B.C. Aerosol Generating Medical Procedure (AGMP) Expert Group Decision Summary: Upper Gastrointestinal Endoscopy

May 10, 2021

This decision summary is intended for health-care providers. It is based on known evidence as of March 8, 2021.

Request and Interim Decision

The B.C. AGMP expert group reviews medical procedures being performed on patients with suspected or confirmed COVID-19 in health-care settings in B.C. The expert group does not provide personal protective equipment (PPE) guidance.

The B.C. AGMP expert group received a request from the provincial Gastrointestinal Endoscopy Advisory Committee to determine if upper gastrointestinal (GI) endoscopy is an aerosol generating medical procedure (AGMP).

The B.C. AGMP expert group determined that upper GI endoscopy is a possible AGMP given that airway intervention may be required during the procedure and as there is emerging albeit limited evidence of potentially increased aerosol generation from an upper GI endoscopy procedure.

Recognizing that evidence is evolving, the B.C. AGMP expert group will re-evaluate the evidence and this interim decision regularly.

B.C. AGMP Expert Group Review

Evidence Review

The B.C. AGMP expert group conducted a literature search to identify relevant primary evidence, review articles, and guidelines/recommendations from governing bodies, medical societies and other expert groups (see appendix A on page 3).

Assessment

The B.C. AGMP expert group assessed the search results for evidence quality and source using the provincial AGMP decision framework. The group acknowledges that there exists emerging evidence indicating aerosol generation from conducting an upper GI endoscopy procedure. However, the group was not able to find any studies that suggested nosocomial transmission of infection to health-care workers (HCWs) has occurred when performing upper GI endoscopy.

Out of an abundance of caution, the AGMP expert group has determined upper GI endoscopy as a possible AGMP. It is recommended that HCWs continue to conduct a point-of-care risk assessment (PCRA) prior to this procedure to help determine if additional measures are needed to minimize risk.

Considerations

The B.C. AGMP expert group recognizes a number of considerations outside of upper GI endoscopy alone that may vary between patients and environmental contexts and would play a role in the overall aerosol generation.

Firstly, there are instances where separate AGMPs could be performed during or before the actual procedure. A small number of upper GI endoscopies are done under general anesthesia requiring endotracheal intubation, which is considered an AGMP. Most are done under procedural sedation directed by the gastroenterologist with no secondary sedation provider or designated airway manager. Although rare, there could be instances in which a patient becomes apneic and requires ventilatory support, and it would be the gastroenterologist who may have to provide bag valve mask ventilation, a procedure which is considered an AGMP.

Secondly, there is inconclusive evidence surrounding the aerosol generating risk involved in the suctioning that occurs during the procedure. Oral airway suctioning is cited by some expert groups as a reason for considering upper GI endoscopy as an AGMP. However, a paper by Chan et al. (2020) suggests that oral airway suctioning decreases particle generation. There is little evidence regarding the aerosol generating risk involved in the deeper suctioning of the GI tract that occurs during exsufflation.

Finally, due to the nature of the procedure, patients frequently cough, belch or retch without any source control (e.g., masking). Induction of such reactions alone do not warrant automatic classification of a procedure as an AGMP. However, other engineering and administrative factors, such as a room's available controls for airflow management and the number of patients seen in rapid sequence that would add to the particles produced in the same room, contribute to the overall risk of aerosol exposure to the providers. Such factors vary across clinical contexts.

Thus, the group recommends that point-of-care risk assessments be done to inform PPE use.

Appendix A: Evidence Pertaining to Upper GI Endoscopy and AGMP Status

Search date: October 3, 2020
Additional articles added: January 6, 2021

Objective

To summarize the current evidence to inform recommendations pertaining to upper GI endoscopy and AGMP status.

Methods

The B.C. AGMP expert group searched databases (Cochrane, PubMed, Google Scholar) for relevant primary evidence, review articles and guidelines/recommendations from governing bodies, medical societies and other expert groups.

Search terms used:
The B.C. AGMP expert group used "aerosol generating medical procedure" OR "aerosol generating procedure" OR "aerosol" AND "endoscopy" OR "esophagogastroduodenoscopy" in the search.

Results

Findings from the literature search ultimately identified seven relevant articles (summarized in table 1) and 18 guidelines/recommendations (summarized in table 2). Less relevant references used as support for the stances taken in the guidelines/recommendations are summarised within the references used column of table 2.

Out of the seven articles, three (by Garbey et al. (2020), Chan et al. (2020), and Sagami et al. (2021)) provided some empirical evidence for aerosol generation during upper GI endoscopy. The other four articles did not provide sufficient evidence to support the classification of the procedure as an AGMP.

Out of the 18 guidelines and recommendations documents, 11 were from medical societies, three were from government bodies and four were from expert/expert groups. Of these:

- Twelve explicitly consider upper GI endoscopy as an AGMP.
- Three do not explicitly consider upper GI endoscopy as an AGMP but recommend the use of respirators.
- One considers it as an AGMP but recommends risk stratifying the use of N95s.
- One considers it an AGMP but recommends against the use of N95s.
- One suggests that AGMP status is contingent on if insufflation is an AGMP.

Of these guidelines and recommendations documents:

- None used the three articles containing the empirical evidence to support their conclusions.
- Six did not provide any references.
- Four provided only other guidelines/recommendations documents as references.
- Four used other guidelines/recommendations documents and articles that do not actually provide sufficient evidence.
- Four only used articles that do not provide sufficient evidence.

Instead, common themes cited in these guidelines and recommendations to support the categorization of upper GI endoscopy as an AGMP include patient coughing/retching, proximity between the provider and the patient and the use of open airway suctioning and insufflation during endoscopy.

Conclusion

Most guidelines and recommendations documents from medical societies, government bodies and other expert groups do not provide references to studies that would allow the expert group to make definitive conclusions regarding upper GI endoscopy as an AGMP. Instead, they use other guidelines and recommendations or articles with insufficient evidence as references.

However, there was some empirical evidence from three recent studies conducted during the ongoing pandemic that demonstrate aerosol generation during upper GI endoscopy. How this level of aerosol generation compares to that from typical activities (e.g., talking and coughing) and how it further translates to COVID-19 transmission is not yet fully clear.

Table 1: Primary Evidence Found and Referenced in Recommendations/Guidelines

	Article Title and Authors	Findings
1	Gastroenterology Procedures Generate Aerosols: An Air Quality Turnover Solution to Mitigate COVID-19's Propagation Risk Garbey et al., Nov 2020.	Using a laser particle counter that continuously monitors airborne particle counts, including small particles defined as 0.5-2.5 µm, airborne particle counts before and during 594 esophagogastroduodenoscopies (EGDs) were measured, with particle counts immediately following sedation being the highest. Ratio of small particle counts during as compared to/ before the procedure is >1 for most EGDs. Initial phase of procedure releases the most aerosols. It is unclear how much of the aerosols are produced from patient coughing at the beginning of the procedure.
2	A Proof of Concept Study: esophagogastroduodenoscopy Is an Aerosol-Generating Procedure and Continuous Oral Suction During the Procedure Reduces the Amount of Aerosol Generated Chan et al., Nov 2020.	Measurements of particle sizes of 0.3 µm, 0.5 µm, 0.7 µm, 1 µm, 5 µm and 10 µm were taken 10cm from 93 patients' mouths before and during EGD. During the EGD procedure, the level of particle counts per cubic feet of all sizes was significantly higher than during the baseline period. Use of the dental sucker (continuous oral suction) significantly reduced the number of particles sized 0.3 µm, 0.5 µm, 0.7 µm, 1 µm, 5 µm and 10 µm expelled during the procedure compared with baseline, although it is unclear if this is due to reduction in oral secretions, and thus reduction in coughing, or due to direct suctioning of particles in the airway. Conscious sedation was not able to reduce the amount of aerosol and droplets generated during the procedure. There was still a surge of all particle sizes during general anesthesia.
3	Aerosols Produced by Upper Gastrointestinal Endoscopy: A Quantitative Evaluation Sagami et al., Jan 2021.	Measurements of 0.3-10 µm particles were taken for 103 patients before, during and after upper GI endoscopy and at the same time points for 90 control patients undergoing a simulated procedure. Aerosols increased significantly in the endoscopy group compared with the control group. The increased aerosol count was also significantly higher during and after endoscopy, compared with before endoscopy. It is suggested that belching is a significant source of the increased aerosols.
4	Risk of Bacterial Exposure to the Endoscopist's Face during Endoscopy Johnston E et al., April 2019.	Significantly increased colony-forming units detected on face shields of endoscopists post-endoscopy compared to controls. Provides strong evidence of sprays of droplets directed to health-care worker during endoscopy, but methods used were not focused on assessing generation of droplets smaller than 30 µm.
5	Mucocutaneous Exposure to Body Fluids during Digestive Endoscopy: The Need for Universal Precautions Mohandas, K M et al., 1999.	Splash of bodily fluids on endoscopist mucosa and skin occurs during endoscopy. Splashing was detected in 13% of cases studied. Unclear if there was a control of some sort to determine baseline risk of a patient simply coughing without any medical intervention. This paper is clearly talking about large droplets, not small aerosols.

	Article Title and Authors	Findings
6	Air Suctioning during Colon Biopsy Forceps Removal Reduces Bacterial Air Contamination in the Endoscopy Suite Vavricka et al., Sept 2010.	Bacterial aerosols during colonoscopy. Droplet size of aerosol samples collected not mentioned, sampler does not differentiate between droplets and droplet nuclei. Speculates that endoscopy generates aerosols, but no references ("*We cannot prove that endoscopy-related bacterial aerosols are responsible for nosocomial infections; our explanations regarding the spread of enterococci are, as yet, only speculative*.") The size cut-off for the MAS100 is about 1.7 µm according to https://www.tandfonline.com/doi/pdf/10.1080/02786820600729146. It will collect everything larger than this size, so the average size of the droplets collected here will likely be much larger, well above 10 µm.
7	COVID-19 and the Risk to Health Care Workers: A Case Report Ng et al., Jun 2020.	Endoscopy was not one of the AGMPs performed in this case report but the procedures performed could be expected to be similar or possibly higher risk as they included: "*endotracheal intubation, extubation, non-invasive ventilation, and exposure to aerosols in an open circuit*." "*In the situation we describe, 85% of health care workers [(a total of 41 HCWs in this case report)] were exposed during an aerosol-generating procedure while wearing a surgical mask, and the remainder were wearing N95 masks. That none of the health care workers in this situation acquired infection suggests that surgical masks, hand hygiene, and other standard procedures protected them from being infected. Our observation is consistent with previous studies that have been unable to show that N95 masks were superior to surgical masks for preventing influenza infection in health care workers (5). We emphasize, however, that nearly all experts recommend that health care workers wear an N95 mask or equivalent equipment while performing an aerosol-generating procedure*."

Table 2: Guidelines and Recommendations from Governing Bodies, Medical Societies and Other Expert Groups

	Agency/Article Type	Title/Author	Stance on Upper GI Endoscopy as an AGMP	Statements on AGMP and Upper GI Endoscopy	References Used Pertaining to Statements on AGMP and Upper GI Endoscopy
A	Canadian Association of Gastroenterology	COVID-19: Advice from the Canadian Association of Gastroenterology for Endoscopy Facilities, as of March 16, 2020 Tse F et al., Mar 2020.	Yes	*"Aerosol-generating medical procedures carry a high risk of COVID-19 transmission. Upper GI procedures are considered high-risk procedures."*	Repici et al., 2020.
B	American Gastroenterological Association	AGA Rapid Recommendations for Gastrointestinal Procedures During the COVID-19 Pandemic Sultan et al., Aug 2020.	Yes	*"We assume that insertion of the endoscope into the pharynx and esophagus is likely to be associated with a similar risk of aerosolization of respiratory droplets to that of bronchoscopy."*	Johnston E et al., 2019. Mohandas, K M et al., 1999. Vavricka et al., 2010. van den Broek (2010) expert opinion on colonoscopy forceps use, that there is no "*proof by hard data that air is a relevant route of transmission in the endoscopy room*."
C	European Society of Gastrointestinal Endoscopy	European Society of Gastrointestinal Endoscopy. ESGE and ESGENA Position Statement on Gastrointestinal Endoscopy and the COVID-19 Pandemic Gralnek et al., Jun 2020.	Yes	*"Periendoscopic aerosolized infections have been reported, making upper GI endoscopy a high-risk procedure."*	Tang et al. (2006) does not mention endoscopy. Parodi et al.(2020) does not mention endoscopy. Repici et al., Jul 2020. Lui et al. (2020) a review of endoscopy guidelines. Sultan et al., 2020. Stodd, 2020. Penman et al., 2020.

	Agency/Article Type	Title/Author	Stance on Upper GI Endoscopy as an AGMP	Statements on AGMP and Upper GI Endoscopy	References Used Pertaining to Statements on AGMP and Upper GI Endoscopy
D	American Association for the Study of Liver Diseases American College of Gastroenterology American Gastroenterological Association American Society for Gastrointestinal Endoscopy	Joint Gastroenterology Society Message: COVID-19 Use of Personal Protective Equipment in GI Endoscopy Stodd, April 2020.	Yes	*"All endoscopic procedures should be considered aerosol-generating procedures (AGP) owing to the possibility of coughing and retching during upper endoscopy and the passage of flatus during colonoscopy. In addition, all endoscopic procedures are at risk of generating aerosol and micro-droplets by the very design, function and leakage of the instruments, valves, ports and air pressures during inflation and suction."*	Wu et al. (2020) an early review of what was known about SARS-CoV-2, which at the time was no evidence for aerosol transmission. Bouroulba L et al. (2014) (paper on sneeze droplet fluid mechanics). Van Doremalen et al. (2020) (Goldberg drum aerosolization paper does not tell us endoscopy risk). Soetikno et al., 2020. No references provided for second sentence regarding inflation and suction.
E	American Society for Gastrointestinal Endoscopy	Coronavirus (COVID-19) Outbreak: What the Department of Endoscopy Should Know Repici et al., Jul 2020.	Implied yes	Suggests respirator masks for endoscopy.	Johnston E et al., 2019.
F	Gastroenterological Society of Australia	Gastroenterological Society of Australia (GESA) Updated Advice on Preventative Measures during Gastrointestinal (GI) Endoscopic Procedures during the COVID-19 Pandemic	Implied yes	Recommends surgical mask for low risk endoscopy, respirator only for high-risk endoscopy.	Ng et al., 2020. Department of Health, Australian Government, Nov 2020.

	Agency/Article Type	Title/Author	Stance on Upper GI Endoscopy as an AGMP	Statements on AGMP and Upper GI Endoscopy	References Used Pertaining to Statements on AGMP and Upper GI Endoscopy
		Devereaux et al., May 2020.			
G	Italian Society of Digestive Endoscopy	Safety in Digestive Endoscopy Procedures in the COVID era Recommendations in Progress of the Italian Society of Digestive Endoscopy Galloro et al., Aug 2020.	Yes	*"As we mentioned above, all endoscopic procedures must be considered as activities at very high-risk of infection because of the prolonged and close contact with the patients, their salivary droplets and body fluids, and of the generation of aerosols.* *The aerosol generation suggests that endoscopic procedures may contribute to the nosocomial transmission of COVID-19."*	Soetikno et al., 2020. Sultan et al., Aug 2020. Knowlton et al. (2018) article on toilet flushing Chapman (2001) "Hot Air?", an anecdote about flatus Chan et al. (2020) was the first article to confirm person-to-person transmission of SARS-CoV-2. Van Doremalen N et al. (2020) Ong et al. (2020).
H	British Society of Gastroenterology (BSG) Joint Advisory Group (JAG) The Association of Coloproctology of Great Britain and Ireland (ACPGBI) Association of Upper Gastrointestinal Surgeons (AUGIS) Pancreatic Society of Great Britain and Ireland (PSGBI) The British Society of Gastrointestinal and Abdominal Radiology (BSGAR)	Endoscopy Activity and COVID-19: BSG and JAG Guidance Penman et al., Mar 2020.	Yes	*"We believe that GI endoscopy of all kinds, but especially upper procedures, are aerosol generating procedures (AGP)."*	Public Health England, COVID-19 Infection Prevention and Control Guidance: Aerosol Generating Procedures, 2021.

	Agency/Article Type	Title/Author	Stance on Upper GI Endoscopy as an AGMP	Statements on AGMP and Upper GI Endoscopy	References Used Pertaining to Statements on AGMP and Upper GI Endoscopy
	UK and Ireland EUS Society (UKI-EUS) Scottish Society of Gastroenterology (SSG) Welsh Association of Gastroenterology and Endoscopy (WAGE) Ulster Society of Gastroenterology (USG)				
I	Public Health England	COVID-19 Infection Prevention and Control Guidance: Aerosol Generating Procedures Public Health England, Jan 2021.	Yes	Upper GI endoscopy is listed as a medical procedure reported to be aerosol generating and associated with an increased risk of respiratory transmission.	Health Protection Scotland, "Assessing the Evidence Base for Medical Procedures which Create a Higher Risk of Respiratory Infection Transmission from Patient to Healthcare Worker," 2020.
J	National Services Scotland	Assessing the Evidence Base for Medical Procedures which Create a Higher Risk of Respiratory Infection Transmission from Patient to Healthcare Worker Version 1.1. 16 Oct 2020 Health Protection Scotland, Oct 2020.	Yes	*"Procedures which are currently considered to create an increased risk of respiratory infection transmission and, therefore, require airborne precautions:* *[...]* *Upper gastro-intestinal endoscopy where there is open suctioning of the upper respiratory tract."*	No references provided. "No evidence of appropriate quality or strength was identified for the following procedures: […] Upper endoscopy"
K	British Society of Gastroenterology	COVID-19: BSG and BASL Advice for Healthcare Professionals in	Yes	*"AGP in this context means upper GI procedures and for patients who fall into this*	No references provided.

	Agency/Article Type	Title/Author	Stance on Upper GI Endoscopy as an AGMP	Statements on AGMP and Upper GI Endoscopy	References Used Pertaining to Statements on AGMP and Upper GI Endoscopy
		Gastroenterology and Hepatology Edwards et al., Mar 2020.		*category, enhanced PPE is recommended including FFP3 masks."*	
L	Department of Health, Australian Government	Guidance on the Use of Personal Protective Equipment (PPE) in Hospitals during the COVID-19 Outbreak Australian Government, Nov 2020.	Yes for AGPs performed on non-COVID-19 patients in operating theatre, emergency department, endoscopy suite	*"Given the relatively low prevalence of COVID-19 in Australia, […]* *A P2 respirator is not necessary in this context."*	No references provided.
M	Asian Pacific Society for Digestive Endoscopy	Practice of Endoscopy during COVID-19 Pandemic: Position Statements of the Asian Pacific Society for Digestive Endoscopy (APSDE-COVID Statements) Chiu et al., Jun 2020.	Contingent on if insufflation is an AGMP, recommending they may be treated as AGMP	*"Although there are no data on whether endoscopy is an aerosol-generating procedure, positive insufflation during endoscopic procedures could pose a risk of generating aerosol and increase the risk of SARS-CoV-2 transmission."*	No references provided.
N	The Romanian Society of Digestive Endoscopy (SRED) and the Romanian Association of Endoscopic Surgery (ARCE)	SRED-ARCE Recommendations for Minimally Invasive Interventions During the COVID-19 Pandemic in Romania Saftoiu et al., Jun 2020.	Yes	*"Endoscopic and laparoscopic procedures are included in the category of aerosol generating procedures, being considered procedures with an increased risk of medical staff contamination (up to 10-20% in some European countries), who can transmit the infection themselves, generating*	Repici et al., 2020.

	Agency/Article Type	Title/Author	Stance on Upper GI Endoscopy as an AGMP	Statements on AGMP and Upper GI Endoscopy	References Used Pertaining to Statements on AGMP and Upper GI Endoscopy
				epidemic micro-outbreaks at hospital or community level."	
O	Expert opinion	Considerations in Performing Endoscopy during the COVID-19 Pandemic Soetikno et al., Jul 2020.	Yes	*"All endoscopic procedures should be considered aerosol-generating procedures (AGPs). Coughing and retching can occur during upper endoscopy, generating aerosols."*	Johnston E et al., 2019.
P	Expert opinion	Gastrointestinal Endoscopy during COVID-19 Pandemic Ang, May 2020.	Implied yes recommends N95	*"It is prudent to wear full PPE, meaning N95 mask, eye protection with face shield or googles, water resistant gown and gloves routinely in all cases of GI endoscopy."*	No references provided.
Q	Expert opinion	Suggestions for Infection Prevention and Control in Digestive Endoscopy during Current 2019-nCoV Pneumonia Outbreak in Wuhan, Hubei Province, China Zhang Y et al. , Apr 2020.	Implied yes, recommends N95	*"Staff in the endoscopy center should achieve biosafety level 2 for all GI endoscopic procedures. Protection at biosafety level 3 is required for all endoscopic procedures in patients with confirmed or suspected 2019-nCoV infection, and for those with very high risk of potential exposure to 2019-nCoV, such as during tracheal intubation, airway care and sputum suction in non-infected patients."*	Richmond et al., (1999). Endoscopy not mentioned. Does state increased risk of SARS-COV-1 transmission with airway suctioning without further references. Bayot et al. (2020) general biosafety guidelines, endoscopy/suctioning not mentioned.
R	Expert opinion	Personal Protective Equipment during Endoscopy Mathew et al., Mar 2020.	Yes	*"Aerosolization of viral particles can occur during the insertion of an endoscope into the pharynx and during the insertion/removal of*	No references provided.

	Agency/Article Type	Title/Author	Stance on Upper GI Endoscopy as an AGMP	Statements on AGMP and Upper GI Endoscopy	References Used Pertaining to Statements on AGMP and Upper GI Endoscopy
				accessories through the biopsy channel."	

References

Primary Sources

1. Garbey, Marc et al. "Gastroenterology Procedures Generate Aerosols: An Air Quality Turnover Solution to Mitigate COVID-19's Propagation Risk." *International journal of environmental research and public health* vol. 17,23 8780. 26 Nov. 2020
2. Chan, Shannon Melissa et al. "A Proof of Concept Study: Esophagogastroduodenoscopy Is an Aerosol-Generating Procedure and Continuous Oral Suction During the Procedure Reduces the Amount of Aerosol Generated." *Gastroenterology* vol. 159,5 (2020): 1949-1951.e4.
3. Sagami, Ryota et al. "Aerosols Produced by Upper Gastrointestinal Endoscopy: A Quantitative Evaluation." *The American journal of gastroenterology* vol. 116,1 (2021): 202-205.
4. Johnston, Elyse R., et al. "Risk of Bacterial Exposure to the Endoscopist's Face during Endoscopy." *Gastrointestinal Endoscopy*, vol. 89, no. 4, 2019, pp. 818–24.
5. Mohandas, K M, and G Gopalakrishnan. "Mucocutaneous exposure to body fluids during digestive endoscopy: the need for universal precautions." *Indian journal of gastroenterology: official journal of the Indian Society of Gastroenterology* vol. 18,3 (1999): 109-11.
6. Vavricka, S R et al. "Air suctioning during colon biopsy forceps removal reduces bacterial air contamination in the endoscopy suite." *Endoscopy* vol. 42,9 (2010): 736-41.
7. Ng, Kangqi et al. "COVID-19 and the Risk to Health Care Workers: A Case Report." *Annals of internal medicine* vol. 172,11 (2020): 766-767. doi:10.7326/L20-0175

Guidelines and Recommendations from Governing Bodies, Medical Societies and Other Expert Groups

A. Tse, Frances et al. "COVID-19: Advice from the Canadian Association of Gastroenterology for Endoscopy Facilities, as of March 16, 2020." *Journal of the Canadian Association of Gastroenterology*, vol. 3, no. 3, 2020, pp. 147–49.

B. Sultan, Shahnaz et al. "AGA Rapid Recommendations for Gastrointestinal Procedures During the COVID-19 Pandemic." *Gastroenterology* vol. 159,2 (2020): 739-758.e4.

C. Gralnek, Ian M et al. "ESGE and ESGENA Position Statement on gastrointestinal endoscopy and the COVID-19 pandemic." *Endoscopy* vol. 52,6 (2020): 483-490.

D. Stodd, Colin. "Joint Gastroenterology Society Message: COVID-19 Use of Personal Protective Equipment in GI Endoscopy." *American Gastroenterological Association*, 17 June 2020.

E. Repici, Alessandro et al. "Coronavirus (COVID-19) outbreak: what the department of endoscopy should know." *Gastrointestinal endoscopy* vol. 92,1 (2020): 192-197.

F. Devereaux, Benedict et al. “Gastroenterological Society of Australia (GESA) Updated Advice on Preventative Measures during Gastrointestinal (GI) Endoscopic Procedures during the COVID-19 Pandemic.” *GESA,* 11 May 2020.
G. Galloro, Giuseppe et al. “Safety in digestive endoscopy procedures in the covid era recommendations in progress of the Italian society of digestive endoscopy.” *Digestive and liver disease: official journal of the Italian Society of Gastroenterology and the Italian Association for the Study of the Liver* vol. 52,8 (2020): 800-807.
H. Penman, Ian D et al. “Endoscopy Activity and COVID-19: BSG and JAG Guidance.” *The British Society of Gastroenterology*, 3 Mar. 2021.
I. Public Health England. “6. COVID-19 Infection Prevention and Control Guidance: Aerosol Generating Procedures.” *GOV.UK*, 8 Mar. 2021.
J. NHS National Services Scotland. “SBAR: Assessing the Evidence Base for Medical Procedures Which Create a Higher Risk of Respiratory Infection Transmission from Patient to Healthcare Worker.” *Health Protection Scotland*, 2020.
K. Edwards, Catherine et al. “COVID-19: BSG and BASL Advice for Healthcare Professionals in Gastroenterology and Hepatology.” *The British Society of Gastroenterology*, 3 Mar. 2021.
L. Australian Government Department of Health. “Guidance on the Use of Personal Protective Equipment (PPE) in Hospitals during the COVID-19 Outbreak.” Australian Government Department of Health, 12 Nov. 2020.
M. Chiu, Philip Wai Yan et al. “Practice of endoscopy during COVID-19 pandemic: position statements of the Asian Pacific Society for Digestive Endoscopy (APSDE-COVID statements).” Gut vol. 69,6 (2020): 991-996.
N. Săftoiu, Adrian et al. “SRED-ARCE Recommendations for Minimally Invasive Interventions During the COVID-19 Pandemic in Romania.” Chirurgia (Bucharest, Romania: 1990) vol. 115,3 (2020): 289-306.
O. Soetikno, Roy et al. “Considerations in performing endoscopy during the COVID-19 pandemic.” Gastrointestinal endoscopy vol. 92,1 (2020): 176-183.
P. Ang, Tiing Leong. “Gastrointestinal Endoscopy during COVID-19 Pandemic.” Journal of Gastroenterology and Hepatology, vol. 35, no. 5, 2020, pp. 701–02.
Q. Zhang, Yafei et al. “Suggestions for infection prevention and control in digestive endoscopy during current 2019-nCoV pneumonia outbreak in Wuhan, Hubei province, China.” Endoscopy vol. 52,4 (2020): 312-314.
R. Mathew, Shibi, and Mathew Philip. “Personal Protective Equipment during Endoscopy.” Journal of Digestive Endoscopy vol. 11,1 (2020): 45–52.