



# Management of a COVID-19 patient in the endoscopy suite

Joseph D. Feuerstein, MD,<sup>1,\*</sup> Nadav Levy, MD,<sup>2,\*</sup> Liana Zucco, MBBS, MSc,<sup>2</sup> Lior A. Levy, MD,<sup>2</sup> Mandeep Sawhney, MD,<sup>1</sup> Satya Krishna Ramachandran, MD<sup>2</sup>

Since the COVID-19 pandemic started in December 2019, gastroenterologists have had to rapidly evolve their endoscopy practice to ensure the safety of endoscopy team members and their patients. Because the virus is transmitted via droplets and potentially via airborne inhalation of aerosolized particles, endoscopic procedures performed on patients with confirmed or suspected COVID-19 increase the risk of transmission to healthcare providers.

To minimize the risk of exposure among healthcare workers and patients, protocols and algorithms to reduce inadvertent transmission of the disease is critical. In this article, we review the workflow that was developed by the coordinated efforts of the Department of Anesthesia and the Division of Gastroenterology at Beth Israel Deaconess Medical Center in Boston (Video 1, available online at [www.VideoGIE.org](http://www.VideoGIE.org)). For this workflow, patients with suspected COVID-19 and COVID-19–positive patients are treated as the same and are referred to as COVID-19 patients.

## INDICATIONS

Given the risks of transmission of COVID-19 during endoscopic procedures, especially upper endoscopy, one should consider performing only those procedures that are emergent or urgent.<sup>1</sup> Emergent or urgent procedures are typically those that require potentially immediate therapeutic intervention or cases in which the procedure is necessary to make an immediate change in clinical management. If the indication fails to meet 1 of these 2 criteria, if it is safe to do so, one should consider delaying the procedure or using another nonendoscopic technique to aid in diagnosis or treatment.

## WORKFLOW DIAGRAMS AND TRAINING

Because the protocols being instituted for safe endoscopy in COVID-19 patients are new, it is critical to develop flow diagrams, cognitive aids, and simulation models (Figs. 1 and 2). Often multiple plan-do-study-act models are needed to develop the optimal process. Training with live simulation models on how the process should run is crucial to ensuring the endoscopy team understands the new protocols and can perform tasks seamlessly.

## ON ARRIVAL TO THE ENDOSCOPY UNIT

When arriving at the facility, one should put on a new facemask. In addition, it is advisable to change into a clean pair of scrubs and keep home clothing unexposed to potential COVID-19. All work areas should be carefully disinfected with a product effective against SARS-CoV-2 (<https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>). Consider repeated cleaning of the work area on a regular basis throughout the day. Even when wearing a facemask, one should maintain physical distancing in workroom areas and attempt to keep individuals as far apart as possible.

## PROCEDURE CONSENT

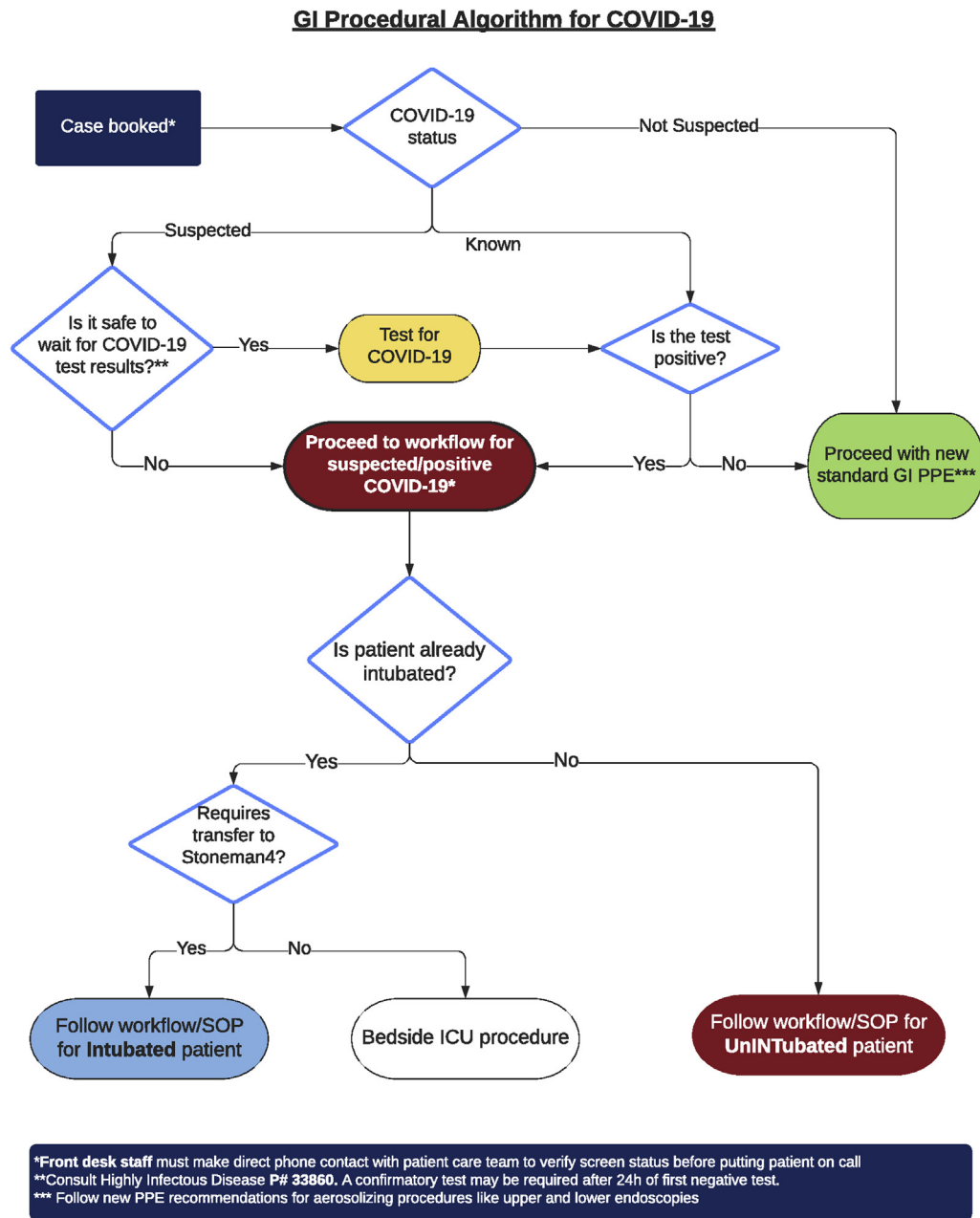
To reduce the risk and time of exposure of healthcare personnel to patients with COVID-19, consider obtaining all procedure consent verbally. This must be reviewed with one's local legal and compliance officers before being instituted.

## PREPROCEDURE CONSIDERATIONS

To reduce the risk of exposure to droplets from COVID-19, a negative-pressure endoscopy room is preferred. If a negative-pressure room is not available, high-efficiency particulate air filters should be used. Ideally, all nonessential equipment should be removed from the room.<sup>1</sup> Any equipment essential to the procedure or nonessential equipment that cannot be moved should be covered in clear plastic drapes to minimize potential contamination of the equipment. Equipment should be stored outside the room and communications (eg, walkie-talkie) should be set up so individuals in the room can contact the "runners" outside the room to prepare any necessary equipment. Once equipment is brought into the endoscopy room, it should be discarded, even if unopened. Alternatively, equipment can be kept in a double bag; then, if the equipment is not used, one can discard the outer bag only.

One should consider intubation for all endoscopic procedures (especially upper endoscopic procedures) to reduce the risk of droplet exposure.

Proper signage should be placed on the endoscopy room door indicating that an aerosol-generating procedure



**Figure 1.** GI procedural algorithm for COVID-19. *PPE*, Personal protective equipment; *ICU*, intensive care unit; *SOP*, standard operating procedures.

is being performed and not to enter the room. Consider marking a large square immediately outside the room as a buffer zone and an area to doff personal protective equipment (PPE).

Before starting the procedure, all team members should huddle to review the planned procedure. The huddle should be done in person with physical distancing or virtually. Team members should identify themselves and their role (eg, endoscopist, anesthesiologist, nurse, technician, runner). A safety officer should be identified; the safety officer will be responsible for ensuring proper

donning and doffing of PPE and monitoring the outside door to the endoscopy room to make sure no one enters the room without proper PPE. Discussions during the huddle should include the following: which personnel will be in the room versus outside the room, what procedure is planned and what equipment will be needed in the room or prepared outside the room, patient disposition, and whether any additional resources are needed (eg, environment services). Finally, one should check whether any team members have questions or concerns.

GI - Workflow for a COVID-19 case – UnIntubated PATIENT			
<b>Pre-procedure Huddle &amp; Room Preparation</b> Team members designated to be in the procedure room should huddle ASAP after the case is booked (in person or virtually): <input type="checkbox"/> Designated Team leader <input type="checkbox"/> Anesthesia provider assigned for case <input type="checkbox"/> Anesthesia runner <input type="checkbox"/> GI attending and Fellow <input type="checkbox"/> RN <input type="checkbox"/> Interventional tech & anesthesia tech <input type="checkbox"/> Outside door runner <input type="checkbox"/> GI resource nurse & PACU nurse <input type="checkbox"/> Designated safety officer to prevent any entry without PPE <input type="checkbox"/> Designated anesthesia Airway team member (optional)  <input type="checkbox"/> Print and display signage outside all doors to the designated procedure room (STDP and PPE posters)  <b>Anesthesia prep:</b> <input type="checkbox"/> Confirm anesthesia plan (GA/MAC) <input type="checkbox"/> Confirm if OR/Procedure Room is ready <input type="checkbox"/> Cover anesthesia machine and Omnicell <input type="checkbox"/> Ensure additional HME/ on expiratory limb of anesthesia circuit <input type="checkbox"/> Prepare required airway equipment onto a designated cart, including an HME filter, Ambu bag & Kelly clamp in case of disconnection, extubation or ventilatory failure <input type="checkbox"/> Prepare required drugs onto a second cart inside the OR <input type="checkbox"/> Confirm which supplies/drugs may be required outside the OR  <b>Procedure prep:</b> <input type="checkbox"/> Procedure staff physically verify & confirm the setup for case <input type="checkbox"/> Confirm supplies required inside the room <input type="checkbox"/> Confirm supplies that may be required outside the room  <b>Preoperative Consent, H&amp;P</b> <input type="checkbox"/> Confirm pre-procedure phone consents and H&P are completed <input type="checkbox"/> RN completes pre-operative intake forms <input type="checkbox"/> GI front desk contacts patient care team for ETA if applicable  <b>Prepare for intubation (if required)</b> <input type="checkbox"/> Schedule designated Airway Team Member if needed*  <b>Prepare for transfer into the Procedure Room</b> <input type="checkbox"/> Identify transfer team members based on patient location <input type="checkbox"/> Confirm route & ensure it is clear of all moveable obstacles Contact ICP (Pg. 94277) to clarify start & stop time for HEPA filter Contact EVS (Pg. 92746 East, 92745 West) to inform case start  <b>Ensure correct PPE is worn by all members**</b>	<b>Transfer into the Procedure Room</b> <input type="checkbox"/> Directly transfer patient into the procedure room <input type="checkbox"/> Do NOT bring patient to holding/PACU areas <input type="checkbox"/> Confirm that the patient is wearing a surgical mask <b>If transporting from ICU:</b> <input type="checkbox"/> Pre-transfer huddle inside patient room with transfer team <input type="checkbox"/> Direct transfer into procedure room <input type="checkbox"/> Call GI desk to confirm patient is en-route <input type="checkbox"/> Continue current infusions, per clinical indication <input type="checkbox"/> Transport monitor – use monitoring brick from patient room <input type="checkbox"/> Transfer members verify patient and staff PPE is per code <b>If arriving from Med-Surg Floor:</b> <input type="checkbox"/> GI desk calls for patient when procedural staff is ready  <b>GI HARD STOP</b> <input type="checkbox"/> Team members present with appropriate PPE & lead (if applicable) <input type="checkbox"/> Anesthesia provider <input type="checkbox"/> GI attending / fellow <input type="checkbox"/> Interventional technician <input type="checkbox"/> RN <input type="checkbox"/> Airway Team member (as required) <input type="checkbox"/> GI Safety checklist initiated by RN <input type="checkbox"/> Ensure HEPA filter is turned ON  <b>Anesthesia Induction</b> <b>If MAC</b> <input type="checkbox"/> All procedural team members present per usual <b>If GA/intubation</b> <input type="checkbox"/> Follow SOP for intubation of COVID-/PUI patient <input type="checkbox"/> Maximum 3 staff in attendance in room with patient: <input type="checkbox"/> Primary anesthesia provider <input type="checkbox"/> Assisting anesthesia provider <input type="checkbox"/> RN (not present if RT is in room) <input type="checkbox"/> All other staff briefly exit the room – doffing not necessary <input type="checkbox"/> Use anesthesia machine as per usual, adjust settings through plastic covering  <b>Transfer patient to procedural table</b> <input type="checkbox"/> If supine, avoid disconnecting ETT from circuit <input type="checkbox"/> If prone position required, follow below steps in sequence: <input type="checkbox"/> Place bite-block PRIOR to prone <input type="checkbox"/> Preoxygenate for 3 minutes with 100% O2, turn OFF ventilator, clamp the ETT, prone, reconnect ventilator after appropriate positioning, remove clamp, RESTART ventilator <input type="checkbox"/> In room team strips linen off bed & pushes bed into hallway <input type="checkbox"/> GI technicians decontaminate patient bed immediately in hallway	<b>Endoscopic Procedure</b> <input type="checkbox"/> Procedural time-out, as usual <input type="checkbox"/> Designated safety officer and runner stay outside during case <b>Communication during case:</b> <input type="checkbox"/> In room team uses hospital phone/intercom to contact outside support <input type="checkbox"/> GI proceduralist to alert staff BEFORE scope extraction <b>Handling in supplies or drugs</b> <input type="checkbox"/> Place onto designated cart immediately outside procedure room <input type="checkbox"/> Inside RN opens procedure room door & collects supplies or drugs  <b>Inadvertent Extubation</b> <input type="checkbox"/> Oxygenation: HME filter must be present between facemask & anesthesia circuit/Ambu bag <input type="checkbox"/> Runner calls CODE BLUE, verifies PPE available for Code team <input type="checkbox"/> If patient is in prone position: runner pushes stretcher into procedure room and procedure team repositions patient <input type="checkbox"/> Early re-intubation or insertion of f-gel with gentle mask ventilation  <b>**PPE for staff involved with care</b> <b>In the procedure room</b> All staff                      N95 respirator + eye protection + gown + head covering + double gloves +/- leg covers <b>Out of the procedure room</b> Anesthesia and nurse runner                      Surgical mask + eye protection + gloves  <b>On transfer to/from ICU</b> Team leader                      Surgical mask + eye protection + gloves All transfer staff except team leader                      N95 respirator + eye protection + gown + head covering + double gloves +/- leg covers Patient                      Surgical facemask  <b>Location of Donning</b> In clean area near or in procedure suite  <b>Doffing</b> <input type="checkbox"/> Ensure a buddy is present to observe doffing	<b>End of Case</b> <b>Team leader confirms the return pathway, choosing one of the options below</b> <input type="checkbox"/> Confirm members and roles for subsequent care <input type="checkbox"/> End of case sign out, as usual <input type="checkbox"/> Call scope room 374-7-5568, 373-7-5484 to inform technician to prepare for incoming used scope <b>At case end, if planning to extubate</b> <input type="checkbox"/> Page PACU nurse to be ready for post-op care <input type="checkbox"/> PACU nurse to identify 1 additional inside aide and 1 additional outside runner to assist with care <b>If planning to transfer to ICU</b> <input type="checkbox"/> Call ICU to notify of case finish  <b>Option 1 (Extubate &amp; recover in procedure room)</b> <input type="checkbox"/> Staff not involved with extubation may doff PPE & exit <input type="checkbox"/> Primary anesthesiologist performs extubation, per COVID-19 airway management SOP, assisted by 2 other staff members in the room (GI fellow, RN) <input type="checkbox"/> Discard airway supplies and seal equipment <input type="checkbox"/> PACU nurse dons PPE and enters room <input type="checkbox"/> GI fellow & RN doff PPE and leave room <input type="checkbox"/> Certain logistical situations may necessitate transfer of the patient after extubation to a designated COVID room for further recovery <input type="checkbox"/> Patient PPE must be maintained for the transfer <input type="checkbox"/> Place an O2 mask over the surgical mask <b>Option 2 (patient remains intubated; transfer to ICU)</b> <input type="checkbox"/> Patient is moved to ICU, with transfer team <input type="checkbox"/> Follow transfer protocol for intubated patient <input type="checkbox"/> Ventilation during transfer: Ambu bag + HME filter <input type="checkbox"/> Staff members not on transfer may doff PPE and exit procedure room  <b>Post-procedure Care</b> <input type="checkbox"/> Anesthesia staff to remain with PACU nurse until RN is comfortable with patient status <input type="checkbox"/> When appropriate, anesthesia staff doffs and leaves room <input type="checkbox"/> PACU nurse manages care until patient is ready for transfer back to non-ICU bed <input type="checkbox"/> When appropriate, patient is moved to hospital room or discharged <input type="checkbox"/> Contact EVS (Pg. 92746 East, 92745 West) to inform end of recovery care  <b>End of Case – Decontamination</b> <b>Refer to Room Turnover for suspected or confirmed COVID-19</b>

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Workflow v12\_4/12/2020

HARVARD MEDICAL SCHOOL  
TEACHING HOSPITAL

Figure 2. GI workflow for a COVID-19 case—unintubated patient.

**DONNING PPE**

PPE is only effective if donned properly. The safety officer should monitor the process carefully and stop the donning process if any concerns are noted. The key steps to proper donning are as follows:

1. Remove all nonessential/personal equipment.
2. Perform hand hygiene: wash your hands with soap and water or hospital-approved hand sanitizer.
3. Apply head cover.
4. Apply N95 respirator and ensure adequate seal.
5. Apply eye protection (or a secondary facemask with eye shield over the N95 respirator).
6. Perform hand hygiene.
7. Apply shoe covers (option to apply leg covers, if available).
8. Don and secure impermeable gown.
9. Don 2 sets of gloves on each hand, ensuring wrists are covered.
10. Confirm with safety officer that all PPE is donned correctly.

**PATIENT ARRIVAL**

COVID-19 patients should be brought directly into the procedure room while wearing a surgical facemask. Shared spaces should be avoided. The procedure team should all be in full PPE when entering the room to speak to the patient.

**PROCEDURE**

A timeout should be performed, and all nonessential personnel should exit the room during intubation to limit the number of people exposed during intubation. Outside the room, personnel should stand in the “buffer zone” and avoid touching the doors. Once intubation is complete, the nurse in the room can open the door, allowing re-entrance to the room. If equipment is needed, the nurse can call to a runner outside the room to prepare the equipment. Equipment can be prepacked in kits, like a bleeding kit (sclerotherapy needle and endoclips). The nurse will open the inner door when the equipment is ready and receive it from the runner outside. When inserting and removing instruments from the endoscope channel, turn the handle left and down to minimize potential exposure during this process. Using gauze to cover the instrument channel on removal may be helpful. Once the procedure is nearing completion, the endoscopist should advise the team that the scope is being withdrawn. Using gauze to cover the endoscope, suctioning secretions on withdrawal, and having the nurse cover the mouth with gauze are all advisable.

**MANAGEMENT OF ADVERSE EVENTS**

The provider’s safety is the priority. Make sure that responders to a CODE call do not enter the room if PPE is not appropriately donned. Management of an adverse event/CODE should proceed according to local protocols.

## DOFFING OF PPE

If an area outside the room is designated as the “buffer zone” or “doffing box,” PPE should be removed in this area, as follows:

1. Remove shoe covers (and/or leg covers if present).
2. Remove gown and gloves and then perform hand hygiene.
3. If wearing an eye shield, remove eye shield and perform hand hygiene.
4. Remove outer facemask and perform hand hygiene.
5. Remove N95 while leaning slightly forward, discard N95, and perform hand hygiene.
6. Remove bouffant and perform hand hygiene.
7. Apply a clean facemask and perform hand hygiene.
8. Ensure the safety officer is supervising the doffing sequence.

## POSTPROCEDURE CONSIDERATIONS

After the procedure, the room should be left closed for 30 minutes to reduce any exposure to procedure-related droplets that might remain aerosolized. The room and endoscope can then be disinfected using routine hospital/institutional protocols for cleaning rooms and endoscopes.<sup>2</sup>

## CONCLUSION

To keep providers safe during endoscopic procedures during the COVID-19 pandemic, it is critical that protocols

are developed to maintain proper PPE and limit the risk of exposures. Simulations and flow diagrams are important tools to train staff on how to perform endoscopy safely.

## DISCLOSURES

*All authors disclosed no financial relationships.*

*Abbreviation: PPE, personal protective equipment.*

## REFERENCES

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Division of Gastroenterology, Department of Medicine, Beth Israel Deaconess Medical Center, Boston, Massachusetts (1), Department of Anesthesia, Critical Care & Pain Medicine, Beth Israel Deaconess Medical Center, Boston, Massachusetts (2).

\*Drs Feuerstein and Levy contributed equally to this article.

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