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Practice Forum

Management of gastrointestinal endoscopy unit during post covid-19 endemic outbreak: A report from Wuhan epicenter



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The COVID-19 pandemic is caused by severe acute respiratory syndrome coronavirus 2 and causing a global public health emergency. During the outbreak, Wuhan was the first reported and hardest-hit city. With the dramatic drop in number of confirmed cases and subsequent ending of Wuhan lock down, asymptomatic carriers and patients in their recovery period still pose an increased risk. Strict and effective infection control protocols should be established and followed.

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Acronyms

SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
COVID-19	Coronavirus Disease 2019
HCP	Health Care Providers
PPE	Personal Protective Equipment
WHO	World Health Organization
CDC	Centers for Disease Control and Prevention

INTRODUCTION

The novel coronavirus severe acute respiratory syndrome coronavirus 2-infected pneumonia was first identified in Wuhan City and referred to as the COVID-19 by the World Health Organization (WHO). It is causing a global pandemic currently. In order to control the epidemic outbreak, the Chinese government mandated a city wide quarantine and lock down of Wuhan on January 23, 2020. As of June 9, 2020, Wuhan had a total of 50,340 confirmed cases and 3,869

deaths. With the initial success for COVID-19 control and prevention, Wuhan had a significant drop in the number of newly confirmed cases and announced the ending lockdown on April 8, 2020. The majority of city hospitals started to resume outpatient clinical work, to meet the increasing demand for routine endoscopic activities. However, due to the characteristics of endoscopy operations, the risk of cross infection may be still high between the endoscopist, staff and the patients. Furthermore, the slow-growing emerging cases of asymptomatic carriers sounded an alarm to us. Here we share our experience and policies, provide recommendations for gastrointestinal endoscopy units on infection control during post-Covid-19 endemic outbreak. The endoscopy labs needs to focus on these 5 directions: (1) patient triage and prescreening before endoscopy; (2) reconstruction of endoscopy center; (3) regular monitoring of personal protective equipment (PPE); (4) protective device training; and (5) implementation of a strategy for stepwise resumption of endoscopic services in post endemic period.

CLINICAL MANIFESTATIONS AND DIAGNOSIS OF COVID-19

Robust evidence coming from Wuhan and other regions across China confirms that about 80% of Covid-19 patients were asymptomatic or only had mild disease. The median age of infected patients was below 60 years.^{1,2} Of confirmed cases, about 20% were seriously or critically ill. Fever, cough, and fatigue were the dominant symptoms while some patients also presented other atypical symptoms, such as headache, sore throat, shortness of breath, and muscle soreness.^{3,4} Additionally, gastrointestinal (GI) symptoms including diarrhea, nausea and vomiting were not uncommon.⁵ The most common

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laboratory abnormalities in patients with COVID-19 were elevated C-reactive protein, decreased lymphocyte count and increased lactate dehydrogenase.⁶ Among patients who underwent chest computerized tomography (CT), ground-glass opacities and bilateral pneumonia were the most frequently reported findings.⁷ Children were less likely to become infected or, if infected, showed mild symptoms.⁸ On the other hand, the elderly and those with comorbidities including hypertension, diabetes, cardiovascular disease, liver diseases, malignancy were more likely to develop serious complications, such as acute respiratory distress syndrome, arrhythmia, and shock critical illness.⁹ According to either WHO diagnostic standards¹⁰ or the National Health Commission of China standards,¹¹ the diagnosis of COVID-19 can be made based on a combination of epidemiologic information (eg, a history of residence in or travel to affected region 14 days prior to symptomatic onset), clinical symptoms, laboratory tests (eg, reverse transcriptase polymerase chain reaction [RT-PCR] tests on respiratory tract specimens) and chest CT scan findings. Of note, a single negative RT-PCR test from suspected patients for COVID-19 does not exclude infection. All health care providers should be alert of patients with an epidemiologic history, COVID-19 related symptoms, abnormal laboratory tests, and/or positive CT scan results.

ASYMPTOMATIC CARRIERS POSE INFECTION RISK DURING ROUTINE ENDOSCOPIC PROCEDURES

It is now believed that COVID-19 infects human by transmitting respiratory droplets and through contact transmission.¹² Increasing evidence indicates that fecal-oral spread and airborne transmission may be other sources of transmission.^{13,14} Recent observation suggests that asymptomatic patients and patients in their incubation period are carriers of SARS-CoV-2 and highly contagious.^{15,16} Furthermore, high viral loads were found in asymptomatic patients during incubation period,¹⁷ and it was reported that viral particles were detected from both feces and urine in patients with COVID-19 in some cases.^{18,19} Surprisingly, the viral load in feces was higher significantly than that in respiratory samples in some cases.¹⁸ This epidemiologic characteristics of COVID-19 has made its control extremely challenging, as it is difficult to identify and quarantine these patients during presymptomatic stage and for asymptomatic carriers.¹² In addition, it remains to be proved whether patients in the recovering phase are potential sources of transmission.²⁰ Since there is a large accumulated volume of postponed endoscopy cases during Wuhan lock down, a significant number of patients needing routine endoscopy procedures may fall in the category of asymptomatic carriers or those in their recovering period. These are potential infection risks to healthcare providers (HCP) in endoscopy centers. Preventive measures are necessary to avoid massive endoscopy-related transmission of the virus. In the following context we would like to share Wuhan experience regarding endoscopy lab infection control.

PATIENT TRIAGE AND PRESCREENING BEFORE ENDOSCOPY

All patients must undergo triage and screening. According to our hospital's infection control guidelines, routine outpatient blood tests, a Covid-19 nucleic acid polymerase chain reaction testing done on nose/throat samples, serum antibody against SARS-CoV-2, and a chest CT scan are all required 7 days before endoscopy. For those patients who were released from quarantine, an official document issued by health authority is also required. In cases of endoscopic emergency or urgency, the patients should take a rapid testing on the day of endoscopy. After completing these required COVID-19 tests, the patients need to sign an informed consent and complete a screening questionnaires at the endoscopy lab check in area, which include questions regarding body temperature, symptoms and all the mentioned above results within 7 days. Only after the patients complete

the evaluation and are confirmed to have a low risk of SARS-CoV-2 infection, they can be formally checked into the endoscopy center, otherwise patients are suggested to go to fever clinic for further evaluation and management (Fig 1 and Supplemental content 1). Proper patient triage and pre-endoscopy screening are the first line of defense against potential nosocomial infections.

ENDOSCOPY CENTER MODIFICATIONS

Similar to the 2 newly built designated Covid-19 hospitals in Wuhan in early February, 2020, our endoscopy center was also modified or reconstructed according to the so-called “three-areas and two-passages” requirement (Fig 2): (1) Clean areas: medical staff offices, change rooms, storage rooms, and meeting room. In these areas HCP can rest and put on PPE; (2) Contaminated areas: waiting hall, appointment rooms, endoscopy procedure rooms and cleaning and disinfection rooms; (3) Potential contaminated areas: these areas are between the clean areas and the contaminated areas. Here, in Figure 2, we enclosed a setup of original endoscopy rooms 7 and 8 by installing 3 doors in the passages and transformed them into 2 separate potential contaminated areas where HCP can remove the PPE after endoscopic procedures. We also installed a temporary wall in the main passage to separate the patient passage and staff passage, therefore isolating HCP from patients to reduce the risk of transmission. All patients arrive at the endoscopy lab waiting lobby by elevator, enter endoscopy center through the front door into the contaminated area through a patient passage. Whereas all HCP walk upstairs on the other side and enter the endoscopic center from the side door, arriving at the clean area through a special staff passage. After putting on PPE in the clean area, HCP then go through the potential contaminated area and finally arrive at contaminated area for endoscopic procedures. Furthermore, we only allow one family member or chaperone per patient who will wait at the waiting area and stay at least 1 meter from each other. Every patient and family member should wear a surgical mask when waiting outside the endoscopy center. Only the patient is permitted to enter the endoscopy center. In this way, we minimize the contact between patients and HCP in the nonprotective state, thereby reducing the risk of nosocomial infection.

PROPER PPE

Retching and coughing can occur during upper endoscopy, generating aerosols. Likewise, patients undergoing colonoscopy may pass flatus and contaminate the surroundings. A recent study in the GI lab found microbes on face shields affixed to the wall 6 feet away from the patient. Although this study does not support the assertion that the unrecognized exposure of the endoscopist's face to potentially infectious samples during endoscopy, the use of universal facial protection during GI endoscopy is recommended.²¹ Moreover, aggressive suctioning and multiple catheter exchange via endoscope working channels may expose staff to splashes of secretion.²² All endoscopic procedures should be considered aerosol-generating procedures,²³ as such may pose potential risk of SARS-CoV-2 transmission. WHO recently published a guideline on the rational use of personal PPE in health care and community settings.²⁴ These include the use of a respirator (N95, FFP2 standard, or equivalent), gowns, gloves, and an eye protection. In China, protective coveralls are most usually used during this outbreak, and gowns are the alternative when protective coveralls are not available.

Medical or surgical masks are loose-fitting and may be effective in blocking splashes and large-particle droplets. However, they cannot filter very tiny particles in the air that are generated by sneezing or certain medical procedures, the N95/FFP2/FFP3 respirator is a protective device designed to form a nice seal around the nose and mouth

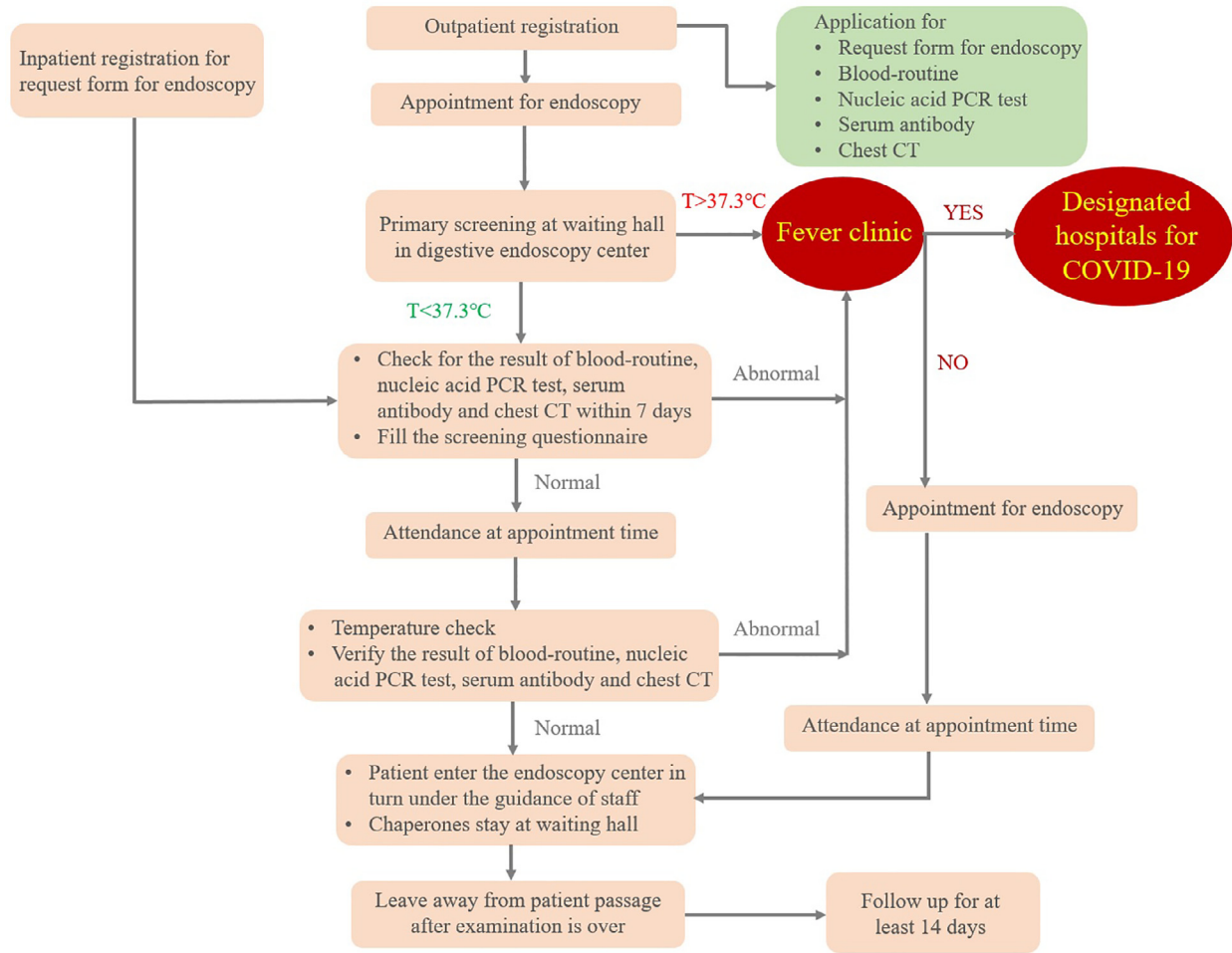


Fig 1. Patient triage and prescreening workflow in digestive endoscopy during COVID-19 endemic in Wuhan.

and provides extremely efficient filtration of airborne particles that can be inhaled through the nose or mouth. A recent study from China showed that no medical personnel working in high-risk departments who practiced strict hand hygiene and wore N95s had become infected regardless of patient's infection status.²⁵ Here we therefore recommend that for HCP including anesthesiologists and nurse anesthetists, an N95 should be used for all endoscopy procedures, and using a Powered Air Purifying Respirator for known COVID-19 positive cases if the procedure absolutely cannot be deferred.

INFECTION CONTROL FOR ENDOSCOPY STAFF

For every health care provider working in the lab, nucleic acid polymerase chain reaction, serum antibodies, a chest CT scan and daily temperature monitoring should be performed. If the result is abnormal, it needs to be reported to the hospital's infection control department immediately for further investigation. In our endoscopy center, all endoscopists and staff received training on infection control, appropriate use of PPE, and standard hand hygiene procedures by using smart phone apps, e-mails, and video conferences. These details have been described in recently published reports.^{23,26} Additionally, every health care provider is required to wear surgical mask after work, and continues to practice good hand hygiene and social distance to avoid community-acquired infection. During the COVID-19 outbreak in Wuhan from January to March, urgent endoscopy was limited to foreign body retrieval, acute GI bleeding, biliary sepsis and GI obstruction requiring stenting. Since the ending of citywide

quarantine on April 8, Wuhan has gradually recovered in every aspect including the health care system. Our center also has resumed all routine diagnostic and therapeutic endoscopy including endoscopic mucosa resection and endoscopic submucosal dissection. The majority of the endoscopic procedures were categorized as biosafety level 2 and the protection level was raised to 3 for tracheal intubation, sputum suction, and airway care, or riskier endoscopic procedures that can produce liquid spatter or aerosols, such as acute GI bleeding, lower GI obstruction requiring stenting. We are very cautious because we believe it is impossible to screen out due to limitations of all existing detection methods, and those who are classified as having a low risk of infection may not be in low risk category. We strongly recommend that the use of medical supplies should be carefully planned and administrators of the endoscopy center should regularly communicate with the hospital administration about the supply and logistics of medical equipment and PPE according to daily endoscopic demand and volume.

ENDOSCOPE REPROCESSING AND ENDOSCOPY CENTER DECONTAMINATION

In our center, the personnel working in the endoscope reprocessing room are provided with full PPE including N95 respirators. Recently US Environmental Protection Agency published a list referring to available chemical disinfectants against SARS-CoV-2.²⁷ Furthermore, previous studies have shown that ultraviolet germicidal irradiation (UVGI) can inactivate coronaviruses including severe

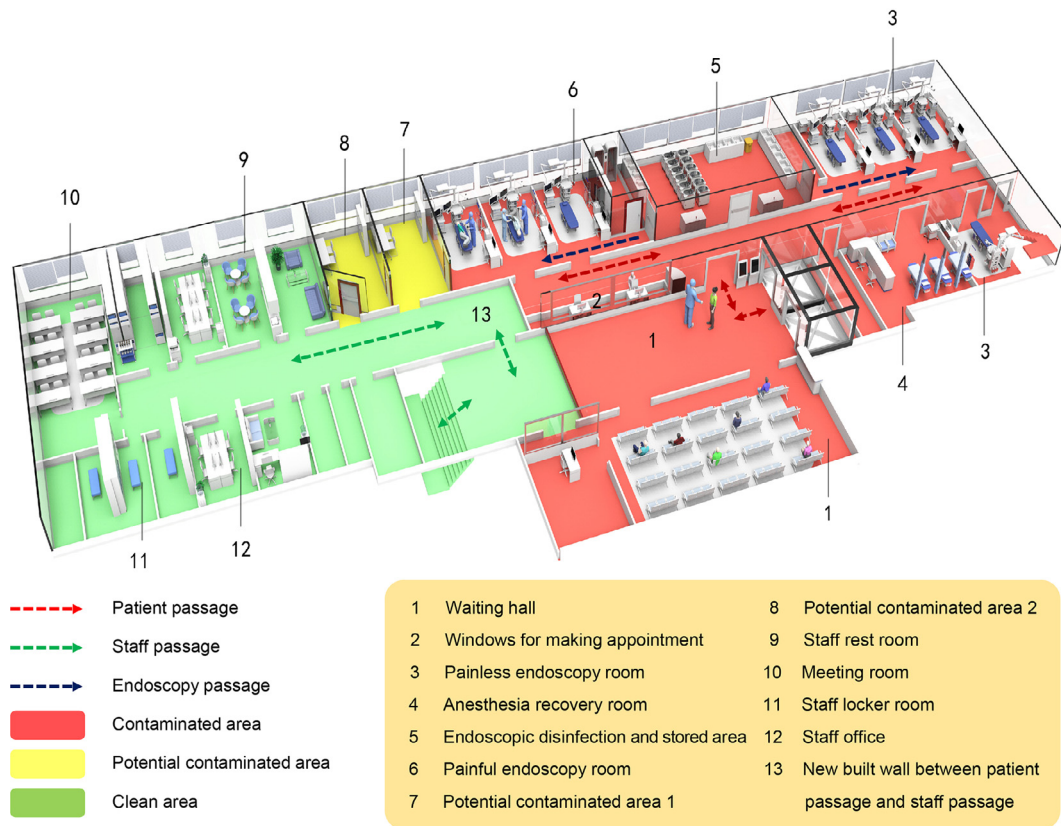


Fig 2. Reconstruction diagram of our digestive endoscopy center as “Three areas and two passages” in Wuhan.

acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV),²⁸ thus this can be utilized for respirator disinfection to facilitate the reuse of dwindling supplies. For suspected or confirmed patients, a single room is prepared. After the endoscopy procedure, we currently use UVGI to disinfect the room for 1 hour. The floor and surface of endoscopy furniture should be wiped or sprayed with disinfectant containing 1,000 mg/L chlorine or 500 mg/L chlorine dioxide at least 30 minutes. Standard room disinfection policy should also be kept in rooms where non COVID-19 or low-risk patients who undergo endoscopy. Since most GI endoscopy centers may not be equipped with negative-pressure rooms, including our center, we moved the endoscopy cart and procedural bed to the window as close as possible for optimal ventilation. For environmental disinfection, we normally wipe or spray the surface of all mental or solid materials (such as tables, chairs, door handles, elevator buttons et al.) with disinfectant containing 1,000 mg/L chlorine or 500 mg/L chlorine dioxide at least for 30 minutes, twice a day. Twice a day, UVGI is also frequently applied for 1 hour every time.

CONCLUSIONS

Since April 6, 2020, our endoscopy center has restarted all routine endoscopy services and executed a strict infection control protocol. The goal is to maintain and achieve no infection among HCP while providing essential services to our patients. In practice, full PPE brings inconvenience into daily endoscopic operations and requires HCP to maintain a good mental and physical condition. To date, this pandemic has imposed major global challenges to the public health system, PPE may become scarce in some areas. Our experience demonstrates that strict prescreening, procedural triage, and endoscopy center modifications may be as important as PPE in preventing

the spread of COVID-19 in endoscopy center during the post endemic period, as we are currently facing in Wuhan.

In the past 60 postlock down working days, the number of endoscopic cases in our center has increased gradually. So far, none of HCP from our endoscopy center has been reported infected with SARS-CoV-2. Been the epicenter of this outbreak in China, we need practice cautions and institute proper infection controls for potential a second wave outbreak. Here we provide our experience according to China’s medical condition and recommend all endoscopy centers currently in endemic areas to adjust their own infection control management strategy and provide a safe and effective endoscopy working environment, and to prepare a smooth transition into postendemic period. Of note, due to the limitations of our knowledge on the COVID-19 caused by SARS-CoV-2, our recommendations must be considered as evolving because they could change in a short time.

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SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.ajic.2020.08.013>.

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