



Editorial

Perspective gastrointestinal endoscopy infection control strategy against COVID-19: Workflow and space management for the operation of endoscopic centers

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All endoscopic centers should establish infection control strategies (ICS) tailored to individual resources based upon updated national and academic guidance for COVID-19 without superseding local advisories and institutional guidelines.¹ Endoscopic administrators have to customize control measures and adjust with the rapidly evolving local and global pandemic and prepare for the upcoming resurgence due to relaxation of social distancing norms. In this regard, Zhang *et al.*² have reported their stringent ICS in Peking Union Medical College Hospital (PUMCH) based on the guidance of the Chinese Society of Digestive Endoscopy and have shared their experiences from the pandemic and the subsequent recovery. Importantly, the ICS was formulated with inputs from infection control experts. A multidisciplinary task force and flexibly positional teamwork are mandatory to fight the unknown infectious agent. The PUMCH ICS has been considered to be an example of the most comprehensive and best practice with fine-tuned itemizations from patient triage to procedures, laboratory environmental infectious control measures, appropriate use of personal protection equipment (PPE), staff management for endoscopy, disinfection of the endoscope, and stepwise resumption planning until the daily endoscopic service in detail. Only urgent or limited semi-urgent procedures were conducted during the pandemic, while the volume was increased to 50% of the normal capacity adjusted with stable PPE supplies towards the end of April 2020 as the local pandemic waned. Even elective endoscopic services, which had been postponed or canceled, were rescheduled and nearly half of them were completed.

The outcome of control measures seems to be attributable to the nationwide regulation and legislation of quarantine, while the actual usefulness of the ICS remains unevaluable in the Chinese outbreak. Indeed, there had been no contagious endoscopic staff in the PUMCH endoscopic center; however, no patients were confirmed as COVID-19 during the study period. The endoscopic center was not

equipped with a negative pressure room, and there were crossing flow lines between patients and staff, and between in- and outpatients within their temporarily changed layout.² Ultimately, there might be flaws to be improved in the PUMCH ICS for endoscopic workflow and space management.

The essential steps including patient triage, risk stratification, and the proper use of PPE to prevent peri-procedural viral transmission have been guided by international organizations.^{3,4} Consolidating these guidelines, the latest WEO recommendations¹ and the PUMCH ICS,² we are transforming, following endoscopic center ICS, the Japanese Rural University Hospital designated for COVID-19. First, the subjects should undergo prescreening for COVID-19 symptoms and history. During the pandemic, chest computerized tomography (CT) should be performed before endoscopic procedures.⁵ Subjects responding affirmatively to any inquiry for COVID-19 or demonstrating pneumatic abnormality on CT should be regarded as suspected cases, and they must undergo PCR testing for SARS-CoV-2 as soon as possible. Patients with positive PCR tests should be considered as confirmed COVID-19 cases, and they must not undergo endoscopic procedures unless those are urgently indicated. The suspected cases that could not be examined by the PCR test before the GI procedures should be treated considering the same amount of precautionary measures as for confirmed COVID-19 cases. Asymptomatic patients without readily suspicious histories, with a normal chest CT scan, and/or negative PCR results, are regarded as being at low risk. The PUMCH ICS modified the triage tactics at the post-peak phase. The semi-urgent and elective patients stayed in Beijing for 14 days, and they underwent PCR within one week before the procedures.² Ideally, the molecular test was performed within 72 h of the procedures¹ to minimize the remote prospect of nosocomial transmission through asymptomatic carriers due to the false-negative test results or viral shedding at the time of reservation. Highly sensitive, reliable, and speedy point-of-care tests should be

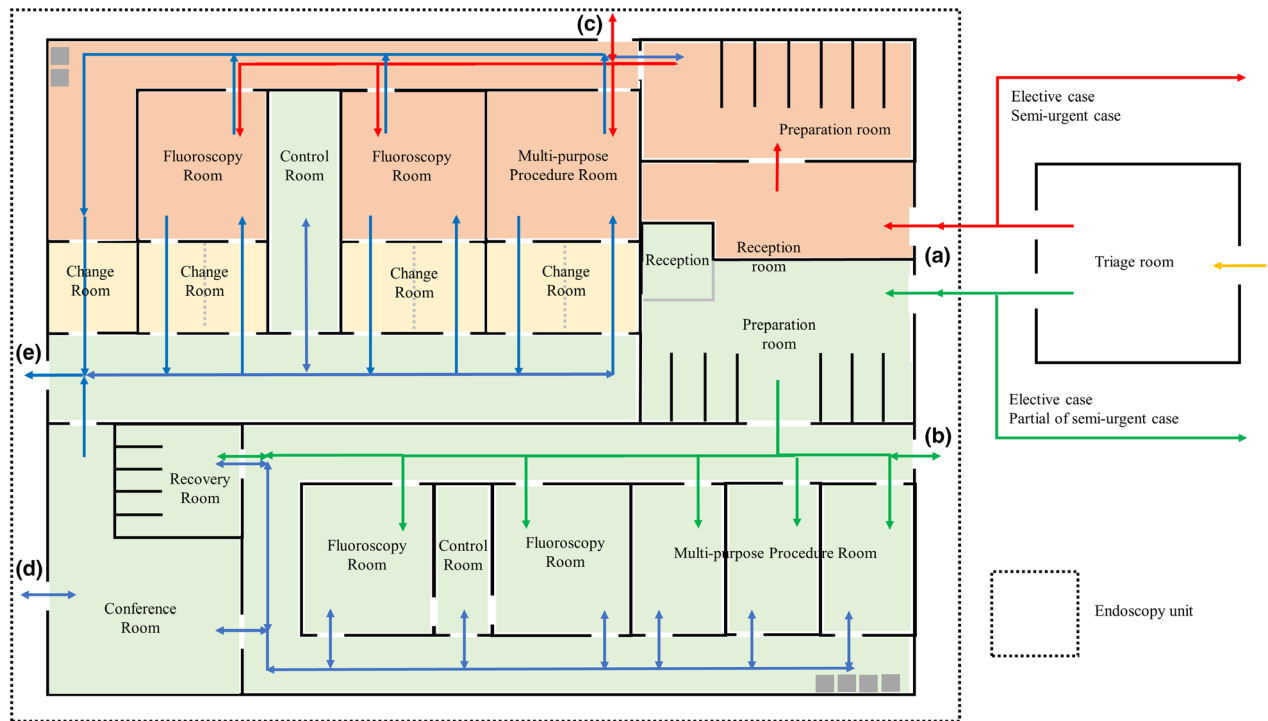


Figure 1 The workflow of the endoscopy unit is depicted. The outpatient flow is shown with orange arrows, confirmed/suspected COVID-19 patient flow with red arrows, and low-risk patient flow with green arrows. The medical staff flow is shown with blue arrows. The automated endoscope reprocessor is shown with a gray box. The endoscopic unit is separated into three zones: contaminated zones (red zones), clean zones (green zones), and buffer zones (yellow zones). Only urgent and partial semi-urgent cases with low-risk COVID-19 enter the endoscopy unit through another entrance a following the triage room. Entrance b is for inpatients with low risk of COVID-19. Additionally, this entrance is used as an exit for low-risk patients leaving the endoscopic unit. Entrance c is for inpatients with confirmed/suspected COVID-19 and is used as an exit for confirmed/suspected COVID-19 patients. Entrance d is for the medical staff. Exit e is for the medical staff who worked in the contaminated zone. The buffer zones for changing rooms before entering the contaminated zones are for the medical staff to wear and remove PPE.

used, but unfortunately, barriers to routine pre-procedural testing include unavailability, cost-effectiveness, and times required for durability in conventional PCR in most Japanese facilities.

The endoscopic workflow should be organized carefully. The endoscopic units should be renovated and provided with a negative pressure setting. If this is not possible, high-efficiency particulate air filtration equipment and ultraviolet illuminator are required in each room, when handling patients with COVID-19. In the absence of such facilities, including our hospital, clear zoning and traffic lines should be established to distinguish COVID-19 patients from endoscopic personnel and low-risk patients. There is still little in the literature that describes the appropriate workflow of the endoscopy corresponding to the era of COVID-19. Therefore, it is necessary to effectively organize the

workflow and workspace in endoscopy centers of tertiary and referral hospitals.

The endoscopy units should be separated into three zones, namely, contaminated, clean, and buffer zones.^{4,6,7} In this issue, Zhang *et al.*² describes that the route of the medical staff should not be the same as that of the patients entering and exiting the endoscopy unit.

After prescreening, the patients were segregated into groups of suspected COVID-19 cases and low-risk cases. The route of patients with suspected COVID-19 has been separated from the route of patients with a low risk of COVID-19. The suspected cases approach the single preparation room (contaminated zones) and undergo the PCR test. The contaminated zones should have negative pressure and air exchange systems in addition to the footswitch door-operating devices. In patients diagnosed

with COVID-19 (confirmed by PCR), only urgent endoscopic procedures should be performed in a negative pressure room (contaminated zones), and any other endoscopic procedures should be postponed. Similarly, patients with suspected COVID-19 who have not been administered the PCR test must be performed in a negative pressure room. In the clean zones, it is sufficient for the medical staff to wear a standard PPE, while enhanced PPE should be used in the contaminated zones. The changing rooms (buffer zones) before entering the contaminated zones are used to wear or remove the PPE by means of at least a partition. Additionally, a workflow organization to allow designated one-way passages for the transportation of used/contaminated equipment (such as endoscopes) is needed to avoid cross-contamination with clean, disinfected equipment.^{2,4} Automated endoscope reprocessors must be installed not only in clean zones but also in contaminated zones (Fig. 1).

For endoscopic procedure stratification, endoscopists should categorize indications according to the level of urgency as urgent, semi-urgent, and elective cases. In particular, to determine whether the semi-urgent endoscopic procedure needs to be performed or postponed, a case-by-case evaluation is needed. Endoscopic ultrasound (EUS) and endoscopic retrograde cholangiopancreatography (ERCP) for hepatobiliary or pancreatic malignancies need to be performed sooner after appropriate staging and subsequent planning of surgical and multidisciplinary treatments. Collectively, it is expected that the fluorescent rooms will be utilized to manage ailments, such as pancreatobiliary diseases and gastrointestinal obstructions more frequently than before the outbreak.

Currently, it is evident that endoscopic personnel are at high risk for SARS-CoV-2 infection during the COVID-19 pandemic. The screening steps should be strict. Even if the single ICS may have defects, the disciplined combination maximizing compliance of ICS would make them much more efficient.⁸ Central operative GI endoscopy should manage the workflow and space to delineate the contaminated zones for the confirmed/suspected patients and the clean zones for the low-risk patients. These approaches could minimize the risk of SARS-CoV-2 transmission during the pandemic and even in the post-peak phase due to inevitable resurges.

CONFLICT OF INTEREST

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NONE.

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