

What should a surgeon know about COVID-19?

Aleksandra Krasieńska¹, Małgorzata Wichrowska¹, Zbigniew Krasieński²

¹Department of Ophthalmology, Poznań University of Medical Sciences, Poland

²Department of Vascular, Endovascular Surgery, Angiology And Phlebology, Poznań University of Medical Sciences, Poland

At the beginning of 2020, the world was informed about an outbreak caused by the new coronavirus in China. The fear of infection results mainly from the scope of the pandemic and high virulence of the pathogen, but it is also associated with ignorance and insufficient information for society and the medical community, especially those who do not deal with infectious diseases in their daily practice. Based on knowledge from previous coronavirus epidemics (SARS 2002–2003 and MERS 2012), it was difficult to predict the extent of the new pathogen and its potential infectivity, pathogenicity and mortality. As health care professionals, we should know not only how to help our infected patients, but also how to protect ourselves when we provide health services to SARS-CoV-2- positive patients and to those who need our help, regardless of the epidemic situation. This letter provides brief information for the thoracic, cardiac, and vascular surgeons' community about principles that, according to various scientific societies, can rationalize the treatment of our patients, whether infected or not.

The COVID-19 pandemic was announced by the World Health Organization (WHO) on March 11, 2020. COVID-19 (Coronavirus Disease 19) is an infectious disease caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), originally named 2019-nCoV (2019-Novel Coronavirus). The first cases were observed in Wuhan (China) in December 2019. They were described by local doctors as pneumonia of unclear etiology. On January 7, 2020, the pathogen was isolated and identified in China. SARS-CoV-2 belongs to the family of coronaviruses (*Coronaviridae*) and is classified as a beta-type coronavirus. It is an enveloped, single-stranded RNA virus, one of the largest cytopathic RNA viruses. Coronaviruses are a family of pathogenic viruses which are widespread around the world and attack both humans and animals. In humans, they mainly cause respiratory infections, which are usually mild. The

concerns surrounding the new SARS-CoV-2 virus stem from the fact that, like the SARS-CoV and MERS viruses, they can cause severe respiratory distress syndromes and multi-organ failure with a potentially fatal course.

It has been speculated that the source of the primary human infection could be animals sold at a fish market in Wuhan, China, suggesting that SARS-CoV-2 is a zoonotic pathogen. The first cases of COVID-19 are patients who confirmed their presence at the said market. Currently, the droplet route is considered the main route of human-to-human transmission. However, the way of acquiring the infection is not entirely clear. From a practical point of view, it is important for surgeons that the RNA of the virus has been identified in almost all body fluids (sputum, discharge from the nose, throat, bronchial tree, conjunctival sac, tears, and stool). Both the fecal-oral and conjunctival route remain likely.

COVID-19 is a complex disease that mainly affects the lower respiratory tract. Its main symptoms are a fever and a cough that can be both dry and wet. However, fever, the most constant feature of this disease, may not be present in the elderly and in immunocompetent individuals. Other symptoms include muscle pains and general fatigue. A runny nose, sneezing and a sore throat are not specific to this disease. However, cases with different clinical symptoms such as rash, nausea, vomiting and diarrhea have been reported. Virus incubation takes 2–14 days, and median incubation period is approximately 5 days. The median time from symptom onset to death is 18 days.

Currently, tests based on the detection of viral RNA using polymerase chain reaction (PCR) in a sample taken from the upper or lower respiratory tract or serum are used to confirm the infection. Laboratory tests show lymphopenia and elevated lactate dehydrogenase and transaminases. SARS-CoV-2 infection cannot be diagnosed on the basis of imaging studies.

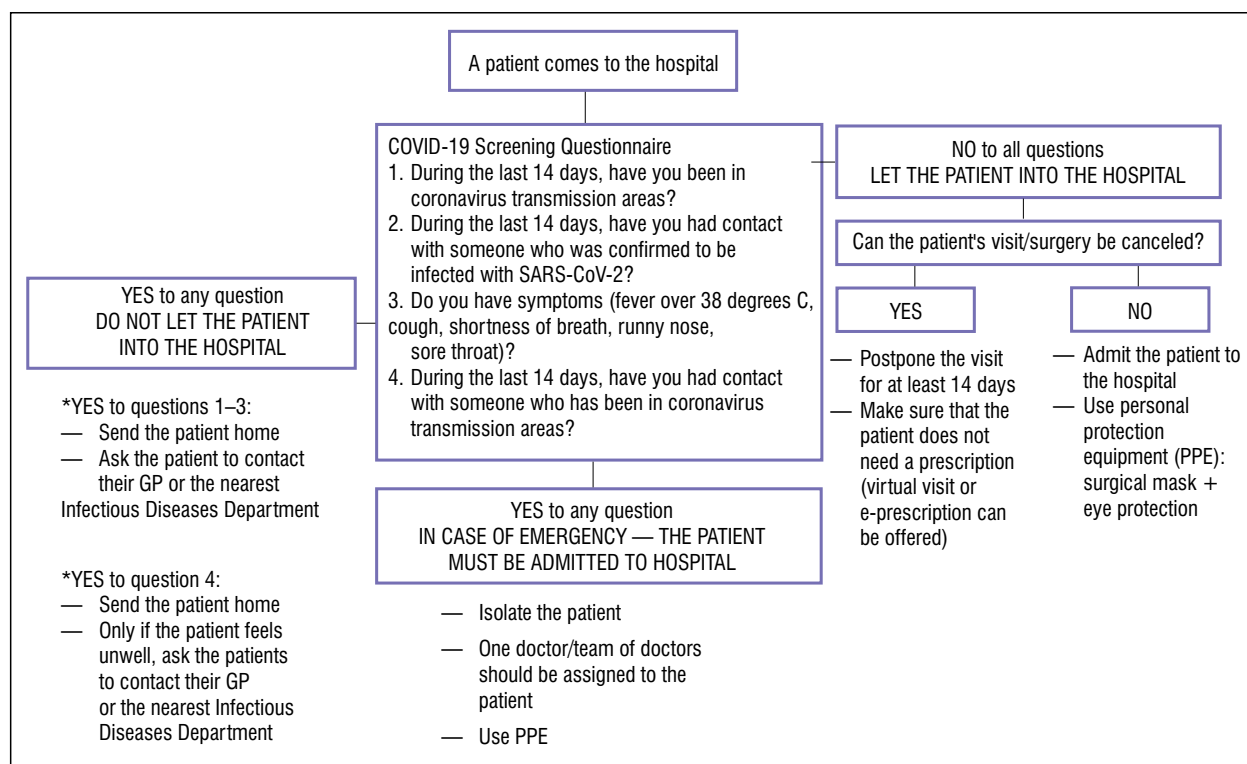
Table I. Pre-operative TRIAGE

OPERATE	POSTPONE, IF POSSIBLE	POSTPONE
AAA: <ul style="list-style-type: none"> ruptured/symptomatic AAA or TAAA infection-related anastomotic aneurysms or vascular graft infection 	AAA and TAAA: > 6.5 cm	AAA: AAA < 6.5 cm
Peripheral artery aneurysms: <ul style="list-style-type: none"> symptomatic peripheral or visceral artery aneurysm pseudoaneurysm (when treatment is not possible: thrombin injection or compression, rapidly expanding or multi-chamber aneurysms) 	Peripheral artery aneurysms: <ul style="list-style-type: none"> asymptomatic peripheral or visceral artery aneurysm 	
Aortic dissecting aneurysm: <ul style="list-style-type: none"> acute dissection or impaired blood supply 		
Acute aortic syndromes — not previously mentioned: <ul style="list-style-type: none"> aortoduodenal fistula with septic/hemorrhagic shock or signs of impending rupture 		
Vascular graft complications: <ul style="list-style-type: none"> arterial prosthesis infection without overt sepsis, or hemorrhagic shock, or impending hemorrhage Carotid stenosis: <ul style="list-style-type: none"> symptomatic carotid stenosis — classic endarterectomy or revascularization via carotid puncture 	Vascular graft complications: <ul style="list-style-type: none"> Repair procedures in significant/symptomatic restenosis 	Vascular graft complications: <ul style="list-style-type: none"> asymptomatic stenosis of the vascular graft or in-stent restenosis
Dialysis: <ul style="list-style-type: none"> vascular access thrombosis or malfunction vascular access infection and ulceration tunneled dialysis catheters kidney failure, requiring dialysis 	Dialysis: <ul style="list-style-type: none"> fistula revision for steal syndrome or ischemia angiographic examination of malfunctioning fistula (blood supply disorders) creation of native fistulas or using grafts — end-stage renal disease, stage 4 or 5 	Carotid stenosis: <ul style="list-style-type: none"> asymptomatic carotid artery stenosis
Acute visceral artery occlusion	Chronic visceral artery occlusion	
Peripheral vascular disease <ul style="list-style-type: none"> acute limb ischemia limb ischemia — progressive ischemia, colliquative necrosis, gangrene fasciotomy for compartment syndrome 	Peripheral vascular disease <ul style="list-style-type: none"> Chronic limb-threatening ischemia, pain at rest or ulceration 	Peripheral vascular disease: <ul style="list-style-type: none"> Angiography or endovascular procedures in intermittent claudication syndrome Classic (open) surgery in the treatment of intermittent claudication
	Thrombolytic treatment: venous or arterial thrombosis	
	TOS: <ul style="list-style-type: none"> Symptomatic thoracic outlet syndrome (TOS) with acute venous or arterial thrombosis and severe edema 	TOS: <ul style="list-style-type: none"> Thoracic outlet syndrome, neurogenic
Trauma: <ul style="list-style-type: none"> Traumatic injury with hemorrhage or ischemia 		

→

Table I. Cont. Pre-operative TRIAGE

OPERATE	POSTPONE, IF POSSIBLE	POSTPONE
Venous: <ul style="list-style-type: none"> acute iliofemoral deep venous thrombosis with <i>phlegmasia</i> 	Venous: <ul style="list-style-type: none"> inferior vena cava filter placement massive iliofemoral venous thrombosis in oligosymptomatic patients procedures in patients with leg ulcers 	Venous: <ul style="list-style-type: none"> asymptomatic May-Thurner syndrome removal of the filter from the inferior vena cava varicose vein surgery or saphenous vein ablation
Wounds/Gangrene/Amputations: <ul style="list-style-type: none"> due to infection/necrosis (major amputations) amputations in patients for whom revascularization is not possible 	Wounds/Gangrene/Amputations: <ul style="list-style-type: none"> surgical debridement wounds requiring skin grafting toes amputations due to ischemia or gangrene 	
Others: <ul style="list-style-type: none"> surgery or embolization for uncontrolled bleeding in unstable patients 	Others: <ul style="list-style-type: none"> surgery or embolization for bleeding in stable patients vascular ports vascular-port-related complications 	

**Figure I.** Pre-admission TRIAGE

There is currently no causal treatment. Conservative treatment, antipyretic drugs, fluid therapy to maintain hemodynamic balance and oxygen therapy are applied. Lung fibrosis may develop during the disease, but opinions as to the pathomechanism of these lesions

are divided – it is not clear whether they result from the course of the disease or are iatrogenic, caused by high oxygen concentrations during the patient's oxygen therapy. There are studies suggesting the effectiveness of antimalarial drugs (chloroquine) in alleviating the

course of the disease. In Poland, Arechin (chlorochine) has been registered for the treatment of COVID-19. Research is also underway on the usefulness of retroviral drugs used for the treatment of HIV infection (in some countries they are already used in supportive therapy).

Due to the lack of causal treatment, we should focus primarily on prevention. Our activities in the field of cardiac and vascular surgery regarding patients with COVID-19 or suspected patients should be based on simple and clear principles.

General rules that can be implemented:

1. Consider nonsurgical treatment, if possible.
2. For a patient suspected of COVID-19, wait for the test result.
3. Aerosol-generating procedures should be performed while wearing full personal protective equipment: an N95 mask, goggles and a protective suit. The aerosol-generating procedures include: intubation, extubation, bronchoscopy, cauterization, laparoscopy, thoracoscopy, and endoscopy.
4. There are currently no conclusive data on the advantage of laparoscopy or classical open surgery in terms of the risk of coronavirus infection. However, the surgeon should make their own decision based on the safety criteria (considering both their own safety and that of the patient) and their own experience.
5. Consider creating a team to decide whether an operation is justified, based on the triage criteria. The team should consist of a surgeon, an anesthesiologist and a nurse.

The detailed recommendations we propose are based on the guidelines of the American College of Surgeons, Society for Vascular Surgery and the recommendations of the Polish Society of Ophthalmologists. In order to maximize the safety of the patient and surgeon in the era of the COVID-19 epidemic, it is recommended:

Level 1

1. Elective admissions to hospital wards and patient visits to clinics should be suspended and surgical procedures limited only to urgent/acute cases.
2. No visitors should be allowed in the hospital.
3. Telemedicine — as far as possible, services for patients can be provided using electronic devices — prescription extension/issuing exemptions.
4. Pre-admission TRIAGE — when a patient has to be hospitalized, he/she should complete an epidemiological questionnaire before entering the hospital.
5. Limit aerosol generating procedures.
6. Staff training to reduce the risk of infection.

Level 2

1. Disinfection of staff hands and equipment of patient examination rooms.
2. Medical personnel should be careful about symptoms such as fever, chills, weakness, muscle pain, sore throat, diarrhea, cough, runny nose, vomiting, and pneumonia. It is also recommended to take body temperature daily.

Level 3

1. Pre-operative TRIAGE (Table I).
2. Masks should be worn by both medical staff and patients.
3. Separate rooms for patients suspected of or diagnosed with COVID-19, including: a separate operating room, space in ICU and other areas for infected patients.
4. COVID-19 patients should be separated from other patients.
5. Medical personnel should be assigned to only care for COVID-19 patients.

Conflict of interest

None.

References:

1. World Health Organization. WHO Director-General's opening remarks at the media briefing on COVID-19 [Internet]. 2020 Mar 11; https://www.who.int/docs/default-source/coronavirus/situation-reports/20200323-sitrep-63-covid-19.pdf?sfvrsn=b617302d_2
2. Polskie Towarzystwo Okulistyczne. Rekomendacje PTO dotyczące postępowania z pacjentem okulistywnym w czasie epidemii COVID-19 [Internet]. 2020 Mar 26; <https://www.termia.pl/zalecenia/Rekomendacje-PTO-dotyczace-postepowania-z-pacjentem-okulistywnym-w-czasie-epidemii-COVID-19,37317.html>
3. American College of Surgeons. COVID-19: Elective Case Triage Guidelines for Surgical Care [Internet]. 2020 Mar 24. Available from: <https://www.facs.org/covid-19/clinical-guidance/elective-case>
4. Guan W, Ni Z, Hu Y, Liang W, Ou C, He J, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med* [Internet]. 2020 Feb 28; <https://doi.org/10.1056/NEJMoa2002032>
5. Lai THT, Tang EWH, Chau SKY, Fung KSC, Li KKW. Stepping up infection control measures in ophthalmology during the novel coronavirus outbreak: an experience from Hong Kong. *Graefes Archive for Clinical and Experimental Ophthalmology* [Internet]. 2020 Mar 3; <https://doi.org/10.1007/s00417-020-04641-8>
6. Society for Vascular Surgery. COVID-19 Resources for Members [Internet]. 2020 Mar 31. Available from: <https://vascular.org/news-advocacy/covid-19-resources#Guidelines&Tools>
7. Chan JF-W, Yuan S, Kok K-H, To KK-W, Chu H, Yang J, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *The Lancet*. 2020; 395(10223): 514–523.