

# General guideline in the endoscopy room to avoid air-borne infection during the COVID-19 pandemic

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Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first reported in December 2019 and has since spread rapidly worldwide. Despite many efforts to prevent the further spread of the virus, cases continue to increase and still present a threat. It was once believed that the development of a vaccine would be the solution; however, the effectiveness of the currently available SARS-CoV-2 vaccine is expected to be hampered by increased mutations in the viral spike glycoprotein, and the pandemic has not yet ended. Considering that fatal coronaviruses, such as SARS-CoV-1 and the Middle East respiratory syndrome coronavirus, have emerged periodically in the last decades, there is a high possibility that an epidemic similar to COVID-19 will occur again in the future, and the importance of basic and universal infection prevention measures still persists. Since the declaration of the COVID-19 pandemic, various international gastroenterology societies have published guidelines to prevent the spread of the infection.<sup>1-3</sup> The primary routes of transmission of COVID-19 are respiratory droplets and airborne aerosols; therefore, these guidelines can be applied universally for infectious diseases transmitted via respiratory specimens.

The typical symptoms of COVID-19 are fever and respiratory symptoms such as cough and sore throat. Nausea, myalgia, and mild flu-like symptoms are also common. However, in rare cases, only digestive symptoms, such as diarrhea and abdominal pain, may appear without respiratory symptoms, and a significant number (approximately 80%) of patients are asymptomatic or show only mild symptoms. This can create a pitfall in quarantine, making it difficult to suspect and diagnose COVID-19 infection. Endoscopy rooms are high-risk areas for the transmission of respiratory infections because endoscopic procedures require a short physical distance between patients and healthcare personnel, and examinees often generate respiratory droplets and aerosols. During an endoscopic procedure, coughing, retching, and flatus can generate aerosols, and oral and/or fecal material often contaminate the surroundings.<sup>4</sup> The risk of exposure to infectious agents is not limited to upper endoscopy procedures; considering the reports on the detection of SARS-CoV-2 in biopsy specimens and stools, a possible fecal-oral transmission is suggested.<sup>5</sup>

Preventive measures in an endoscopy center start by minimizing the chance of an infected person visiting the center. To achieve this, it is necessary to first determine whether there is any risk of infection by asking structured questions. Generally, the questionnaire consists of the following questions: whether a person (1) has/had any symptoms related to COVID-19 infection, such as fever (>37.5°C), cough, sore throat, or respiratory problems in the past 14 days, considering the maximum incubation period; (2) has a family member or close contact with a suspected or confirmed case of COVID-19; and (3) has ever been to a facility/areas that are at a high-risk for COVID-19.

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The body temperature of the visitor should then be checked before entering the endoscopy center. If the reply to any of the above questions is positive, a test for COVID-19 should be performed, and the person should undergo endoscopy only after a negative result is confirmed. If the test result is positive, the endoscopy should be postponed until quarantine is completed. These screening procedures are intended to reduce the likelihood of an infected person visiting the endoscopy center. However, the utility of the screening questionnaire is limited when community transmission is established, and transmission through individuals with asymptomatic or atypical symptoms is present. In the phase of community spread via asymptomatic individuals, prescreening checklists have limited utility. Therefore, all patients undergoing endoscopy should be considered as potentially infected or capable of infecting others.<sup>6</sup>

Once a person enters the endoscopy center, infection control relies on basic standard precautions for infection prevention, such as hand hygiene, distancing, and wearing appropriate personal protective equipment. Endoscopy examinees should wear a surgical mask before and after endoscopy, and hand hygiene should be performed using an alcohol-based solution. When performing upper gastrointestinal endoscopy, the mask of the examinee should be removed immediately before the endoscopy, and should be put on again immediately after the procedure. To avoid close contact and cross-infection between examinees, a 1 to 1.8 m distance between examinees should be maintained. The number of people and guardians in the waiting room or recovery room should be limited to a minimum and waiting times should also be kept to a minimum. For healthcare personnel, all workers should thoroughly wash their hands using alcohol-based solutions before examinations and procedures, and surgical masks, goggles or face shields, gloves, and waterproof gowns should be worn. When aerosol production is anticipated, a mask equivalent to the N95 (KF94 in Korea) should be worn. In addition to the aforementioned precautions, the American Society for Gastrointestinal Endoscopy recommends covering the hair with a hairnet or hat.<sup>3</sup> The guidelines of the Korean Society of Gastrointestinal Endoscopy recommend that the endoscopists and medical staff should wear an N95 mask (KF94 in Korea) and face shields or safety glasses when performing upper gastrointestinal endoscopy, endoscopic retrograde cholangiopancreatography, endoscopic ultrasonography, and urea breath tests.<sup>7</sup>

After endoscopy, strict adherence to hand hygiene, environmental disinfection, and ventilation is required because SARS-

CoV-2 can remain viable in aerosols and on the surrounding surfaces of the endoscopy room for a long time.<sup>8</sup> Disinfection of endoscopic equipment can be carried out according to the previously established reprocessing procedures for endoscopes and accessories, without modifications.<sup>9</sup> Healthcare personnel who reprocess the endoscopic equipment should wear appropriate personal protective equipment, including gloves, waterproof gowns, face shields, bonnets, and surgical masks.

Hospital-grade disinfectant solutions and wipes must be used for environmental disinfection. After endoscopy, the bed and bed rails that had come into contact with the patient should be cleaned every time, and other high-touch surfaces, such as keyboards, computer mice, phones, door handles, and faucets, should be disinfected at least twice a day. Restrooms should also be cleaned frequently. The endoscopy room should be ventilated using a ceiling-type air conditioner or fan coil unit, and the disinfection space should be ventilated by installing a dedicated vent. The patient waiting area should be ventilated at least twice a day (once in the morning and once in the afternoon) by opening the windows and doors.

It is advised that the endoscopy should be postponed for patients with confirmed or suspected COVID-19 infection. However, in an emergency setting, such as gastrointestinal bleeding, acute cholangitis, or gallstone pancreatitis, an experienced endoscopist who can perform the endoscopy with a minimum number of assistants, should proceed with the procedure. All staff members should wear respiratory protection equipment equivalent to N95 masks, disposable gloves, eye protection equipment (goggles or face shields), hairnets, shoe covers, and disposable long-sleeved waterproof gowns. If possible, Level D protective equipment is recommended. It is best to perform the endoscopy in a negative-pressure room; however, if an endoscopy center does not have a negative-pressure room, it is recommended to perform the endoscopy in a well-ventilated room and perform the procedure as the last examination of the day. To prevent cross-infection and close contact between patients, the travel time or route should be discussed in advance. For disinfection of the endoscopy room, the healthcare personnel should wear personal protective equipment for at least 30 minutes after the patient has left the room. For ventilation, a dedicated ventilation vent should be installed in the endoscopy room, and after environmental disinfection, at least 30 minutes of ventilation for a negative-pressure room and 1 hour for a non-negative-pressure room is required before a new patient can enter the room.

The endoscopy room is a particularly vulnerable space for the

transmission of COVID-19 and other infectious diseases. Special efforts are required to prevent the spread of infections in this area. The first step in preventing the spread of infection is to minimize the possibility of an infected person visiting the endoscopy room. In addition, even if an infected person visits the endoscopy room, the risk of transmission of infection should be minimized through hand hygiene, wearing appropriate personal protective equipment, and maintaining distance (spatial and temporal). On the other hand, it is also important to thoroughly follow the guidelines for reprocessing the endoscope, cleaning the endoscopy room, and ventilation. When the endoscopy is performed in a patient suspected or confirmed to be infected with COVID-19, special attention is required with respect to personal protective equipment, patient movement, disinfection, and ventilation after the procedure. In the past two years of the COVID-19 pandemic, there have been many changes in transmission dynamics, such as the rate and extent of the spread of the virus. Vaccines and therapeutic agents have been developed; however, there have been changes in the transmission power and virulence due to the emergence of COVID-19 variants. Recently, in Korea, social distancing is being relaxed due to the 'With Corona policy,' and the period from infection to release from quarantine is becoming shorter. Despite these facts, the basic disease transmission route and natural history have not changed significantly, and the basic infection prevention measures are still valid and important.

### Conflicts of Interest

The authors have no potential conflicts of interest.

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### Author Contributions

Conceptualization: KHC, SJC; Supervision: SJC; Funding acquisition: SJC; Resources: SJC; Investigation: KHC, SJC; Writing-original draft: KHC; Writing review & editing: KHC, SJC.

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