SAŽETAK
U vreme KOVID-19 pandemije, Urgentni centar Univerzitetskog kliničkog centra Srbije (UC-UCCS), iako ne-kovid ustanova, morao je da se prilagodi zbrinjavanju velikog broja kritično obolelih i potencijalno zaraznih bolesnika. U ovom radu prikazujemo prilagođavanje UC-UCCS-a uslovima pandemije, u situaciji prethodno nedovoljno definisanih protokola za postupanje u ovakvim situacijama. U martu 2019. godine, formirano je Prijemno trijažno odeljenje urgentne medicine (PTOUM). Osnovni zadatak ovog odeljenja je jasno razdvajanje bolesnika sa epidemiološkim rizikom (ER) od onih koji taj rizik nemaju, te njihovo dalje izolovano zbrinjavanje. Procena epidemiološkog rizika podrazumeva popunjavanje epidemiološkog upitnika, ciljanu kratku anamnezu, merenje temperature i procenu respiratornog statusa bolesnika. Kompletan proces trijaže, inicijalne dijagnostike i lečenja bolesnika sa ER-om je domen rada i odgovornosti specijalista urgentne medicine. Od 15. marta 2020. godine do 15. marta 2021. godine je kroz trijažu obrađeno 155.000 bolesnika, od toga 9.519 sa ER-om, koji su zbrinuti u PTOUM-u. Ovakvom trijažom je minimalizovano širenje infekcije uz istovremeno zbrinjavanje svih kritično obolelih, bez obzira na ER. Međutim, na istom mestu su zbrinjani bolesnici sa manjim, ali i oni sa visokim rizikom za KOVID-19, zbog deficit prostora. Takođe, trijaža se odnosi samo na „kovid trijažu” a ne i na trijažu po stepenu hitnosti obolelih, što je osnova rada svakog savremenog urgentnog centra.

Ključne reči: KOVID-19, epidemiološki rizik, trijaža, Urgentni centar

ABSTRACT
At the time of the COVID-19 pandemic, the Emergency Center of the University Clinical Center of Serbia (EC-UCCS), although a non-covid hospital, had to adapt to taking care of a large number of critically ill and, at the same time, potentially contagious patients. In this paper, we present the ways that the EC-UCCS has adjusted to the conditions of the pandemic, where no precise protocols had previously been established for acting in these types of situations. In March 2019, the Admissions Triage Facility of Emergency Medicine (ATFEM) was established. The main task of this facility was to separate patients with epidemiological risk (ER) from patients without risk and to carry out their further isolated care. ER assessment involves completing an epidemiological questionnaire, a targeted brief history, body temperature measurement, and assessment of the patient’s respiratory status. The complete triage process, initial diagnosis, and treatment of patients with ER is the task and responsibility of emergency medicine specialists. Between March 15, 2020 and March 15, 2021, about 155,000 patients were examined in triage, of whom 9,519 had ER and were taken care of in the ATFEM. This triage method minimizes the spread of infection while taking care of all critically ill patients, regardless of ER. However, both patients with low and high risk of COVID-19, were all admitted to the same facility, due to the shortage of available space. Also, triage relates only to “covid triage” and not to triage according to the degree of urgency of the patients, which is the primary task of every modern emergency center.

Key words: COVID-19, epidemiological risk, triage Emergency Center
INTRODUCTION

The COVID-19 pandemic has completely engaged the entire community of health workers. The disease is being analyzed from the perspective of epidemiology, etiology, pathogenesis, clinical manifestations of the disease, best diagnostic criteria, and treatment protocols. At the same time, the need for a complete reorganization of the healthcare system has arisen.

The Emergency Center of the University Clinical Center of Serbia (EC-UCCS) has been a non-covid hospital since the beginning of the pandemic. However, 20-25% of patients suffering from the COVID-19 infection require some form of intensive care [1,2], which is why it is to be expected that some of them, as patients with an emergency condition, will come to non-covid healthcare facilities, especially to the EC. Furthermore, as this is a hospital with considerable resources, and certain emergency conditions (in the domain of cardiac surgery, vascular surgery, microsurgery) on the territory of the City of Belgrade and in the surrounding area can be treated 24/7 only at the UC, it was clear that this hospital would treat those COVID-19 positive patients, who, due to their particular condition, cannot be treated elsewhere. Also, urgent non-covid conditions may be accompanied by a mild, unrecognized or even asymptomatic clinical presentation of the COVID-19 disease, which is why the EC had to be prepared for the influx of such patients, as well. Finally, there are also sporadic arrivals of patients with clear clinical symptoms of the COVID-19 infection, who, nevertheless, mistakenly come to the EC due to their lack of information. The inflow of such patients lays an additional burden on hospital capacity and increases the potential for intrahospital morbidity and mortality [3], which is why the EC, although a non-covid hospital, had to adapt to dealing with critically ill patients, who may also be highly contagious.

In this paper, we present the ways that the EC-UCCS has shown flexibility and adaptability to the conditions of the pandemic, where no precise protocols had previously been established for acting in these types of situations.

ORGANIZATION OF THE EMERGENCY CENTER IN THE PANDEMIC

The essence of the shift in the operation of the EC is in the precise odvajanje bole- snika sa epidemiološkim rizikom (ER) za KOVID-19 ili potvrđenih KOVID-19 pozitivnih bolesnika od pacije- nata koji nemaju rizik za KOVID-19, i u njihovoj daljoj odvojenoj dijagnostici i lečenju. Time je omogućeno zbrinjavanje svih kritično obolelih bolesnika, bez obzi- ra na rizik za KOVID-19, racionalizacija upotrebe lične zaštitne opreme, kao i sprečavanje širenja infekcije na ostale bolesnike ili zdravstvene radnike.

Prvog dana uvođenja vanrednog stanja u Srbiji, 15. marta 2020. godine, formirano je Prijemno trijažno odeljenje urgentne medicine (PTOUM), koje je inicijalno brojalo 7 specijalista urgentne medicine (UM), 2
specijalizanta, jednog doktora medicine i 20 medicinskih tehničara. Pomoć su činili specijalizanti hirurške, interne medicine i anestezije, a od jula meseca, uključili su se i specijalisti urgentne medicine iz okolnih beogradskih opština. Na današnji dan, ovu službu čini 10 specijalista i jedan specijalizant urgentne medicine, kao i 20 medicinskih tehničara, dok pomoć čine 1 specijalista i 2 specijalizanta urgentne medicine iz okoline Beograda. Uloga PTOUM-a je precizna trijaža bolesnika sa ER-om za KOVID-19 i njihovo dalje izolovano i kompletno zbrinjavanje.

Učinjena je promena namene ambulante najbliže trijažnom prostoru (hirurška opservacija) u prijekorno trijažnu ambulantu urgentne medicine (PTA), u kojoj može istovremeno da se zbrane 6 - 12 bolesnika. Obezbedena su sva neophodna dijagnostička sredstva (EKG aparat i defibrilator, neinvazivni monitoring, portabilni ventilator, aspirator, pokretni RTG i ultrazvučni aparat, centralni kiseonički protok i prenosive kiseoničke boce), samo za potrebe zbrinjavanja bolesnika sa ER-om. Obezbeđen je jedan aparat za kompjuterizovanu tomografiju samo za ovaj profil bolesnika, a transport do njega je unapred definisan, epidemiološki bezbednim putem, bez kontakta sa drugim bolesnicima.

**PROCENA EPIDEMIOLOŠKOG RIZIKA**

Odvajanje bolesnika sa i bez ER-a se sprovodi od strane iskusnih medicinskih tehničara, odmah na prijemu u UC. U specifičnim situacijama, pomoć čine specijalizanti ili specijalisti urgentne medicine. Procena ER-a podrazumeva popunjavanje epidemiološkog upitnika, kratku ciljana anamnezu, merenje temperature i procenu respiratornog statusa bolesnika. Pitanja na epidemiološkom upitniku su se vreme-nom menjala i zavisila su od trenutne epidemiološke situacije. Tako je u prvim upitnicima postojalo pitanje o putovanjima u inostranstvo, posebno u visoko rizične zemlje i regije kao što su tada bile Italija, Španija i Francuska. Posljednja novouvedena pitanja se odnose na trenutni epidemiološki status bolesnika, a od jula meseca, uključili su se i specijalist i 2 specijalizanta urgentne medicine iz okoline Beograda.

Pitanja na epidemiološkom upitniku su se vreme-nom menjala i zavisila su od trenutne epidemiološke situacije. Tako je u prvim upitnicima postojalo pitanje o putovanjima u inostranstvo, posebno u visoko rizične zemlje i regije kao što su tada bile Italija, Španija i Francuska. Posljednja novouvedena pitanja se odnose na trenutni epidemiološki status bolesnika, a od jula meseca, uključili su se i specijalist i 2 specijalizanta urgentne medicine iz okoline Beograda.

**EPIDEMIOLOGICAL RISK ASSESSMENT**

On the first day that the state of emergency was declared in Serbia, March 15, 2020, the Admissions Triage Facility of Emergency Medicine (ATFEM) was established. It was initially staffed with 7 emergency medicine (EM) specialists, 2 residents, one M.D. and 20 medical technicians. Surgery, internal medicine and anesthesiology residents acted as auxiliary staff, and, as of the month of July, they were joined by emergency medicine specialists from the surrounding Belgrade municipalities. At present, the staff of this facility includes 10 EM specialists, 1 EM resident, and 20 medical technicians, while the auxiliary staff includes 1 EM specialist and 2 EM residents from the Belgrade suburban area. The role of the ATFEM is in the precise triage of the patients with epidemiological risk (ER) of COVID-19 and in their further isolated complete diagnostics and treatment.

The examination room nearest to the triage space (surgical observation room) was reallocated to be used as the admissions triage examination room (ATER) for emergency care, where between 6 and 12 patients can be cared for at any given time. All necessary diagnostic equipment and resources (ECG machine and defibrillator, non-invasive monitoring, portable ventilator, aspirator, portable X-ray and ultrasound machine, central oxygen supply and portable oxygen tanks) were made available only for the care of patients with ER. A separate CT machine was designated only for these patients, while patient transportation to this machine was predefined so as to be performed via an epidemiologically safe route, without contact with other patients.
ZBRINJAVanje BOLESNIKA SA EPIDEMIOLoškim RIZIKOM (ER)

Proces respiratornog statusa podrazumeva merenje saturacije pulsnim oksimetrom, orijentacionu procenu broja respiracija, a kod pojedinih bolesnika i brzu auskultaciju od strane specijalizanta ili specijaliste urgentne medicine. Na taj način se odvajaju bolesnici koji su respiratorno insuficijentni usled edema pluća, hroničnog bronhitisra, KOVID-19 oboljenja, ili metaboličke acidozne ili bolesnici koji hiperventiliraju. Za sve bolesnike koji su respiratorno insuficijentni iz nejasnog razloga, smatra se da imaju ER.

Bolesnici bez ER-a se sa trijaže u odgovarajuću ambulantu i dalje se zbrinjavaju po standardnoj, od ranije definisanoj proceduri. U slučaju da se kod nekog od takvih bolesnika u toku pregleda ispostavi da ipak možda ima ER, biva vraćen u PTA radi ponovne procene. Bolesnici za koje se na trijaži proceni da imaju ER se nadalje dijagnostikuju i leče u prijemno-trijažnoj ambulanti.

ZBRINJAVanje BOLESNIKA SA EPIDEMIOLoškim RIZIKOM (ER)

Ceо proces trijaža, pregleda, i procene u pogledu potrebe za odgovarajućom dijagnostikom, inicijalnim lečenjem i potrebošću za drugim konsultativnim specijalističkim pregledima bolesnika sa ER-om, predstavlja domen rada i odgovornosti specijalista urgentne medicine. Nakon obrade bolesnika sa ER-om, specijalista urgentne medicine, u dogovoru sa konsultantima, donosi odluku o daljem bolničkom lečenju bolesnika ili se bolesnik uz adekvatnu terapiju, može uputiti na dalje kućno lečenje. U slučaju potvrde virusa SARS-KoV-2 (antigenski test dostupan od novembra meseca 2020. godine) ili kliničke i laboratorijske prezentacije bolesnika koja jasno ukazuje na KOVID-19 infekciju, pacijent se iz PTA upućuje u dostupne kovid bolnice. Ako je pak indikovano bolničko lečenje bolesnika kod kojeg postoji ER, ali ne i jasna potvrda o virusu SARS-KoV-2, tada se prijem realizuje u UC-u, u jednoj od dve jedinice predviđene za izolaciju - internističkoj jedinici za izolaciju (za prijem internističkih bolesnika) ili hirurškoj jedinici za izolaciju (za prijem hirurških bolesnika). U bolničkim jedinicama za izolaciju, kod bolesnika koji se na trijažu proceni da imaju ER, a kada se prevode na regularnu odeljenju, za potrebe operativnog lečenja bolesnika koji su pod ER-om, izdvojena je jedna operaciona sala samo za ovaj profil bolesnika.

Ovakva organizacija je omogućila racionalnu primenu lične zaštite opreme (LZO). Svi zaposleni u PTOUM-u, bolničkim jedinicama za izolaciju, svi koji učestvuju u operativnom programu u izolovanoj situaciji, služe kao izolovana jedina za operativni program u izolovanoj situaciji, služe kao izolovana jedina za izolaciju bolesnika, koji su potrebni za odgovarajuće medicinske usluge. Ovaj sistem je omogućio optimalno rješenje situacije u medicinskoj zajednici, a time je povećao sigurnost i kvalitet medicinske usluge.

CARRYING FOR PATIENTS WITH EPIDEMIOLOGICAL RISK (ER)

The whole process of triage, examination, and assessment of the need for appropriate diagnostics, initial treatment and other consultative specialist examinations of patients with ER, falls within the responsibilities of emergency medicine specialists. After the patient with ER is processed, the EM specialist, in consultation with the consultants, makes the decision on whether the patient is to receive further in-hospital treatment or whether they are discharged for at-home treatment. In case of confirmed SARS-CoV-2 viral infection (the antigen test has been available since November 2020), clinical and laboratory presentation of the patient which clearly indicates COVID-19, the patient is transferred from the ATER to an available covid hospital. If, however, in-hospital treatment of a patient with ER is indicated, but clear confirmation of the SARS-CoV-2 viral infection is lacking, the patient is admitted to the EC, into one of the two units designated for isolation – the internal medicine isolation unit (for internal medicine patient admission) or the surgical isolation unit (for the admission of surgical patients). In the hospital isolation units, diagnostics and treatment of such patients is continued until there is definitive confirmation.
Operational sali, all consultants in PTA, received complete LZO (previously Uputstvo za korišćenje lične zaštitne opreme u pandemiji izdatim od strane Instituta za javno zdravlje Srbije „Dr Milan Jovanović Batut”), while the remaining healthcare staff in contact with patients without ER have had at their disposal basic PPE, depending on the work they perform.

**RESULTS**

Between March 15, 2020 and March 15, 2021, a total of 155,000 patients were processed in triage. Of this number, 9,519 patients were with ER and were taken care of in the admissions triage examination room. The greatest number of patients with ER was registered in the period November – December 2020 (Figure 1), which corresponds to the third wave of infection in Serbia (Figure 2). The greatest number of documented COVID-19 positive patients was registered from November 2020 to March 2021, which correlates with the implementation of antigen testing for SARS-CoV-2 virus.

**DISCUSSION**

The urgent center UKCS-a is an institution with the highest number of processed patients in Serbia (170,000 - 185,000 annually, before the pandemic). Unlike other institutions, which can restrict the intake of patients, scheduling preadmissions or delaying elective interventions, urgent centers have the most comprehensive treatment capacity, which makes it possible to rationally use personal protective equipment (PPE), while the remaining healthcare staff in contact with patients without ER have had at their disposal basic PPE, depending on the work they perform.

Legend: ER – epidemiological risk; ATER - admissions triage examination room

**Figure 1.** The number of patients with epidemiological risk and the number of confirmed COVID-19 positive patients cared for at the admissions triage examination room between March 2020 and March 2021.
Triage is the basis of the proper functioning of every modern emergency center [4]. As a process of categorizing patients into groups of different priority, depending on the degree of severity of their condition or injury [5], triage was, prior to the pandemic, performed in front of each examination room. Switching from such triage to triage in the pandemic is an essential change in the operation of the EC. The professional medical community recommends that triage in mass disasters (including a pandemic) should be performed by doctors with considerable clinical experience [6], senior physicians, particularly intensive care and emergency medicine specialists [7]. This was, in fact, applied when the Admissions Triage Facility of Emergency Medicine was formed, placing emergency medicine specialists in the front line.

DISCUSSION

The Emergency Center of the UCCS is the hospital with the largest number of treated patients in Serbia (170,000 – 185,000 a year, prior to the pandemic). As opposed to other hospitals, which can limit the influx of patients, by scheduling doctor’s appointments or by postponing scheduled elective surgical procedures, emergency centers must respond to every arrival of critically ill patients and must have an efficient and reliable method of operation in place, for all situations, especially in the pandemic that the entire world is now facing.

Triage is the basis of the proper functioning of every modern emergency center [4]. As a process of categorizing patients into groups of different priority, depending on the degree of severity of their condition or injury [5], triage was, prior to the pandemic, performed in front of each examination room. Switching from such triage to triage in the pandemic is an essential change in the operation of the EC. The professional medical community recommends that triage in mass disasters (including a pandemic) should be performed by doctors with considerable clinical experience [6], senior physicians, particularly intensive care and emergency medicine specialists [7]. This was, in fact, applied when the Admissions Triage Facility of Emergency Medicine was formed, placing emergency medicine specialists in the front line.
Ono što je bilo i ostalo presudno za samu ustanovu je-
ste ublažavanje širenja infekcije unutar ustanove, po-
gotovo sprečavanje prodora SAR-CoV-2 virusa na ode-
ljenja intenzivne nege.
Na ovaj način je bilo moguće prihvatiti sve kritično
obolele pacijente u UC-u bez rizika (ili sa malim rizi-
kom) za transmitnju KOVID-19 infekcije.
Naravno, ni u idealnim uslovima, a ponajmanje u
situisniji u kakvoj se sad nalažemo, ne postoji trijaža bez
mana. Osnovni nedostatak ovakvog razvrstavanja pa-
cijenata jeste prvenstveno oslanjanje na kliničku sliku
i simptome bolesnika, koji su, kod KOVID-19 oboljenja,
veoma raznovrsni i nespecifični. Povišena temperatura,
dispneja, bol u grlu i malaksalost nisu vezani samo za
KOVID-19 oboljenje, pa se često dešavalo da se u am-
bulantni brijanj vaju pacijenti kod kojih se napokon
dijagnostikuje srčano popuštanje, pogoršanje HOBP-a
astme, bakterijska pneumonija, plućna embolija,
epsa, itd. Zbog same prostorne ograničenosti nisu
razdvajani febrilni ili respiratorno insuficijentni paci-
meni manje suspektni na KOVID-19 infekciju od visoko
sepsa, itd. Zbog same prostorne ograničenosti
asti bolesnika koji su se istovremeno javljali u UC. Sličan
problem imali su i drugi urgentni centri, što su Levi
saradnici pokazali u svom radu, iz 2020. godine, koji se
ostali centri u delu za oblačenje i uklanjanje LZO-a, što
delotvorna trijaža je najvažnija tokom bilo koje situ-
acije masovnih nesreća, u koju spada i pandemija, jer
veliki broj pacijenata može brzo nadvladati ograničene
raspoložive resurse. Zato su Jasni protokoli (zakonski
ukovireni) urgrentnog zbrinjavanja u svim situacijama,
itetu potrebni, kao i prateća infrastruktura.

**Sukob interesna:** Nije prijavljen.

There are still many unknowns related to the SARS-
CoV-2 virus and the COVID-19 disease, but it was very
quickly established what the only effective course of
action in the fight against the disease entails, this be-
ing; strict isolation of suspected or confirmed COVID-19
patients, protective measures, and mass testing [8].
Immunization, as a way of limiting infection spread,
became available a year after the infection emerged.

As it was not possible to test every patient coming to
the EC, and since the result of the PCR test, as the most
reliable diagnostic test, takes time, it is clear that iso-
lation of patients suspected of the infection was the best
way to limit infection spread. This was, in fact, the aim
of Emergency Center reorganization, which is why a
separate, admissions triage examination room was es-
established. Patients with confirmed COVID-19 infection
were referred to covid hospitals, without further delay.

What was, and still is, of the utmost importance for the
hospital itself, was reducing the spread of the infection
within its walls, especially preventing the SARS-CoV-2
virus from entering the intensive care units.

In this way, it was possible to admit all critically ill
patients to the EC with no or very little risk of further
COVID-19 transmission.

Of course, even in ideal conditions, let alone in the
situation that we have found ourselves, flawless triage
does not exist. The main drawback of this patient triage
system is relying on the clinical presentation and symp-
toms exhibited by the patient, which, in COVID-19,
tend to be very varied and nonspecific. Elevated body
temperature, dyspnea, a sore throat, and malaise are
not symptoms connected only to the COVID-19 dis-
ease, which is why it has often occurred that some of
the patients initially cared for in the ATER were event-
ually diagnosed with heart failure, COPD or asthma
eacerbation, bacterial pneumonia, pulmonary embo-
lish, sepsis, etc. Due to constraints in available space,
febrile or patients with respiratory insufficiency, who
were less suspicious of COVID-19, were not separated
from patients with a high suspicion of the infection.

The floor area of 50 square meters and the availability of 6-
12 beds with 6 spots for oxygen supply have proven to
be insufficient for treating a large number of patients
arriving at the EC at the same time. Other emergency
centers have faced a similar problem, as reported by
Levy et al., in their study from 2020, which describes
the organization of triage at the Sheba Medical Center
[9]. Space was limited in the changing and PPE disposal
area, as well, which often necessitated improvisation.
Another disadvantage of this type of triage is that
it applies only to grouping patients according to ER
and not also according to the degree of emergency
of the illness or injury. The degree of emergency is still
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determined separately within each examination room, including the ATER. This is due to the already described lack of space for triage as well as the deficit in staff. However, the Admissions Triage Facility of Emergency Medicine, which was formed to meet the needs arising in the pandemic, and which has been developing and establishing itself over the past year, is already working on implementing new triage protocols for categorizing patients by degree of emergency (the SRTS protocol), which will be implemented immediately after capacities in both staff and space are increased.

CONCLUSION

Effective triage is of the utmost importance in any situation where there are mass casualties, which includes pandemics, since a great number of patients can very quickly overwhelm the limited available staff and resources. This is why clearly outlined protocols (defined by law) for emergency care in all situations are absolutely necessary, as is supporting infrastructure.

Conflict of interest: None declared.