



The impact of COVID-19 on the organisation of surgical activity

Vpliv covid-19 na organizacijo kirurške dejavnosti

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Abstract

The SARS-CoV-2 pandemic completely caught the world by surprise. The whole healthcare system had to be reorganised in a very short time. COVID-19 patient-admitting hospitals had to be restructured overnight into parts with COVID-19 patients and parts with non-COVID-19 patients. When working with surgical COVID-19 patients, a complete and consistent use of protective equipment is especially necessary to prevent infection of healthcare workers. It is also important to organise special clinical pathways within hospitals to prevent contamination of non-COVID-19 parts of the hospital. All elective surgeries have been temporarily cancelled. We are beginning to release restrictions on elective surgery under special conditions to protect healthcare workers and patients. COVID-19 swabs are recommended, but not strictly necessary, before elective surgery. Swabs can be either negative or inconclusive in 30% of cases, and therefore cannot be completely relied upon. It is especially important that patients or their families did not have signs of a respiratory infection in the previous 14 days. We must consider each patient as potentially infected with SARS-CoV-2 in the hospital. The same is true for healthcare workers – when using protective equipment, we must act as if each worker is potentially infected with SARS-CoV-2.

Izvleček

Pandemija virusa SARS-CoV-2 je popolnoma presenetila celotni svet. V zelo kratkem času je bilo potrebno reorganizirati zdravstveni sistem v celoti. Bolnišnice, ki sprejemajo bolnike s covidom-19, je bilo treba čez noč prestrukturirati v del bolnišnice za bolnike s covidom-19 in v del bolnišnice z ostalimi bolniki, ki nimajo covid-19. Pri delu s kirurškim bolnikom s covidom-19 je potrebna predvsem popolna in dosledna uporaba zaščitnih sredstev, da ne pride do okužbe zdravstvenega osebja. Prav tako je potrebna posebna klinična pot znotraj bolnišnic, da ne pride do kontaminacije v delu bolnišnice, ki je brez bolnikov s covidom-19. Začasno so bile odpovedane vse elektivne kirurške obravnave. Zdaj se pod posebnimi pogoji za zaščito zdravstvenih delavcev in bolnikov ponovno sproščajo. Pred elektivnimi kirurškimi posegi se priporoča jemanje brisov na covid-19, vendar to ni nujno. Brisi so namreč v 30 % negativni oz. nezanesljivi in se nanje ne moremo popolnoma zanesti. Predvsem je pomembno, da bolnik v zadnjih 14 dneh ni imel znakov prehladne bolezni in prav tako ne člani njegove družine. Znotraj ustanove se moramo vesti do vsakega sprejetega bolnika, kot da je lahko okužen z virusom SARS-CoV-2. Enako velja za osebje. Ravnati se je potrebno glede zaščitnih ukrepov tako, kot da je vsak od zaposlenih okužen z virusom SARS-CoV-2.

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1 Introduction

During the so-called “peace-time” operation, hospitals across the world are forced to utmost utilise their staff, equipment, and facilities, and operate without any internal backups. The owners or managers immediately assign any available or backup capabilities to additional programmes. After September 11 2001, a new professional activity was developed: medicine in emergency situations, with a separate extensive field for surgery in emergency situations. It combines the disaster management during natural disasters, epidemics or man-made events. In Slovenia, this is conducted in collaboration between the Administration of the Republic of Slovenia for Civil Protection and Disaster Relief, police and public healthcare. In an emergency medical event, we act according to predefined plans, designed according to different scenarios, i.e., imagine the unimaginable (1).

The SARS-CoV-2 pandemic has taken the whole world by surprise. None of the most developed countries were ready for it, even though they have excellent-grade healthcare systems. COVID-19 demands that countries immediately and significantly rearrange the organisation of their healthcare in such a way to limit the spread of infection and provide care to a multitude of patients with complications, including acute respiratory failure. The first demand on reorganisation is related to separating hospitals to the part with COVID-19 and the part without COVID-19. The second demand represents a major increase of those hos-

pital capacities that support treating patients with acute respiratory failure that requires artificial ventilation. Physicians and their colleagues must be provided with appropriate protection from the virus with personal protection equipment in appropriately equipped premises. When a hospital is activated into the state of a yellow or red alert, a planned and fast reorganisation changes the function of individual wards for accepting new patients. The SARS-CoV-2 virus demands an enormous increase in hospital capacities for treating patients with an atypical pneumonia. Because of the expansion of wards for infectious diseases and intensive care therapy, the capacities for surgical wards had to be temporarily reduced, consequently halting their operations in full or for the most part.

This was also what the Slovenian surgeons faced in “COVID hospitals”. Our activities were reduced to the most essential operations, as we lent our surgery beds to infectologists for an indefinite period and shrunk our out-patient activities to just those with “urgent” and “very urgent” referrals.

2 Urgent hospital reorganisations

A hospital that takes in a patient with COVID-19 has to be reorganised. It has to be divided into two parts that operate completely separately, each with their parallel emergency room (ER), their diagnostics, their staff and their availability of beds. At the entrance to the hos-

pital, epidemiological triage, performed by a physician and a senior staff nurse (SSN), has to separate the patients to those who are not manifesting signs and symptoms of an infectious disease (anamnesis, symptoms and signs noted on a preprepared notes), and to those who are manifesting signs and symptoms of an infectious disease besides the disease for which they came to the hospital. The patients with signs or symptoms of infectious disease or when it is suspected that it could be present, are referred to the COVID-19 unit. The patient with a suspected surgical disease is examined at the COVID-19 unit by an appropriately specialised surgeon. The indication is set by the general emergency medical services (GEMS) physician at the COVID-19 unit. The need for extremely rationalised use of personal protective equipment (PPE; FFP-2 and FFP-3 masks, protective suit, face shield, appropriate protective gloves, appropriate footwear) demanded that a patient with a surgical disease was examined at the COVID-19 unit by an appropriately specialised surgeon only after the GEMS physician called them.

In cases of emergency surgical interventions that do not permit several hours of postponing the surgery while waiting for the results of the swab for the SARS-CoV-2 virus, the operation must be performed in an operating room for operations of infected patients that has a completely separated air conditioning, and with staff using PPE. Air ventilation must be completely separate from the non-COVID-19 part of the hospital. It is recommended to first designate the rooms, equipment, and instruments from those used in the non-COVID-19 part of the hospital (2,3). In 2016, Slovenia got modern emergency rooms. They have designated operating space that was intended for life-saving procedures before the epidemic. During the pandemic, these operating rooms were designated

for COVID-19 patients.

The other part of the hospital is intended for non-COVID-19 treatment. To this end, we had to establish a new parallel emergency room for patients who do not manifest the symptoms of a contagious disease and whom we do not want to expose to the patients with the SARS-CoV-2 virus. Epidemiological triage refers them to the part of the hospital that is separate from the COVID-19 patients. It has its own entrance with GEMS, clinical first aid (CFA) and internal medicine first aid (IMFA), a “clean” reanimation pathway, its own diagnostics, its own operating rooms, intensive care unit and surgical hospital beds.

Dividing the hospital into the COVID-19 part and the non-COVID-19 part is the perfect solution. Due to the characteristics of the virus and the specificity of COVID-19, there is a so-called grey zone between them that we strive to limit as much as possible.

3 Surgical treatment of patients during the SARS-CoV-2 virus pandemic

At the start of the pandemic, several international surgical professional associations published recommendations that we follow in our surgical work (3,6):

1. All elective surgical operations are postponed to the time after the end of the red alert.
2. A part of the surgical staff (specialists, young specialists, nurses, and other colleagues) had to be reassigned to positions under the professional control of internal medicine in the newly established departments of internal medicine/infectious diseases. For this to happen, we had to first provide quick and short training courses to the staff that had not been specialised to work under the new conditions.

3. With a drastic reduction in the number of operations, the patients on waiting lists had to be triaged again. The most urgent cancer patients, for whom postponing the operation would have a significant impact on the development of their treatment or even on their survival, could not be reappointed. International recommendations for preparing patient lists for surgery during the pandemic recommend the decision is made by the multidisciplinary team, if possible, by including an oncologist, surgeon, anaesthesiologist, cardiologist, and a specialist for the patient's condition.
4. All injuries that require quick surgical action are treated just like before the pandemic.
5. Indications and principles of care in the trauma unit and at emergency surgery unit are the same as before the pandemic.
6. For patients who were positive for the SARS-CoV-2 virus, the indications and principles of therapy are the same as for trauma patients and other emergency surgical patients before the pandemic. In an emergency, when there is no time to wait for the results of the swab, the emergency surgical patient (a severely injured patient) is treated as if their test were positive, i.e., they enter the system through the COVID-19 unit. Once the swab results are in, and the patient has undergone the essential operation, they are admitted into intensive care therapy of the COVID-19 part of the hospital or the non-COVID-19 unit, or into regular hospital care of the COVID-19 unit or non-COVID-19 unit.
7. Surgical patients without epidemiological signs of infection with the SARS-CoV-2 virus are referred to the non-COVID-19 part of the hospital, while adhering to all of epidemiologists' general safety recommendations. We must not treat any patient as if we are completely certain they are actually negative.
8. Besides taking swabs, ESTES recommendations recommend taking a radiogram or a CT of the lungs before operation. Epidemiological recommendations in different articles derogate from these recommendations. They recommend that patients with the absence of signs of an infectious disease should be treated according to appropriate protocols, without taking a swab before the operation. If there are characteristic radiological changes, we recommend treatment as if they were a COVID-19 patient, even before the results of the swab come in.
9. Along with specialists of intensive care, anaesthesiologists are among the few experts who are experienced in treating patients, connected to a respirator. Therefore, it is logical that during the epidemic they are even more in demand than otherwise.

With COVID-19, complications are more frequent with older patients. This also applies to physicians and their colleagues. Younger physicians, residents and medical students who volunteer are helping to significantly unburden the healthcare system in these emergency situations that are caused by the pandemic. Young physicians must have their mentors constantly available for consultations.

Even when there is a suspicion that a patient is infected, there must be a completely equal level of quality of care to those who are not infected. The need to use PPE must not cause delays with urgent procedures. Urgent surgical conditions represent a high risk for errors in approach and time. The COVID-19 pandemic does not justify any derogation

from standard procedures for surgical treatment. Quite the opposite. It tasks the healthcare providers with having to adhere to additional epidemiologically conditioned measures, thereby extending reaction times and increase security risks.

4 Logistical challenges in surgical activities

It is recommended to designate a part of operating rooms exclusively for care of COVID-19 patients. Appropriately equipped antechambers have to ensure a safe point of entry, putting on PPE, planning one-way pathways for the staff through operating rooms, safe disposal of used equipment (infected gloves, masks, face shields, clothes), disinfection of surfaces, sterilisation of instruments and disinfection of premises in clean and not-clean wardrobes and filters. For typical procedures, the clinical pathway requires locations for typical work steps and they must be assessed from the epidemiological perspective. The share of procedures at which it is predicted that aerosols with infected matter are released (intubating, using turbines, drills, pressurised water cleaning of the operating field, operations of the head and the chest), the staff that is in the room at the time must first obtain safety definitions and additional protection. A separate system of air conditioning from the rest of hospital premises must be ensured (negative air pressure in the room, high frequency of air exchange in the operating room) (2,3,5,6). Using smoke vacuums and filters for aerosols is recommended when working with an electric knife, an ultrasonic cutter, or a laser cutter (with laparoscopy, we need a smoke filter connected to HEPA filters). For thorough cleaning of facilities after the procedure, the staff requires additional appropriate training.

A protected and safeguarded transfer of used instruments and recyclable pieces

of PPE for repeated use must be ensured, along with their separate safe preparation at the unit for sterilisation. Transport pathways, separate from the so-called “clean hospital” must also be ensured for this equipment.

By ensuring good planning of a surgical procedure, we strive to ensure that all the instruments and other tools are in the room before the infected patient enters, and we also strive to prevent any staff from entering and exiting the room during the operation unnecessarily. The guideline is to use as many single-use items, as this additionally reduces safety risks.

The completely separate part of the hospital for COVID-19 supports safe movement of infected patients through all the premises to the reanimation room, the admittance outpatient clinic, separate imaging diagnostics (RTG, CT, US), separate transport pathway to the COVID-19 operating room, transport to the post-operative care on the COVID-19 ward. First, we had to define the safety risks at crossings with clean pathways (changing floors in the hospital by using only certain elevators).

At the start of the pandemic, countries were facing a lack of protection equipment, with PPE for surgical and intensive care therapy especially in critical supply. A lot of effort had to be put toward ensuring equipment for protecting the face (airtight glasses, face shields, FFP-2 and FFP-3 masks), water resistant coats, rubber gloves, gaiters, and single-use head covers. The shortage of individual pieces of protective equipment for surgical teams and for the patients does not resolve us of the responsibility that we have for planning the treatment of such patients. Safety standards and quality standards must be the same as before the epidemic.

Anaesthesiologists and their colleagues are faced with additional chal-

lenges at the beginning of anaesthesia and after the surgery, related to known methods of infection spread. Because of the collective safety, the procedures are led by the most experienced surgeons and anaesthesiologists, as time of operation and potential exposure to the virus should be kept as short as possible and planned ahead.

In order to avoid aerosol contamination, it is paramount to use PPE that can completely separate the air the staff inhales from the air in the room. Similarly, it is recommended to use devices for removing/filtering smoke that is generated when using an electric knife, laser, ultrasonic cutter or other techniques that release aerosol into the air around the patient. This group of risks also includes laparoscopies.

5 Recommendations of the extended professional multidisciplinary team for surgery, adopted on May 2, 2020, for safe work with non-emergency patients during the SARS-CoV-2 epidemic

Institutions performing surgical procedures must meet epidemiological measures for safe treatment, i.e., protection from the SARS-CoV-2 virus. This includes epidemiological safety measures that are now needed (ensuring 2–3 m safety distance between patients in the waiting rooms, in wards, hospital rooms and intensive care units, PPE for employees, protective masks for patients, intensive hand disinfection of the patients from the moment they enter the building on, disinfecting the employees' hands after every contact with patient, etc.).

Every institution must prepare a special clinical pathway for treating the pa-

tient with regard to the potential of infection with the SARS-CoV-2 virus. This clinical pathway must include the patient's treatment one day before entering the institution, when their health condition is checked before they are admitted. The basic clinical pathway for adopting a patient for elective specialist treatment was defined by the Ministry of Health of the Republic of Slovenia in early April 2020:

1. *The evening before the planned treatment the physician/nurse conducts a telephone call with the potential elective patient (teleconsultation). They ask them whether they have any symptoms of respiratory infection (elevated temperature, cough, sore throat, runny nose, muscle pain), and about any potential contact with COVID-19 infected/potentially infected patient (infected relatives, room-mates).*

A – If the patient is showing symptoms, the procedure is postponed for 14 days (then followed up by a new call, situation permitting), and the patient is issued with instructions for self-isolation.

B – If the patient's relatives (who live together/are in close contact) show signs of respiratory infection, the procedure is postponed for 7 days (then followed up by a new call, situation permitting).

2. *If the patient does not meet items 1A or 1B, they come to the procedure/examination the following day. Another conversation is held with them, the same as on telephone, and they are examined. If they do not have any of the conditions from 1A or 1B, they are treated.*

3. *If it turns out that the patient is positive for COVID-19 or has signs of infected upper respiratory tract, they are referred back to their personal/selected physician for further procedures.*

Every institution must have their own clinical pathway for moving the patient within their premises in such a way as to

minimise patients meeting one another as much as possible.

In those cases where the institution has completed the treatment of surgical patients who were referred as very urgent and urgent, they may continue treating patients who were referred regularly, resources permitting.

We recommend institutions extend their patient treatment into the afternoon and the weekend, if human resources permit this, as this reduces patient contact and reduces the number of delayed treatments.

The expanded professional board finds that testing patients for the SARS-CoV-2 virus before admitting them to hospital is not sensible, as it does not provide any additional safety for the staff or the patients. It is especially important to adhere to epidemiological safety measures and correctly assess the patient regarding the respiratory infection before they enter the hospital. On the premises, every admitted patient has to be treated as if they are potentially infected with the SARS-CoV-2 virus. The same applies to the staff. It is important to adhere to the protective measures as if every employee were infected with the SARS-CoV-2 virus.

Those establishments that are overtasked with treating COVID-19 patients should refer surgical patients to other establishments for elective procedures.

6 Conclusion

The SARS-CoV-2 virus epidemic has put great additional demands on surgeons in order to continue performing safe procedures for the patients and the staff. The epidemic is not an excuse to relinquish current standards of surgical care. Some areas of surgery are related to additional safety risks (ORL, MAFA,

dental and oral surgery, ophthalmology, thoracic surgery). Without complete protection with standardised PPE, it is not permitted to provide surgical treatment. In such cases, it is fair for the patient and the providers to transfer the patient to an appropriate establishment with suitable equipment.

Taking swabs before the operation is not recommended, as it is not necessary, nor sensible. Swabs are negative in 30% of the cases and not completely reliable. Therefore, on the premises, every admitted patient has to be treated as if they are potentially infected with the SARS-CoV-2 virus. The same applies to the staff. It is important to adhere to the protective measures as if every employee were infected with the SARS-CoV-2 virus.

Epidemiological risk demands exact human resource management. The required self-isolation of the staff that came in a non-safe contact with an infected patient, threatens that with an uncontrollable spread of the epidemic, hospitals would be left without qualified surgical practitioners. Until a safe and effective vaccination of the whole population is completed, we expect that safety risks in the form of sporadic outbreaks of COVID-19 will be recurring in individual regions. Clinical pathways have to be planned carefully to prevent exposure.

We still do not know how long we will be exposed to the novel coronavirus, and the dynamics of the pandemic. Therefore, it is important to plan the measures in detail, to not overtask the qualified practitioners and to economise on PPE, while also minding that we do not to cause more harm with surgical practice to patients who have not been able to obtain timely surgical therapy because of the epidemic.

References

1. Lennquist S, ed. Medical Response to Major Accidents and Disasters. Belin: Springer – Verlag; 2012. DOI: [10.1007/978-3-642-21895-8](https://doi.org/10.1007/978-3-642-21895-8)
2. Ti LK, Ang LS, Foong TW, Ng BS. What we do when a COVID-19 patient needs an operation: operating room preparation and guidance. *Can J Anaesth*. 2020;67(6):756-8. DOI: [10.1007/s12630-020-01617-4](https://doi.org/10.1007/s12630-020-01617-4) PMID: [32144591](https://pubmed.ncbi.nlm.nih.gov/32144591/)
3. American College of Surgeons. Surgical Care and Coronavirus Disease 2019 (COVID-19). Chicago: American College of Surgeons; 2020 [cited 2020 Apr 17]. Available from: <https://www.facs.org/about-acsc/covid-19/information-for-surgeons>.
4. American College of Surgeons. Local Resumption of Elective Surgery Guidance. Chicago: American College of Surgeons; 2020 [cited 2020 Apr 17]. Available from: <https://www.facs.org/covid-19/clinical-guidance/resuming-elective-surgery>.
5. American College of Surgeons. Clinical Issues and Guidance according COVID-19. Chicago: American College of Surgeons; 2020 [cited 2020 Apr 17]. Available from: <https://www.facs.org/covid-19/clinical-guidance>.
6. Coimbra R, Edwards S, Kurihara H, Bass GA, Balogh ZJ, Tilsed J, et al. European Society of Trauma and Emergency Surgery (ESTES) recommendations for trauma and emergency surgery preparation during times of COVID-19 infection. *Eur J Trauma Emerg Surg*. 2020;46(3):505-10. DOI: [10.1007/s00068-020-01364-7](https://doi.org/10.1007/s00068-020-01364-7) PMID: [32303798](https://pubmed.ncbi.nlm.nih.gov/32303798/)
7. Zheng MH, Boni L, Fingerhut A. Minimally invasive surgery and the novel coronavirus outbreak: lessons learned in China and Italy. *Ann Surg*. 2020;272(1):e5-6. DOI: [10.1097/SLA.0000000000003924](https://doi.org/10.1097/SLA.0000000000003924) PMID: [32221118](https://pubmed.ncbi.nlm.nih.gov/32221118/)
8. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. China Medical Treatment Expert Group for Covid-19. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med*. 2020;382(18):1708-20. DOI: [10.1056/NEJMoa2002032](https://doi.org/10.1056/NEJMoa2002032) PMID: [32109013](https://pubmed.ncbi.nlm.nih.gov/32109013/)