REVIEW ARTICLE

SPECIFIC SAFETY MEASURES NEEDS TO BE TAKEN BY RADIOLOGISTS AND TECHNOLOGISTS IN SUSPECTED COVID-19 PATIENTS

Shehzad Khan,[1] Surraya Halimi,[2] Shah Abbas,[3] Muhammad Nadeem,[3] Shah Babar,[4] Sanyya Hadi,[5] Wajeeha Shahid[6]

[1] Department of Radiology, Saidu Teaching Hospital, Swat, Pakistan.
[2] Department of Gynaecology, Saidu Teaching Hospital, Swat, Pakistan.
[3] Department of Surgery, Saidu Teaching Hospital, Swat, Pakistan.
[4] Department of Cardiology, AFIC Rawalpindi, Pakistan.
[5] Department of Radiology, AFIRI Rawalpindi, Pakistan.
[6] The Kidney Centre Post-Graduate Teaching Institute, Karachi, Pakistan.

PJR July - September 2020; 30(3): 189-194

ABSTRACT

The novel coronavirus (COVID-19) emerged in December 2019 in Wuhan, China. Since then, this extremely transmissible COVID-19 has been spreading across the globe, with a fast rise in the amount of deceases. Novel COVID-19-infection is characterized by fatigue, fever, dry dyspnoea, and cough. The lot of testing features concerning radiology departments have been reported alike to other kinds of coronavirus syndromes that existed in the past like SARS and MERS. The current review aims to briefly deliberate the recognized precautionary and curative measures of coronavirus disorders for clinical and medical experts with a concentration on the recommended ways by global experiences. Furthermore, the author's appraisal safety and precautions measures for radiology and clinical department workforces to accomplish patients with confirmed and suspected COVID-19. Application of the vigorous plans in the respective divisions is mandatory to prevent more viral transmissions to the patients and health care providers.

Key Words: Coronavirus, viral radiography, radiology, clinical safety

Introduction

Coronaviruses are single strand ribonucleic acid, enveloped, non-segmented and positive-sensed viruses which belong to the family Coronaviridae. There are about six recognized types of coronavirus which cause diseases in human beings comprising four which are responsible for mild respiratory illnesses while remaining two are identified as severe acute respiratory syndrome (SARS) coronavirus and Middle East Respiratory Syndrome (MERS) which cause epidemics with higher rates of mortalities.[1] The novel kind of coronavirus also known as COVID-19 was introduced in December 2019 extracted from samples of lower respiratory tract of many patients from Wuhan, China.[2]

The symptoms exhibited in these patients were severe pneumonia such as respiratory distress fatigue, fever, and dry cough. The novel COVID-19 is thought to have instigated from the seafood market in Wuhan, China. Currently, the virus has been reported in 202 countries across the globe with 1,133,758 confirmed cases (5th April WHO situation report) and exhibits transmission from human-to-human and the World Health Organization classified it as a pandemic. The average incubation duration is assessed to be 5.2

Correspondence : Dr. Shehzad Khan
Department of Radiology,
Saidu Teaching Hospital, Swat,
Pakistan.
Email: shehzadkaan@gmail.com

Submitted 11 April 2020, Accepted 13 May 2020

days and shreds of evidence demonstrate that transmission of the virus can occur during this duration in asymptomatic patients. The WHO has called a global health emergency after such an outbreak.[3]

The developmental research of vaccines and antiviral medications for COVID-19 are in progress but are several months away. In the interim, the burden on the global health care personnel endures intensifying in two major ways. Firstly, the potentially irresistible burden of diseases which is stressing the capacity of the health system and secondly the adversative influences on health care staff especially radiology and pathology lab workers are on the main risks of infections.[4]

In the first-line health care staff, the radiographers are maybe exposed seriously to the novel COVID-19. There should be proper guidelines placed for diagnostic imaging services to manage people with suspected or confirm infection of COVID-19.[5] The novel COVID-19 is extremely contagious and is supposed to transmit frequently via respiratory precipitations, but there is ambiguity as to either the transmission of the virus can ensure through touching a surface or using the different contaminated items.[6]

A systematic understanding of the viral transmission routes will be crucial for the safety of health care professionals and patients. The patient s droplets have the highest risks of transmissions within 91.44 cm to 183 cm (3 ft to 6 ft) from originating source. To diagnose people suspected with COVID-19 with imaging techniques, the portable equipment of radiography must be used beyond these limits of transference from the patients.[7]

Radiology protective preparation is a collection of policies and measures which apply directly to the departments of imaging and designed for accomplishment of sufficient capability for sustained operative procedures during such health care emergency of extraordinary extents and the caring of COVID-19 patients as well as to stabilize the radiologic diagnostics and interventional provision for the whole health care system. Due to variable infection policies of control and management both countrywide and locally, the rules for radiology awareness for COVID-19 have been carefully intended.[8]

On the base of experiences with SARS, the practice of a satellite radiography center and enthusiastic radiographic equipment can reduce the transmission risks from confirmed infected people. If a patient requires to be shifted to the radiology department, the wearing of surgical masks must be ensured during such a transporting process. Since March 2020, the WHO recommended respiratory protection by the means of a standard medical mask to protect any aerosol transmission. There are thousands of health care workers have been infected worldwide with hundreds of demises.[9]

The COVID-19 transmission into the families of clinicians is extensively reported. Despite the identification that transmission befalls typically through symptomatic people, there is information of asymptomatic patients also who transmitted it to multiple doctors and paramedical staff. These facts emphasize the necessity for preventions of cross-infections. Shreds of evidences regarding transmissions and deaths apprise the scientific community of the significance of preparation, vigilance, protection, and active management.[10]

The Centers for Disease Control and Prevention (CDC) recommended further guidelines from airborne defenses and the practice of N95 mask significantly during close contact with COVID-19 confirmed patients or under examination for the suspected virus. Furthermore, the precautionary instructions from viral droplets recommend appropriate special protective kit including goggles for eye protection, fluid-resistant featured disposable isolation gown, a pair of disposable gloves with over gown cuffs coverage, and a face mask external to goggles if possible. The CDC and the American College of Radiology (ACR) in the United States have recommended that non-urgent appointments of all other patients except COVID-19 patients should be postponed.[11]

There are a lot of concerns and questions still unclear particularly in the sites and clinics of higher risks. The main problem is in the emergency departments where the gathering is recognized for curative necessities including technicians and radiologists.[12] A few of such rules which must be placed in these critical areas include promoting cough etiquette, wearing a facemask on the arrival of the patient, tissues supplying, and fulfilling hand hygiene. The suspected patients with symptoms of COVID-19 should be quickly separated and triaged from the overall population preferably in a well-ventilated area with a minimum six feet distance from other people till they can be sited in the isolation rooms.[13]

The technologist s staff who encounter different patients with respiratory disorders must wear the gloves and mask with goggles as indorsed. So far if COVID-19 patient is not suspected, it might be present alike symptoms so precautions must be adopted and improved hygiene both personal and environmental is recommended.[14] Stringent obedience to guidelines is of higher significance for the shield of health care workforces. The COVID-19 is recognized to live for hours or days on the surfaces but it is also efficiently killed by existing sanitizers when used appropriately. Goggles, masks, gloves, and such barriers cannot protect health technologists on encountering latterly with contaminated sides without hands washing.[8]

As ambiguities continuously exist about the COVID-19 spreading, the professionals of diagnostic imaging have been also called for the scanning of a growing proportion of patients who may be agonizing with the viral infections. To support ultrasound technologists and for the protection of both their health as well as their patients, the American Institute of Ultrasound in Medicine (AIUM) freshly published designed guidance to prevent more viral transmission.[9]

There are following precautionray measures published by AIUM:

- Ultrasound technicians should have limited contact with the patient having specified health conditions that can make them susceptible.
- There should complete training is given to sonographers to control infections with fitted respirators including FFP3 and N95 during critical conditions.
- There should be an organized appointment scheduled to prevent crowding in the waiting areas and the seats of waiting room must be apart at least 6 feet with masks wearing restrictions for both patients and paramedics upon arrival.
- The visitors, medical students, and trainees should not be permitted to come to the inspection rooms along with the patients.
- Presume each patient has COVID-19, thus disinfect and clean the room and equipment while closing clinics and procedure rooms.
- Hand hygiene must be performed before and after the checkup of every patient and removing personal protective equipment as well as exchanging highly infectious materials.
- Appropriate hand hygiene can be made with an alcohol-based sanitizer having 70-95% alcohol or using warm water for hands washing or with soaps for 20 seconds.
- Practice disposable latex-free gloves throughout the ultrasound inspection and change them afterward each patient.
- The scanning should perform with one hand on the machine controls and keyboard and one on the transducer. It helps to prevent any cross-contamination because of misters and particulate matters which can accrue to the keyboard crevices.

Health care personnel must concentrate on scrupulous hands hygiene and circumventing contaminated workstations. Medical staff must clean workstations and personal belongings such as nametags, mobile phones, stethoscopes, keyboards, landlines, dictation devices, and other substances with hospital-delivered sanitizers or alcohol-based purifiers.[15] It is serviceable for the workers of hospital staffs to upsurge the regularity of cleaning of normally touched exteriors such as countertops, light switches, chair arms, elevator buttons, escalator railings, handles, and doorknobs. Active sanitization is not simply a technical matter, it also is comforting to concerned and stressed radiologists, technologists, patients, and visiting people.[16]

Healthcare administrations should prepare to discourse the higher demands for the care of enlarged proportion of patients with mild or acute respiratory suffering which is a prominent symptom of COVID-19 and focused on the available ventilators and particular protective apparatus. Based evidence from Chinese, Italian, and South Korean hospitals, there are some measures are obligatory to apply.[17] Firstly, provide treatment services for both moderate and severe cases of COVID-19 with serious care proficiencies such as canceling of non-urgent operations, staff redeployments, and creating momentary treatment services. Secondly, to discourage the personal visits of symptomatic patients without prior bit of advice and reduce the organizational workload for staff to make the availability of resources.[18]

The pandemic COVID-19 transmission in the department of radiology can primarily occur through indirect, and direct contact, droplets of patients and airborne ways. Any of such exposure kinds can arise during

patient registrations, history recording, clinical examinations, transportations and radiologic inspection as well as in the waiting areas. Thus, it is significant to recognize people who might carriage exposure risks of COVID-19 to others and taking the proper precautions based on the probable transmission routes for a certain infection.[19]

Personal protective equipment is referred to as the protective apparatus worn for prevention from exposure to harmful biologic or chemical agents. Such equipment can be simple for example nonsterile examination gloves as well as complex for example isolation suits of positive pressure worn in highly restraint laboratories.[20] The equipment requirements are personalized for every definite situation based on the risk assessment for a certain pathogen and the predicted exposure. The appropriate utilization of personal protective equipment is directed by and must be performed in acquiescence with the Occupational Health and Safety Administration guidelines.[21]

Based on medical experiences with SARS, there have been offered few major precautions for each radiology worker to provide safeguard all their staff and patients from COVID-19 infection:

- Before the arrival of COVID-19 patients in the radiology and pathology department, inform them with symptoms of respiratory infections to take proper precautions like wearing a mask, hand hygiene to avoid possible viral spreading.
- Do not permit them to wait with other patients and ensure their rapid checkup and kept them in isolation.
- Ensure proper supplies of respiratory hygiene, and cough protocols such as 70% to 95% alcohol-based hand sanitizer, tissues, restriction to touch trash bins and wearing facemasks.
- All patients with confirmed COVID-19 must be placed in an airborne infection isolation room with negative air pressure as compared to the surrounding environment.
- Change the air minimum six times per hour by the exhausting highly efficient particulate air filter.
- Healthcare workers and radiologists should wear clean gloves and isolation gowns as well as goggles for eye protection.
- Establish appropriate procedures for monitoring, managing, and training visitors for maintenance of minimum viral exposure.
- Place specific physical barriers and partitions like curtains between medical workers and patients to implement engineering control measures.
- Laboratories and medical wards must be environmentally cleaned and disinfectant consistently and correctly.

In the radiology department, the common routes of blood-borne viral exposure comprise needle-sticks and splashes on mucous membranes including nose, eyes, and mouth often occurs during angiography, intrahepatic shunt settling, vascular access, solid organ biopsy, drainage catheter placement, lumbar puncture, urologic and biliary operations and joint aspiration and injections.[22] The seroconversion occurrences of the hepatitis B virus, hepatitis C virus, and human immunodeficiency virus after needlestick injuries has been reported 62%, 1.8%, and 0.3% respectively. Hospital workers including doctors, supporting staff, administrations and preparation teams must be stressed by the encounters of continued responses of COVID-19, and management must stress the significance of self-care as the focus of the main responses.[23]

Conclusion

Considerate and transparent communication could participate in confidence and a sense of care. The liberating all administrative team members and clinicians from other commitments and tasks permit them to concentrate on the instantaneous needs of COVID-19 care and management. Moreover, food provision, decompression time, rest breaks, and adequate duty times might be as imperative as availability of protective equipment and protocols when days turn into weeks and months. Regular feedback and information sessions with the wide-ranging serving community and local managers accompanied by concise, measured, and clear communications will assist them to stay attentive on care and protected in their regulations.

Conflict of Interest: None

References

1. Gostin LO, Hodge JG. US emergency legal responses to novel coronavirus: Balancing public health and civil liberties. JAMA 2020; **323(12):** 1131-2.

2. Ashour MA, Arabi M, Justaniah AI. Vascular and interventional radiology workflow management during the COVID-19 pandemic: Position statement by the saudi interventional radiology society. Arab J Intervent Radiol [Epub ahead of print] [cited 2020 Aug 8].

3. Momattin H, Mohammed K, Zumla A, Memish ZA, Al-Tawfiq JA. Therapeutic options for Middle East respiratory syndrome coronavirus (MERS-CoV) possible lessons from a systematic review of SARS-CoV therapy. Int J Infect Dis. 2013; **17(10):** e792-8.

4. Tsou IYY, Goh JSK, Kaw GJL, Chee TSG. Severe acute respiratory syndrome: management and reconfiguration of a radiology department in an infectious disease situation. Radiology. 2003; **229(1):** 21-6.

5. Gogna A, Tay KH, Tan BS. Severe acute respiratory syndrome: 11 years later - a radiology perspective. Am J Roentgenol. 2014; **203(4):** 746 - 8.

6. Chen Z, Zhang L, Qin C, Ba L, Christopher EY, Zhang F, et al. Recombinant modified vaccinia virus Ankara expressing the spike glycoprotein of severe acute respiratory syndrome coronavirus induces protective neutralizing antibodies primarily targeting the receptor binding region. J Virol. 2005; **79(5):** 2678-88.

7. Gozes O, Frid-Adar M, Greenspan H, Browning PD, Zhang H, Ji W, et al. Rapid ai development cycle for the coronavirus (covid-19) pandemic: Initial results for automated detection & patient monitoring using deep learning ct image analysis. arXiv Prepr arXiv200305037. 2020;

8. Lomongo S, Alyousef K, Mustonen R, Othman K. Management of Patient Flow in Vascular and Interventional Radiology During MERS-CoV Outbreak. J Radiol Nurs. 2017; **36(3):** 184-7.

9. Raghavan K, Hicks RM, Kohli MD, Kolli KP, Itri JN, Seidenwurm DJ, et al. Collaborative Opportunities for Radiology Quality Improvement Projects. Acad Radiol. 2020; Mar 20;S1076-6332(20)30101-X.

10. Kooraki S, Hosseiny M, Myers L, Gholamrezanezhad A. Coronavirus (COVID-19) outbreak: what the department of radiology should know. J Am Coll Radiol. 2020; **17:** 447-51.

11. Paules CI, Marston HD, Fauci AS. Coronavirus infections - more than just the common cold. JAMA 2020; **323(8):** 707-8.

12. McIntosh K. Coronavirus disease 2019 (COVID-19). UpToDate Hirsch MS, Bloom A (Eds) Accessed Mar. 2020; 5.

13. Livingston E, Bucher K. Coronavirus disease 2019 (COVID-19) in Italy. JAMA. 2020; **323(14):** 1335-41.

14. He M-L, Zheng B, Peng Y, Peiris JSM, Poon LLM, Yuen KY, et al. Inhibition of SARS-associated coronavirus infection and replication by RNA interference. JAMA 2003; 290(20): 2665-6.

15. Chandy PE, Nasir MU, Srinivasan S, Klass D, Nicolaou S, Babu SB. Interventional radiology and COVID-19: evidence-based measures to limit transmission. Diagn Interv Radiol. 2020; **26:** 236-40.

16. Rajput R, Chouhan Z, Suthar P, Chouhan RRS, Mathur S, Purohit P. MERS-CoV (Middle East Respiratory Syndrome Corona virus): A Dental Surgeon Perspective. 2393-915X; (Print): 2454-7379

17. Chung M, Bernheim A, Mei X, Zhang N, Huang M, Zeng X, et al. CT imaging features of 2019 novel coronavirus (2019-nCoV). Radiology 2020; **295:** 202-7.

18. Mitka M. Deadly Mers coronavirus not yet a global concern. JAMA. 2013; **310(6):** 569-74.

19. van Beek EJ, Reekers JA, Batchelor DA, Brandjes DP, B ller HR. Feasibility, safety and clinical utility of angiography in patients with suspected pulmonary embolism. Eur Radiol. 1996; **6(4):** 415-9.

20. Han R, Huang L, Jiang H, Dong J, Peng H, Zhang D. Early clinical and CT manifestations of coronavirus disease 2019 (COVID-19) pneumonia. Am J Roentgenol. 2020; **35(3):** 1-6.

21. Chen W, Su XY, Wang VJ, Wang EC, Xu R, Zhong S, Sun G, Xia J. Novel Coronavirus International Public Health Emergency: Guidance on Radiation Oncology Facility Operation. Advances in Radiation Oncology. 2020 Apr 1.

22. Swerdlow DL, Finelli L. Preparation for possible sustained transmission of 2019 novel coronavirus: lessons from previous epidemics. JAMA 2020; **323(12):** 1129-30.

23. Mossa-Basha M, Meltzer CC, Kim DC, Tuite MJ, Kolli KP, Tan BS. Radiology Department Preparedness for COVID-19: Radiology Scientific Expert Panel. Radiology. 2020;200988 (Published Online:Mar 16 2020;