

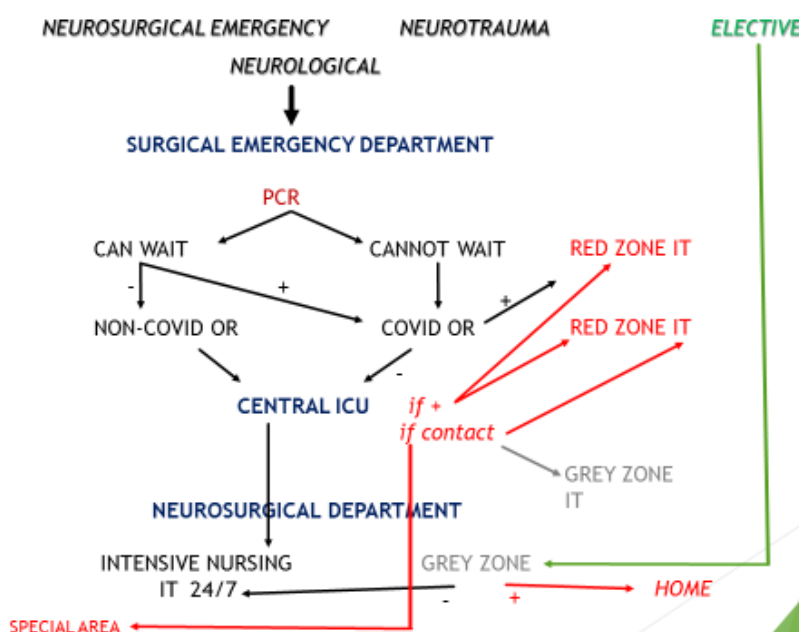
Dear Sir or Madam,

Thank you very much for your review and the comments, which were very valuable to us for the revision. We have fully revised the text and indicated the issues we addressed with red font in the body of the article. Please find more detailed answers to your questions below, together with an extended list of references. We hope that the revisions are satisfactory.

Reviewer 1

QUESTION 1. Add flow charts of admitting cases for different categories with discharge criteria (in pandemic situation). Add some graphs /tables to differentiate criteria (precovid and during covid situation) -I think this will add value to the article.

ANSWER 1. Thank you for this suggestion. We have described the admitting and the discharge criteria for specific groups of neurosurgical pathology since it is not possible to comment on every single type of neurosurgical pathology. Besides, in our clinical practice, we have clustered the patients with comparable pathology into groups and addressed them accordingly. The explanation and the flow chart has been added below. This explanation has also been added into the text. The figure has been added into the text.



All patients with different neurosurgical emergencies, including neurotrauma and neurological diseases (all vital emergencies) that required prompt neurosurgical action, were admitted to the surgical general emergency department (Figure 1). After initial screening for COVID-19 with rapid antigen test (RAT) and then immediately with the RT-PCR test, the urgent patients were divided into two groups: I) to those that could not wait and II) to those that could wait.

The inclusion criteria for emergency surgery included:

- I) all paediatric and adult patients with raised ICP (stroke, abscess, tumour, subdural hematoma, deteriorating hydrocephalus),
- II) all traumatic cases needing observation or emergency operation,
- III) spinal compressive myelopathy (traumatic and non-traumatic),
- IV) vascular emergencies (ruptured intracranial aneurysm, ruptured arteriovenous malformations).

The urgent cases are triaged according to:

- the complexity of the case,
- the availability of surgical instruments,
- the availability of an anaesthetic team,
- the availability of postoperative accommodation (COVID-19/non-COVID-19 emergency rooms).

Those patients that could not wait were operated on immediately to save life or minimise the risk of neurological deterioration. These urgent patients were operated on in the COVID-19 operation theatre with full personal protective equipment. The RT-PCR test was done during surgery to accommodate these patients after the operation to suitable postoperative hospital

areas. If the test was positive, the patients were further treated in the red zones, which included the COVID-19 intensive care units and special areas on the neurosurgical ward. In case the patients have contacted COVID-19 during the hospital transferred to the same red areas or discharged home, when in appropriate condition. Those patients that were in contact with COVID-19 and were not confirmed positive, were transferred and treated in the grey areas, which included intensive care therapies and normal ward care. They were tested with the RT-PCR every day during the treatment and when negative, transferred to green areas.

The patients that could wait were addressed according to the COVID-19 RT-PCR test. When negative, they were treated in the green areas and when positive, they were transferred to the red areas.

The elective patients were involved in a separate leg and they were completely separated from the emergency patients. They were admitted into grey areas in the neurosurgical department and waited for the results of the RT-PCR test. When positive, they were discharged home. When negative, they were treated in the green areas, including intensive care units and normal ward facilities.

All patients were regularly tested with RT-PCR tests when treated on the ward and in the ICU. In green zones, the tests were taken 24 hours apart, in red areas they were tested every 72 hours. Grey res were transitional places, where the RT-PCR tests were undertaken daily. Grey res were transitional places. When negative, the patients were transferred to green areas. When positive, they were treated further in red areas.

After the neurosurgical treatment, the patients were discharged from the ward as soon as possible to generate new capacities. Most of them were discharged home, some also to the rehabilitation facilities, depending on their health condition. The length of hospital stay depended on the type of pathology, recovery, flow and general condition of the patient. For example, when no complications occurred, patients having had microdiscectomy were discharged home after two to three days, spinal fixation required four days of hospitalisation, the operations of brain tumours and vascular pathology (unruptured aneurysms, AVMs) required five to seven days of hospitalisation. There were more difficulties encountered in long term treatment, including trauma patients, infections, haemorrhages, those with complications and concomitant diseases, since these patients were unable to be discharged from the hospital early. Longer recovery was expected here and they were later transferred to

special rehabilitation and nursing institutions. The treatment here varied, from several weeks to months.

From the COVID-19 point of view, the discharge criteria from the isolation (suspending transmission-based precautions) were the following: I) ten days after symptom onset, plus at least three additional days without symptoms (including without fever and respiratory symptoms) for symptomatic patients and II) ten days after a positive test for SARS-CoV-2 for asymptomatic cases. To confirm the clearance of virus, and thus allow discharge from isolation, required a patient to be clinically well and to have two negative RT-PCR results on sequential samples, which were taken 24 hours apart.

A special regimen was held at the outpatient clinic. Every patient acquired a slot for consultation. Only RAT-tested and COVID-19 negative patients were admitted for consultations and this certificate was checked at the entrance. Upon arrival to the neurosurgical outpatient clinic, every patient filled in the questionnaire regarding health conditions and possible COVID-19 symptoms and exposure. The separation of seating was in effect in the waiting room and all areas were ventilated frequently. Preferably and when possible, the windows were opened all the time when the patients were on the premises. Face shields and masks were worn by the staff and when possible, the e-consultations and the telephone- consultations were used.

Reviewer 2

QUESTION 1. 1-Regarding the overview: This is your local experience in your country, can you present for us what is the comparison between your experience and other neurosurgery hospitals in Europe, for example?

ANSWER 1. Thank you for this recommendation. We have described an overview of the management in Europe. This was also added into the text.

The COVID-19 pandemics caused difficulties in every health system. European countries were almost equally affected and adjustments needed to be done to provide the necessary care for COVID -19 patients and normal functioning of the health system in parallel (1). It is beyond the scope of this article to describe in detail the measures in every country. The European Union has issued recommendations for their member states on how to deal with the pandemics. Of course, there were differences among the European countries within their

health policies (2,3). In general, a series of departmental protocols were put in place and protective measures were taken to cope with the massive influx of COVID-19 patients and to preserve the regular medical services running normally. The hospitals needed to change their organization urgently. It was necessary to reallocate the medical staff, equipment and material, create management protocols, dedicate in-hospital routes and operating theatres for patients with COVID-19 (1,4). The conventional outpatient service was altered into telemedicine outpatient service and elective surgeries were postponed or stopped. The strict control of elective and/or emergency admissions, prevention of intermixing of cases and health care staff, improvements in operation and treatment processes, allocation of designated areas for holding and operating COVID-19 patients and strict ward management were put into practice. Additionally, some patients with COVID-19 had to undergo urgent surgery, while others became symptomatic within days of elective surgeries. For these, the treatment protocols were adjusted. The most affected countries were Italy, Portugal and Spain, followed by central European and Eastern European countries (1,2,5,6).

In neurosurgical care, there have been reports from various parts of the world including North America and Europe about the change in neurosurgical practice during the COVID-19 pandemic (2,5-7). Especially neurosurgical patients demanding intensive treatment and long-term patients were affected due to a lack of resources. The supportive equipment, ventilators, intensive care unit beds, nursing and health personnel were redirected into the care of patients with COVID-19. The countries with better and more stable health systems suffered less impairment, which was evident already among the European countries. This was particularly evident during the peaks of infection waves. In the developing world with limited medical resources, dense and large populations, shortage of medical staff and already strained health infrastructure, these deficiencies were even more pronounced (1,3,8,9).

QUESTION 2. From my point of view the number of cases was insufficient to generalize your experience, I think more cases to get solid data.

ANSWER 2. Thank you for this notice. It is true, that the numbers of patients are low. However, we are a medium volume centre and these are the numbers of patients we are dealing with. The whole population of Slovenia is about two million and our centre covers about three-quarters of the country. We have been collecting the numbers during the epidemics as we are involved in a prospective study in cooperation with the university centre Maribor, the second neurosurgical centre in the country.

The numbers of patients that were described in the text have been used for illustrative purposes and comparison between the pre-covid and covid periods. They are not used to generalise our experience to other centres but merely to compare our numbers and workload between these two periods.

We have also added this limitation of the study in the Discussion.

We did not record a significant drop in the number of cases operated. We are aware that the number of patients included in the study was relatively low and that this was a limitation to our study. However, since we are a medium volume centre, it is impossible to obtain higher numbers in the examined periods, namely in the study periods from February 2019 to March 2020 (pre-COVID-19 period) and from March 2020 to April 2021 (COVID-19 period). The whole population of Slovenia is about two million and our centre covers three-quarters of the country. The inflow of patients was constant during the last years and it was the same also during the epidemic period. Of course, the regimen of medical examinations, follow-ups and admissions was adapted according to the situation during the pandemics. We are aware that the numbers of patients in the study cannot be compared to other high volume and high-frequency centres across Europe and the world. The numbers we obtained were used for illustrative purposes and to conclude from our practice, that it is possible with an accurate protocol and strict anti-COVID-19 measures to enable the neurosurgical service to run even in challenging times.

QUESTION 3. In Discussion, can you explain more about the Infection Control Procedures if you caught positive case of COVID-19 and his neurosurgical condition was emergent?

ANSWER 3. Thank you for this observation. This part has been added into the Discussion.

As mentioned, special precautions were implemented for patients with urgent neurosurgical that were COVID-19 positive. These patients were operated on immediately in the COVID-19 operation theatre. The intubation was done according to a quick protocol by the anaesthesiologist and the nurse assistant. At that time, no other staff were present in the operation theatre. After intubation, the surgical staff approached and started with the procedure. Personal protective equipment was worn all the time and the protective measures

were respected. The equipment and material in the operating theatre were kept to a minimum. During the surgery, the RT-PCR test was done to help with the postoperative patient accommodation arrangement. When confirmed positive, the patients were further treated in the red zones, which encompassed the COVID-19 ICUs and special areas on the neurosurgical ward. Sometimes, the patients were caught positive while hospitalised. The RT-PCR tests were done here every two days. In these instances, the patients were transferred to red areas and treated there according to their condition. When ICU was needed, the patients were transferred there. In more stable health conditions, they were treated in the red areas on the neurosurgical ward. Alternately, when their condition allowed, they were discharged home.

References

1. Doglietto F, Vezzoli M, Gheza F, Lussardi GL, Domenicucci M, Vecchiarelli L, Zanin L, Saraceno G, Signorini L, Panciani PP, Castelli F, Maroldi R, Rasulo FA, Benvenuti MR, Portolani N, Bonardelli S, Milano G, Casiraghi A, Calza S, Fontanella MM. Factors Associated With Surgical Mortality and Complications Among Patients With and Without Coronavirus Disease 2019 (COVID-19) in Italy. *JAMA Surg.* 2020;155(8):691-702.
1. Suleyman G, Fadel RA, Malette KM, Hammond C, Abdulla H, Entz A, Demertzis Z, Hanna Z, Failla A, Dagher C, Chaudhry Z, Vahia A, Abreu Lanfranco O, Ramesh M, Zervos MJ, Alangaden G, Miller J, Brar I. Clinical Characteristics and Morbidity Associated With Coronavirus Disease 2019 in a Series of Patients in Metropolitan Detroit. *JAMA Netw Open.* 2020;3(6):e2012270.
3. Clavien PA, Barkun J, de Oliveira ML, et al. . The Clavien-Dindo classification of surgical complications: five-year experience. *Ann Surg.* 2009;250(2):187-196.
4. Leira EC, Russman AN, Biller J, Brown DL, Bushnell CD, Caso V, Chamorro A, Creutzfeldt CJ, Cruz-Flores S, Elkind MSV, Fayad P, Froehler MT, Goldstein LB, Gonzales NR, Kaskie B, Khatri P, Livesay S, Liebeskind DS, Majersik JJ, Moheet AM, Romano JG, Sanossian N, Sansing LH, Silver B, Simpkins AN, Smith W, Tirschwell DL, Wang DZ, Yavagal DR, Worrall BB. Preserving stroke care during the COVID-19 pandemic: Potential issues and solutions. *Neurology.* 2020;95(3):124-133.
5. Arteaga AS, Aguilar LT, González JT, Boza AS, Muñoz-Cruzado VD, Ciuró FP, Ruíz JP. Impact of frailty in surgical emergencies. A comparison of four frailty scales. *Eur J Trauma Emerg Surg.* 2021;47(5):1613-1619.

6. Rockwood K, Song X, MacKnight C, et al. . A global clinical measure of fitness and frailty in elderly people. CMAJ. 2005;173(5):489-495.
7. Borghesi A, Maroldi R. COVID-19 outbreak in Italy: experimental chest X-ray scoring system for quantifying and monitoring disease progression. Radiol Med. 2020;125(5):509-513.
8. Borghesi A, Zigliani A, Masciullo R, et al. . Radiographic severity index in COVID-19 pneumonia: relationship to age and sex in 783 Italian patients. Radiol Med. 2020;125(5):461-464.
9. Dindo D, Demartines N, Clavien P-A. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg. 2004;240(2):205-213.

Dear Sir,

Thank you very much for your letter and the comments regarding the article. We have revised the text as required. We have improved the tables and have revised the image in the .ppt. All the parts are freely movable. The revised text is enclosed, as well as the figures. We hope that the article will be suitable acceptance.

Yours sincerely,

Tomaz Velnar

Dear Sir or Madam,

Thank you very much for your review and the comments, which were very valuable to us for the revision. Please find the answers to your questions below.

Reviewer 1

QUESTION 1. I accepted this manuscript for publication.

ANSWER 1. Thank you for the revision and for the notice.

Reviewer 2

QUESTION 2. Accepted after revision and additions.

ANSWER 2. Thank you for this kind answer. We have improved the tables and have revised the image in the .ppt.