



# Preliminary information on prevention of infections caused by SARS-CoV-2 virus in endoscopic laboratories

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## Abstract

**Introduction.** On 11 March 2020, the Director-General of the World Health Organization (WHO) announced COVID-19 (Coronavirus Disease 2019) as a global pandemic. Currently, no vaccines are available and there is little evidence of the efficacy of potential therapeutic agents. Furthermore, there is presumably no pre-existing immunity in the population to the new coronavirus, and it is assumed that everyone in the population is susceptible.

**Objective.** The aim of the procedures described in the article is to minimize the risk of human-to-human transmission of the SARS-CoV-2 (Severe acute respiratory syndrome – coronavirus 2) virus during procedures carried out in endoscopic laboratories.

**Brief description of the state of the art.** SARS-CoV-2 infection can be asymptomatic, cause severe pneumonia, or lead to death. Symptoms of COVID-19 range from none (asymptomatic) to severe pneumonia and it can be fatal. Case studies to-date indicate that this infection causes a mild illness (i.e. pneumonia or mild pneumonia) in approximately 80% of cases, and most cases recover; 14% have a more severe illness, 6% experience a critical illness. The vast majority of the most serious illnesses and deaths have occurred among the elderly and people with other chronic underlying diseases. Average progression times include:

- in mild cases: from the onset of symptoms to recovery in almost 2 weeks;
- in severe cases: from the onset of symptoms to recovery in 3–6 weeks, and from symptoms to death in 2–8 weeks.

**Conclusions.** Special precautions should be taken and procedures followed when performing invasive medical procedures in endoscopic laboratories in patients with specific or clinically probable SARS-CoV-2 infection. This article contains up-to-date information as at 04/04/2020.

## Key words

COVID-19, endoscopic laboratory, SARS-CoV-2 infection

## INTRODUCTION

**Epidemiology.** By 4 April 2020, 3,627 infections due to the SARS-CoV-2 coronavirus responsible for the COVID-19 epidemic and 79 deaths had been confirmed in Poland [1]. Worldwide, 1,140,327 cases of infection and 60,887 deaths had been confirmed at the same time [1]. Reports state that SARS-CoV-2 is transmitted by secretions from the respiratory tract (droplets), and via the faecal-oral route. The virus may be found on contaminated surfaces in the environment, including the environment of diagnostic laboratories [2, 3]. It is spread not only by patients with symptoms, but also by people with no symptoms; infection may have taken place from 5–7 days before the onset of symptoms [4, 5]. The virus spreads mainly through the droplet route, especially when 2 people are in close contact with each other (distance less than 1–2 m). Infection is possible through direct or indirect contact with the patient's secretions and excretions, as well

as with contaminated objects in their surroundings [6, 7]. To-date, the virus has been detected in nasal and throat secretions, in sputum, urine, stool, tear fluid, serum and whole blood [5, 8].

While carrying out examinations, staff are exposed to the danger of the patient's respiratory secretions. Staff of endoscopic laboratories during endoscopic procedures in the gastrointestinal tract, in addition to exposure to viruses found in saliva microdroplets in exhaled air, are also exposed to contact with other infectious material, such as the patient's faeces, urine and mucus [9].

**Structure of the SARS-CoV-2 virus.** Coronaviruses are a family of enveloped viruses. The virion diameter is about 100 nm. The name of the family comes from the projections on the virion surface, resembling the projections of a crown [6]. The viruses belonging to this family have been classified into 2 separate subfamilies: *Coronavirinae* and *Torovirinae*. The *Coronavirinae* subfamily, after taking into account the genetic features of individual species, was divided into 4 types: alpha-, beta-, delta- and gamma-coronaviruses. From the medical point of view, the viruses of the alpha and beta

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groups, to which all known species infecting humans belong, are the most interesting. [7]. Coronaviruses are characterized by high prevalence and frequency, and high genetic diversity [10]. SARS-CoV-2 is the official name of the coronavirus from Wuhan in China that causes COVID-19 [11].

**Properties of the family *Coronaviridae*.** Research conducted by American scientists shows that the time that SARS-CoV-2 is present on surfaces depends, among others, on their type. A virus released during coughing or sneezing was able to survive in the air for up to 3 hours, on surfaces made of copper up to 4, and on cardboard – up to 24 hours. The virus lasted the longest – up to 2–3 days, on plastic and stainless-steel surfaces [12, 13]. The half-life of the virus has also been defined, i.e. the time required for half of its particles to lose their ability to cause infection. It appears that in the case of aerosols in the air this is 66 minutes [12, 13].

The half-life of the virus on the other surfaces tested was as follows:

- for stainless steel – 5 hours 38 min.;
- for plastic – 6 hours 49 min.;
- for cardboard – 3.5 hours (the researchers stipulated that in the case of cardboard they obtained considerable discrepancies in the results);
- for copper – 46 min. [12, 13].

The fate of viruses outside the human body depends not only on the type of surface on which they are located, but also on the environmental conditions – temperature, humidity, the presence of specific chemicals, pH and UV radiation, including from the Sun. It is easiest for coronaviruses to survive in a cool, humid environment. At temperatures around 4 degrees Celsius, some types of coronaviruses can remain active for up to 28 days. At room temperature, i.e. about 20–22°C, the virus can survive for 2 days, at 30–40 degrees Celsius they persist for a shorter time – about 1 hour.

Studies have shown that they can be effectively inactivated by surface disinfection procedures with solutions of 62–71% ethanol, 0.5% hydrogen peroxide, 0.1% sodium hypochlorite (which is the main component of bleach), or bleach, in one minute.

Fabrics that may be contaminated with SARS-CoV-2 viruses should be washed at 60 degrees Celsius, in a bleach-based detergent [12, 13, 14].

#### **General rules of conduct – Current state of knowledge.**

1. Cough, fever, fatigue or sore throat are the most common symptoms in adults.
2. Gastrointestinal symptoms may occur, including nausea and/or diarrhoea. There have been reports of isolated cases of diarrhoea preceding cough and fever.
3. The virus may be present in gastrointestinal secretions, and viral RNA is detectable in the faeces. Gastrointestinal infection should be considered.
4. Asymptomatic spread may occur during the (average incubation period is ~5 days, with a range of 0–14 days).
5. Older people and those listed by the Center for Disease Control and Prevention (CDC) as vulnerable populations, including with severe, chronic diseases, such as heart disease, lung disease, diabetes, decompensated cirrhosis, HIV with low CD4 count, and immunosuppression (including recipients of liver and other solid organs), are more exposed to more serious illness.

Pregnancy can be a risk.

6. Best protection against virus transmission:
  - hand washing;
  - not touching the face;
  - covering mouth and nose;
  - social distancing;
  - avoiding crowds [4, 15].

#### **General recommendations for performing endoscopic tests.**

1. Consider rescheduling planned, non-urgent endoscopic procedures. Classification of procedures into non-urgent / post-ponement and non-urgent / execution may be useful.
2. Pre-screen all patients for symptoms or exposure to high risk of illness. Patients should be asked for a history of fever or respiratory symptoms, including family members or close contact with people who have similar symptoms, any contact with a confirmed case of COVID-19, and any recent trip to a high risk area.
3. Avoid bringing patients (or their escorts) to a medical facility who are over 65-years-of age, or who have one of the risk factors mentioned above
4. Ensure that appropriate personal protective equipment is available and worn by all members of the endoscopy team: gloves, mask, eye protection / goggles, face shields and apron.
5. Measure the patient's body temperature after their arrival at the endoscopy department.
6. Keep a proper distance between the patient and staff member (minimum distance is about 2 m).
7. Caution should be exercised during isolation of patients with a positive SARS-CoV-2 test, or those waiting for test results; endoscopic procedures are best performed in negative pressure rooms.
8. Consider a telephone visit after 7 and 14 days to enquire about a new diagnosis or development of COVID-19 symptoms.
9. For scheduled surgery visits, consideration should be given to remote visits, if possible via telemedicine, to reduce the density of persons and provide necessary care to patients who cannot travel.
10. It is important to meet the needs of staff and introduce rules to protect medical staff.
11. Patients taking IBD (inflammatory bowel disease) immuno-suppressants and those with auto-immune hepatitis should continue to take their medication. The risk of exacerbating the disease outweighs the risk of coronavirus infection. These patients should also follow CDC guidelines for risk groups, avoid crowds and restrict travel [4, 15, 16].

The above recommendations are based on the recommendations from the WHO, CDC and European Centre for Disease Prevention and Control (ECDC) [4, 12, 15, 16]. They describe the current state as at 01/04/2020.

The development of the pandemic will increase the experience and level of knowledge, which will result in, among others, changes in the recommendations.

**Specific rules of conduct in endoscopic laboratories.** To protect staff in endoscopic laboratories against SARS-CoV-2 virus infection, certain procedures should be implemented to prevent transmission from an infected patient to those carrying out examinations.

**Organizational activities.** To prevent SARS-CoV-2 transmission in endoscopy centres, the following organizational activities and preventive measures are recommended:

1. In the area of an epidemic, endoscopy should be performed only in urgent cases in the treatment of patients with diseases such as acute gastrointestinal bleeding, foreign bodies in the gastrointestinal tract, and acute purulent cholangitis,
2. In the area of an epidemic, all types of gastrointestinal endoscopic procedures should be performed in laboratories that meet the requirements of level 2 biosafety,
3. In the area of an epidemic, procedures such as endotracheal intubation, respiratory tract care, sputum suction performed on patients who are infected or suspected of being infected with SARS-CoV-2, and those with a very high risk of potential exposure to SARS-CoV-2, should be performed in laboratories that meet the requirements of level 3 biosafety [17, 18].

**Protection of personnel.** Any employee showing fever, fatigue and dry cough, or informing about contact with an infected SARS-CoV-2 patient, must be properly identified and treated;

- a) temperature check – required for every employee before entering the work area every day;
- b) hand hygiene – staff are required to wash their hands in accordance with the recommendations of the World Health Organization; hand washing should take at least 40–60 seconds, disinfection at least 20–30 seconds;
- c) personal protective equipment – required for personnel who have direct contact with patients: wearing of disposable aprons, masks, goggles, hats and shoe covers during work – general protection principles described in the relevant documents of the CDC and ECDC apply [19–23];
- d) an examination report may be completed by other qualified employees in a clean room, under the supervision of a physician in the area of the procedure; this can help to avoid potential contamination,
- e) after a procedure, personnel are required to remove all protective clothing and clean their hands before entering a rest area,
- f) personnel's work clothes should be washed at 60 degrees Celsius, in bleach-based agents, or at 90 degrees Celsius with the use of detergent [9, 14].

Remember to maintain the highest possible standard of hygiene, according to the always-binding rule that washing is the most important, because thorough cleaning determines correct disinfection.

In addition, based on the experience of Chinese and Italian centres, it seems that a very important aspect of personnel work is also appropriate organization of shift work. The purpose of such proceedings is the economic and rational management of human resources, so that people with extensive professional experience are active throughout the duration of the epidemic [24, 25].

**Disinfection of endoscopes.** SARS-CoV-2 coronavirus is easily deactivated by many commonly used disinfectants, there are no additional requirements and resources necessary for endoscope cleaning and the disinfection process [24, 26, 27].

#### Room disinfection:

1. It is recommended that endoscopic procedures with a high risk of infection and/or in patients with confirmed SARS-CoV-2 infection be performed in rooms with the possibility of creating negative pressure [17, 18].
2. It is recommended to subject a room in which endoscopic procedures are performed to UV rays, and fumigation with ozone after the procedures have been performed. Chlorine-based disinfectants, e.g. 0.1% sodium hypochlorite solution, are recommended for daily floor cleaning [9, 28, 29].
3. In the case of negative-pressure rooms, a delay of about 30 minutes is suggested before allowing a new patient to enter the room. Because small particles remain airborne for some period of time, in the absence of negative pressure rooms, alternative measures such as diluting the air in the space with cleaner air from outdoors should be considered, and the room kept empty for at least 1 hour [24].

**Waste management.** Waste generated in Endoscopic Laboratories is highly contagious, i.e. such wastes which are identified or reasonably suspected to contain biological pathogens. They should be collected at the place of origin:

1. **in inner packaging** composed of:
  - a) a single-use bag made of polyethylene foil, red in colour, durable, resistant to moisture and chemicals, which after being filled and closed should be placed in a second bag meeting the same requirements, or;
  - b) in the case of collecting medical waste with sharp ends and edges, a stiff, moisture-resistant, mechanically puncture- and cutting- resistant container, red in colour;
2. **in outer packaging**, which is a red container, durable, resistant to moisture and chemicals, with the possibility of being tightly closed. The inner packaging should be placed into the outer packaging. Before using the bag/container, attach a self-adhesive label, enter the start date, and time and name of the organizational unit. The container must also be marked with a self-adhesive label with a warning sign against biological hazard, with the words below 'MATERIAL INFECTIOUS TO PEOPLE' Highly contagious medical waste can be stored at the point of origin for no longer than 24 hours. If the container or bag is damaged, it must be placed together with the waste in another larger, undamaged bag.

#### Container filling:

Containers or bags are filled to no more than **2/3 of their volume** in a way that allows them to be securely closed.

**Once closed, containers or bags cannot be opened.**

Next, the containers with highly contagious waste should be sent for disposal [23, 30].

## CONCLUSIONS

The currently assessed risk of serious illness associated with SARS-CoV-2 infection in individuals in the EU / EEA and Great Britain is considered moderate for the general population and high for older adults and people with chronic underlying diseases [5].

A high level of public awareness is necessary for an effective response during the pandemic through social isolation in relation to COVID-19. Efforts related to communicating the risks should emphasize that although it is a new and highly contagious disease, the vast majority of infected people will recover [24]. The public need for accurate, evidence-based information and advice on COVID-19 is very high and requires extraordinary efforts to provide information quickly and continuously to the general public and medical staff. Information should be provided in a transparent and consistent manner to stakeholders and the public in line with the development of the epidemic situation. Risk communication strategies should clearly justify any non-pharmaceutical activities or remedies that are being implemented or planned [5].

The described recommendations are specific, they refer to endoscopic laboratories, they are a fragment of a whole which constitute hospitals. As the current pandemic develops and new facts about the course of the COVID 19 disease and virus biology appear, they may be subject to modifications. It will only be possible to assess the effectiveness of the described prevention methods in endoscopic laboratories in a broader perspective after the end of the COVID-19 pandemic.

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