

## Review

# COVID-19 and gastrointestinal endoscopy: What should be taken into account?

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On March 11, 2020 the World Health Organization declared COVID-19 pandemic, leading to a subsequent impact on the entire world and health care system. Since the causing Severe Acute Respiratory Syndrome Coronavirus 2 houses in the aerodigestive tract, activities in the gastrointestinal outpatient clinic and endoscopy unit should be limited to emergencies only. Health care professionals are faced with the need to perform endoscopic or endoluminal emergency procedures in patients with a confirmed positive or unknown

COVID-19 status. With this report, we aim to provide recommendations and practical relevant information for gastroenterologists based on the limited amount of available data and local experience, to guarantee a high-quality patient care and adequate infection prevention in the gastroenterology clinic.

**Key words:** COVID-19, endoscopy, personal protective equipment, protection management, SARS-CoV-2

## INTRODUCTION

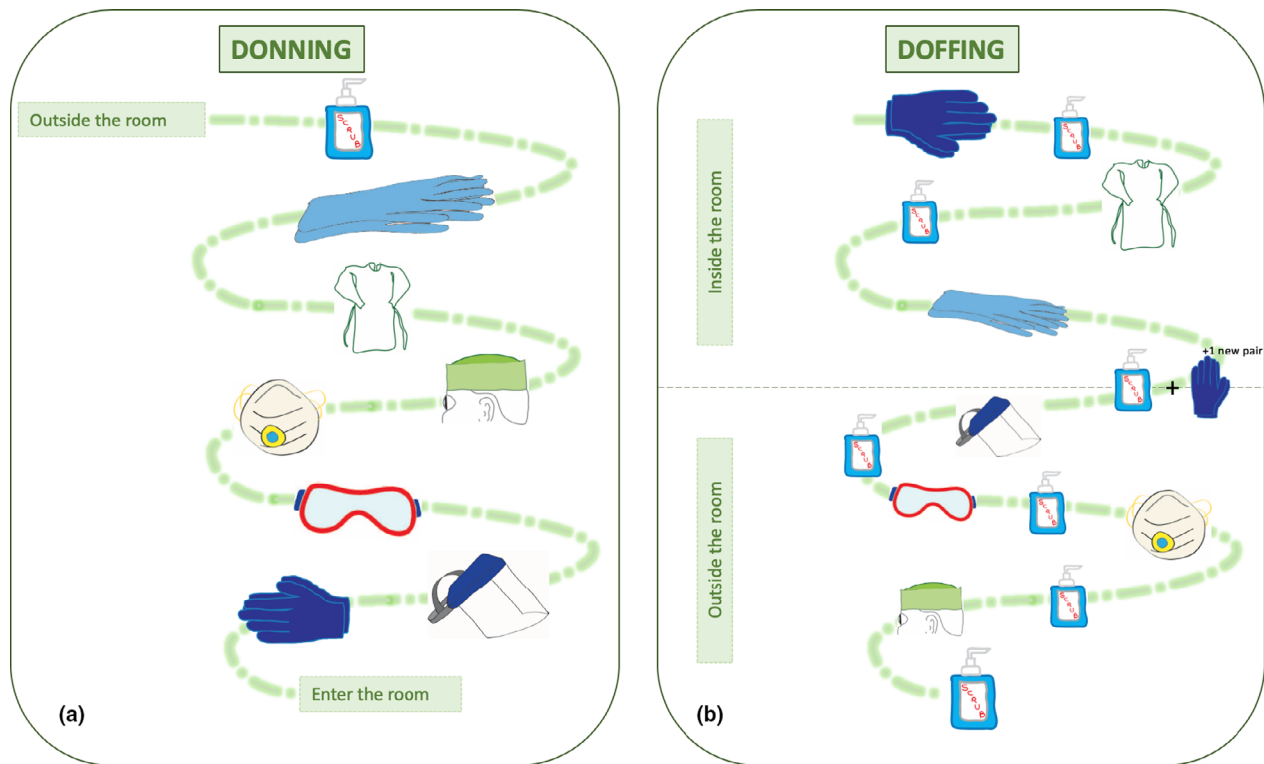
SINCE THE first reports of cases with pneumonia of unknown origin at the end of December 2019 in Wuhan, Hubei Province, China, our world has been in a state of high vigilance. On December 31, 2019, the etiological virus was identified as a novel Severe Acute Respiratory Syndrome (SARS) coronavirus, originating from bats. The World Health Organization (WHO) officially named it the SARS-CoV-2 (CoV-2) virus, causing the disease COVID-19.<sup>1</sup> From then on, the number of infections and subsequent need of hospitalization increased rapidly, first throughout China and later on to Italy, subsequently to Spain and the rest of Europe and the World.<sup>2</sup> In the beginning of February a first COVID-19 positive patient, returning from Wuhan, was identified by the Belgian government leading to gradual implementation of increasingly stringent measures to control this highly contagious disease effectively immediately. Strict isolation measures were imposed on March 17, 2020, through until the present day.<sup>3</sup> These measures and rules

also involve changes to the organization of health care installations, staff, and services.

Severe Acute Respiratory Syndrome-CoV-2 virus, as other coronaviruses, causes a variety of possible symptoms ranging from mild rhinitis, fever, cough or diarrhoea, to pneumonia and acute respiratory distress syndrome with need of ventilatory support. The number of hospitalizations, the need of intensive care and the number of deaths is still rising. The global impact is tremendous as described by Perisetti *et al.*<sup>4,5</sup>

Currently, published mortality rates range between 2% and 4.3%, though true mortality is probably lower in view of an underestimated denominator.<sup>6</sup> Risk factors have not yet all been identified in large (ongoing) trials, but observational data and case series suggest arterial hypertension and diabetes mellitus as risk factors for severe disease.<sup>6</sup> SARS-CoV-2 virus spreads via droplets and aerosols, and indirectly by contact with contaminated surfaces which implies the absolute need of personal protective equipment (PPE) for both patients and health care workers/professionals, especially those operating in the aerodigestive tract.<sup>6–8</sup> Hence, numbers ranging from 9% to 12% circulate in health care workers being COVID-19 positive, especially otorhinolaryngologists, pulmonologists, intensive care and emergency doctors, anesthesiologists and gastroenterologists

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**Figure 1** (a, b) Stepwise overview of the donning and doffing procedure in case of contact with a patient with a COVID-19 positive or unknown/doubtful COVID-19 status. Donning procedure (before entering the room): (1) disinfection of the hand, (2) put on long nitrile gloves, (3) put on the impermeable gown, (4) take a surgical hat, (5) FFP2/3 mask, (6) put on the goggles, (7) put on a face shield and (8) put on a second pair of short nitrile gloves. Doffing procedure (inside the room – disposable items): (i) take off the short nitrile gloves, (ii) take off the impermeable gown and (iii) remove the long nitrile gloves. Between every step disinfection of the hands is necessary. Before leaving the room a new pair of short nitrile gloves has to be put on as protection against possible skin transmission. Doffing procedure (outside the room – recyclable items): (i) take off the face shield, (ii) remove the goggles, (iii) remove the FFP2/3 mask (iv) take of the surgical hat and remove the second pair of short nitrile gloves. Between every step disinfection of the hands is necessary. The face shield, goggles and FFP2/3 mask should be collected for recycling.

given the fact that the highest viral loads have been measured in the nasopharynx.<sup>9,10</sup> Although the respiratory and upper gastrointestinal (GI) tract seem the most harmful, recent data show an important presence of viral ribonucleic acid (RNA) in fecal samples up to a mean of 27.9 days versus 16.7 days in respiratory samples.<sup>11</sup> The possibility of fecal–oral transmission has been suggested but hard evidence has not been established yet.<sup>12</sup> However, fecal excretion might contribute to viral transmission considering the evidence of fecal excretion for both SARS-CoV and Middle East Respiratory Syndrome CoV, and their ability to remain viable in conditions that could facilitate fecal–oral transmission, it is possible that SARS-CoV-2 could also be transmitted via this route.<sup>13,14</sup> Therefore, we propose to consider both flexible upper and lower GI tract endoscopy

also as high-risk procedures for disease transmission and we suggest implementation of proper PPE measures as well.

The aim of this report is to provide a practical guide for the management of personal protection when performing endoscopic/endoluminal procedures of the GI tract in emergency, ambulatory or hospitalized patients, based upon the current available information worldwide and local experience in our tertiary university hospital.

## METHODS

WE PERFORMED A Pubmed, Medline and Embase search between March 23, 2020, and April 3, 2020, using ‘SARS-CoV-2’, ‘COVID-19’, ‘GI endoscopy’, ‘endoscopy, digestive system endoscopy’ as MeSH terms. We

used only published data, reports and articles written in the English language. After exclusion, 36 of 46 articles were eligible for enrolment. An extensive authors' methodology for systematic searches is available on request. Since we aim to provide practical guidance and clinical recommendations, we prioritized statements by international medical associations such as the World Health Organization and the European and US Centers for Disease Prevention and Control.

For our guidance in protective measures, we divided our in-hospital patients in two subgroups based on the COVID-19 status: (i) COVID-19 negative; (ii) COVID-19 unknown/doubtful or confirmed positive.

## RESULTS

### General assessment

**B**EFORE PERFORMING ANY type of endoluminal procedure of the GI tract (eg, oesophagogastroduodenoscopy, placement of feeding tubes, endoscopic retrograde cholangiopancreatography (ERCP)) a general assessment of the urgency and need of the procedure is strongly recommended. All endoluminal procedures should be considered high risk, therefore only procedures in which time delay is unacceptable or where it affects the patient's survival should be performed.

Before any procedure can be performed, the patient should wear a surgical mask and should be questioned about contact with COVID-19 positive individuals and recent or present symptoms like fever, cough and dyspnea, rhinitis, sudden loss of smell and/or taste. A new onset of nausea, diarrhoea or abdominal discomfort can be considered as suspect for (entero)colitis, especially when combined with fever.<sup>11</sup> Additionally, temperature can be measured and real-time reverse transcription polymerase chain reaction (RT-PCR) testing on nasopharyngeal swab is recommended before performing any endoluminal procedure.

### The outpatient clinic

In line with social distancing and avoiding contact, optimization of consultation via telephone or video consultation is highly recommended if possible.

If clinical evaluation is mandatory in case of alarm symptoms like involuntarily loss of weight, inability of oral intake, jaundice, we advise to take some precaution in the outpatient clinic.

Before entering the waiting room, temperature measurement of the patient can be considered and symptoms as abovementioned should be questioned. Recognition of the early COVID-19 signs is of high importance to avoid further spreading, since people are most likely contagious in the

24 h before developing respiratory symptoms.<sup>9</sup> Rules for social distancing should be applied in the waiting area. Visiting patients should be informed, chairs should be provided at the required distance and the total number of patients inside a room (one person per 10 m<sup>2</sup>) should be respected. Patients can be accompanied by a maximum of one adult, although single patients are preferred. Before clinical examination the attending physician should question the patient about any systemic or respiratory symptoms.

We recommend limiting clinical examination to the specific regions and examinations necessary for the patient's complaints. When auscultation of asymptomatic patients is required, protection with a surgical mask is sufficiently protective. In case of a symptomatic patient, a FFP2/3 mask, gown, goggles and face shield are mandatory (see Section 3.3 Dressing and undressing, for the donning and doffing procedure; Fig. 1a,b).

In the ideal scenario, all patients should be offered a surgical mask. However due to resource allocation, the use of surgical masks can be (temporarily) limited. Therefore, patients with (preliminary) symptoms should be prioritized in the provision a surgical mask and should be isolated as much as possible.

Since the COVID-19 status of ambulatory patients is currently still mostly unknown and since the procedures are at high risk for transmission, wearing adequate PPE is mandatory. This includes (i) a surgical hat, (ii) long nitrile gloves (considered to be a second skin), (iii) an impermeable gown, (iv) a FFP2/3 mask and (v) goggles and/or face visor for the attending health care worker, as suggested by the WHO.<sup>15</sup> Specific 'donning and doffing' measures have to be taken into account (see Section 3.3 Dressing and undressing; Fig. 1a,b). Although protective materials such as gloves and masks are scarce, any type of unprotected patient contact is prohibited and cannot be tolerated.

### Summary of measures to be taken at the outpatient clinic

1. Limit the number of patients and identify patients suitable for remote consultation.
2. Question patients about COVID-19 contact and symptoms before clinical examination.
3. Consider temperature measurement.
4. Provide patients with a mask.
5. Apply social distancing rules in the waiting room. Limit the waiting time and number of patients.
6. Avoid physical contact. If necessary, limit the amount of manipulations during clinical examination.
7. Allow only essential staff with proper PPE.

8. Keep doors shut as much as possible.
9. Apply general rules of hand hygiene.

### The endoscopy unit

If feasible, elective procedures should be postponed. Upper and lower GI endoscopy should be limited to emergencies only. In our tertiary university hospital only 19.2% of initially scheduled procedures were performed, resulting in an average of 12 procedures per day (including unscheduled urgent procedures for foreign object impaction, melena and/or macroscopic blood loss and volvulus). Between March 16 and April 3, 2020, 1127 (80.8%) procedures have been postponed in our hospital. Only cancer treatments or staging, evaluation of colitis and melena or persistent loss of weight were not postponed in our hospital. In Table 1 we provide an overview of 100 endoscopic procedures performed between March 23, 2020, and April 3, 2020, in our hospital (University Hospitals Leuven, Campus Gasthuisberg) categorized in terms of urgency and indication.

Upper and lower GI endoscopy should be limited to emergencies only. Possible examples as proposed by the British Society of Gastroenterology are acute upper GI bleeds, esophageal variceal bleeding, acute esophageal obstruction with foreign objects, food bolus or strictures, perforations or leaks, dysphagia due to tumor stenosis and sigmoidal volvulus.<sup>16</sup> ERCP for acute cholangitis or bile duct obstruction and biliary stenting are also included in this list.<sup>16</sup> Unpostponable procedures like endoscopic placement of feeding tubes have to be evaluated case by case. Presently, indications like high-grade dysplasia treatments or early cancer treatments will be postponed. However, with continued implementation of protective and limiting measures over time, performance of endoscopic treatment of dysplastic and early malignant pathologies has to be reconsidered since disease progression can cause patients to be no longer amenable for endoscopic curative treatment. An overview of recommendations by 21 endoscopic associations for performance of an endoscopic procedure during this COVID-19 pandemic is available from Castro Filho *et al.*<sup>17</sup>

In case of emergency where COVID-19 screening would imply an unacceptable time delay, the patient should be considered as possibly COVID-19 positive and the same protective measures should be taken into account as described for a confirmed COVID-19 positive patient.<sup>18</sup>

### The COVID-19 status

As defined by the WHO, a confirmed COVID-19 patient is a patient with positive laboratory finding confirming a COVID-19 infection irrespective of any clinical sign or

**Table 1** Overview of 100 endoscopic procedures in University Hospitals Leuven – Campus Gasthuisberg (performed between March 23, 2020 to April 3, 2020) categorized in terms of urgency and indications

Endoscopic procedures UZ (n = 100)	Urgent	Semi-urgent	Elective
N, (%)	51 (51)	36 (36)	13 (13)
Indications			
Acute colitis n, (%)	6 (11.8)	NA	NA
Melena n, (%)	10 (19.6)	NA	NA
Feeding tubes n, (%)	11 (21.6)	NA	NA
Biliary stenting n, (%)	3 (5.9)	NA	NA
EUS n, (%)	3 (5.9)	NA	NA
Volvulus n, (%)	2 (3.9)	NA	NA
Hematemesis n, (%)	2 (3.9)	NA	NA
Anemia n, (%)	6 (11.8)	NA	NA
Colorectal stenosis n, (%)	4 (7.8)	NA	NA
Esophageal impaction n, (%)	1 (1.9)	NA	NA
Dysphagia n, (%)	3 (5.9)	12 (33.3)	NA
RBPA n, (%)	NA	4 (11.1)	NA
Barrett n, (%)	NA	2 (5.6)	NA
Tumor diagnosis n, (%)	NA	5 (13.9)	NA
Postoperative control n, (%)	NA	3 (8.3)	NA
Weight loss n, (%)	NA	2 (5.6)	NA
EMR/ESD procedure n, (%)	NA	4 (11.1)	NA
Abdominal pain n, (%)	NA	2 (5.6)	NA
Changed stool pattern n, (%)	NA	2 (5.6)	NA
Pyrosis n, (%)	NA	NA	1 (7.7)
Posttransplant control n, (%)	NA	NA	2 (15.4)
POEM n, (%)	NA	NA	1 (7.7)
Evaluation post Barrett n, (%)	NA	NA	2 (15.4)
Follow-up IBD n, (%)	NA	NA	3 (23.1)
Pretransplant evaluation n, (%)	NA	NA	1 (7.7)
Polyp treatment n, (%)	NA	NA	2 (15.4)
Follow-up colorectal tumor n, (%)	NA	NA	1 (7.7)

EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection; EUS, endoscopic ultrasound; IBD, inflammatory bowel disease; NA, not applicable; POEM, peroral endoscopic myotomy; RBPA, red blood loss per anum; UZ, University Hospitals Leuven.

symptom. A doubtful or unknown COVID-19 patient is a patient with an unknown or inconclusive test and meeting at least one of the following criteria: (i) acute respiratory symptoms without other etiology and a history of travel to or residence in a country with known COVID-19 transmission in the past 14 days, (ii) acute respiratory symptoms after contact with a confirmed or suspected COVID-19 patient in



the 14 days prior to symptom onset and (iii) severe respiratory symptoms necessitating hospital admission and no other possible etiology.

### The screening procedure

During the COVID-19 pandemic, patients need to be risk stratified and screened before any endoscopic procedure. Before arrival, each patient should be questioned about: (i) fever, (ii) travel history (including all countries with a high incidence in COVID-19 transmission within the past 14 days prior to the endoscopy), (iii) occupational exposure (including health care workers or laboratory staff handling COVID-19 specimens), (iv) contact history (in the last 14 days) and (v) clustering. In case of the presence of one of these five risk factors, the patient is to be considered as a suspected case and COVID-19 RT-PCR should be conducted prior to the endoscopic procedure. In case of a positive or inconclusive RT-PCR test the procedure is high risk allowing only urgent endoscopies. In the absence of one of these risk factors symptoms should be questioned and if present, the procedure is considered intermediate risk permitting only urgent endoscopy. Low-risk patients are patients with no risk factors and no symptoms or at least one positive risk factor but a negative laboratory RT-PCR test.<sup>19</sup>

Patient screening is highly variable in different centers due to resource allocation. The patient's COVID-19 status can be determined by a combination of the clinical presentation, RT-PCR test (nasopharyngeal swab and/or bronchoalveolar lavage) and/or multi-sliced chest computed tomography (CT) scan.<sup>20</sup> The sensitivity of RT-PCR tests is moderate to high depending on the timing and type of test.<sup>21</sup> Anal swabs have also been tested but seem to be positive in later stages of the infection and remain positive when oral swabs have already negativized.<sup>22</sup> Given the scattered landscape of possible tests and their results in combination with the possible spectrum of symptoms, doubts may remain about the patient's COVID-19 status. Therefore, both ESGE/ESGENA and Repici *et al.* published a possible flowchart for PPE after risk evaluation based upon symptoms and contacts. Our management is built on the combination of possible risk contacts, symptoms and test results. Asymptomatic patients with a negative PCR test and/or negative CT scan should be considered COVID-19 negative. In asymptomatic patients we have found last week that 2% of patients referred for elective procedures test positive. Hence a combination of absence of risk factors, symptoms and a negative nasopharyngeal swab very likely holds a low risk for contamination during the procedure and justifies less stringent measures to save on limited protective resources.

Once a patient has any systemic (especially fever) or respiratory (cough, dyspnea, chest pain) or GI (nausea or diarrhoea) symptom or a positive PCR test result or positive CT scan, the patient is considered COVID-19 positive and extra measures should be taken.

For doubtful cases, we suggest considering them 'unknown' and take the same precautions as for a confirmed COVID-19 positive patient. Routine RT-PCR testing could be implemented to optimize classification of patients.



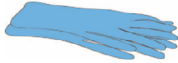

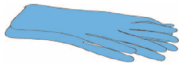












### General and personal protective measures

For COVID-19 positive patients endoscopic procedures should preferentially be performed in a specially prepared endoscopy room where special measures have been taken like (i) equalizing ventilation and pressure (or even negative pressure) in the endoscopy room and the corridor by lowering the atmospheric pressure (if possible), to prevent the development of an air flow towards the corridor with possible risk of disease spreading. (ii) The COVID-19 status of the patient should be clearly visible at the outside of the endoscopy room during the entire procedure. (iii) When needed, the anesthesiologist should have taken the proper PPE measures (as all entering staff) including a surgical cap, an impermeable gown, a pair of long nitrile gloves, a FFP2/3 mask, goggles, a transparent face shield and a second pair of nitrile gloves before entering the room and executing a Rapid Sequencing Induction (to minimize aerosolization and coughing) and a subsequent save intubation.<sup>23</sup> (iv) Doors have to remain closed as much as possible to reduce possible spreading. (v) Avoid the use of local anesthetic sprays to reduce the risk of aerosol formation.<sup>24</sup> (vi) Minimize bowel preparation and inflation to reduce aerosolization. We suggest endoluminal evaluations like a rigid rectoscopy for immediate rectal evaluation as replacement for flexible recto- or sigmoidoscopy when necessary. (vii) When performing a biopsy in COVID-19 doubtful/unknown or positive patients, we suggest collecting the sample(s) in separate recipients and a specific sealed bag after disinfecting the recipients with concentrated sodium hypochlorite solution. We advise to secure this sealed bag in a second plastic bag for transport to the pathology lab. We also suggest notifying the pathology lab of this transport and to take the appropriate measures for unpacking and processing the biopsies.

Personal protective equipment recommendations for endoscopic GI procedures can be found in Table 2.

1. Confirmed COVID-19 positive patients, doubtful or unknown COVID-19 status (high-risk patients):

**Table 2** Overview of the necessary personal protective equipment during endoluminal gastrointestinal procedures depending on the COVID-19 status of the patient

		Outpatient clinic	Endoscopy room	
COVID-19 status		Unknown	Negative	Positive
		Patient with surgical mask	Pressure and ventilation adaptation	
Personal Protective Equipment (PPE)	STEP 1	 a	 a	
	STEP 2	 b	 g	 b
	STEP 3	 c	 c	 c
	STEP 4	 d	 e	 d
	STEP 5	 e	 f	 e
	STEP 6	 f	-	 h
	STEP 7			 f

(a) surgical hat; (b) long nitrile gloves; (c) impermeable gown; (d) FFP2/3 mask; (e) goggles; (f) nitrile gloves; (g) surgical mask; (h) face shield.

PPE: scrubs (once daily), surgical hat, long nitrile gloves, impermeable gown, FFP2/3 mask, goggles, face shield, second pair of nitrile gloves.

## 2. COVID-19 negative or low-risk patients:

PPE: disposable gown, surgical hat, surgical mask, goggles or disposable face shield and one pair of nitrile gloves.

For other endoluminal procedures like insertion of nasogastric tubes, distance between the physician and patient should be maximized as much as possible. Preference is not to use local oral anesthetic sprays in order to minimize oral aerosolization.<sup>24</sup> Manipulations should be minimized and proper cleaning and disinfecting tools have to be accessible immediately. Patients wear a surgical mask at all times covering their mouth (the nose can be cleared of the mask during the procedure) to reduce the aerosolization due to possible coughing or gagging. These measures can

also be applied for other endoscopic/endoluminal examinations within the field of otorhinolaryngologists who perform their laryngoscopy during consultation.

## Dressing and undressing

### Donning and doffing procedure

Before every procedure with a COVID-19 positive patient, special PPE measures have to be taken. As described by the WHO, COVID-19 is a highly contagious infection spreading through droplets and therefore specialized PPE measures have to be implemented, different from those of other highly contagious diseases, such as Ebola that spreads via bodily fluids. The use of coveralls is not necessary in the case of COVID-19.<sup>15</sup>

The sequence of dressing and undressing with these PPE is very particular and should be followed in the correct order at all times to avoid patient to health care worker transmission. The dressing procedure is called ‘the donning’ and the undressing procedure is called ‘the doffing’.

The donning procedure consists of eight steps (see Fig. 1a):

1. Disinfect hands with alcohol.
2. Put on long nitrile gloves (second skin).
3. Put on an impermeable gown.
4. Put on a surgical hat.
5. Put on a FFP2/3 mask (adjust correctly around the nose and beneath the chin).
6. Put on the goggles over the FFP2/3 mask.
7. Put on the face shield.
8. Put on a second pair of (short) nitrile gloves.

The doffing procedure consists of the same eight steps but in an altered sequence and every step is separated from another by disinfecting your hands with alcohol. Steps 1–3 are inside of the room for the removal of disposable PPE, steps 4–6 are outside of the room for collection of recyclable face shield, goggles and mask. Due their scarcity, specialized cleaning and sterilisation programmes have been implemented for these items after recollection (see Fig. 1b). Since contamination is most likely to happen because of errors during the ‘undressing/doffing’ procedure, leading to accidental contact with the contaminated mask, goggles or front of the gown, extra awareness and training for this procedure is advisable.

1. Remove the second pair of nitrile gloves.
2. Remove the impermeable gown.
3. Remove the long nitrile gloves.
4. Take off the face shield and put in a recycle bin for collection.
5. Take of the goggles (from behind – over the head, do not touch the front or glasses) and put them in the same recycle bin as the face shield for collection.
6. Take of the FFP2/3 mask (from behind – over the head, do not touch the front) into a second recycle bin for collection.

We recommend the possibility of taking off the face shield, goggles and FFP2/3 mask after putting on a new pair of nitrile gloves outside of the room, to minimize possible transmission to the health care worker’s skin while taking off these protection measures. Removal of the surgical hat and disinfection of the hands with alcohol as the final step are considered standard of care (steps 7 and 8).

After an endoluminal procedure the room has to be considered contaminated during at least 1 h for rooms without negative pressure. When the latter is present, a new patient can be allowed in the COVID-19 room after 30–

60 min.<sup>18</sup> Stable data on the virucide effect of chemicals against SARS-CoV-2 are not yet available. Hence, we based our recommendation on data from other SARS-CoV viruses. Since SARS-CoV is known to be stable in feces and on smooth surfaces, we recommend using special (virucide) disinfection (eg. sodium hypochlorite) products or UV-C to clean the room and surfaces.<sup>18,25</sup>

### The buddy system

To minimize the consumption of PPE and to optimize patient flow and reduce the in-room time, we suggest working in a two-person system, one experienced medical doctor (‘the attending physician’) and one assistant (‘the buddy’) together in the room with the COVID-19 positive or high-risk patient when performing an endoscopy. For optimizing the workflow and provision of unforeseen equipment and to reduce the amount of consumed PPE, a third assistant outside of the endoscopy room is preferable. We recommend these ‘assistants’ to be experienced endoscopy nurses. If possible, one should always choose the most experienced physician and assistant in order to maximize the speed and smoothness of the procedure, thereby reducing the procedural and exposure time. The buddy always remains at a distance from the patient (at least 1.5 m) and performs all necessary non-clinical tasks like opening the patient’s medical file, writing down the clinical/endoscopic findings, prescribing medication and providing additional equipment if necessary.

In low-risk or confirmed COVID-19 negative patients this buddy system is not required and the endoscopist can be assisted by one (or more) endoscopic nurse without taking the enhanced but only the standard PPE and infection control measures.

### DISCUSSION

**S**PECIAL SITUATIONS REQUIRE special measures. Since the outbreak of the COVID-19 pandemic the entire world has been set upside down and strict rules have been implemented. The fact that this new virus is highly contagious and pathogenic, prompted adjustments to our general practical guidelines for endoluminal procedures.<sup>15</sup> With this document we aim to provide a practical guide for clinical and endoscopic practice based on the small amount of available data about this SARS-CoV-2 infection. The PPE recommendations are adapted to specific patient groups (outpatient/ambulatory or endoscopy unit) and their possible COVID-19 status. By combining both symptoms and test results our document differs from the current ESGE

consensus and the paper by Repici *et al.* only taking the possible COVID-19 infection risk evaluation into account.

The major limitation of our recommendations is the current lack of sustainable or validated data supporting our findings and recommendations. The sudden appearance and previously unknown existence of this SARS-CoV-2 virus as well as the much (yet) untranslated Chinese data are responsible for this shortcoming.

Secondly, our recommendations could be criticized by the fact that we categorized doubtful or unknown patients in a same group as the COVID-19 positive patients, although a certain amount of the doubtful or unknown patients might be negative and therefore do not need to be approached with all of the scarce PPE.

Guidelines regarding COVID-19 diagnosis and treatment are still under discussion and evolve fast with almost daily adjustments. In the future, widespread screening and availability of serological tests might facilitate the current recommendations and further planning of endoscopic procedures. The exact timespan between contagious and no-longer-contagious has still to be established. Therefore, recommendations about the minimum time of postponing cannot yet be provided. Determination of IgG and IgM may be a possible solution for this current problem.

Nevertheless, the authors strongly believe that any contribution to increase the awareness of the vulnerability of endoscopists is of the highest importance at this stage of the pandemic.

## CONCLUSION

**S**EVERE ACUTE RESPIRATORY Syndrome-Cov-2 infection is a highly contagious new disease primarily spreading via droplets and with the highest concentration of virus in the naso-oropharynx but also presence of SARS-CoV-2 virus in the lower GI tract. Hence, endoscopists are at high risk for transmission when performing GI endoscopy or nasogastric endoluminal procedures. Awareness and protection of the entire team with the imposed PPE measures is of the utmost importance to avoid further spreading and hazardous extra infections.

## CONFLICTS OF INTEREST

**A**UTHORS DECLARE NO Conflict of Interests for this article.

## FUNDING INFORMATION

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