ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 4, Issue – 1, January - 2021, Page No. : 333- 345

Infection Control Strategies and Recommendations for Oral Radiologists in Covid-19

[1]Dr. Ayushi P. Mangulkar, Post Graduate student, Department of Oral Medicine and Radiology, Nair Hospital Dental College, Mumbai, Maharashtra

[2]Dr. Aaditi Kadam, Post Graduate student, Department of Oral Medicine and Radiology, Nair Hospital Dental College, Mumbai, Maharashtra

[3]Dr.Freny Karjodkar, Head of Department, Department of Oral Medicine and Radiology, Nair Hospital Dental College, Mumbai, Maharashtra

[4]Dr.Kaustubh Sansare, Associate Professor, Department of Oral Medicine and Radiology, Nair Hospital Dental College, Mumbai, Maharashtra

Corresponding Author: Dr. Ayushi P. Mangulkar, Post Graduate student, Department of Oral Medicine and Radiology, Nair Hospital Dental College, Mumbai, Maharashtra

Citation of this Article: Dr. Ayushi P. Mangulkar, Dr. Aaditi Kadam, Dr. Freny Karjodkar, Dr. Kaustubh Sansare, "Infection Control Strategies and Recommendations for Oral Radiologists in Covid-19", IJDSIR- January - 2021, Vol. – 4, Issue - 1, P. No. 333-345.

Type of Publication: Review Article

Conflicts of Interest: Nil

Abstract

The pandemic of COVID-19 is the prime health issue of global concern currently. This disease has caused tremendous health, and socio-economic crisis. Health care facilities are rapidly trying to adapt to the new changes and protocols required to be followed to deal with this health crisis. This Dental health care demands even otherwise and now even more careful handling of patients and undertaking of infection control measures precisely while delivering oral health services, in order to prevent the dental operator and well as his staff members, family and patients and other members of the society from contracting this disease. Oral and Maxillofacial Radiology is a very crucial part of dental care and thus it's quite mandatory to bring out changes in the way dental radiology is practiced by the general practioners. The aim of this review is to provide a protocol to improve infection control and prevention practices in Oral Radiology in the current Covid-19 pandemic.

Keywords: COVID-19, SARS CoV-2, Oral and Maxillofacial Radiology, Infection Control, Paperless Dentistry.

Introduction

The COVID-19 pandemic which is caused due to the SARS-CoV-2 virus that spreads through aerosols has caused deleterious effects on the delivery of oral health care system worldwide.

During this period of health crisis, the onus is on dentists to follow rigorous and highly effective infection control protocols to ensure that the dental patients receive dental treatment without causing any cross-contamination. This article highlights on the importance and the ways a dentist can carry out radiology procedures amidst this pandemic by following certain protocols.

Oral Implications After Covid-19 Crisis

Although the exact transmission routes are yet to be determined with certainty, as with influenza and many other viruses affecting the upper and lower respiratory airways, aerosol transmission between humans has been found to a confirmatory and major source of transmission.[1,2] So, it is important to emphasize that prolonged close face-to-face contact between patients and dentists creates a high risk for cross-infection.

The contact between the mouth of the patients and the production of aerosols while carrying out dental therapy would appear to create a substantial risk for contamination and spread of the virus within dental clinics as shown in figure no.1 Furthermore, it is likely that University Dental Clinics and Dental Hospitals, where patients, students and teachers share the same spaces, may potentially create a reservoir and 'hub' for the spread of the virus.[3]

Routine dentistry has been suspended in several countries, including India to reduce virus transmission. Indian dental association declared on 17th of March 2020 that only emergency dental care should be carried out such as odontogenic infections or trauma with appropriate personal protective equipment (PPE).

Going forward, as SARS-CoV-2 is going to be a hazard presumably until a vaccine is developed and distributed, dental practitioners have to adapt their practices to protect themselves and their patients from this infection.[4]Since Imaging plays an important role in diagnosis of an oral disease; this minireview was prepared after searching related literature for recommendations and protocols that could significantly reduce the risk of an operator or a dental assistant, radiology personnel to get contaminated, while at the same time protect the patients.

Steel, paper, plastics and other metallic objects in the area of dental radiology unit can act as a source of cross contamination since the virus is said to be prevalent from few hours to days on these surfaces. (Figure No.2)[5]

Materials And Methods

The following electronic bibliographic databases were used to identify relevant scientific literature: MEDLINE, EMBASE, Science Direct, and the Google search engine. Literature search was conducted for English-language articles using both index terms (eg, Medical Subject Headings [MeSH], Entree) and free-text keywords to identify eligible reports. The search items used were "coronavirus disease 19, COVID-19, severe acute respiratory syndrome coronavirus 2, SARS-CoV-2, transmission, pandemic, oral procedures, oral diagnosis, oral radiology, dental, personal protective equipment, infection prevention and control." The last search was run on 3rd of September 2020.

Do's And Don'ts for Oral Radiologist In Light of Covid -19

Subjects with COVID-19 may be asymptomatic or pre-symptomatic (20%–86% of all infections).[6]Thus, there are high chances that asymptomatic patients with undiagnosed COVID-19 may come to the dental clinics, making the oral radiology centre a source of COVID-19 transmission to both personnel and dental patients.

Infection Control and Preventive Measures in the Department of Oral Radiology

Infection control and preventive measures are important to prevent cross infections and dental personnel. A survey found that only 40% of radiology department professional staff has knowledge of infection control practice.[7]

Therefore, in addition to regular training, infection control training should be made mandatory.

Routine disinfection procedure to be followed

1. Object surface disinfection

-Object (dental chair) surface should be wiped with 1,000 mg/L chlorine-containing disinfectant, wiped twice with 75% ethanol for non-corrosion resistance, once every 4 hours. [8]

2. Equipment disinfection

-After each examination, the equipment should be thoroughly disinfected by wiping the surface with 75% of ethanol.

-The equipment in the contaminated area must be wiped with 2,000 mg/L chlorine-containing disinfectant. [9]

- Corrosive disinfectants should not be used.

- The Disinfectant sprays should be sprayed meticulously, as they might penetrate the equipment and can cause short circuit of the instrument. Before using disinfection spray the radiology equipment should be shut down, allowed to be cooled down and must be completely covered completely by a plastic film. [10,11]

3. Air disinfection

-All central air conditioners should be turned off to prevent air contamination.

-The door of the operatory area must be opened for ventilation, each time more than 30 min, once every 4 hours.

4. Other preventive measures-

- All disposable products should not be reused and should be discarded with utmost care.

-The reusable products such as google and face shield should be disinfected by soaked it in 1000mg/ml of disinfectant containing chlorine or 75% ethanol for more than 1hr.

Collection and processing of the medical waste-

-All the waste from patients should be managed strictly.

- The infectious waste should be discarded in a medical waste collection bag. Ideally the bag should not be more than 3/4th full.

- The cleaners should take secondary level protection and should be responsible for handover protection, safe transportation and proper storage of the infection waste.

Personal Protection-

-All the members of the dental team must adapt the habit of maintaining proper hand hygiene.

Indications for hand hygiene and selection of hand hygiene agents-

1. When the hands are not visibly soiled, an alcohol-based sanitizer should be used.

2.It is necessary to sanitize the hands every-time, before and after coming in direct contact with patients as well the operatory equipment.

3.Hand hygiene before wearing and after removal of gloves should be done.

4.Before the consumption of any eatables, hands should be thoroughly washed with soap and water.

Technique of Hand Washing

- Bracelets, watches and rings should be removed before starting the surgical hand scrub.
- While decontaminating the hands with an alcohol-based sanitizer, the sufficient quantity of product (according to the manufacturers recommendations) has to be applied upon palm of one hand and then both the hands have to be rubbed together, making sure that all the surfaces of hands and fingers are covered.
- When washing hands with soap and water, hands should first be made wet with water. Then the handwashing product should be applied onto the palms as per the recommendations of the manufacturer. Later, hands should be rubbed together vigorously to form a thick lather for at least 20 seconds. It should be ensured that all the surfaces of

palms and fingernails are covered with the lather. After final rinsing of hands with water, hands should be dried thoroughly with a disposable towel. A towel/tissue should be used to turn off the faucet, in order to avoid contact with the tap.

- Use of hot water for hand washing should be avoided, because repeated exposure to hot water might increase the risk of dermatitis.
- Liquid, bar or powdered forms of plain soap are acceptable when washing hands with a non-antimicrobial soap and water. It is advisable to use soap racks when using bar soaps.
- Multiple-use cloth towels of the roll or hanging type are not recommended for use in health-care settings. [11] figure No.3

Clothing Recommendations

1.Mask

- Masks should be placed over the nose, mouth and chin and should be adjusted in such a way that there are no gaps on either side of the mask.
- According to CDC (Centre for disease control and prevention) has warned that facial hair may interfere with the effectiveness of face masks. [12]
- Masks are effective only when used in combination with proper hand hygiene. Figure No.4

2. Personal Protective Equipment (PPE)

1. PPE that covers the clothing and skin and completely protects mucous membranes is required when caring for patients[13,14]
2. Separate rooms for donning and doffing of PPE Figure no.5
3. Scrubs

Waiting Area Precautions

1.Display visual alerts about respiratory hygiene, cough etiquette, social distancing and disposal of contaminated items in trash cans.

2.Availability of sufficient three-layered surgical masks, sanitisers and tissue papers for patient use at the desk should be ensured.

3. Foot Pedal Hand sanitizer dispenser should be placed at the entrance.

4. The waiting chairs, should be distant, preferably a meter apart.

5. Physical barriers to be installed.

5.A bin with lid should be available, where patients can discard used paper tissues.

6. Toys magazines and frequently touched objects should not be kept in the waiting area since they can be a source of cross contamination. [15]

Administrative Control

1. Ensure that there is no overlap of dental appointments.

2.Caseless / contactless payment methods should be employed.

3.Patients can be advised to wait in their private vehicles or outside the dental facility where they can be contacted by mobile phone when it is there turn for radiologic investigation.

4. There should be restriction for the number of patients to be taken daily for radiology diagnosis. [16,17]

Engineering Controls

-Use of Air Filters to Reduce COVID-19 Severity and Spread.

It is speculated that use of air filters near a coronavirus patient may reduce the viral load in the environment is sufficient to decrease the probability of health care worker infection through flaws in Personal Protective Equipment (PPE). Fluid droplets from the cough or sneeze of an infected patient are typically 5 microns ($5 * 10^{-6}$ m) or

larger. HEPA filters can reliably capture particles of this size. ULPA (Ultra-Low Penetration Air) filters are even better, catching 99.99% of particles 0.12 microns and above. [18,19] figure no.6

So, this raises the question of whether treatment rooms, waiting rooms and corridors should have HEPA filtration installed rapidly. Empirical investigations of air viral loads, deposition patterns of viral particles on surfaces should be used to determine whether this approach has merit and the urgency for further testing and implementation. [20,21]

Recommendations For Oral Radiographic Examination Procedures-

-Whenever a patient makes appointment for radiographic diagnosis-

1.Screening of every asymptomatic patient should be done meticulously. Proper history, sign and symptoms to be noted. -His/her temperatures should be measured at the entrance of radiology department.[22]

2.Considering every patient as a potential asymptomatic COVID-19 carrier.

3.Considering recently recovered patients as potential virus carriers for at least 30 days after the recovery confirmation by a laboratory test and to be taken for radiographs after consulting a physician.[23]

-Firstly, while taking intraoral/extraoral radiograph patient is asked to remove the mask.

-Using 0.23% povidone iodine mouthwash for at least 15 sec before the procedure can reduce the viral load in patient's saliva. (Eaggers et al 2018)[24]

-The distance from an x-ray room to the dental operatory (treatment room) plays a key role and it should follow a standard guideline to prevent aerosol transmission. It was found that dental aerosol can reach 1-3 meters from its source, so it is recommended that oral radiology room should be at-least three meters away from the dental operatory. [25]Figure no.7

Intraoral Vs Extra Oral Radiographs

Usually extraoral radiographs are preferred than intraoral as the quality of extra oral radiographs is much more improved and can be useful in detection of odontogenic cysts, tumours fractures and periodontal, periapical pathologies associated with caries and gives complete information of the entire dentition with very less contamination [25]

However procedural periapical radiographs are required as while measuring the working length, to know the extent of obturation in root canal treatment and is cost effective, hence it is unavoidable. Mouth rinse containing oxidative agents such as 0.2% povidone or 1% hydrogen peroxide is recommended. [26]

Sensors used, should be sanitized properly and the outer covering should be properly discarded. Measures to prevent gag reflex should be elicited, as gag reflex can lead to coughing and spread of corona virus.[27]

Paperless Radiology

Hard copies of images can be a major means of transmission of COVID-19 since disinfection with solutions can affect the quality of the radiographs and jeopardize the diagnostic information; therefore, a teleradiology system is recommended to prevent contamination. Paperless systems minimize the risk of document-mediated transmission. Electronic examination application forms, informed consent for CBCT and panoramic radiographs examination of patients, and imaging data can be viewed throughout the hospital without contact with physical documents. [28]

Oral Radiologists can perform diagnosis and patients can use mobile APPs or patient portals to check their results. This paperless system contributes significantly to the lack of virus transmission. [29]

Post-Exposure Measurements

If a dental personnel or radiology technician indirectly comes into close physical contact with infected or suspected infected patients, one should strictly follow the standardized procedures to enter and leave contaminated and suspected contaminated areas. Once exposed, they must report the incident and should be isolated immediately. [30]

-Hydroxychloroquine Prophylaxis-

As per the revised advisory given by the Ministry of health and Family welfare dated 22.05.2020, all asymptomatic healthcare workers involved in the care of suspected or confirmed cases of COVID-19 are advised to take HCQ prophylaxis after medical consultation. [30]

Conclusion

Covid-19 is a huge global threat with number of confirmed reports and number of deaths rising every day. The goal of our article was to highlight what the specialty is facing and how oral radiologists can handle the situation because shutting down the dental clinics completely will procure a loss not only to the patients who require prompt dental treatment but also a financial loss to the dentists. Also, competent authorities should step in to help dental practices, hospitals and healthcare workers in order to ensure the provision of all types of healthcare efficiently in these testing times and beyond.

To conclude, we radiologists need to adapt ourselves to the new normal and change our radiology practice to some extent;as 'Change is the only constant in life'.

References

1. A. Du Toit, Outbreak of a novel coronavirus, Nat. Rev. Microbiol. 18 (123) (2020), https://doi.org/10.1038/s41579-020-0332-0.
2. Roujian Lu, X. Z. (2020, January). Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. The lancet, 565-574. doi: https://doi.org/10.1016/ S0140-6736(20)30251-8
3. Zhou P, Yang X-L, Wang X-G. Discovery of a novel coronavirus associated with the recent pneumonia outbreak in 2 humans and its potential bat origin. bioRxiv, January 23, 2020.
4. The Current State of Nuclear Medicine and Nuclear Radiology: Workforce Trends, Training Pathways, and Training Program Websites
5. Academic Radiology In Brief • Full-Text • PDF
6. Automated Radiology-Pathology Module Correlation Using a Novel Report Matching Algorithm by Organ System
7. Day M. Covid-19: four fifths of cases are asymptomatic, China figures indicate. BMJ 2020;369. http://dx.doi.org/10.1136/bmj. m1375. m1375.
8. Ferneini EM. The financial impact of COVID-19 on our practice. J Oral Maxillo- fac Surg)2020;(Apr 9). http://dx.doi.org/ 10.1016/j.joms.2020.03.045. [Epub ahead of print].
9. World Health Organization. Infection pre- vention and control during health care when COVID-19 is suspected. Interim guidance 19 March 2020. https://apps.who.int/iris/ handle/10665/331495 [Accessibility verified April 24, 2020].
10. Savarino, A.; Boelaert, J.R.; Cassone, A.; Majori, G.; Cauda, R. Effects of chloroquine on viral infections: An old drug against today's diseases? Lancet Infect. Dis. 2003, 3, 722–727. [CrossRef]
11. Li, H.; Wang, Y.M.; Xu, J.Y.; Cao, B. Potential antiviral therapeutics for 2019 Novel Coronavirus. Chin. J. Tuberc. Respir. Dis. 2020, 43, E002. [CrossRef]
12. Duan, J.; Yan, X.; Guo, X.; Cao, W.; Han, W.; Qi, C.; Feng, J.; Yang, D.; Gao, G.; Jin, G. A human SARS-CoV neutralizing antibody against epitope on S2

protein. Biochem. Biophys. Res. Commun. 2005, 333, 186–193. [CrossRef]

13. Yu J, Ding N, Chen H, et al. Infection control against COVID-19 in departments of radiology. Acad Radiol 2020; 27:61.
14. Veena HR, Mahantesha S, Joseph PA, et al. Dissemination of aerosol and splatter during ultrasonic scaling: a pilot study. J Infect Public health 2015; 8(3):260–265.
15. Kweon HH, Lee JH, Youk TM, et al. Panoramic radiography can be an effective diagnostic tool adjunctive to oral examinations in the national health checkup program. J Periodontal Implant Sci 2018; 48(5):317–325.
16. ECDC. Personal protective equipment (PPE) needs in healthcare set- tings for the care of patients with suspected or confirmed novel coronavirus (2019-nCoV), https://www.ecdc.europa.eu/en/publications-data/personal-protective-equipment-ppe-needs-healthcare-settings- care-patients (2020, accessed 11 April 2020).
17. Samaranayake LP, Reid J, Evans D. The efficacy of rubber dam isolation in reducing atmospheric bacterial contamination. ASDC J Dent Child 1989;56:442
18. Solderer A, Kaufmann M, Hofer D, Wiedemeier D, Attin T, Schmidlin PR. Efficacy of chlorhexidine rinses after periodontal or implant surgery: a systematic review. Clin Oral Investig 2019;23:21
19. Koeman M, Ven Ajam van der Hak E, Joore HCA, Kaasjager K, Smet AGA, de Ramsay G, Dormans TPJ, Aarts Lphj Bel EE, de Hustinx WNM, Tweel I, van der Hoepelman AM, Bonten M. Oral decontamination with chlorhexidine reduces the incidence of ventilator- associated pneumonia. Am J Respir Crit Care Med 2006;173:1348
20. Eggers M, Koburger-Janssen T, Eickmann M, Zorn J. In vitro bacteri- cidal and virucidal efficacy of Povidone-Iodine gargle/mouthwash against respiratory and oral tract pathogens. Infect Dis Ther 2018;7:249 Eggers M. Infectious disease management and control with povidone iodine. Infect Dis Ther 2019;8:581
21. Jnli Ding[1] & Haihong Fu[2] & Yaou Liu[1] & Jianbo Gao[3] & Zhenlin Li[4] & Xin Zhao[5] & Junhui Zheng[6] & Wenge Sun[7] & Hongyan Ni[8] & Xinwu Ma[9] & Ji Feng[10] & Aiqin Wu[11] & Jie Liu[3] & Yun Wang[2] & Pengfei Geng[12] & Yong ChenPrevention and control measures in radiology department for COVID-19 https://doi.org/10.1007/s00330-020-06850-5
22. Available from: https://www.who.int/emergencies/diseases/ novel-coronavirus-2019/technical-guidance [Last accessed on 2020]
23. 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.
24. https://www.mohfw.gov.in/pdf/AdvisoryontheuseofHydroxychloroquinasprophylaxisforSARSCoV2infection.pdf,https://www.icmr.gov.in/pdf/covid/techdoc/HCQ_Recommendation_22M
25. Marko Hyttinen, Anna Rautio, Pertti Pasanen, Tiina Reponen, G Scott Earnest, Andrew Streifel, and Pentti Kalliokoski. Airborne infection isolation rooms–a review of experimental studies. Indoor and Built Environment, 20(6):584–594, 2011.
26. Eunice YC Shiu, Nancy HL Leung, and Benjamin J Cowling. Controversy around airborne versus droplet transmission of respiratory viruses: implication for

infection prevention. Current opinion in infectious diseases, 32(4):372–379, 2019.

27. Khai Tran, Karen Cimon, Melissa Severn, Carmem L Pessoa-Silva, and John Conly. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. PloS one, 7(4), 2012.
28. Jiayu Li, Anna Leavey, Wang Yang, Caroline O'Neil, Meghan Wallace, Adrianus Boon, Pratim Biswas, Carey-Ann D Burnham, and Hilary M Babcock. Defining aerosol generating procedures and pathogen transmission risks in healthcare settings. In Open forum infectious diseases, volume 4, pages S34–S35. Oxford University Press US, 2017.
29. Santos GNM, Leite AF, Figueiredo PTS, Pimentel NM, Flores-Mir C, Melo NS, et al. Effectiveness of e-learning in oral radiology education: a systematic review. J Dent Education 2016; 80: 1126–39.

Legend Figures

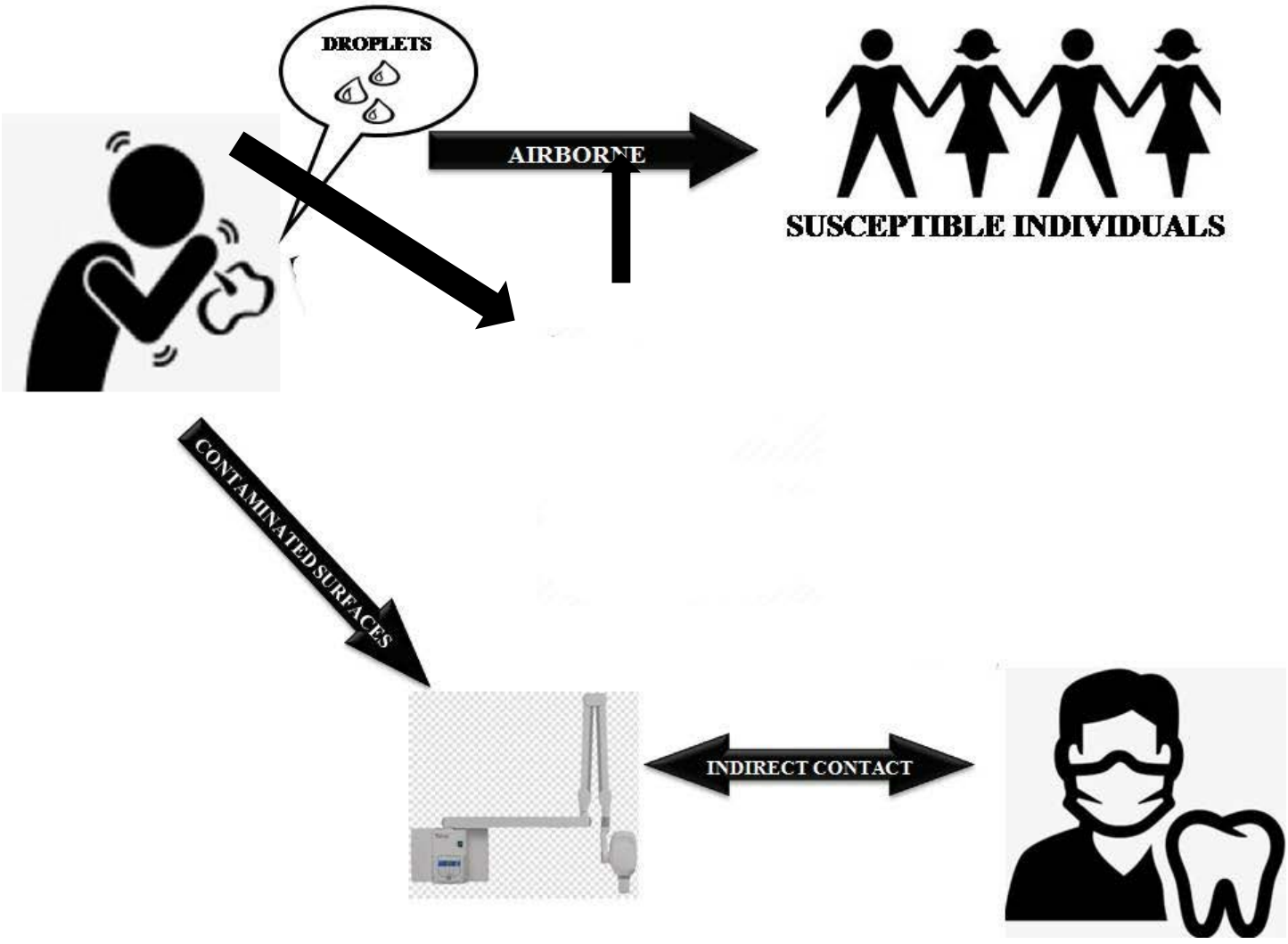

Figure 1: Illustrative diagram showing transmission routes in Oral Radiology setup.

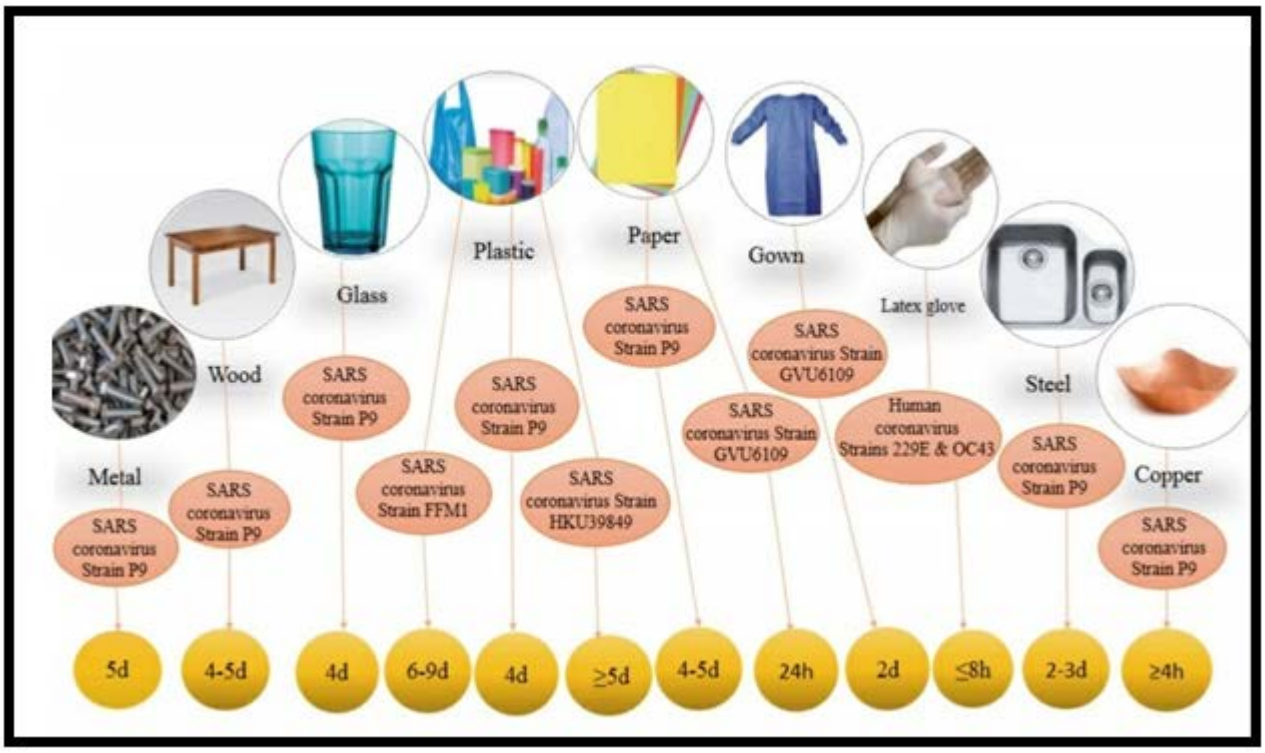

Figure 2: Illustrative diagram showing prevalence of Corona virus on various materials

Figure 3: Illustrative diagram showing hand washing technique recommended by WHO

Figure 4: Illustrative diagram showing technique to use mask by WHO

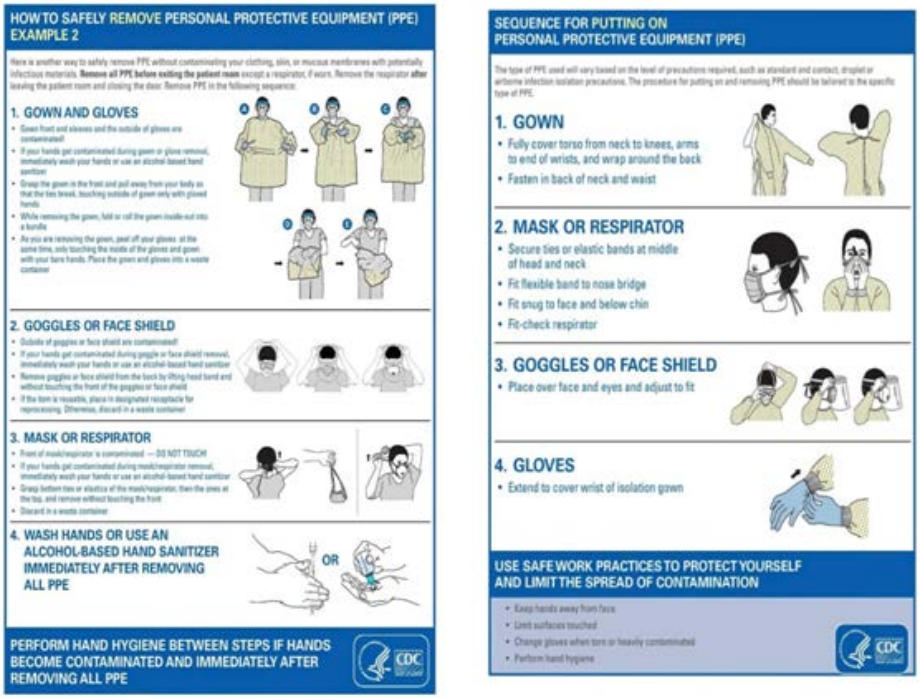

Figure 5: Illustrative diagram showing donning and doffing technique.

Figure 6:Image of Hepa filter used for filtration of air.

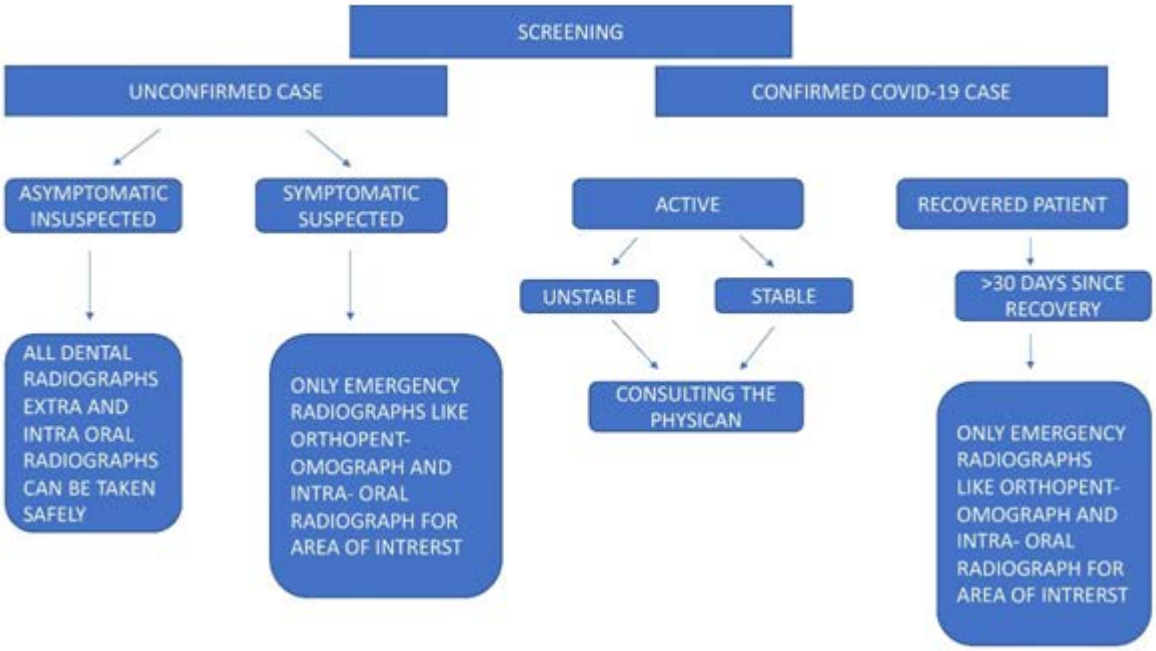

Figure 7: Flowchart representing screening protocol for patients.