



# Impact and Counter Measures of COVID-19 Nosocomial Infection on Upper Gastrointestinal Surgery

Fumiaki Yano\*, Takahiro Masuda, Masami Yuda, Yuichiro Tanishima, Katsunori Nishikawa, Muneharu Fujisaki, Norio Mitsumori, Takashi Ohtsuka, Toru Ikegami and Takao Ohki

Department of Surgery, Jikei University School of Medicine, Tokyo, Japan

## Abstract

**Objectives:** The Jikei University Hospital (JKUH) declared a hospital-wide state of emergency on 4<sup>th</sup> April 2020, the day after confirming its first COVID-19 nosocomial infections, generally suspending first-time outpatient consultations, new admissions, and non-urgent procedures and tests. This report details how upper gastrointestinal surgeries at JKUH were affected by the COVID-19 pandemic.

**Methods:** The records of 103 patients scheduled for elective surgery to treat an upper gastrointestinal disease or condition at JKUH between January and April 2020 were reviewed to assess our institution's response and areas for improvement.

**Results:** Starting 20<sup>th</sup> April, all inbound patients were screened for COVID-19 through RT-PCR and chest CT, a policy that successfully prevented new nosocomial infections from asymptomatic carriers. 80.0% of the scheduled surgeries were performed as planned (n=82), none of whom were COVID-19-positive. However, 20.0% (n=21) of the procedures had to be postponed, 38.1% (n=8) of which were to treat malignant disease. Five of them were postponed despite their malignancy due to the need to ensure sufficient availability of ICU beds. In addition, our gastrointestinal surgery division decided to cancel all operations to treat benign conditions in the pandemic's wake; however, the quality-of-life reductions experienced by patients with achalasia or GERD - comprising 85% of the cases - are hard to reconcile with a designation of 'non-urgent'.

**Conclusion:** The COVID-19 pandemic forced our department to postpone 20% of the scheduled upper gastrointestinal surgeries. Surgery was still indicated for all cases, and those designated as "non-urgent" would nonetheless have benefited from quicker intervention.

**Keywords:** COVID-19; SARS-CoV-2; 2019-nCoV; Coronavirus; Nosocomial infection; Gastrointestinal surgery; UGI surgery

## Introduction

On 8<sup>th</sup> December 2019, the Chinese government determined that the cause of death of 1 patient in the city of Wuhan in Hubei Province was identical to that of 41 cases of unknown etiology who died at other facilities [1]. This agent was subsequently officially named as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) [2], and the disease caused by the virus, Coronavirus Disease 2019 (COVID-19).

The ensuing pandemic has rocked the entire world. According to a release by Japan's Ministry of Health, Labor and Welfare, the country's first domestic infection was a male resident of Shinagawa Prefecture in his 30s, who developed symptoms after returning home from Wuhan on 6<sup>th</sup> January 2020 [3].

When an infection cluster occurred aboard the Diamond Princess, the cruise liner pulled into port in Yokohama on 5<sup>th</sup> February, where passengers were quarantined for two weeks [4]. Those who tested positive for the coronavirus (then known as 2019-nCoV) started to be transported ashore for treatment in medical facilities. The Jikei University Hospital (JKUH) was among them, which started to accept infected individuals on 11<sup>th</sup> February. The number of new domestic infections rose slowly in the ensuing weeks, tracing a gentle curve, but the rate began to rapidly accelerate at the end of March, exceeding 100 new cases per day. Once it became clear that civic leaders would take emergency action - the Prime Minister would declare a nationwide state of emergency, and the Tokyo Governor suggested that the metropolitan government might need to issue lockdown

## OPEN ACCESS

### \*Correspondence:

Fumiaki Yano, Department of Surgery, The Jikei University School of Medicine, 3-25-8, Nishishimbashi, Minato-ku, Tokyo 105-8461, Japan, Tel: +81 3 3433 1111; Fax +81 3 5472 4140;

E-mail: f-yano@jikei.ac.jp

Received Date: 24 Aug 2020

Accepted Date: 25 Sep 2020

Published Date: 01 Oct 2020

### Citation:

Yano F, Masuda T, Yuda M, Tanishima Y, Nishikawa K, Fujisaki M, et al. Impact and Counter Measures of COVID-19 Nosocomial Infection on Upper Gastrointestinal Surgery. Clin Surg. 2020; 5: 2965.

Copyright © 2020 Fumiaki Yano. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

orders - citizens rushed to stockpile facemasks, hand sanitizers, and basic necessities. Supplies of Personal Protective Equipment (PPE) to medical facilities dwindled amidst the ensuing supply chain disruptions and closures of factories where biomedical equipment and reagents are manufactured.

Despite all this, our Department of Surgery continued normal operations until 3<sup>rd</sup> April, when the first SARS-CoV-2 cluster was observed at JKUH. Six nosocomial infections were discovered - 2 inpatients, 3 nurses, and 1 doctor - and traced to an asymptomatic carrier admitted for an unrelated illness. The next day, the hospital director issued a hospital-wide state-of-emergency declaration, generally suspending first-time outpatient consultations and new admissions, as well as non-urgent surgeries and tests. Our decision to test all inpatients on the day of admission using Real-Time Polymerase Chain Reaction (RT-PCR) assay and chest Computed Tomography (CT) scan starting from 20<sup>th</sup> April was a key factor in preventing the occurrence of any new nosocomial infections by asymptomatic carriers. This report is our account of how surgeries for different upper gastrointestinal diseases and conditions scheduled at JKUH were affected by the COVID-19 pandemic.

## Materials and Methods

### Statement of ethics

The protocol of this study was approved by the Institutional Review Board at the Jikei University School of Medicine (28-062 [8305]). All procedures were conducted in accordance with the Declaration of Helsinki.

### Patient population

The records of 103 patients (30 female, 64.9 ± 15.1 years) scheduled for elective surgery at JKUH between January and April 2020 to treat an upper gastrointestinal disease were retrospectively reviewed.

### Surgery cases

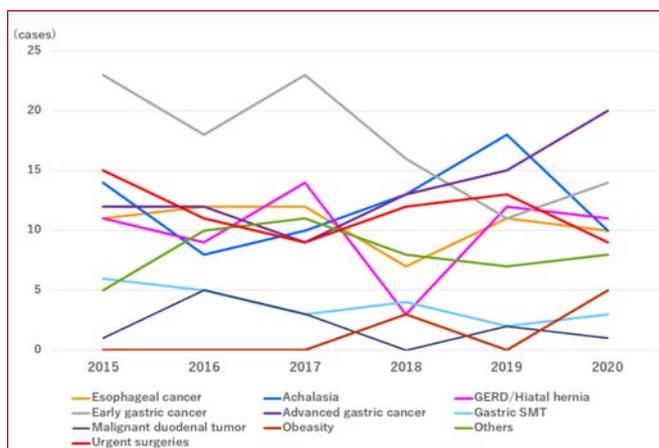
We compared with the number of surgeries for upper gastrointestinal diseases during the past 5 years at the same period, further, the changes in the number of whole surgeries in the entire department of surgery at JKUH from January 2020 to the end of April 2020 was investigated. We assessed our institution's response and areas for improvement for COVID-19.

## Results

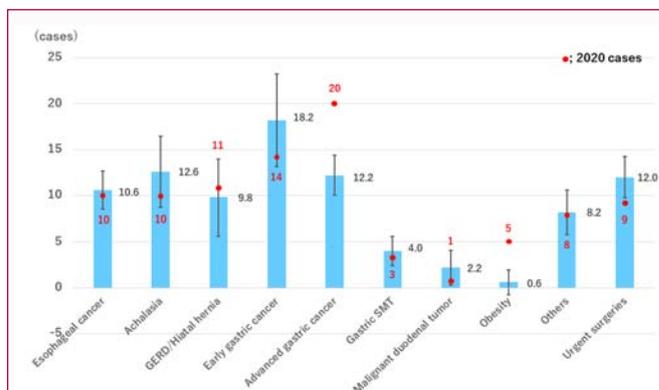
Operations were performed in 80.0 % of the total cases (n=82) but were forced to be postponed in the other 20.0% (n=21). None of these patients were positive for COVID-19.

Surgery cases between 1<sup>st</sup> January to 30<sup>th</sup> April in 2015-2020

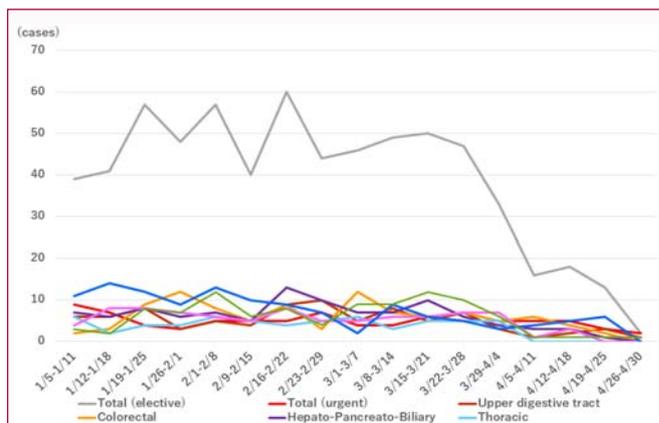
Figure 1 depicts the number of upper gastrointestinal surgeries performed by disease/indication from January 2020 to the end of April, alongside the corresponding numbers for the same period in each of the past five years. Compared with 2019, we performed fewer procedures over the 2020 period for the following conditions: Esophageal cancer, achalasia, Gastroesophageal Reflux Disease (GERD)/Hiatal Hernia (HH), urgent surgeries, and malignant duodenal tumor. The declines are especially marked for urgent surgeries (except appendectomy) and achalasia, falling by ~50% and 30%, respectively. In contrast, we actually performed more procedures for gastric cancers over the 2020 period, by 30% for both early- and advanced-stage cases.



**Figure 1:** Yearly changes in numbers of elective and urgent surgeries for upper gastrointestinal diseases (Jan 01<sup>st</sup> to Apr 30<sup>th</sup>, 2015–2020). Surgeries for achalasia and urgent cases fell dramatically in the 2020 period, by ~50% and 30% respectively.

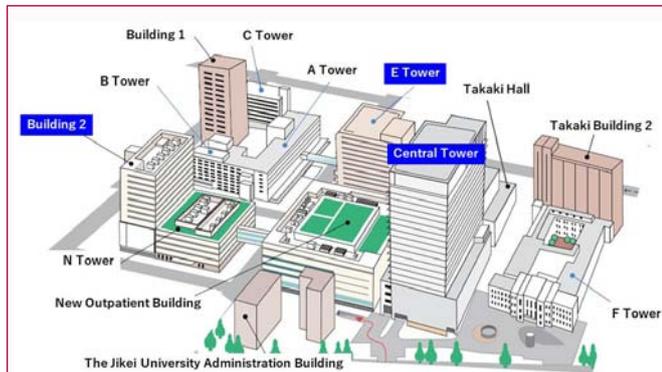


**Figure 2:** Numbers of upper gastrointestinal surgeries in the 2020 period compared with their previous 5-year averages (2015–2019). Historical data are shown as red dots (mean ± SD). Fewer surgeries than average were performed for all conditions except GERD/HH, advanced gastric cancer, and obesity.



**Figure 3:** Weekly changes in elective and urgent surgeries for entire JKUH surgical faculty by pathology (Jan 05<sup>th</sup> to Apr 30<sup>th</sup>, 2020). Surgeries rapidly declined across the board in late March.

Figure 2 presents the same data as a comparison between the number of 2020 surgeries and the (previous) 5-year mean for each disease/indication over the same period. We performed fewer procedures than average for all conditions except GERD/HH,



**Figure 4:** Building layout of the Jikei University and the Jikei University Hospital (This layout has been modified from the map of [http://www.jikei.ac.jp/univ/pdf/univ\\_map.pdf](http://www.jikei.ac.jp/univ/pdf/univ_map.pdf)). Zoning has been established on the campus for infection control. Patients scheduled for admission first come to **Building 2**, where RT-PCR samples and chest CT scans are taken. SARS-CoV-2-positive patients are admitted to the **E Tower**, while negative patients are admitted to the **Central Tower**.

advanced gastric cancer, and obesity.

Figure 3 shows the weekly changes in elective and urgent surgeries for entire JKUH surgical faculty between 5<sup>th</sup> January to 30<sup>th</sup> April in 2020. Surgeries rapidly declined across the board in late March.

## Postponed Surgeries

Twenty percent (20.0%) of the total surgeries were postponed (n=21), of which 38.1% were to treat malignant disease (n=8: Table 1). Clinical staging of esophageal and gastric cancers respectively follows the Japanese classification of esophageal cancer, 11<sup>th</sup> Edition [5] and Japanese classification of gastric carcinoma, 15<sup>th</sup> Edition [6]. There were three postponed cases of esophageal cancer, all of which were Stage I, including one who was downgraded from their initial diagnosis (Stage II) after responding favorably to neoadjuvant chemotherapy. In addition, there were four postponed cases of gastric cancer (Stage I: 3, IIA: 1) and one of Gastrointestinal Stromal Tumor (GIST) of the stomach.

These eight patients with malignant disease were informed of the need to postpone their intended procedure at JKUH due to the new hospital-wide restrictions instituted in response to the COVID-19 pandemic. Three elected to be transferred to another facility for the procedure (37.5%), while one - the aforementioned esophageal cancer patient who underwent neoadjuvant chemotherapy - decided to

change their treatment plan to instead pursue radical chemotherapy. In addition, 61.9% of patients with benign disease (n=13) agreed to wait to undergo their scheduled procedure until the effects of the pandemic had subsided.

## Benign Diseases

Sixty-nine point two percent (69.2%) of the total patients with benign disease complained of feeding difficulties and/or vomiting (achalasia: 8, intrathoracic stomach: 1), significantly harming their Quality of Life (QOL). The remaining 30.8% consisted of two cases of severe GERD (Los Angeles classification Grade C: 1, D: 1) and two of obesity.

## Discussion

Once a person becomes infected, the effects of SARS-CoV-2 first manifest in the respiratory epithelial and alveolar cells, then move on to the gastrointestinal system [7]. In addition, nearly 15 years ago, viral particles from the 'original' SARS coronavirus (SARS-CoV) were discovered in colon biopsy tissue taken from infected patients [8]. This suggests that the use of electric scalpels or laparoscopic instruments during an upper gastrointestinal procedure could aerosolize infectious droplets, thereby increasing infection risk among medical personnel. JKUH observed its first nosocomial infections on 3<sup>rd</sup> April 2020 and issued a hospital-wide state-of-emergency declaration the next day. While this marked the official start of the hospital's policy of postponing non-urgent surgeries, our Department of Surgery's faculty was already intentionally scaling back operations as the pandemic unfolded: In fact, it was already decided on 25<sup>th</sup> March to cancel all metabolic surgeries and procedures for benign conditions (e.g. GERD/HH, achalasia) within the gastrointestinal surgery division (Table 1). We continued to treat high-priority cases of malignancies such as advanced-stage esophageal and gastric cancer through the end of April, since postponing surgical treatment in such cases can directly harm long-term outcomes. Worldwide, it is estimated that the COVID-19 pandemic led to the cancellation or postponement of 81.7% of the surgeries for benign conditions and 37.7% of the surgeries for all-type cancer. Even if institutions' surgical infrastructures were somehow strengthened by 20% over pre-pandemic levels, it would take approximately 45 weeks to 'catch up' and perform all cancer-related procedures originally planned [9].

Between January and the end of April this year, we performed over 30% fewer achalasia and urgent surgeries than in the same period in 2019. For achalasia, we decided to refrain from elective surgery

**Table 1:** Postponed surgeries.

Organ	Disease	Patients	cStage (pts.)	Outcome	Date of last surgery (2020)
Esophagus	Cancer	3 <sup>†</sup>	I (3)	Transferred; 2,	Apr-20
				Radical chemoradiotherapy; 1	
	Achalasia	8	N/A	All waiting	Mar-25
	GERD / HH	3	N/A	All waiting	Mar-13
Stomach	Cancer	4 <sup>†</sup>	I (3)	Transferred; 1, Waiting; 2	Apr-24
			IIA (1)	Waiting; 1	
	GIST	1 <sup>†</sup>	N/A	Waiting; 1	Mar-27
	Obesity	2	N/A	All waiting	Feb-18

<sup>†</sup>: Malignant disease

**Abbreviations:** GERD: Gastroesophageal Reflux Disease; HH: Hiatal Hernia; GIST: Gastrointestinal Stromal Tumor; cStage: Clinical Stage; pts: Patients; N/A: Not Applicable

**Table 2:** Urgent classification of upper gastrointestinal diseases requiring surgical intervention (sample).

Urgency level	Disease (estimated)	Recommended time for surgical interventions (days)	Recommended time to outpatient presentation
I	Trauma,	0-14	Immediately
	Perforation (Boerhaave syndrome, foreign body, cancer, ulcer, inflammation)		
	Penetration (cancer, ulcer, inflammation)		
	Bleeding (varices, Mallory-Weiss syndrome, cancer, ulcer, inflammation, diverticulum)		
	Strangulated ileus		
	Incarcerated esophageal HH		
	Esophageal/gastric/duodenal/small intestinal cancer with local complications (e.g. bleeding, stenosis)		
Esophageal/gastric/duodenal/small intestinal GIST with local complications (e.g. bleeding, stenosis)			
II	Advanced esophageal/gastric/duodenal cancer	14-28	Next working day-1 week
	Symptomatic intrathoracic stomach		
	Pyloric stenosis due to duodenal ulcer		
III	Early/superficial esophageal cancer	28-90	1-2 week
	Early gastric cancer		
	Therapy-refractory GERD/NERD		
	Esophageal achalasia/Jackhammer esophagus		
	Obesity		
IV	Asymptomatic GERD/HH	>90	Telemedical care
	Diverticulum of the esophagus		
	Others		

**Abbreviations:** HH: Hiatal Hernia; GIST: Gastrointestinal Stromal Tumor; PEH: Para Esophageal Hiatal hernia; GERD: Gastroesophageal Reflux Disease; NERD: Non-erosive Reflux Disease; HH: Hiatal Hernia

earlier than many other conditions given its low risk as a benign condition. For urgent surgeries, the drop was a logical consequence of the hospital's updated policy, as part of the state-of-emergency declaration on 4<sup>th</sup> April, to reject new admissions and stop first-time outpatient consultations across the board. Conversely, we performed 30% more surgeries to treat early and advanced gastric cancers. For advanced-stage cases, this matches the long-term trendline, with operation counts steadily rising since 2017. For early-stage cases, this runs counter to the long-term (5-year) downward trend. There is no clear reason for these increases, even assuming a reduction in *Helicobacter pylori* infections. However, we can infer that the COVID-19 pandemic did not greatly influence our provision of care for gastric cancers (Figure 1).

The Japan Society of Clinical Oncology and other surgical oncology organizations around the world have previously formulated triage guidelines to determine the priority of surgical interventions for cancer patients. However, these have been based on expert opinions, rather than created using real data. Especially salient is the absence of evidence related to how long cancer surgery can be safely postponed without negatively affecting long-term prognosis. In a retrospective review of esophagectomy for esophageal cancer, Visser et al. [10] found patients' Disease-Free Survival (DFS) and Overall Survival (OS) were unaffected by their waiting time from diagnosis to treatment (<8 vs. ≥ 8 weeks), whether the procedure was primary surgery or secondary to neoadjuvant chemotherapy. Similarly, in a retrospective review of (clinical) stage II/III gastric cancer, Furukawa et al. [11] concluded that patients' OS were unaffected by their waiting time from endoscopic diagnosis to treatment up to 90 days by comparing three groups: short (≤ 30 days), intermediate (31 to 60 days), and long (61 to 90 days) waits. Given these promising signs, we

anticipate that our patients who are now awaiting surgery because of the COVID-19 pandemic will not suffer permanent harm in terms of long-term outcomes; however, as a statistical aggregate, survival is not the whole story.

COVID-19 patients' condition tends to rapidly deteriorate once they enter acute respiratory arrest, making ensuring sufficient availability of Intensive Care Unit (ICU) beds and mechanical ventilators an issue of the highest priority in order to protect both the other patients and the hospital workers at risk of nosocomial infection [12]. Surgery was postponed for eight patients with malignant conditions. Delays were ruled feasible by the patient's attending physician in two cases of early gastric cancer and one case of GIST. Despite the high risk indicated for three esophageal and two advanced-gastric cancer patients, we were forced to postpone treatment since they would have needed to convalesce in an ICU bed for a while thereafter, putting pressure on availability. When presented with this justification, two of the former and one of the latter (n=3, 40%) and their families requested referrals to a different hospital to undergo the procedure as planned (Table 1).

From a clinical perspective, doctors regard benign diseases differently from malignant diseases, as delaying surgical treatment rarely carries the risk of fatal outcomes. This is why at Jikei University Hospital; we have decided to postpone all elective surgeries for benign diseases until the end of March. However, members of this category seemed to suffer greater reductions in QOL than those with asymptomatic malignant diseases: These included several patients with achalasia or intrathoracic stomach who complained of feeding difficulties and/or vomiting, and one severe case of drug-resistant GERD who experienced significant reflux symptoms at nighttime and after meals. From their perspective, their discomfort is hard to

reconcile with a designation of 'non-urgent.'

The policy of JKUH's division of gastrointestinal surgery with regard to malignant disease is to delay all elective procedures for esophageal cancer rated Stage I. We carried out operations as planned for advanced-stage cases nearing the end of a neoadjuvant chemotherapy regimen, if we believed they could be removed from ventilation on the same day as the procedure based on a preoperative assessment. Of these 10 patients (Figure 1), reconstruction was performed in two stages for two (20%) at high risk for suture failure: One scheduled for colon reconstruction, with a history of gastrectomy, and one with past diabetes and renal insufficiency. Surgeries for gastric cancers were postponed unless they were of advanced stage and were not expected to require postoperative intensive care.

Our hospital-wide state of emergency declaration demanded the postponement of non-urgent procedures. Currently, our division is implementing the urgency classification shown in Table 2 for upper gastrointestinal diseases requiring surgical intervention. We expect to continually refine this 'rough draft' in line with changes to our institution's clinical needs and available medical resources, which can vary on a daily basis. Urgency level I designates conditions that require immediate surgical intervention (within 14 days of diagnosis) such as perforation, penetration, and tumor hemorrhage. Level II includes advanced-stage, 'high-priority' upper gastrointestinal cancers that should be resected within 14 to 28 days of diagnosis. We have also placed two benign conditions in this category - namely, symptomatic intrathoracic stomach and pyloric stenosis due to duodenal ulcer - since acute volvulus, when left untreated, can quickly escalate to blockage and even gastric necrosis, raising the risk of perforation [13,14]. Under level III, we have placed early-stage cancers and benign diseases, where postponement of surgery negligibly affects long-term outcomes, but which should still be treated within 28 to 90 days of diagnosis due to the associated reductions in QOL. Obesity is included at this level - despite provisions in Japan's medical insurance scheme that only cover surgical interventions for morbid obesity (i.e. gastric bypass) once six or more months have passed after the initial diagnosis - because of the need to treat other, concurrent diseases in the interim, such as diabetes mellitus. Finally, Level IV includes all other conditions not present in Levels I to III.

To avoid nosocomial infections, hospitals must endeavor to prevent SARS-CoV-2 transmission between patients and between patients and medical personnel [15]. Some institutions have reported conducting triage interviews with surgical patients by phone prior to admission [16], but the RT-PCR and chest CT remain the most common screening methods in practice today. Unfortunately, SARS-CoV-2 RT-PCR assays in isolation are unreliable, having been shown to result in high false-negative rates (30% ~ 40%) due to their low sensitivity (60% ~ 70%). Chest CT, in contrast, has high sensitivity, equating to a mere 2% ~ 3% probability that a negative diagnosis is incorrect [17]. Most institutions use both techniques in parallel for this reason [18,19].

Infection-control zoning has been established on the JKUH campus to keep COVID-19-positive and negative inpatients separate; they are housed in the E Tower and Central Tower, respectively (Figure 4). Patients scheduled for admission first come to the first floor of Building 2, where RT-PCR samples and chest CT scans are taken. They are then transferred to the E Tower to await the results. Emergency admissions at night are temporarily housed in the E Tower and tested the next morning; they are only permitted to enter the

Central Tower if both screening tests yield a negative diagnosis. This zoning system allows JKUH to tightly control the risk of nosocomial COVID-19 infections from asymptomatic carriers.

The current pandemic has placed constraints on the production and supply of medical goods, as well as transportation networks among nations, leaving many facilities with severe PPE shortages. Before all planned operations can be rescheduled, hospitals must first ensure that there are (or will be) sufficient medical resources available for that purpose: These include medical personnel, operating rooms, ICU and general-ward space, testing labs, PPE, ventilators, surgical equipment, medicines, disinfectants, and cleaning supplies [20]. In addition, a certain number of beds in the ICU must be equipped with ventilation equipment and kept open in anticipation of a spike in infections after the lifting of the state of emergency in Japan. It is essential that departments resume surgical schedules gradually: It will take time - about several months or even years - before we can safely return to normal volumes. JKUH's inventory of PPE is slowly returning to normal, little by little, bolstered by production and supply from individuals and companies far removed from the medical industry. We are starting to see signs of recovery, heartened by the donations of patients and the broader community. However, we must remain ever vigilant, as from a global perspective, the raging storm of SARS-CoV-2 is far from over.

## Conclusion

The COVID-19 pandemic forced our department to postpone 20% of planned upper gastrointestinal surgeries. Our hospital's implementation of routine screening by RT-PCR and chest CT, as well as infection-control zoning to keep COVID-19-positive cases isolated from negative individuals, was crucial to our success in preventing nosocomial spread.

## Acknowledgement

The author would like to acknowledge Drs. A. Watanabe and S. Kitazawa to collect the patients' information. We want to say special thanks to all who donated us PPE.

## References

1. Nkengasong J. China's response to a novel coronavirus stands in stark contrast to the 2002 SARS outbreak response. *Nat Med.* 2020;26(3):310-1.
2. Shigemura J, Ursano RJ, Morganstein JC, Kurosawa M, Benedek DM. Public responses to the novel 2019 coronavirus (2019-nCoV) in Japan: Mental health consequences and target populations. *Psychiatry Clin Neurosci.* 2020;74(4):281-2.
3. Japan: Ministry of Health, Labor and Welfare Online Resources.; Outbreak of patients with pneumonia associated with new coronavirus (1<sup>st</sup> case). 2020 [cited 2020 Jan 15]. [Internet].
4. Mizumoto K, Chowell G. Transmission potential of the novel Coronavirus (COVID-19) onboard the diamond Princess Cruises Ship, 2020. *Infect Dis Model.* 2020;29:264-70.
5. Japan Esophageal Society. Japanese classification of esophageal cancer, 11<sup>th</sup> Ed: Part I. Esophagus. 2017;14:1-36.
6. Japanese gastric cancer association. Japanese classification of gastric carcinoma. 15<sup>th</sup> Ed. Tokyo: Kanehara & Co., Ltd., 2017.
7. Zhang Y, Geng X, Tan Y, Li Q, Xu C, Xu J, et al. New understanding of the damage of SARS-CoV-2 infection outside the respiratory system. *Biomed Pharmacother.* 2020;127:110195.
8. Chan PK, To KF, Lo AW, Cheung JL, Chu I, Au FW, et al. Persistent infection of SARS coronavirus in colonic cells *in vitro*. *J Med Virol.*

- 2004;74:1-7.
9. COVID Surg Collaborative. Elective surgery cancellations due to the COVID-19 pandemic: Global predictive modeling to inform surgical recovery plans. *Br J Surg.* 2020;12:10.
  10. Visser E, Leefink AG, van Rossum PS, Siesling S, van Hillegersberg R, Ruurda JP. Waiting time from diagnosis to treatment has no impact on survival in patients with esophageal cancer. *Ann Surg Oncol.* 2016;23:2679-89.
  11. Furukawa K, Irino T, Makuuchi R, Koseki Y, Nakamura K, Waki Y, et al. Impact of preoperative wait time on survival in patients with clinical stage II/III gastric cancer. *Gastric Cancer.* 2019;22:864-72.
  12. Phua J, Weng L, Ling L, Egi M, Lim CM, Divatia JV, et al. Intensive care management of Coronavirus Disease 2019 (COVID-19): Challenges and recommendations. *Lancet Respir Med.* 2020;8:506-17.
  13. Omura N, Tsuboi K, Yano F. Minimally invasive surgery for large hiatal hernia. *Ann Gastroenterol Surg.* 2019;3:487-95.
  14. Yano F, Stadlhuber RJ, Tsuboi K, Gerhardt J, Filipi CJ, Mittal SK. Outcomes of surgical treatment of intrathoracic stomach. *Dis Esophagus.* 2009;22:284-8.
  15. Flemming S, Hankir M, Ernestus RI, Seyfried F, Germer CT, Meybohm P, et al. Surgery in times of COVID-19 -recommendations for hospital and patient management. *Langenbecks Arch Surg.* 2020;405:359-64.
  16. Tolone S, Gambardella C, Bruscianno L, Del Genio G, Lucido FS, Docimo L. Telephonic triage before surgical ward admission and telemedicine during COVID-19 outbreak in Italy. Effective and easy procedures to reduce in-hospital positivity. *Int J Surg.* 2020;78:123-5.
  17. Nair A, Rodrigues JCL, Hare S, Edey A, Devaraj A, Jacob J, et al. A British Society of Thoracic Imaging statement: Considerations in designing local imaging diagnostic algorithms for the COVID-19 pandemic. *Clin Radiol.* 2020;75:329-34.
  18. Pan L, Mu M, Yang P, Sun Y, Wang R, Yan J, et al. Clinical characteristics of COVID-19 patients with digestive symptoms in Hubei, China: A descriptive, cross-sectional, multicenter study. *Am J Gastroenterol.* 2020;115:766-73.
  19. Zarrintan S. Surgical operations during the COVID-19 outbreak: Should elective surgeries be suspended? *Int J Surg.* 2020;78:5-6.
  20. Japan: The Japanese Society of Gastroenterological Surgery; Proposal regarding provision of surgical medical care for converging pandemic of novel coronavirus. 2020 [cited 2020 May 22]. [Internet].