comes from the Latin word which means crown. And the word corona is taken as the name of the virus because of the shape of the virus which is like a crown or corona of heaven around the virions.

Corona virus has 4 classifications consisting of Alphacoronavirus, Betacoronavirus, Gammacoronavirus and also Deltacoronavirus. Meanwhile, the darCoV genome itself is an RNA virus that has positive sense and also has a single strand. Meanwhile, the size of this virus varies between 26 and 32 kb. Types of alpha and beta corona viruses usually infect mammals. Meanwhile, the Delta and Gamma viruses usually infect poultry.

The pneumonia outbreak that emerged from this Beta virus was MERS and also SARS in 2002. The plague first spread rapidly around the world from China. At that time the virus could kill up to 11% of the total population. While MERS appeared for the first time in Saudi Arabia in 2012 which spread quickly to other parts of the world with a much more devastating death rate. Approximately 37% of the death rate of the world's population is recorded. During this pandemic, bats were the main cause of the virus. It is estimated that the virus from bats infects humans through civets and camels. So that the virus spread to humans.

And the same case occurred at the end of 2019 in Wuhan, China. This acute level respiratory disease quickly spread to all cities in China, especially Wuhan. After that, in early 2020, the Corona virus has spread to various countries and also to Indonesia. Precisely in early March 2020. It was found that the cause of the virus was a coronavirus which was named 2019 novel coronavirus or 2019-nCoV.

The 2019-nCoV outbreak occurred due to zoonotic transmission which originally came from a seafood market located in Wuhan, China. And the Chinese people's habit of consuming raw meat is an indication of the spread of the virus. From this habit, the process of transmitting the virus from human to human occurs quickly. The disease caused by the 2019-nCoV virus is then known as Covid-19 or Coronavirus Disease 19.

Just like other RNA viruses, 2019-nCoV quickly adapts when it finds a new host to inhabit. In addition, the virus is susceptible to genetic evolution which causes the development of mutations from time to time so that it is able to create mutant variants that have different characteristics from the initial variants. This is what makes virologists and vaccine makers have to compete in reading the characteristics of the virus.

Among the Covid 19 variants, there are those considered by WHO as VOCs or variants of concerns. This is due to the impact on global public health. Based on WHO epidemiology, there are 4 types of VOC Covid 19 that have been identified according to[5]consisting of:

1. Alpha Virus which was discovered at the end of 2020 in December in England to be precise
2. The Beta Virus was discovered at the same time as Alpha's discovery in South Africa
3. The first reported gamma found in Brazil in early 2021 or January
4. Delta was discovered in India at the same time as Alpha and Beta were discovered.

Based on research from experts, ACE2 is actually the main receptor for the corona virus. ACE2 is expressed on lung alveolar cells as well as enterocyte cells in the ileum and colon. Likewise in the esophageal epithelium, proximal tubular cells of the kidney. Then myocardial cells and also bladder cells and oral mucosa cells. If ACE2 is high, it can be a risk factor for contracting the Covid 19 virus.

One of the symptoms that is quite common is the syndrome or symptoms of acute respiratory disorders which can cause organ damage. This symptom is often associated with cytokine storm syndrome which can cause a high response to Th1 cells or T-Helper 1. The Covid 19 virus is indeed

similar to the MERS and SARS pandemics. The virus will spread from infected individuals. The spread can be through droplets from saliva that appear due to coughing or breathing.

The droplet has a diameter of 5 to 10 m which can be suspended in a closed and static environment. The resistance of the virus can be for 8 to 14 minutes or continue to experience transmission through the air. Especially from infected patients to other people who are in good health. Even healthy people can only act as intermediaries and transmit the virus by making direct contact with other people.

According to research[6]The methods of indirect transmission have been mentioned through vomit marks from Covid 19 patients and also the faecal-oral route. The infected host will release the virus into the environment. The virus can survive for 6.8 hours in plastic. Meanwhile, stainless steel only lasts 5.6 hours. Then 3.5 hours hold on cardboard. While 1.1 hours survive on aerosol materials. If healthy individuals touch surfaces with these materials and touch body parts such as the nose, mouth and eyes, virus particles can enter the host cells which will become their infection.

Other studies mention[7]that viruses can maintain their viability on human skin for up to 9 hours. And this is one of the reasons the pandemic is getting worse by increasing contact transmission. Other studies have also been conducted on pregnant women, especially in the third trimester, who can get an immunocompromised situation where the mother can transmit the Covid virus to the fetus. However, it is not known with certainty whether the transmission of the virus occurs during normal delivery. The reason is that during the cesarean delivery process, no baby was found negative for the Covid 19 virus.

In the last 2 decades, according to WHO, it has become a serious problem for public health in the world. The reason is that in these 2 decades humans have been hit by extraordinary diseases and epidemics. The SARS virus in 2002 to 2003 shocked the world. Then there was the bird flu virus in 2009. Then there was MERS-CoV in 2012 and finally there was the Covid 19 virus which had a far bigger and more significant impact on global health.

The pandemic declared by WHO, the Covid 19 virus has spread to 223 countries which has contaminated millions of people with a high global death rate. This of course has had an effect on people's lives since the case of the Black Death in the 13th century which claimed 75 million to 200 million people. However, death from the Covid 19 virus is influenced by several factors related to age and also the physical condition of each individual. And the severity of the disease also differs between countries.

Photo of the thorax is one of the diagnoses to determine whether the patient has contracted the corona virus or not. Thorax itself has a definition as a cavity that has a conical shape at the bottom which is bigger than the top. While the back is longer than the front. On the back there are 12 thoracic vertebrae. While in front is formed by the sternum. While at the top formed the clavicle and also the scapula. For the lower part there is a diaphragm, and on the right and left 12 ribs will be formed with the position of the body circumference from the back to the front.

According to narrative[3]that Thorax has the function of being a place to protect organs in the thoracic cavity such as the lungs and heart, blood vessels and liver. Besides that, it is a place for the aorta, liver and also other internal organs. Meanwhile, Susilo (2020) said that the thorax can be one way to see the symptoms of pneumonia cases caused by the Covid 19 virus.

Based on research records and also covid cases, mysterious pneumonia was first discovered in December 2019 in Wuhan, China which spread quickly. It was recorded that there were 5 patients suffering from ARDS or Acute Respiratory Distress Syndrome. The development of the spread of the virus is very fast and increased dramatically in just a few days. There were 44 cases recorded that appeared from the end of 2019 to January 3, 2020. This virus attacks the respiratory system, causing mysterious pneumonia.

Based on research from[8]that chest radiology examination is one of the most important and useful ways. The reason is that this technique can be used to find out and assess chest X-rays using X-rays which are a routine obligation. Disease in the lungs cannot be ruled out with certainty before radiological examination is carried out to see cases of further spread of the virus. This examination is indeed relatively much faster and also cheap and easy to do compared to other examinations that are much more sophisticated.

From narrative[9], [10]that the thoracic examination technique that is quite routinely used is the AP technique or Antero Posterior and also Postero Anterior and Lateral. Chest X-rays normally cannot be used to make a diagnosis of the Covid 19 virus. However, it can be used as evaluation material and also for triage for patients who have a suspicion of the Covid 19 infection.

According to the narrative of[11]that the performance of CXR can be further improved if used with RT-PCR. The chest x-ray examination is not very sensitive in finding abnormalities in the lungs, especially in the early stages of the disease. However, in an emergency situation, this diagnostic tool will be very useful as a way to see the development of lung abnormalities in the Covid 19 case.

The technique of examining the thorax in patients with the Covid 19 pandemic uses an AP projection and follows the direction of the caudal ray by passing through a glass window, which is the technique used during this pandemic. Of course, there is a need for modifications to radiographic techniques that are much more effective and efficient.

There is a diagnostic role during this pandemic where this can control the spread of the Covid 19 virus. The condition of the patient is urgent and also the importance of public health, could be one of the results of awareness in increasing testing for the Covid 19 virus. This patient with Covid 19, appears to display much more extensive pulmonary involvement which is capable of giving lower lobe influence as well as consolidation. While Communitu Acquired Pneumonia is characterized by new lung infiltration.

From the narrative by[12]explained that the role of CXR can provide supporting factors that provide ease of performance of CXR in the ER isolation room in order to reduce the occurrence of cross-infection processes between patients. There are differences regarding the role and also the procedure for examining a chest photo that diagnoses the Covid 19 virus with other diseases.

**Research Method**

This research used a descriptive qualitative method by approaching it with a review of the available literature. This research takes data from main sources in books, journals and also several sites on the internet. The research data collection was carried out by documenting and also looking for journals that have a correlation with scientific writing journals regarding the role of chest photos and also the Covid 19 virus. For data analysis in this study by analyzing bibliographic annotations as well as organize, identify and formulate procedures.

## 3. RESULTS AND DISCUSSION

Thorax photos have an important role for patients during the Covid 19 pandemic, especially for patients at the Mental Hospital in West Java Province. This chest radiological examination has a function in establishing the diagnosis and also in evaluating the treatment of Covid 19. This method is a diagnostic method that is quite important as an evaluation material for the respiratory tract as well as blood vessels and the mediastinum. Likewise in the area of the heart, pleura and also the wall on the chest.

The human lung has a division into several lobes. In the area on the right, the lung has 3 lobes consisting of the upper, middle and also lower. While the left lung has 2 lobes consisting of the upper and lower parts. Lung thoracic photo will be divided into 6 zones consisting of:

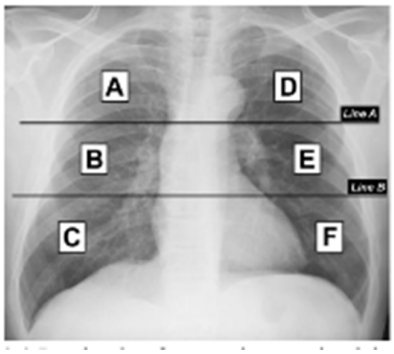


Figure 1. Lung Thorax Photo

1. The upper zone is called Zone A and also D. This zone is located on the inferior wall of the aortic arch.
2. The middle zone, denoted by B and E, lies on the inferior wall of the aortic arch and also above the inferior wall of the pulmonary vein on the right.
3. Zones C and F are the lower zones that lie inferior to the right inferior pulmonary vein.

There are several terms from the results of chest photos obtained from Covid 19 patients which consist of:

1. Ground Glass Opacities
   This term is referred to as ground glass opacification, which is the result of radiology showing areas with increased lung cloudiness. This result will produce cloudiness that is not evenly distributed in the lower and upper right lung and consolidation in the middle area.

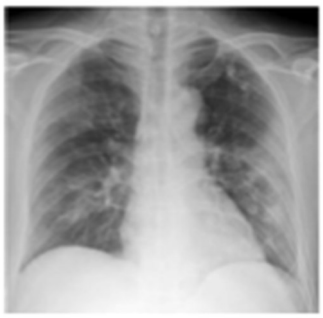

Figure 2. Ground Glass Opacities

2. Consolidation
   This term refers to the results of a chest photo which is characterized by areas in the lungs that appear from the liquid and solid material that is in the lung ducts.

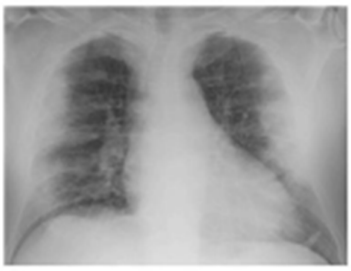

Figure 3. Consolidation

3. Cardiomegaly
   This term occurs with the process of increasing the size of the heart with a larger transverse diameter of the cardiac silhouette, which is about 50% of the diameter of the chest, which is located on the anterior posterior projection of the CT scan.

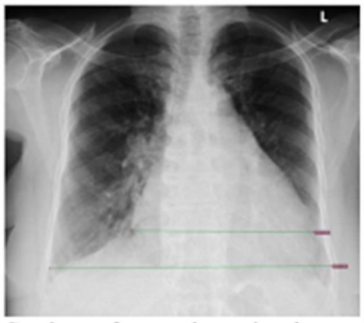

Figure 4. Cardiomegaly

4. Nodule
   A pulmonary nodule is defined as a round opacity about 3 cm in diameter. This image is the result of an anteroposterior thorax from a Covid 19 patient. It is shown with a single nodular at the bottom of the left lung.

Figure 5. Nodules

5. Pleural Effusion
   This term refers to the accumulation of fluid that lies between the parietal pleura and also the visceral or pleural cavity. In the chest X-ray of this patient there is a meniscus sign.

Figure 6. Pleural Effusion

6. Pneumothorax
   This term is a description of the presence of air contained in the pleural space. The visceral pleural line is clearly visible on chest X-ray without any distal lung markings. And the picture below is a thorax photo of a Corona patient.

Figure 7. Pleural Effusion

Meanwhile, Schiaffino stated that the diagnostic from CXR had performance in the examination of the Covid 19 patient. A normal X-ray of the chest does not necessarily rule out the diagnosis of Covid 19. However, this diagnostic tool can be useful as a way of evaluating and also triaging narratives by[13].

Chest radiography has various functions, one of which is as a way of screening in diagnosing the physical condition of the patient. This diagnosis is made for patients who are unable to be transferred to the radiology department to do a chest X-ray. The radiographic process of the thorax in patients with mild Covid 19 virus infection will display blurry shadows around the subpleural area of the lungs.

According to[14]that consolidation is found in cases that are severe enough where they coalesce and become large patches to allow for pleural effusions detected on chest X-rays.

Temporary[5]states that chest x-rays have a basic sensitivity of up to 69% when compared to tests carried out by RT-PCR. While 9% of patients with chest X-ray abnormalities will be preceded by an RT-PCR test with positive results. According to the narrative of[15]it was stated that CXR or Chest X-Ray is one of the first-line methods with faster results when compared to doing an RT-PCR test. Especially if using a portable X-Ray unit that can facilitate the reduction of patient movement so as to minimize the risk of cross-infection between individuals or other patients.

Chest photos have an important role in identifying the disease in patients who have very high clinical suspicion of the Covid 19 virus, according to the statement from[16]. And this method can be used as a way to see progress and also evaluate the Covid 19 case, especially in patients at the West Java Psychiatric Hospital. The function of this CXR examination can assist in clinical diagnosis of patients during the Covid 19 pandemic.

Examination of chest x-rays is one way to make the diagnosis. This CXR examination can be done as a screening tool at a low cost and also a much faster examination. Apart from that, it is easy to use and can assist in the development and evaluation of the Covid 19 case.

According to Schiaffino, for the results of radiographic images of chest photos in patients with a diagnosis of Covid 19, according to Schiaffino, in chest x-rays, blurred consolidation can be seen with a peripheral distribution and also apical deposits. Meanwhile, in small peripheral blurring, opacity in the peri-hilar region on the lower right is often misinterpreted by radiologists. Meanwhile, according to the narrative of[16], the radiographic results of the CXR X-ray examination of the diagnosis of Covid 19, show the presence of ground glass dencities in patients with Covid 19 which has a sensitivity of 69%. Lung consolidation as well as ground glass opacity and bilateral lower lobe consolidations are different from pneumonia caused by bacteria. Thus it has a unilateral tendency and will involve a single lobe.

In the case of Covid 19 and pneumonia caused by the virus, it will produce a level of turbidity in the lung area which will be more than 1 lobe. This is because this corona virus has a much lower lung distribution and also often occurs bilaterally in the lung area. While based on research from[16], peripheral air space opacities are one of the features of the corona virus which is quite unique and also specific for pneumonia which is a fairly high frequency of peripheral lung involvement in the Covid 19 case.

Meanwhile, diffuse air space disease or diffuse clouding of the lungs in patients suffering from the Covid 19 case, has a CXR that has a similar pattern. This becomes a widespread infection or inflammatory process of the syndrome of acute respiratory distress or commonly known as ARDS. Radiographic results by prioritizing the portable thorax technique, can be obtained by means of a glass wall that has a low exposure and also positions and movements related to artifacts. This can affect the results of CXR photos.

Representative chest radiographs of pneumonia in elderly patients, will show extensive alveolar involvement in the peripheral area of the second zone in the lung area. In addition, the involvement will be clearly visible in the middle and inferior areas of the right lung. Then on the left inferior, only around 50 to 75% lung involvement is seen. For pleural effusion can be seen in the area on the left.

Another case that can be seen in elderly patients at a mental hospital in West Java, is reticular opacities in the lung area. Antero posterior radiography on a chest X-ray will show focal linear reticular opacities in the central area of both lungs which are in the center and also the periphery of the lungs. The radiographic results from the thoracic examination of the Covid 19 case can show the occurrence of bilateral lower lobe consolidations which are very much different when compared to pneumonia caused by bacteria. Where this can make people have a unilateral tendency.

Then a chest radiographic examination with relatively low sensitivity to the corona virus, needs to be examined using an RT-PCR swab which is the standard standard in Covid 19 examinations and also a CT Scan process as the next step. This way you can be sure about the chronic symptoms of Covid 19.

The procedure for examining a chest photo in the diagnosis of Covid 19 can be used as a way to maintain pre-control windows and also tube output which requires up to 3-fold increase.

A portable radiography unit procedure that uses disposable plastic coatings, can be a solution to reduce the risk of contamination and also cross infection. This method requires a radiographer operating the machine who is in the room with the patient. While the other radiographers were outside the room. The procedure for examining the thorax with an X-Ray cassette during a pandemic will be covered with 3 pieces of plastic which will then be tied tightly with adhesive tape. Likewise with the X-ray machine which is wrapped with 2 radiographers who operate it.

From the results and also the process obtained in the chest X-ray, of course the procedures that must be obeyed and also carried out so that the photo taking process runs optimally without any cross-infection occurring. The procedure for examining chest x-rays is indeed quite important to avoid cross-infection. The portable CXR procedure, according to Christopher (2020), radiographers during the Covid 19 pandemic will use complete PPE with due observance of health protocols. The CXR unit will be brought into the patient's room. It will then be placed parallel to the patient's bed and will place the detector on the back of the patient with an AP projection.

While another procedure is to place this portable Covid 19 outside the isolation room. During the inspection process, 2 radiographers will be carried out where 1 radiographer will be inside with complete PPE. While another person will be outside the isolation room. After entering the isolation room, the radiographer placed the detector on the back of the Covid patient with an AP projection. Previously, patients from the Mental Hospital would be calmed down before the examination was carried out so that the process ran smoothly.

The commonly used radiographic techniques are based on the theory of[10], [17]namely AP or Antero Posteror and also PA or Postero Anterior and Lateral. Meanwhile, based on the narrative from Brady, that the radiographer will place the bed near the door which is covered with glass. Then place the digital detector on the back of the patient with the AP or Antero Posterior technique. The radiographer will move away from the patient. Then outside of the room, the radiographer will place the head of the X-ray tube near the door so that the X-ray photo process can be carried out.

Various kinds of procedures from theories and research that are carried out are of course to prevent health workers from being infected with the Covid 19 virus. Especially in Mental Hospital patients who require special measures. Especially if you are in an unstable condition. Practically the patient must be made calm and easy to work with before the X-ray process is carried out. The application of strict health protocols can provide assurance that minimal infection and cross-contamination occur so as not to increase the patient's status from the Covid 19 virus.

## 4. CONCLUSION

Chest photos have a very important role in the Covid 19 case in the process of diagnosing the patient's physical condition and also from the mental side of the patient which makes it impossible to be transferred to the radiology department. With recommendations for using the method and also using Chest X Ray to be the first line in identifying chronic symptoms of the Covid 19 virus. This procedure has also implemented health protocols with complete PPE used by medical personnel and also a disinfection process to prevent contamination or cross-infection.

## REFERENCES

[1] C. Grace, “Manifestasi Klinis dan Perjalanan Penyakit pada Pasien Covid-19,” *J. Major.*, vol. 9, no. 1, pp. 49–55, 2020.

[2] C. Huang *et al.*, “Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China,” *Lancet*, vol. 395, no. 10223, pp. 497–506, 2020, doi: 10.1016/S0140-6736(20)30183-5.

[3] E. C. Pearce, *Anatomi dan fisiologi untuk paramedis*. PT Gramedia Pustaka Utama, 2016.

[4] A. Borghesi and R. Maroldi, “COVID-19 outbreak in Italy: experimental chest X-ray scoring system for quantifying and monitoring disease progression,” *Radiol. Med.*, vol. 125, no. 5, pp. 509–513, 2020, doi: 10.1007/s11547-020-01200-3.

[5] C. Fechner *et al.*, “COVID-19 and the role of imaging: early experiences in Central Switzerland.,” *Swiss Med. Wkly.*, vol. 150, pp. w20304–w20304, 2020, doi: 10.4414/smw.2020.20304.

[6] N. Y. Damo, J. P. Porotu’o, G. I. Rambert, and F. E. S. Rares, “Diagnostik Coronavirus Disease

2019 (COVID-19) dengan Pemeriksaan Laboratorium Mikrobiologi Klinik," *eBiomedik*, vol. 9, no. 1, 2021, doi: https://doi.org/10.35790/ebm.v9i1.31899.

[7] D. Ippolito *et al.*, "Diagnostic impact of bedside chest X-ray features of 2019 novel coronavirus in the routine admission at the emergency department: case series from Lombardy region," *Eur. J. Radiol.*, vol. 129, p. 109092, 2020, doi: 10.1016/j.ejrad.2020.109092.

[8] A. England, E. Littler, S. Romani, and P. Cosson, "Modifications to mobile chest radiography technique during the COVID-19 pandemic–implications of X-raying through side room windows," *Radiography*, vol. 27, no. 1, pp. 193–199, 2021, doi: doi: 10.1016/j.radi.2020.07.015.

[9] Z. Brady *et al.*, "Technique, radiation safety and image quality for chest X-ray imaging through glass and in mobile settings during the COVID-19 pandemic," *Phys. Eng. Sci. Med.*, vol. 43, pp. 765–779, 2020, doi: 10.1007/s13246-020-00899-8.

[10] K. L. Bontrager and J. P. Lampignano, "Textbook of positioning and related anatomy." CV. Mosby Company, St. Louis, 2018.

[11] B. Hurt, S. Kligerman, and A. Hsiao, "Deep learning localization of pneumonia: 2019 coronavirus (COVID-19) outbreak," *J. Thorac. Imaging*, vol. 35, 2020.

[12] S. Schiaffino *et al.*, "Diagnostic performance of chest X-ray for COVID-19 pneumonia during the SARS-CoV-2 pandemic in Lombardy, Italy," *J. Thorac. Imaging*, vol. 35, no. 4, pp. W105–W106, 2020.

[13] H. W. Kim *et al.*, "The role of initial chest X-ray in triaging patients with suspected COVID-19 during the pandemic," *Emerg. Radiol.*, vol. 27, pp. 617–621, 2020, doi: 10.1007/s10140-020-01808-y.

[14] Z. Jiang *et al.*, "The role of imaging techniques in management of COVID-19 in China: from diagnosis to monitoring and follow-up," *Med. Sci. Monit. Int. Med. J. Exp. Clin. Res.*, vol. 26, pp. e924582-1, 2020, doi: 10.12659/MSM.924582.

[15] D. Cozzi *et al.*, "Chest X-ray in new Coronavirus Disease 2019 (COVID-19) infection: findings and correlation with clinical outcome," *Radiol. Med.*, vol. 125, pp. 730–737, 2020, doi: 10.1007/s11547-020-01232-9.

[16] A. Jacobi, M. Chung, A. Bernheim, and C. Eber, "Portable chest X-ray in coronavirus disease-19 (COVID-19): A pictorial review," *Clin. Imaging*, vol. 64, pp. 35–42, 2020, doi: 10.1016/j.clinimag.2020.04.001.

[17] J. Lampignano and L. E. Kendrick, *Bontrager's textbook of radiographic positioning and related anatomy-E-book*. Elsevier Health Sciences, 2017.