

Impact of the beginning of COVID 19 pandemic on prehospital emergency medical service utilization

Utjecaj početka COVID-19 pandemije na korištenje vanbolničke hitne medicinske službe

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Summary

Patients seek emergency medical service (EMS) help for non-urgent conditions every day. The aim of this study was to analyze the impact of the first 28 days of the COVID-19 pandemic in Croatia on prehospital EMS utilization. A retrospective observational cohort study of all patients attended by EMS teams of Sveti Ivan Zelina, Croatia, in the period from March 11 through April 8, and for every year between 2015 and 2020. The data from the mentioned period for 2020 was also compared with the 8 weeks earlier period (December 18, 2019, through January 15, 2020). Data was collected from eHitna software, and the main measure of outcome was determined by the International Classification of Disease (ICD-10) diagnostic code, assigned by the attending physician. During the study period, we observed 1171 walk-in patients and 750 on field interventions. There was a decrease of 41% in walk-in cases during the pandemic from an average of 209 (± 36.89) cases between 2015 and 2019 to 123 walk-in cases in 2020. Also, there was a significant increase in the proportion of cases involving injuries by 11% ($p = 0.01$) and mental health issues by 5% ($p < 0.01$). Considering that there were 41% more walk-in visits in the pre-pandemic period, we conclude that EMS is used in large numbers for non-emergency conditions.

Key words: Emergency Medical Services, Primary Health Care, Public Health, Pandemics, COVID-19

Sažetak

Pacijenti svakodnevno koriste hitnu službu zbog stanja koja nisu u domeni hitnih. Cilj ovoga istraživanja bio je analizirati korištenje hitne medicinske skrbi u prvih 28 dana COVID-19 pandemije u Hrvatskoj. Opservacijska retrospektivna kohortna studija provedena je na svim bolesnicima koji su se javili u hitnu službu u Svetom Ivanu Zelini, Hrvatska, od 11. ožujka do 8. travnja, za svaku godinu, od 2015. do 2020. Također, podaci iz navedenoga razdoblja 2020. godine uspoređeni su s razdobljem 8 tjedana ranije (18. prosinca 2019. do 15. siječnja 2020. godine). Podaci su prikupljeni putem sustava eHitna, a kao glavni razlog dolaska korišten je podatak unesen od strane liječnika putem šifarnika Međunarodne klasifikacije bolesti (MKB-10). Tijekom ispitivanoga razdoblja, 1171 pacijent fizički je posjetio hitnu ambulantu, te je obavljeno još 750 terenskih intervencija. Tijekom pandemije bilježi se pad posjeta od prosječnih 209 ($\pm 36,89$) između 2015. i 2019. godine na 123 posjete u 2020. godini, što je pad od 41%. Također, zabilježen je značajan porast dolazaka zbog ozljeda za 11% ($p = 0,01$), te psihičkih poremećaja za 5% ($p < 0,01$). Sudeći po broju od 41% više fizičkih dolazaka u ambulantu hitne službe prije pandemije, zaključujemo da su pacijenti doista koristili hitnu medicinsku službu za stanja koja nisu hitna.

Ključne riječi: Hitna medicinska služba, primarna zdravstvena zaštita, javno zdravstvo, pandemija, COVID 19

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Introduction

On 11 March 2020, the Minister of Health of the Republic of Croatia declared the COVID-19 disease pandemic caused by the SARS-CoV-2 virus.¹ Prehospital care is an essential part of emergency health care and as such it is performed without any restrictions during the pandemic. Although many other clinicians face challenges during this period, the challenges of emergency medical service (EMS) employees are particularly difficult, so national guidelines have been adopted to define the procedures with patients, proper use of personal protective equipment and decontamination procedures.^{2,3} On April 8, 2020, the total number of infected persons in Croatia was 1343, where 19 died, while 179 persons recovered.⁴ Considering those circumstances and due to the lack of education of the general public on how to utilize the healthcare system, a considerable number of visits to the prehospital EMS units are still by patients seeking non-urgent care. The inability to access general practitioners, concern about the current present, perceived EMS effectiveness, and awareness of how individuals conceptualize an emergency are all important predictors of attendance rates.⁵⁻⁸ Research shows that about 40-50% patients seek EMS help because of non-emergency conditions.^{9,10} Attitudes and habits of non-urgent patients are linked to local, and socially shared practices.¹¹ Our hypothesis was that patients with non-urgent care problems sought significantly less medical attention from EMS because of the COVID-19 pandemic. The aim of this study was to analyze the impact of the first 28 days of the COVID-19 pandemic in Croatia on prehospital EMS utilization. Our specific aims were to check the differences of the presented diagnoses distribution in COVID-19 pandemic and to compare the out-of-hospital EMS utilization in the analyzed pandemic period with eight weeks before the outbreak period.

Materials and Methods

This community-based retrospective observational cohort study of all consecutive patients requiring out-of-hospital EMS in the period from March 11 through April 8 for every year between 2015 and 2020 was conducted using information from our database eHitna software (Rinels d.o.o., Rijeka, Croatia). This period was used because the mentioned software was set to analyze 28 consecutive days. The total number of cases during the study period was 1171 walk-in patients (624 female, 547 male) and 750 (389 female, 361 male) on field interventions. Also, cases were observed during four weeks after the COVID-19 pandemic outbreak

and compared to eight weeks before the outbreak (December 18, 2019, through January 15, 2020). Patients of all ages and gender receiving prehospital emergency medical assistance with a documented primary assessment were included from the EMS team located in Sveti Ivan Zelina, Croatia which covers the area of one town and 61 localities (185.44 km²). Sveti Ivan Zelina is a suburban town in Central Croatia (25 km from Zagreb, the capital) counting 15 959 inhabitants (year 2011) in the whole area and 2 764 in the town itself.^{12,13} Codes were assigned by the EMS call center dispatcher by Croatian index for field interventions as follows: 1) red – life-threatening emergent cases, 2) yellow – non-life-threatening urgent cases which need to be checked by a physician, 3) green – non urgent or chronic cases.¹⁴ The primary assessment using the International Classification of Disease (ICD) diagnostic code, assigned by the attending physician as the main diagnosis, was used as the main measure of outcome. In this study we did not distinguish repeat callers, thus repeat interventions were treated as individual cases. Furthermore, we did not analyze the impact of education, socioeconomic or other characteristics of patients on EMS usage or physicians recommendations.

The study was submitted to and approved by the Committee on Ethics and Research of the institution. Data was entered into Excel for Windows (Microsoft Corporation, Redmond, WA, USA) and transported into MedCalc Statistical Software version 15.8 (MedCalc Software BVBA, Ostend, Belgium; <https://www.medcalc.org>; 2015) for data analysis. The One-sample proportion test was used to assess whether a proportion of set diagnoses during pandemic was significantly different from an average proportion of set diagnoses in the early years from 2015 to 2019 with 95% Confidence Interval (CI) for the observed proportion and P-value < 0.05 as significant.

Results

There were no statistical significant differences between genders. We found difference in the number of on field interventions during pandemic, 117 cases in 2020, 9.02% less compared to average of same period in previous years 126.6 (\pm 9.01). There was a decrease by 41% in walk-in cases during the pandemic from an average of 210 (\pm 36.89) cases between 2015 and 2019 to 123 walk-in cases in 2020. We found no significant difference between the proportion of index criteria set by the dispatcher for on-field interventions (Acute 55.6 vs. 48 in 2020, P = NS; Urgent 67 vs. 58 in 2020, P = NS, Usual 10 vs. 11; P = NS) (Figure 1).

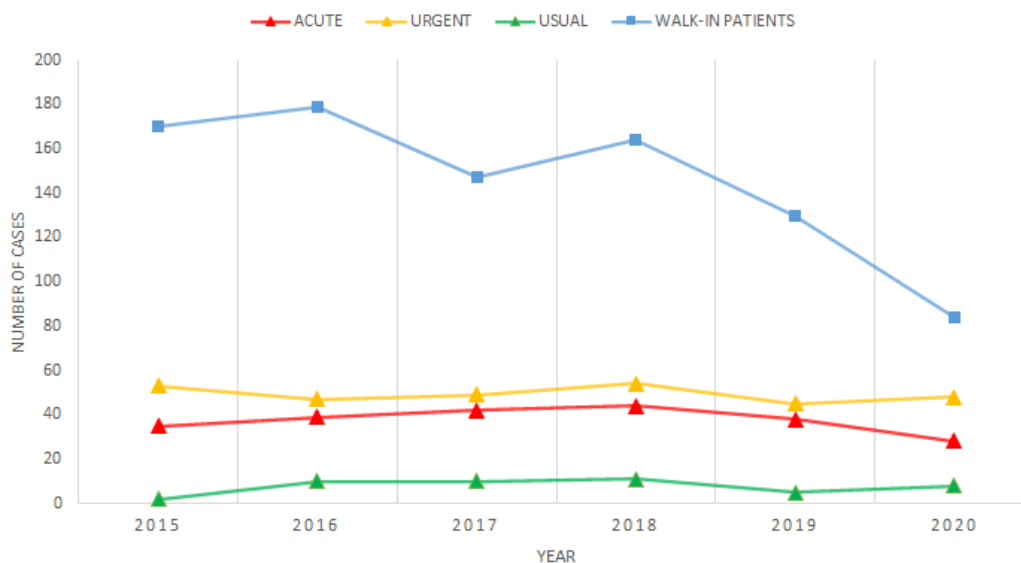


Figure 1 Utilization of prehospital emergency medical service of the town of Sveti Ivan Zelina, Croatia from March 11 through April 8 during a 5-year period by priority level for field interventions (Croatian Index for Emergency Medical Assistance) and walk-in patients

Slika 1. Korištenje prehospitalne hitne medicinske pomoći grada Svetog Ivana Zeline, Hrvatska od 11. ožujka do 8. travnja tijekom petogodišnjeg razdoblja po stupnju prioriteta za intervencije na terenu (Hrvatski indeks hitne medicinske pomoći) i pacijente bez najave.

During the pandemic, a different distribution of presented diagnoses was observed, a greater proportion of cases in injury, poisoning and certain other consequences of external causes (S00-T98) by 11% (35.8 to 31 cases per year, $P = 0.01$), an increase in the total proportion of cases in mental and behavioral disorders (F00-F99) by 5% (4.4 to 9 cases, $p < 0.01$) and an insignificant increase in proportion of cases in symptoms, signs and abnormal clinical and laboratory findings, not

elsewhere classified (R00-R99) as in diseases of the skin and subcutaneous tissue (L00-L99) by 3%. We found an insignificant but paradoxical decrease by 6% (27.2 to 8, $p < 0.01$) of cases in diseases of the respiratory system (J00-J99) and 4% decrease in diseases of the eye and adnexa (H00-H95), diseases of the circulatory system (I00-I99) and diseases of the musculoskeletal system and connective tissue (M00-M99) since the pandemic was declared (Figure 2).

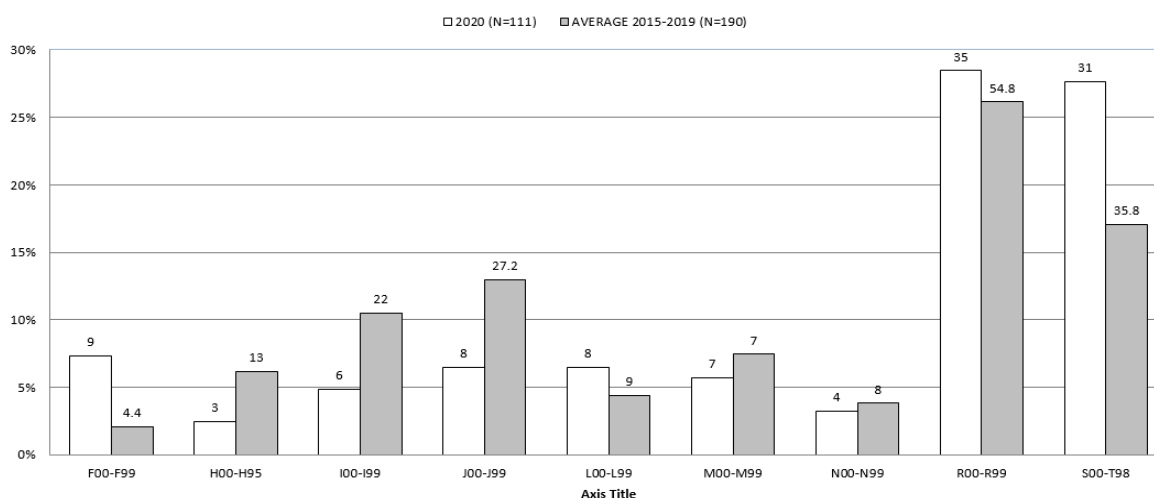


Figure 2 Absolute number and percentage of all cases stratified by ICD-10 classification in 2020 (white bars) and average during 2015 to 2019 (gray bars)

Slika 2. Apsolutni broj i postotak svih slučajeva stratificiranih prema ICD-10 klasifikaciji u 2020. (bijeli stupci) i prosjek tijekom 2015. do 2019. (sive stupci)

Comparing data 8 weeks before and 4 weeks after the COVID-19 outbreak, a significant change was noticed. The most significant decrease of cases was seen in J00-J99 group (1.61 before vs. 0.29 cases per day during the outbreak, $p < 0.001$), H00-H95 group (0.68 vs. 0.11, $p < 0.001$), I00-I99 (0.71 vs. 0.21, $p < 0.001$), M00-M99 (0.61 vs. 0.25, $p < 0.01$), and N00-N99 (0.38 vs. 0.14, $p < 0.05$). On the other hand, a significant increase of noted cases was found only in S00-T98 group (0.64 vs. 1.21 cases per day during the outbreak, $p < 0.01$). Noteworthy, a slight insignificant increase was found in F00-F99 group (0.23 vs. 0.32 cases per day during the outbreak, $p = \text{NS}$) (Figure 3).

Discussion

The psychological and psychosocial impact on patients is evident through an increase in mental disorder diagnoses as the COVID-19 pandemic is inducing a considerable degree of fear and concern in the population. The main psychological impact in public mental health terms is elevated rates of stress or anxiety. But as new epidemiological measures are introduced, levels of loneliness, depression, alcohol, and drug abuse as well as self-harm or suicidal behavior were expected to rise.¹⁵ The period of time at the end of March was used on purpose because of the beginning of the first lockdown in Croatia.

EMS are widely available in Croatia and patients abuse the possibility to seek medical attention whenever they need it. A reduced proportion of

diagnoses such as otitis, pharyngitis, acute nasopharyngitis or hypertension suggests that there is a considerable EMS utilization for conditions that are not urgent during regular work. Our research showed a decrease of 41% patients seeking EMS help which is comparable to other studies.^{9,10} Factors associated with frequent utilization include gender, race, poor mental health, mental health drugs, prescription drug abuse, social networks, employment, perceptions of service quality, seriousness of condition, persistence of condition, and previous hospital admittance.¹⁶ We showed a significant decrease of seeking EMS because of H, I and J diagnoses in the pandemic period. Furthermore, an increased proportion of patients with injuries indicates that during the pandemic emergency medical assistance was requested by people who really needed it and that, among other factors, public awareness of the appropriate use of emergency medical services had increased.

Inappropriate usage of EMS has serious repercussions. It depletes health system resources, weakens EMS staff morale, and can result in delaying response to other emergency calls. Reducing unnecessary primary care cases in EMS seems to be possible and can have operational and economic benefits for EMS as well as for urgent patients. On the other hand, the efficiency of EMS can be improved by increasing the capacity for inpatient psychiatric hospitals for treating indigent patients because of the rising prevalence of psychotic spectrum disorders, affective disorders, personality disorders and dementia.¹⁷

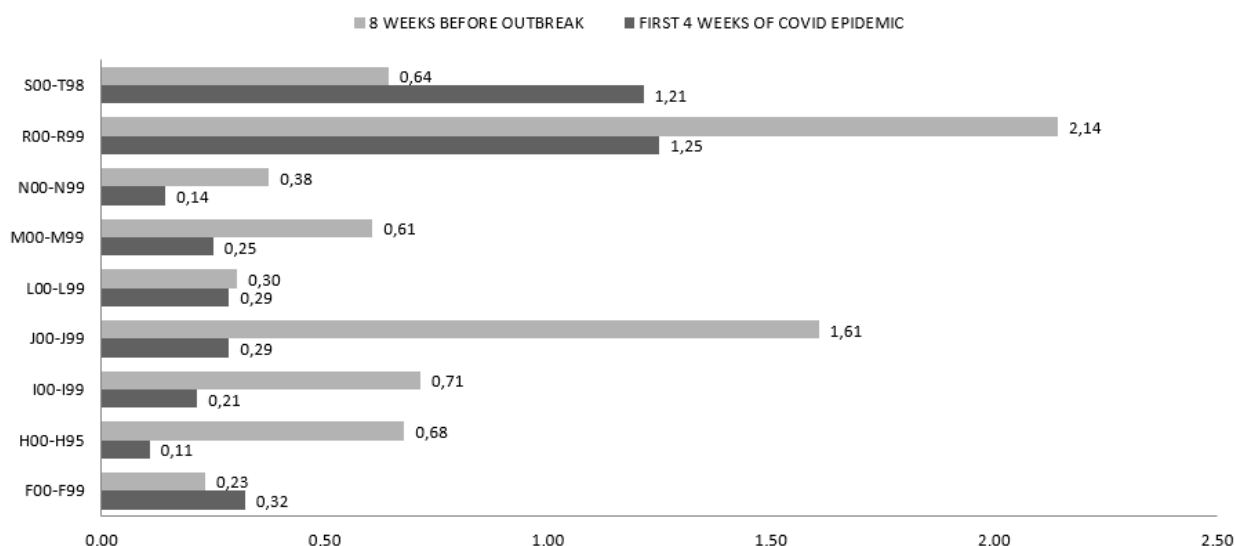


Figure 3 Ratio of main walk-in and field intervention cases grouped by ICD-10 classification per day in an 8-week period before the COVID 19 outbreak (gray) and the first 4 weeks of COVID 19 pandemic outbreak (black).

Slika 3. Omjer glavnih slučajeva bez najave i intervencija na terenu grupiranih prema klasifikaciji ICD-10 po danu u razdoblju od 8 tjedana prije izbijanja COVID-19 (sivo) i prva 4 tjedna izbijanja pandemije COVID-19 (crno).

Awareness rising activities for inappropriate ambulance use prevention and expanding primary care clinic office hours can also significantly reduce EMS utilization for non-emergency conditions.¹⁸ According to the newest study from the United Kingdom the impact of Acute Visiting Scheme (AVS) in primary care led to the significant reduction of EMS utilization.¹⁹ The goal of the EMS team is to start appropriate treatment or to rule out an emergency medical condition rather than addressing non-emergency conditions, this can ultimately result in inappropriate care for patients with non-emergency conditions. However, non-urgent patient EMS care may be less effective than primary care. Unfortunately, patients frequently do not comply with the advice they receive from the physician including other EMS staff.²⁰ This study has several limitations. We did not divide patients by their emergency diagnosis, comorbidities, and their chronic therapy because of practical reasons. On the other hand, we did not have data on the socioeconomical and education determinants of patients. Other data of patients who were sent to the hospital emergency room could not be assessed to check their final diagnoses. Further research should include family practices to show how many patients really needed EMS care or could be solved within their chosen family physician. Patient and staff education are the main keys of the medical care quality on all healthcare levels, not only EMS.

Conclusion

Our results indicate that there were significantly more visits in the pre-pandemic period, leading us to conclude that emergency medical services are used in large numbers for non-emergency conditions. The pandemic period, possibly because of the fear of infection, shows us the possibility to use emergency medical service as to closely match "response" with "request" and that we can lower the rate of the inappropriate use of EMS.

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