

BSGIE survey on COVID-19 and gastrointestinal endoscopy in Belgium : results and recommendations

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Abstract

Background and Aims : With the first wave of the COVID-19 pandemic declining, activities in the gastrointestinal clinic are being recommenced after a period of stringent measures. Since a second COVID-19 wave is not entirely ruled out health care professionals might remain faced with the need to perform endoscopic procedures in patients with a confirmed positive or unknown COVID-19 status.

With this report we aim to provide a practical relevant overview of preparation and protective measures for gastroenterologists based on the currently available guidelines and our local experience and results of a national Belgian survey, to guarantee a fast recall of an adequate infection prevention if COVID-19 reoccurs.

Methods : From the 23rd of March 2020 and the 13th of May 2020 we performed a Pubmed, Embase and Medline search, resulting in 37 papers on COVID-19 and endoscopy. Additionally, we combined these data with data acquired from the national BSGIE survey amongst Belgian gastroenterologists.

Results : Based on 72 completed surveys in both university and non-university hospitals, the results show (1) a dramatic (<20%) or substantial (<50%) decrease of normal daily endoscopy in 74% and 22% of the units respectively, (2) a difference in screening and protective measures between university and non-university hospitals. These findings were subsequently compared with the current guidelines.

Conclusion : Based on new data from the BSGIE survey and current guidelines we tried to realistically represent the current COVID-19 trends in protective measures, screening and indications for endoscopy and to provide a practical overview as preparation for a possible second wave. (*Acta gastroenterol. belg.*, 2020, 83, 344-354).

Keywords: COVID-19, endoscopy, Belgium, personal protective equipment (PPE).

Introduction

At the transition of 2019 to 2020, a novel Severe Acute Respiratory Syndrome coronavirus (SARS-CoV-2) causing the disease COVID-19, started spreading around the globe. COVID-19 was declared a pandemic on December 31st 2019 by the World Health Organisation (1). The number of infections and subsequent need of hospitalization increased rapidly, first throughout China and later on via Italy and Spain and the rest of Europe and the World (2). Ever since, all local governments have implemented stringent measures to control this highly contagious disease effectively immediately. These protective measures not only had a large impact on the socio-economical world but also on our private matters

and health care installations, staff and services as endoscopy (3).

This new SARS-CoV-2 virus, as other coronaviruses, causes a variety of possible symptoms ranging from mild upper respiratory symptoms as rhinitis, fever, cough, anosmia and dysgeusia to pneumonia and acute respiratory distress syndrome (ARDS) with need of ventilatory support. Gastrointestinal (GI) symptoms as diarrhoea and loss of appetite and nausea are common. The global impact is tremendous as described by Perisetti *et al.* (4).

Transmission is mainly done by droplets, although the virus remains vivante for 72h on smooth surfaces and faecal-oral transmission is not excluded either (5-8).

Since gastrointestinal endoscopic procedures involve passing through the naso-oro-pharynx with a possible risk of aerosolization and the possibility of viral shedding via faeces, both upper and lower GI endoscopy are to be considered as high-risk procedures for disease transmission. The provision of proper personal protective equipment (PPE) measures is of the utmost importance to minimize the patient – health care worker transmission that is currently shown to be between 9-12% and can be confirmed by data from one of our tertiary Belgian university hospitals (University Hospitals Leuven) with hospitalisation of a maximum of 159 confirmed COVID-19 positive patients at one time during this pandemic (9-11.)

Recently the number of new infections, hospital admissions and need of intensive care is declining in Asia and Europe, due to strict measures taken by the local authorities. With this decline, this wave of COVID-19 seems to be conquered due to the strict measures taken by the local authorities. Nevertheless, a second flare of this COVID-19 is not (yet) ruled out and therefore with this report we aim to provide a practical guidance for gastroenterologists about how to organise the endoscopy

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unit, prepare the staff and take proper PPE measures when facing the need of performing a upper or lower GI endoscopy in times of COVID-19 recurrence, based on the current experience and guidelines gathered during this first COVID-19 disease wave.

Materials and methods

We performed a Pubmed, Medline and Embase search between the 23rd of March 2020 and the 13th of May 2020 using ‘SARS-CoV-2’, ‘COVID-19’, ‘gastrointestinal endoscopy’, ‘endoscopy, digestive system endoscopy’ and ‘COVID-19, endoscopy, guideline’ as MeSH terms. We only used published data, reports and articles written in the English language, resulting in 37 papers. Since we aim to provide a practical guidance and clinical recommendations, we prioritized statements by international medical associations such as the World Health Organization and the European and US Center for Disease Prevention and Control.

We also used results of an 18-questions survey established by the Belgian Society of Gastrointestinal Endoscopy (BSGIE) board and an online version created using Google Forms. All questions contained multiple answer options, and in some free comments were possible. The survey was anonymous without traceability of the results to specific endoscopy units. The link to the survey was then sent out to all BSGIE members with the following explanatory notes:

Dear BSGIE Member,

COVID-19 outbreak has an important impact on both our daily life and our endoscopy practice. The BSGIE wants to evaluate the impact of COVID-19 on endoscopy units in Belgium.

We would like to ask you to complete the **BSGIE “COVID-19 and endoscopy” survey** according to the situation in April 2020.

It only takes 5 minutes and the results provide important scientific and practical information on how endoscopy is organized in Belgium during the COVID-19 crisis.

Please pay attention to the following:

1. Only 1 survey per endoscopy unit. Please avoid multiple completed surveys from the same endoscopy unit, in order not to bias the final results.

2. BSGIE members working in a hospital and a private practice are asked to complete the survey twice: 1 for the hospital and 1 for the private practice.

3. BSGIE members working in a private practice are asked to complete the survey according to the situation in their private practice.

Results

1. The BSGIE survey – Real-time Belgian clinical practice in times of COVID-19

After 1 invitation and 1 reminder, a total of 72 surveys were completed. Results of these 72 surveys

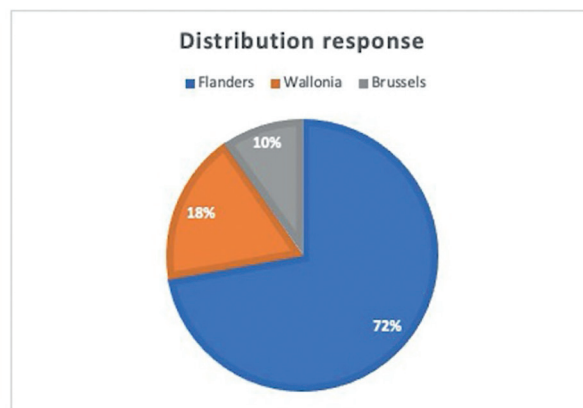


Figure 1. — Regional distribution of completed surveys

Table 1. — Number of completed surveys by region and hospital type

	University hospital	General hospital	Private practice
Flanders	9	39	4
Wallonia	3	8	2
Brussels	5	2	0

were analysed. Although BSGIE aims to represent all Belgian endoscopists, the majority of survey responses came from Flanders (Figure 1). Moreover, there are 7 university hospitals in Belgium, but the survey revealed 17 completed questionnaires from university hospitals (Table 1). However, possible duplicates could not be traced back because of the anonymous character of the survey. The non-uniform distribution of completed surveys and the possibility of multiple completed survey from the same endoscopy unit may represent a bias in the final results.

Analysis revealed that the COVID-19 pandemic greatly impacted on all endoscopic units, with a complete shut-down of 2 private practices, a dramatic decrease (<20%) of normal daily endoscopy workload in 74% of the units and a substantial decrease (<50%) of normal daily endoscopy workload in 22% of the units. In 1 unit, the endoscopy workload remained unchanged. Moreover, in the majority (81%) of the endoscopy units the endoscopy personnel (nurses, trainees and/or staff members) was redeployed to dedicated COVID-19 units.

The government ordered reduction of normal medical activity to only urgencies, which also applied to endoscopy activity. The survey included a question on which endoscopic indications were considered urgent (any life-threatening medical condition, or with the risk of losing an organ), semi-urgent (risk of losing an organ on the long term or impact on quality of life) or non-urgent. Table 2 provides a list of endoscopy indications which were considered urgent or semi-urgent allowing endoscopic examination and/or therapy during the period of forced reduced endoscopy activity. The survey revealed important differences of what is considered a (semi-)

Table 2. — List of endoscopy indications that are considered urgent or semi-urgent and can go ahead during the COVID-19 pandemic according to the completed surveys. Numbers represent the percentage of positive responders

Endoscopy indication	Positive response
1. Acute upper GI bleeding	97,2 %
2. Acute obstructive cholangitis / pancreatitis ^a	93,1 %
3. Acute lower GI bleeding	91,7 %
4. Symptomatic patient with alarm signs ^b	87,5 %
5. Acute upper GI obstruction (malignant / benign)	83,3%
6. EUS (± FNA / FNB) of potentially neoplastic lesion	83,3 %
7. Endoscopic dilatation of symptomatic GI stricture	76,4 %
8. Nutritional support (nasogastric tube / PEG / PEJ)	70,8 %
9. Endoscopic therapy of neoplastic lesions with HGD	65,3 %
10. Suspected IBD	63,9 %
11. Infected walled-off necrosis	58,3 %
12. Achalasia therapy (dilatation / POEM) for severe symptoms ^c	58,3 %
13. Upper GI fistula / leakage	55,6 %
14. High-risk surveillance (colon cancer, FAP, Barrett with dysplasia)	45,8 %
15. Positive faeces occult blood test without symptoms	44,4 %
16. Radiofrequency ablation of Barrett with HGD	37,5 %
17. Suspected small bowel bleeding (videocapsule / DA enteroscopy)	36,1 %
18. Iron deficiency anaemia without symptoms	30,6 %
19. Biliary stricture calibration by scheduled stent exchange	27,8 %
20. Asymptomatic common bile duct stone	19,4 %
21. Argon plasma coagulation	19,4 %
22. Scheduled prophylactic variceal band ligation	13,9 %
23. Endoscopic therapy of neoplastic lesions with LGD	12,5 %
24. Symptomatic patients without alarm signs	9,7 %
25. Endoscopic follow-up IBD	8,3 %
26. Scheduled endoscopic follow-up in prospective clinical trial	4,2 %
27. Achalasia therapy (dilatation / POEM) for little symptoms	2,8 %
28. Radiofrequency ablation of Barrett with LGD	1,4 %
29. Low-risk surveillance	0 %
30. Transanal EUS for faecal incontinence / constipation	0 %

^a obstruction: malignant, stone, occluded stent. ^b alarm signs : anaemia, rectal blood loss, age >50 years, weight loss, change in bowel habits, family history of GI cancer. ^c achalasia symptoms: no food intake possible, >10 kg weight loss, aspiration pneumonia

Abbreviations : DA enteroscopy: device-assisted enteroscopy; EUS : endoscopic ultrasound ; FAP: familial adenomatous polyposis; FNA : fine needle aspiration ; FNB : fine needle biopsy; GI: gastrointestinal; HGD: high grade dysplasia; IBD: inflammatory bowel disease; LGD: low grade dysplasia; PEG: percutaneous endoscopic gastrostomy; PEJ: percutaneous endoscopic jejunostomy; POEM: peroral endoscopic myotomy.

urgent endoscopic indication. Scientific guidelines how to deal with the COVID-19 pandemic in endoscopy units were quickly and freely available online. In Belgium, university hospitals rather created own local guidelines, whereas general hospitals seemed to follow guidelines from scientific organisations like the European Society of Gastrointestinal Endoscopy (ESGE) and in Wallonia some endoscopy units followed the French guidelines from the Société Française d'Endoscopie Digestive (SFED) (Figure 2).

In order to protect endoscopy personnel from viral transmission, patients are often screened for COVID-19

infection, and specific PPE is used. How and which protective measures were taken in the endoscopy units is shown in Figures 3 and 4. Figure 3 shows which patients were screened (Figure 3A) and how (Figure 3B). Initial triage is based on a patient interview about possible exposure to the virus. More specific screening requires clinical testing. Figure 3 shows that in university hospitals the majority of patients is screened for infection using nasopharyngeal swab with or without additional CT scan of the lungs, whereas in private practice screening is absent. However, in general hospitals 39% of the endoscopy units considered all patients as potentially

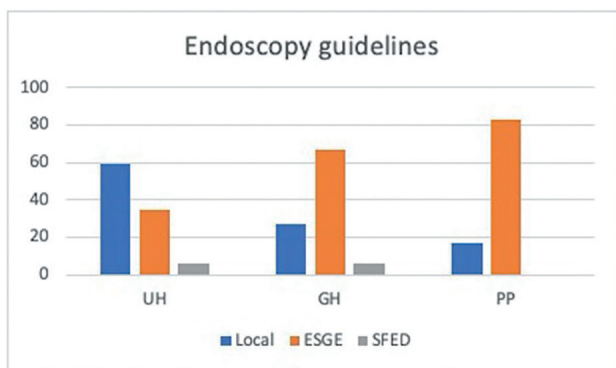


Figure 2. — COVID-19 guidelines followed in endoscopy units in Belgian university hospitals (UH), general hospitals (GH) and private practices (PP). Results are expressed as % of completed surveys per hospital type.

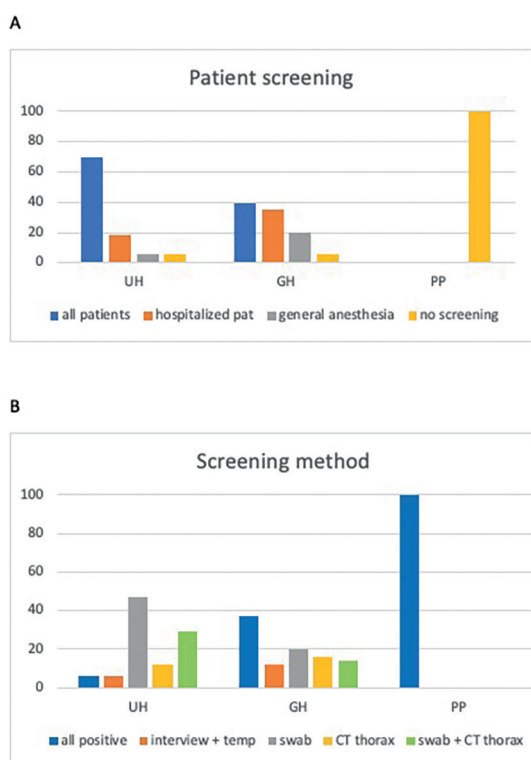


Figure 3. — A : COVID-19 screening used for patients needing endoscopy in university hospitals (UH), general hospitals (GH) and private practices (PP). Results are expressed as % of completed surveys per hospital type. B : COVID-19 screening methods used for patients needing endoscopy in university hospitals (UH), general hospitals (GH) and private practices (PP). Results are expressed as % of completed surveys per hospital type.

infected. This is also reflected in the use of PPE (Figure 4). The use of specific filtering facepiece masks (FFP) 2/3 is more widespread in endoscopy units of general hospitals, even in patients that screened negative, whereas in university hospitals the conventional (but not protective) surgical masks were used in this situation. In patients with COVID-19 who had to undergo an endoscopic procedure, the endoscopy personnel were protected using FFP2/3 masks. No endoscopy was performed in COVID-19 patients in private practices.

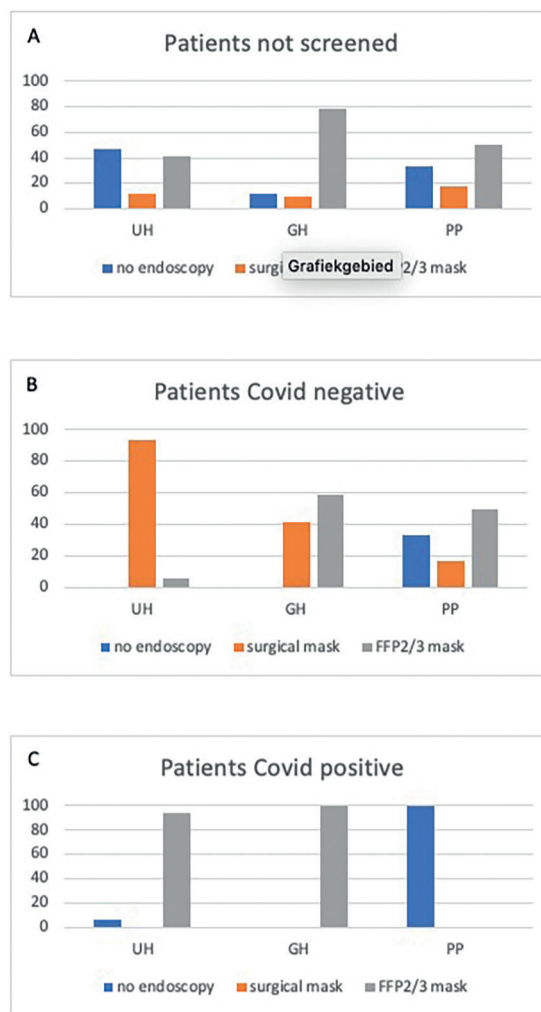


Figure 4. — A : Protection of endoscopy personnel when patients needing endoscopy are not screened for COVID-19 in university hospitals (UH), general hospitals (GH) and in private practices (PP). Results are expressed as % of completed surveys per hospital type. B : Protection of endoscopy personnel when patients needing endoscopy are screened negative for COVID-19 in university hospitals (UH), general hospitals (GH) and in private practices (PP). Results are expressed as % of completed surveys per hospital type. C : Protection of endoscopy personnel when patients needing endoscopy are screened positive for COVID-19 in university hospitals (UH), general hospitals (GH) and in private practices (PP). Results are expressed as % of completed surveys per hospital type.

2. International guidelines and the experience of a University Hospital

a. General assessment

Before performing any type examination or 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 affects the patient's survival should be performed.

Patients 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 anosmia or dysgeusia before any physical contact or procedure. A new onset of nausea, diarrhoea or abdominal discomfort can be considered as suspect for (entero)colitis, especially when combined with fever (12). 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.

b. The outpatient clinic

To be in line with social distancing rules, consultation via telephone or video consultation is highly recommended when possible.

If physical and clinical evaluation is mandatory in case of involuntarily loss of weight, inability of oral intake or jaundice patients can be seen in the outpatient clinic when applying some precautions by both the patient and the physician.

Before entering the waiting room, temperature measurement 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 hours before developing respiratory symptoms. (9) Rules for social distancing should be applied in the waiting room, patients should be informed and chairs at a distance of minimal 1.5m should be provided at all times. Patients can only be accompanied by maximum 1 adult, however patients visiting alone are preferred. Patients should wear a surgical mask at all times.

Within the room for clinical examination, social distancing rules should be applied as much as possible. Clinical examination is to be limited 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 adequate PPE measures including a FFP2/3 mask, gown, goggles and face shield are mandatory (see paragraph Dressing and undressing for the donning and doffing procedure, see figure 1a-b)

Summary of measures to be taken at the outpatient clinic as recently described by Sinonquel *et al.* (11).

- Limit the number of patients and identify patients suitable for remote consultation
- Question patients about COVID-19 contact and symptoms before clinical examination
- Consider temperature measurement
- Provide patients with a mask
- Apply social distancing rules in the waiting room. Limit the waiting time and number of patients.
- Avoid physical contact. If necessary, limit the amount of manipulations during clinical examination

- Allow only essential staff with proper PPE
- Keep doors shut as much as possible
- Apply general rules of hand hygiene.

c. The endoscopy unit

Organisation of the endoscopy unit

Procedures in confirmed COVID-19 patients should be performed in a specially prepared endoscopy room where specific COVID-19 measures have been taken like (1) an entrance and exit different and separated from the other endoscopy rooms, (2) equalizing ventilation and pressure (if possible even negative pressure) in the endoscopy room and corridor by lowering the atmospheric pressure, (3) a clear signalisation at the outside and inside of the room of the COVID-19 positive status of the patient and (4) doors have to be closed as much as possible.

For patient considered high-risk or COVID-19 positive, separate pre- and post-GI endoscopy recovery areas should be organised (13).

After an endoscopic procedure the room has to be considered contaminated during at least one hour for rooms without negative pressure. When the latter is present, a new patient can be allowed in the COVID-19 room after 30-60 minutes (14). Stable data on the virucide effect of chemical against SARS-CoV-2 are not yet available. Hence, recommendations are based on data from other SARS-CoV viruses. Since SARS-CoV is known to be stable in faeces and on smooth surfaces, using special (virucide) disinfection (eg. sodium hypochlorite) products or UV-C to clean the room and surfaces is recommended (14,15). In the ideal setting one or more endoscopes should be reserved for COVID-19 patients only, if possible. Specialized endoscope cleaning programs need to be implemented in the routine.

The endoscopy staff needs to be informed and properly trained in how to handle with patients with confirmed COVID-19, hygiene measures, isolation rules and the correct use of PPE (see paragraph Dressing and undressing for the donning and doffing procedure, see figure 5a-b) (13). Minimization of the entering staff is necessary to prevent transmission. An additional measure to reduce the number of entering staff, the in-room time and consumption of PPE and to optimize the workflow is the introduction of a buddy-person system: one attending endoscopist and one assistant ('the buddy') together in the room with the high-risk patient. To optimize the workflow and provision of unforeseen equipment and to reduce consumption of PPE a third assistant outside the endoscopy room is preferable. It is recommended to choose your assistants within the most experienced endoscopy nurses. If possible, one should always choose the most experienced physician and nurses within one executing team.

When needed for the procedure, the anaesthesiologist 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.(16) Avoidance of local anaesthetic sprays is also preferable to reduce the risk of aerosol formation (17).

In low risk or confirmed COVID-19 negative patients the buddy system is not required and the endoscopist can be assisted by one (or more) endoscopic nurse, taking the only the standard PPE and infection control measures.

Patient risk stratification

The WHO defined a COVID-19 patient as a patient with a positive laboratory test confirming a SARS-CoV-2 infection irrespective of any clinical sign or symptom. Patients with (1) acute respiratory symptoms without other aetiology and a history of travel to or residing in a country with known COVID-19 transmission in the past 14 days, (2) acute respiratory symptoms after contact with a confirmed or suspected COVID-19 patient in the 14 days prior to symptom onset and (3) severe respiratory symptoms necessitating hospital admission and no other possible aetiology, are defined as doubtful or ‘maybe’ COVID-19 patients.

When both laboratory findings and symptoms are negative, patients can be considered COVID-19 negative, moreover since only 2% of our asymptomatic patients have a positive reverse transcription polymerase chain reaction (RT-PCR) test.

Pre-procedural risk stratification and screening

Before arrival, patients should be questioned about : (1) presence of fever, (2) their travel history (including all countries with a high incidence in COVID-19 transmission within the past 14 days prior to the endoscopy), (3) occupational exposure (including health care workers or laboratory staff handling COVID-19 specimens), (4) any contact history (in the last 14 days) and (5) clustering. If one of these five risk factors are present a RT-PCR test should be conducted prior to the endoscopy, since the patient is considered ‘suspicious’. In absence of one of these five factors, symptoms should be questioned in these intermediate-risk patients. In case of asymptomatic patients without risk factors, the patient is considered high-risk unless a negative RT-PCR is upfront available (Figure 5).

The most recent European Society of Gastrointestinal Endoscopy (ESGE) definition of low-risk and high-risk patients is shown in table 3.

Based on the ESGE recommendations, risk stratification should preferably be done at least 24h prior to the endoscopy (by phone) and on the day of the endoscopy (13). During this questioning, rules of social distancing should be applied as should surgical mask be worn by both the health-care professional and the patient.

Risk stratification and PPE measures (Table 3)

– Low-risk patient

PPE measures include : surgical hat, shoe covers/ disposable shoes, surgical mask, non-sterile nitrile

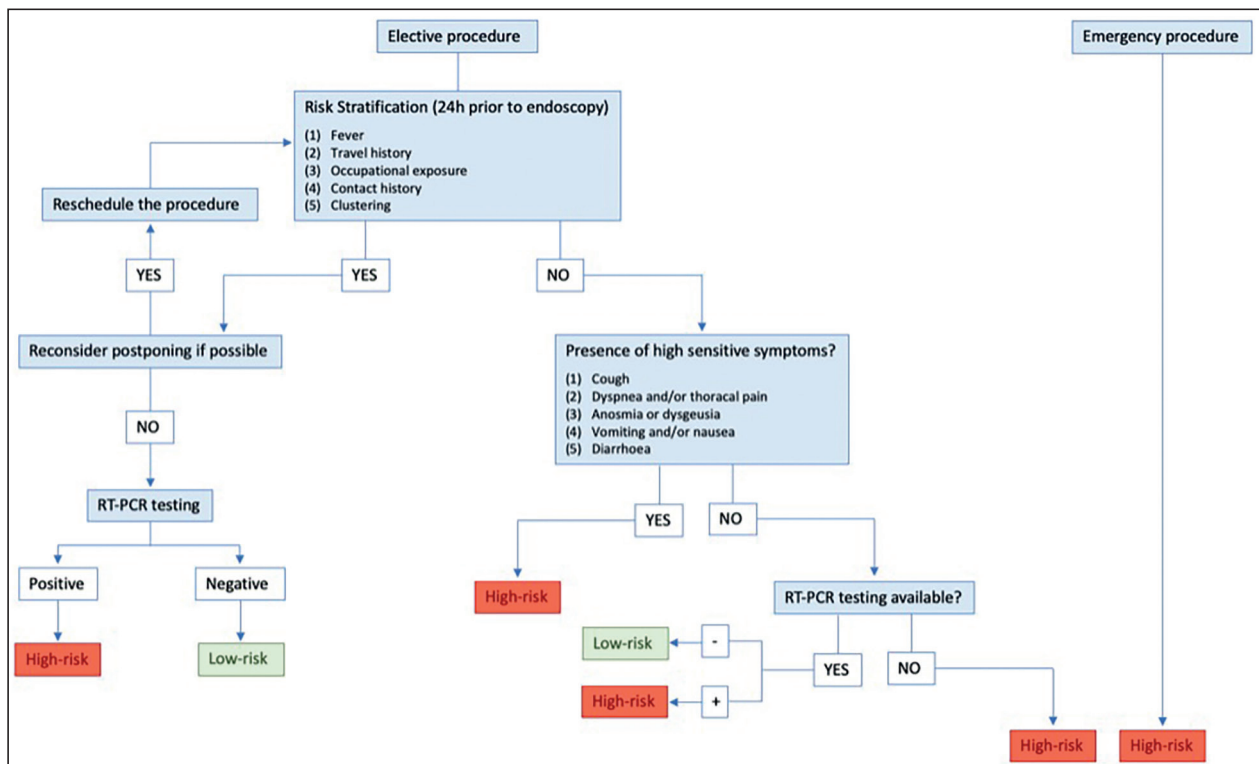


Figure 5. — Flowchart for risk stratification and procedure allocation. RT-PCR : Reverse transcription polymerase chain reaction.

Table 3. — Patient risk stratification classes combined with class-specific characteristics and the necessary Personal Protective Equipment (PPE) measures to be taken per class

Patient risk stratification	Characteristics*	PPE measures
Low risk	<ul style="list-style-type: none"> - No Symptoms (eg, cough, fever, dyspnea, diarrhea) - AND no contact history with COVID-19 positive person - AND no travel or residence in high-risk COVID-19 locations in the previous 14 days - AND negative RT-PCR testing for COVID-19 	<ul style="list-style-type: none"> - Surgical hat - Shoe covers/disposable shoes - Surgical mask - Non-sterile nitrile gloves - Goggles/disposable face shield - Impermeable gown
High risk	<ul style="list-style-type: none"> - Presence of symptoms (eg, cough, fever, dyspnea, diarrhea) - OR a travel or residence in high-risk COVID-19 locations in the previous 14 days - OR contact with a COVID-19 positive (or very likely positive) person 	<ul style="list-style-type: none"> - Surgical hat - Shoe covers/disposable shoes - FFP2/3 mask - Long non-sterile nitrile gloves (second skin) - Goggles/disposable face shield - Impermeable gown - Second pair of short non-sterile nitrile gloves

* Based on the most recent European Society of Gastrointestinal Endoscopy recommendations by Gralnek I. *et al.*(12)

gloves, goggles/disposable face shield, impermeable gown

– High-risk patient

PPE measures include: surgical hat, shoe covers/disposable shoes, FFP2/3 mask, long non-sterile nitrile gloves, goggles/disposable face shield, impermeable gown, second pair of short non-sterile nitrile gloves.

Post-procedural risk stratification

If possible and necessary, patient tracing after 7 and 14 days can be considered to inquire about a possible new COVID-19 diagnosis or occurrence of COVID-19 related symptoms (13).

Contaminated waste and endoscopic devices used during a procedure of a confirmed or suspected COVID-19 patient should be disposed or sterilized via specialized cleaning programs.

Urgency stratification/Timing of endoscopy

If feasible elective procedures should be postponed and upper and lower GI endoscopy should be limited to emergencies only. The following GI endoscopy procedures are considered to be urgent by the ESGE and British Society of Gastroenterology (13,18) :

- Acute upper or lower GI bleeding with haemodynamic instability
- Anemia with haemodynamic instability
- Foreign body in oesophagus and/or high-risk foreign body in the stomach
- Obstructive jaundice

– Acute ascending cholangitis

– Capsule/enteroscopy for urgent/emergent bleeding

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 (14).

All other procedures are considered postponable. Although some endoscopic procedures have to be performed within 12 weeks to prevent further harm to the patient. A case by case evaluation and management of such high-priority endoscopic procedures like cancer treatments, high-grade dysplasia treatments, dysphagia with alarm symptoms, feeding tubes, necrosectomy, etc is mandatory (Table 4). Indications with low-priority and no priority are also shown in table 3 (13). An overview of recommendations by 21 endoscopic associations for performance of an endoscopic procedure during this COVID-19 pandemic is available by Castro Filho *et al.* (19).

Donning and doffing procedures

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 as Ebola that spreads via bodily fluids. The use of coveralls is not necessary in case of COVID-19 (20).

Table 4. — Overview of indications for endoscopic procedures according to priority and rescheduling recommendations based on the recent European society of Gastrointestinal endoscopy recommendations (12)

	Urgent (Perform always within 12-24h)	High-priority (<12 weeks delay)	Low-priority (≥ 12 weeks delay)	No priority (Postpone always)
Upper GI tract	<ul style="list-style-type: none"> - Acute upper GI bleeding with HDI - Anemia with HDI - Foreign body in esophagus and/or high-risk foreign body in the stomach 	<ul style="list-style-type: none"> - Endoscopic treatment of HGD or early IMC in the esophagus or stomach - Malignant esophageal stricture stenting - Feeding tubes (PEG/PEJ/NJ) - Upper GI fistula/leakage - Dysphagia or dyspepsia with alarm symptoms - Upper GI bleeding without HDI - Severe anemia without HDI - Tissue acquisition needed for initiation of systemic therapy or surgery - Low-risk foreign body of the stomach - Benign stricture dilatation 	<ul style="list-style-type: none"> - Endoscopic treatment of LGD or early IMC in the esophagus or stomach - Duodenal polyp - Band ligation/non-emergency - Iron deficiency anemia - Achalasia (POEM, balloon dilatation) 	<ul style="list-style-type: none"> - BE without dysplasia or BE LGD after treatment surveillance - Surveillance for gastric atrophy or intestinal metaplasia - Post-endoscopic resection (including immediate endoscopy after resection) - After surgical resection of cancer - Surveillance of Lynch syndrome or other hereditary syndromes - Diagnosis of reflux disease, dyspepsia - Screening for EC, GC in high-risk patients - Bariatric GI endoscopy procedures (intra-gastric balloons, endoscopic sleeve gastropasty)
Lower GI tract	<ul style="list-style-type: none"> - Lower GI bleeding with HDI - Capsule/enteroscopy for urgent or emergent bleeding 	<ul style="list-style-type: none"> - Malignant colonic stricture stenting - Rectal bleeding - Melena after negative upper-GI endoscopy - Severe anemia without HDI - FOBT+ CRC screening - Large colonic polyps at high-risk of SMI 	<ul style="list-style-type: none"> - Iron deficiency anemia - gFOBT/FIT+ (outside national CRC screening program) 	<ul style="list-style-type: none"> - Surveillance for IBD - Post-polypectomy surveillance - Diagnosis of IBS-like symptoms - Screening for CRC
Biliary system	<ul style="list-style-type: none"> - Obstructive jaundice - Acute Ascending cholangitis 	<ul style="list-style-type: none"> - Lymph node EUS sampling - Radiologic evidence of mass - Gallstone-related pancreatitis - Pancreatic mass/stricture - Biliary stricture dilatation - Pancreatico-biliary stent replacement for non-urgent indication - Necrosectomy 	<ul style="list-style-type: none"> - Lymph node EUS sampling - Pancreatic cyst (in function of the risk features) - Biliary stricture/no urgency (no cholangitis, no jaundice) - Submucosal lesion EUS sampling 	<ul style="list-style-type: none"> - Surveillance for PSC - Screening for pancreatic cancer

GI: Gastrointestinal; HDI: hemodynamic instability; HGD: High grade dysplasia; IMC: intramucosal cancer; PEG: Percutaneous Endoscopic Gastrostomy; PEJ: Percutaneous Endoscopic Jejunostomy; (g)FOBT: (gastric) Fecal Occult Blood Test; CRC: Colorectal cancer; SMI: Submucosal Invasion; EUS: Endoscopic Ultrasound; LGD: Low grade dysplasia; POEM: Peroral Endoscopic Myotomy; FIT: Fecal Immunochemical test; BE: Barrett Esophagus; EC: Esophageal cancer; GC: gastric cancer; IBD: Inflammatory Bowel Disease; IBS: Irritable Bowel Syndrome; PSC: Primary Sclerosing Cholangitis

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 (figure 6a) :

1. Disinfect hands with alcohol
2. Put on long nitrile gloves (second skin)
3. Put on an impermeable gown
4. Take 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 similar actions but in an altered sequence and every step is separated from another by disinfecting your hands with alcohol. The removal of disposable PPE happens inside the room, the recyclable items are removed outside of the room (eg, recyclable face shield, goggles and mask) (Figure 6b). Due its scarcity specialized cleaning and sterilisation programmes have been implemented for these items

after recollection. 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 of all staff 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

Taking a new pair of nitrile gloves outside of the room for the removal of the face shield, goggles and FFP2/3 mask in order to minimize possible transmission to the health care worker’s skin is recommended. Removal of the surgical hat, the shoe covers and disinfection of the hand with alcohol as final step are considered standard of care.

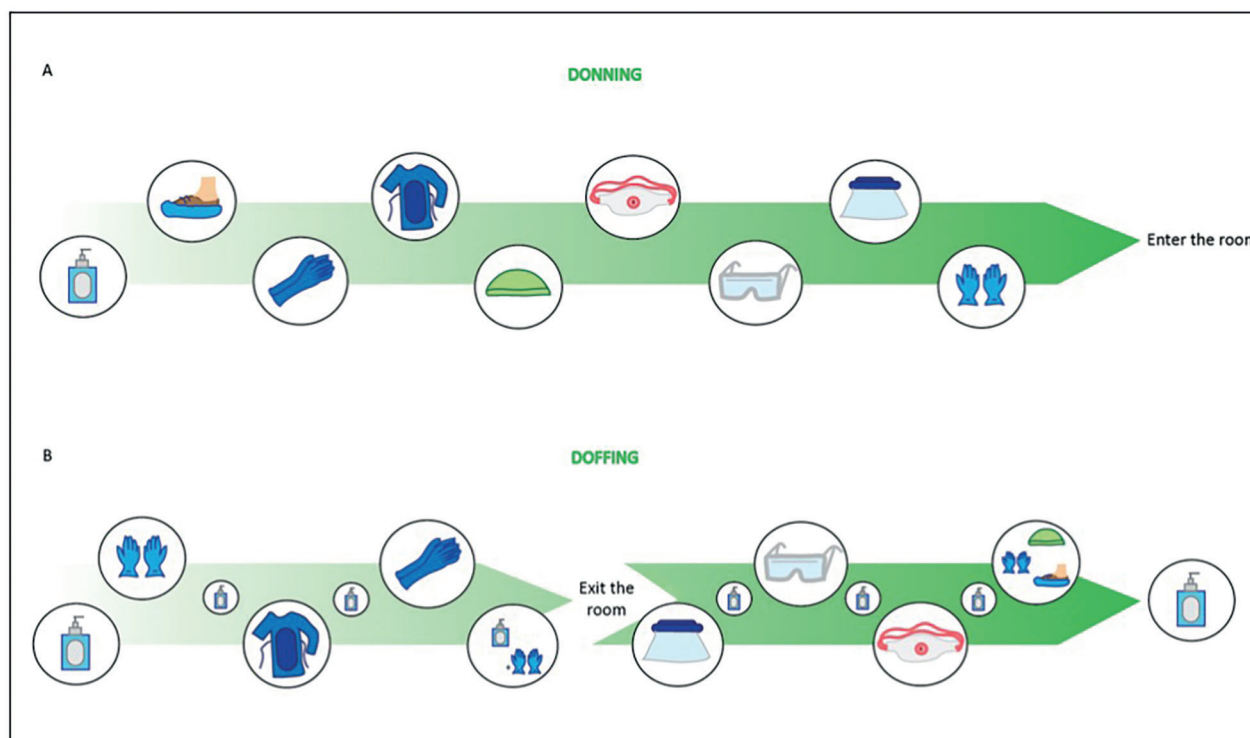


Figure 6. — Schematic visualization of the dressing (DONNING) and undressing (DOFFING) procedure for health-care professionals in case of contact with a COVID-19 positive or suspected COVID-19 patient

Donning procedure (before entering the room) : (1) disinfection of the hand, (2) shoe covers, (3) long non-sterile nitrile gloves, (3) impermeable gown, (4) take a surgical hat, (5) FFP2/3 mask, (6) goggles, (7) face shield and (8) second pair of short non-sterile nitrile gloves.

Doffing procedure (inside the room – disposable items) : take off (1) the short nitrile gloves, (2) the impermeable gown and (3) long non-sterile 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): Remove (1) the face shield, (2) the goggles, (3) the FFP2/3 mask (4) take of the surgical hat and shoe covers 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.

Discussion

Our world was recently turned upside-down by the COVID-19 pandemic. Special measurements and strict rules have been imposed upon the entire world with impact on the socio-economical and medical world. General guidelines for a high-quality endoscopy and patient care had to be adjusted in short notice. With the experience from this first wave of COVID-19 we tried to summarize and represent these adjusted guidelines made by the endoscopic societies combined with our local tertiary experience and the results of a national survey amongst Belgian gastroenterologists on the practical approach of COVID-19 in our Belgian hospitals. With this report we aim to provide a clear and practical overview on the measures to be taken if COVID-19 would reoccur in the future.

Prevention of this infection and disease transmission is only possible with proper PPE measures and a good risk stratification of the patients to be treated. Current guidelines define two risk levels, high and low-risk patients based on mainly symptoms and risk factors and available RT-PCR tests (13,18). They do not specify what to do when RT-PCR is not available in asymptomatic patients without any risk factors. Based on the Belgian survey of the BSGIE we note that most of the Belgian hospitals consider an asymptomatic patient without ability of doing RT-PCR testing as a high-risk patient. Moreover, since data from UZ Leuven show 2% of asymptomatic patients with a positive RT-PCR testing, it seems advisable to consider these asymptomatic patients as a high-risk population.

A widespread screening and availability of serological tests might facilitate the current doubt on patients' COVID-19 status and the further planning of endoscopic procedures. The exact timespan between contagious and no-longer-contagious has still to be established. Therefore, we do not express ourselves about the minimum time of postponing as do the guidelines. Determination of IgG and IgM may be a possible solution for this current problem.

The major limitation of our recommendations and approach is the current lack of sustainable or validated data supporting our findings and recommendations. However, all endoscopic associations have made an effort to provide new and adjusted guidelines. Therefore, we tried to combine their recommendations with our suggested approach and the results of a national Belgian survey.

Secondly, as abovementioned we consider asymptomatic patients without available RT-PCR as high-risk patients, based on the 2% positivity in our local tertiary hospital. This approach could be criticized by the fact that a certain amount of these patient will be COVID-19 negative and therefore do not need to be approached with all of the scarce PPE.

Third, due to the continuous changes of governmental measures, the BSGIE decided to create and perform their survey in April 2020, when the COVID-19 outbreak

peaked in Belgium. It was recognized that this method has several shortcomings : (1) the risk of multiple completed surveys from the same endoscopy unit (as illustrated by the relatively high number of completed surveys coming from university hospitals) and (2) the non-uniform regional distribution of completed surveys (with 72% coming from Flanders). Officially, Belgium has 7 university hospitals, 79 classical general hospitals and 17 general hospitals with a university character (21). Moreover, many hospitals have multiple locations, which could explain some of the possible inconsistencies encountered during the analysis of the completed survey. However, due to the anonymous character of the survey, results cannot be traced back to specific hospitals or endoscopists.

Taking into account the abovementioned shortcomings, the survey has revealed some interesting differences in strategies coping with the COVID-19 outbreak in Belgian endoscopy units when compared to the official international guidelines of the different endoscopic societies. The results may also reflect different strategies in university and general hospitals. It seems that university hospitals relied more on patient screening whereas general hospitals relied primarily on PPE of endoscopy personnel. Reasons to explain these differences may be diverse. However, the most plausible explanation is probably the local availability or scarcity of rapid and reliable screening methods on the one hand, and of sufficient and correct PPE on the other hand during the peak of the COVID-19 outbreak in April 2020.

Conclusion

COVID-19 is a highly contagious new disease spreading via droplets but also present in the lower gastrointestinal tract. Thus, endoscopists are at high risk for transmission when performing GI endoscopy or nasogastric endoluminal procedures.

Although the first COVID-19 wave diminishes in Europe, new cases of COVID-19 have been reported in China and South-Korea after loosening their quarantine measures. Therefore, we would like to provide a holistic overview for gastroenterologists that can be used as practical guidance in preparing our gastroenterology and endoscopy clinic in case a second COVID-19 wave would occur. A correct protection of the entire team and patients with the imposed PPE measures is warranted to prevent further spreading and hazardous extra infections in times of COVID-19.

Authorship contribution

PS/RB/TM are responsible for the concept of this paper, wrote the manuscript and made the figure and table outlines.

All other authors provided valuable feedback, suggestions, validation of the procedures on the work floor and corrections to improve the quality of the manuscript.

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