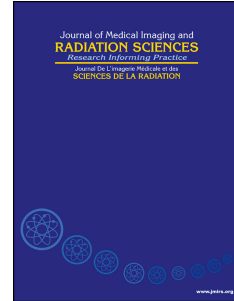




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What We Know So Far (As of March 26, 2020) About COVID-19 – An MRT Point of View

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Dear Editor,

Subject: What We Know So Far (As of March 26, 2020) About COVID-19 – An MRT Point of View

1. What is the difference among the terms “2019 novel coronavirus”, “SARS-CoV-2” and “COVID-19” and “COVID-19 Virus”?

- *2019 Novel Coronavirus (2019-nCoV)* is a temporary unofficial name of the novel coronavirus that caused the severe acute respiratory syndrome (SARS) outbreak in Wuhan, China in 2019.
- *SARS-CoV-2*: the official name of *2019-nCoV*, with nomenclature determined by the International Committee on Taxonomy of Viruses [1]. The “SARS” part of the name refers to the new coronavirus’ genetic link to the virus that caused the 2003 SARS outbreak.
- *COVID-19*: the disease caused by *SARS-CoV-2* and was named by the World Health Organization (WHO) on Feb 11, 2020. “CO” refers to corona, “VI” to virus, and “D” to disease, while “19” designates the year of initial discovery of this disease.
- *Covid-19* refers to the disease while *SARS-CoV-2* refers to the virus that causes the disease. However, the WHO sometimes uses the term “*COVID-19 virus*” for the virus instead of its official name of “*SARS-CoV-2*”.

2. How does coronavirus affect the human body?

- SARS-CoV-2 virus binds to Angiotensin-Converting Enzyme II (ACE2) in the alveolae of the lung to gain entry into the host cells [2, 3]
- ACE2 receptors also exist in heart, kidney, gastrointestinal tract (GI) tract, urinary systems [4], and even oral mucosa (especially in the oral tongue) [5]
- These findings indicate that the organs with high ACE2-expressing cells should be considered as potential high risk for SARS-CoV-2 infection

3. What symptom should I pay more attention to when I screen a patient?

- COVID-19 is a lower airway disease. Most common symptoms (viral-related) include fever, coughing (often dry a cough initially, generally becoming productive later), muscle aches, fatigue, and shortness of breath [6, 7].
- A very recent study suggests that digestive symptoms such as loss of appetite and diarrhea are also common [8]
- In contrast, upper airway catarrh syndrome, such as running nose or sneezing, are rare in COVID-19 patients [9]
- According to the WHO, the three most common symptoms for COVID-19 are: fever, tiredness, and dry cough [10]

- In addition to respiratory symptoms, some COVID-19 patients may exhibit GI symptoms [8], suggesting unexplained diarrhea and may also be considered for screening
- Recently, the American Academy of Otolaryngology – Head and Neck Surgery also recommended adding “sudden loss of taste or smell” as one of the symptoms for screening of COVID-19 [11]

4. How long does it usually take from infection to recovery?

- The median time from symptom to recovery is 22 days in survivors and median duration of viral shedding is 20 days (longest 37 days) [12]
- This information is useful for the strategic planning of cancer treatment during the COVID-19 outbreak:
 - Delaying cancer treatment for COVID-19 positive cancer patients may be feasible for certain cancers, if expected delay is about 4 weeks

5. How is the virus transmitted?

- COVID-19 virus can spread via respiratory mucus or saliva droplets (coughing and talking), contact with bodily fluids (e.g. saliva, vomitus, etc), or from contaminated surfaces [13]. There is no convincing clinical evidence of aerosol spread although in vitro experiments suggested that aerosol spread cannot be fully ruled out [14] (to be discussed later)
 - Differences between respiratory “droplets” and “aerosol” depend on the size of the particles and duration of suspension in the air. Respiratory droplets are generally and arbitrarily defined as $> \text{five } \mu\text{m}$ in diameter while aerosol particles are considered as $\leq \text{five } \mu\text{m}$ in diameter. These size partitions are still in discussion without complete agreement among groups [15].
- The most common route of viral transmission is through close contact with infectious secretions (sputum, serum, blood, and respiratory droplets) from a COVID-19 patient
- Mucosal surfaces of the face including nose, mouth, and eyes (often forgotten by most people) can all be the entrance portal for the COVID-19 virus
- Close contact increases risk of viral contraction:
 - Close contact is defined by the United States (US) Centers for Disease Control and Prevention (CDC) as: being within 2 meters of a COVID-19 patient for a prolonged period of time [16]
- Recent investigation shows that the COVID-19 virus may suspend in the air for two to three hours (depending on heat and humidity, and presumably air flow), and exist on external surfaces for more than three days (more stable on plastic and stainless steel than on copper and cardboard) [14]

- Exercising good hand hygiene is very important to avoid SARS-CoV-2 entering the eyes, nose and mouth after touching an infected surface
- Since the COVID-19 virus can stay suspended in the air for two to three hours depending on humidity, heat, and airflow [14], WHO advises that “airborne precautions” should be considered for health care professionals (HCPs)
- CDC and Public Health Ontario now recommend “*airborne precautions*” for HCPs when performing aerosol generating medical procedures for all suspicious or confirmed COVID-19 patients [17, 18]

6. What is my risk and how I can minimize the risk of getting infected?

- Health care professionals (HCPs) are at high risk since a recent study shows that a substantial proportion of virus spread occurs in the asymptomatic or pre-symptomatic phase [13]
- Personal protective equipment (PPE) including eye shielding is an essential first step [19].
- MRTs should follow institutional guidelines for use of PPE and exercise good hand hygiene
 - Protect eyes, mouth and nose with masks, face shields, gowns, gloves
 - Avoid having their hands directly touch surfaces
 - Practice good hand hygiene

7. What strategies should departments consider to minimize the risk of intra-departmental COVID-19 transmission?

- In addition to wearing PPE, and practicing good hand hygiene, keep your face as far away from your patients as possible, and avoid directly facing a patient’s nose and mouth
- Develop staff training programs
- Screen patients and staff
- Disinfection procedures should be established for floor and walls, surfaces, air, and “spills”/disposals [21]
- When talking to a patient, keep your distance (preferably two meters when possible) with patients since we do not know who may be an asymptomatic viral carrier.
 - Notably studies have shown that the risk of droplet transmission as defined above (i.e. > five µm in diameter), is very low beyond one to two metres [15]

Radiation therapy:

- A recent publication from China shared specific practice guidelines and treatment workflow for radiotherapy during COVID-19 outbreak [20]:
 - Health education for patients: informing about the risk of cross-contamination, zoning design and workflow of radiotherapy during the outbreak

- Zoning: A radiotherapy center should be divided into a “Clean Zone”, “Semi-soiled/semi-contaminated Zone”, and “Soiled/contaminated Zone” with clearly defined protection measures for each zone
- Special consideration should be paid to disinfection of immobilization devices
- Strategic planning to prioritize PPE usage within department and organization may be necessary to ensure sustained availability of PPE for staff safety
- It is important to communicate with the treating Radiation Oncology to triage COVID-19 suspicious or confirmed cases to consider:
 - Whether postponing/withholding radiotherapy is acceptable
 - When to restart radiotherapy
 - Whether to modify the radiotherapy regimen to use a shorter course
- For a suspicious COVID-19 patient, some cancer centers in Wuhan have asked patients to wear a mask under their thermoplastic mask for head and neck and central nervous system radiotherapy [20]

8. What are some useful disinfection measures for SARS-CoV-2?

- SARS-CoV-2 viruses are extremely vulnerable to solvent and detergents (e.g. soap) to break down the viral membrane [22] Washing hands with soap for a sufficient period (>20 minutes) is effective to kill SARS-CoV-2
- SARS-CoV-2 viruses are also sensitive to heat (about 60 C°) as shown in several experiments because heating could denature proteins [23, 24]
- The viruses can be effectively inactivated by surface disinfection procedures with 62-71% ethanol (alcohol), 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within one minute [25]
- Other disinfectants for use against COVID-19 virus are listed via the US EPA website: [26]
- UV-C light is reported to be effective to kill >99% of other coronavirus (MERS-CoV and SARS-CoV) in 10 minutes [27], and has been used in some Chinese Hospitals as a disinfection method [21]

9. What is the incubation period for COVID-19?

- Generally, the median incubation period for COVID-19 is approximately **5.1 days** (mean 5.5 days)
- In 97.5% of infected persons, symptoms appear within 12 days [28]
- Screening for a travel history of 14 days and current symptoms will catch the majority of COVID-19 patients

- However, emerging evidence suggests that a proportion of viral transmission could occur before symptom onset [29-31]
- Some small studies suggested that asymptomatic viral carriers may be infectious for up to three weeks [29]

10. How contagious is the *COVID-19 Virus* compared to other coronaviruses?

- The transmutability of a virus is measured using the “*reproduction number*” (R₀). This is measured by the number of individuals affected by one viral carrier. The higher the R₀, the more transferable the virus is and the higher the risk for rapid spread.
- The WHO initial estimation of R₀ for SARS-COV-2 is 1.4-2.5 [2]
- However recent review shows that the mean R₀ for *COVID-19 Virus* is 3.3, and a median of 2.8 [32]
- There are at least two strains of SARS-CoV-2: S type (the older version) and L type (the newer strain). L type seems more aggressive and the virus spread is more rapid [33]

11. How can MRTs protect their family?

- Consider using hospital issued surgical scrubs at work and leaving them at work for hospital wash
- Do not wear scrubs on public transportation and at home
- Leave your coat and shoes at the door, away from living areas
- For disinfection, CDC recommends dilute household bleach solutions, alcohol solutions with at least **70%** alcohol, and most common EPA-registered household disinfectants
 - Five tablespoons (1/3rd cup) bleach per gallon of water or
 - Four teaspoons bleach per quart of water
- Separate the dirty scrubs from normal clothing
- Launder items using the hottest appropriate water setting

12. What are controversies about some medications during the *COVID-19* outbreak?

- *Ibuprofen and Acetaminophen*: France has reported that non-steroidal anti-inflammatory medication (NSAIDs), such as ibuprofen, might aggravate symptoms of *COVID-19*, hence, suggesting avoidance of their use. However, the Food and Drug Administration (FDA) and WHO feel that more evidence is needed and have not recommended avoiding ibuprofen to treat *COVID-19* symptoms
- *ACE inhibitors or ARBs*: Several researchers observed an association between ACE inhibitors and severity of *COVID-19* [6] and proposed a hypothesis that ACE inhibitors could act as a potential

risk factor for COVID-19 by up-regulating ACE2 [34, 35]. However, others believe that the current data has not proven its causation and recommend against cessation of this anti-hypertension medication [36].

13. What is the effective treatment for COVID-19?

- Mostly supportive care
- Two drugs recently received FDA approval for “compassionate use” (i.e. “expanded access”): *chloroquine/hydroxychloroquine* and *remdesivir* for treatment of COVID-19 based on some preliminary promising clinical data [37-39], but their ultimate value remains uncertain

14. When an individual has recovered from SARS-CoV-2, could he/she get re-infected?

- A recent animal model experiment (on monkeys) shows that primary SARS-CoV-2 infection could protect an individual from subsequent infection [40]
- The duration of the putative protection remains unknown.

Author: Shao Hui Huang

Correspondence:

Shao Hui Huang, MRT(T), MD, MSc

Department of Radiation Oncology

Princess Margaret Cancer Centre, University of Toronto

Toronto, Canada

Shaohui.huang@rmp.uhn.ca

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