



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



# An assessment of treatment, transport, and refusal incidence in a National EMS's routine work during COVID-19

Maya Siman-Tov<sup>a,b,\*</sup>, Refael Strugo<sup>a</sup>, Timna Podolsky<sup>a</sup>, Oren Blushtein<sup>a</sup>

<sup>a</sup> Magen David Adom, Tel Aviv, Israel

<sup>b</sup> Sackler Faculty, Public Health School, Tel-Aviv University, Tel-Aviv, Israel

## ARTICLE INFO

### Article history:

Received 10 December 2020

Received in revised form 18 January 2021

Accepted 20 January 2021

### Keywords:

Covid-19

Transport refusals

Pre-hospital activities

## ABSTRACT

**Background:** COVID-19 created lifestyle changes, and induced a fear of contagion affecting people's decisions regarding seeking medical assistance. Concern surrounding contagion and the pandemic has been found to affect the number and type of medical emergencies to which Emergency Medical Services (EMS) have responded.

**Aim:** To identify, categorize, and analyze Magen David Adom (MDA), Israel's national EMS, pre-hospital activities including patients' refusal to hospital transport, during the COVID-19 pandemic crises.

**Methods:** A comparative before and after design study of MDA incidents during March/April 2019 and March/April 2020. Medical type, frequency, demographic, location, and transport refusal proportions and outcomes were analyzed.

**Results:** A decrease of 2.6% in the total volume of incidents was observed during March and April 2020 compared with the equivalent period in 2019. This contrasted with the retrospective trend of annually increase observed through 2016–2019. Medical categories showing increase in 2020 were infectious disease, cardiac arrest, psychiatric, and labor and deliveries, with out-of-hospital deliveries increasing by 14%. Decreases in 2020 were seen in neurology and trauma, with trauma incidents occurring at home showing an 8.6% increase. Patients' refusal to transport rose from 13.4% in 2019 to 19.9% in 2020. Cases of refusals followed by death within 8 days were more prevalent in 2020.

**Conclusion:** EMS must be prepared for changes in patients' behavior due to COVID concerns. Targeting populations at risk for refraining or refusing hospital transport and implementing diverse models of EMS, especially during pandemic times, will allow EMS to assist patients safely, either by reducing truly unnecessary ED visits minimizing contagion or by increasing hospital transports for patients in urgent or emergent conditions.

© 2021 Published by Elsevier Inc.

## 1. Introduction

During the current COVID-19 pandemic, Emergency Medical Service organizations globally have met the crisis while continuing their regular pre-hospital work. Routine work was influenced both by EMS workers' need to take precautions such as Personal Protective Equipment (PPE), case overload, and the risk of contagion for themselves or their patients [1] and by the patients' fear of contagion. The overwhelming realities of the pandemic did not prevent EMS from responding to out-of-hospital-cardiac-arrest (OHCA), stroke, ST Elevated Myocardial Infarction (STEMI), births, anaphylactic shock, seizures, and trauma [2,3]. However, many EMS systems, as well as other medical systems, reported changes in prevalence and types of incidents and calls [3,4]. Lockdown and quarantine also affected locations where traumatic injuries occurred [5]. By comparing the number and type of incidents during the

pandemic time to previous years, EMS and hospitals are able to assess the decline or increase in emergency incidents and characteristics.

COVID-19 created lifestyle changes based on government rulings as well as personal choices, such as lockdown, isolation, social distancing, and travel restrictions [6,7]. These affected patients' decisions regarding transport to hospital, as well as medical crews' decision to transport or treat at home certain conditions. The extreme concern of contagion has caused medical workers to fear that patients with urgent or emergent conditions will decline treatment or transport due to fear of contagion [8].

This has been shown to be a real concern, as patients with serious conditions showing obvious signs of deterioration due to neglect have admitted they delayed seeking medical attention because of fear of COVID-19 contagion in the hospital [9]. Conversely, a case study found that hospitals and primary care doctors are showing a generalized decline in alacrity treating conditions in the gray area of urgency, particularly in cardiac and cancer patients. While the decision to delay hospitalization for diagnosis or treatment, minimizing patient exposure

\* Corresponding author at: Yermuyahu 25 Kiryat Ono, Israel.  
E-mail address: [mayas@mda.org.il](mailto:mayas@mda.org.il) (M. Siman-Tov).

to COVID-19, may seem compassionate and careful, this can lead to avoidable deaths [10].

In particular, changes in prevalence of urgent cases such as cardiovascular incidents, and trauma have been observed. Chicago based research reports a 20% reduction in EMS calls for suspected stroke as well as fewer hospital admissions for stroke, although the basis for the decline remains unclear [11]. Hospitals across Europe have seen a reduction in STEMI patients. Several possibilities may have contributed to this trend. Patients may be afraid of infection or neglect, EMS personnel trained to diagnose STEMI may be less available, response times and call to treatment times are significantly longer as well as added time required for Personal Protective Equipment (PPE) implementation [12]. In the USA, a preliminary analysis of STEMI during the early stages of the COVID-19 pandemic show an estimated 38% reduction in STEMI activations in hospital catheterization labs, possibly due to avoidance of medical care because of isolation and contagion fear, and increased use of pharmacological reperfusion due to COVID-19 [1]. An increase in cath lab responses has been seen as well due to COVID-19 screenings and PPE requirements [13].

In Israel, as in many countries globally, the COVID pandemic heavily affected public health systems. Magen David Adom (MDA), the Israeli national EMS organization serving a population of 9 million, was heavily employed in the fight against the COVID-19 pandemic, working closely with the Ministry of Health (MOH) [14]. During routine times, MDA receives an average of 6000 emergency calls daily, and dispatches teams to an average of 1500 EMS incidents daily. MDA is built to effectively respond to both individual and mass civilian and military emergencies, and using this expertise created an overnight response to the MOH request for nationwide SARS-COV-2 sampling including home visits and drive thru centers. Moreover, during the initial COVID crisis MDA created and ran a “corona call center” responding to upwards of 50,000 calls daily.

While this unprecedented COVID undertaking was occurring in MDA, ongoing routine incidents continued while showing some changes in frequency and type. This study aims to describe routine pre-hospital activities of Israel's national EMS organization during the COVID-19 pandemic crises. We believe this will enable other EMS organizations to adapt their resources and activities ensuring the ongoing health and safety of their patients.

## 2. Methods

### 2.1. Aim

This study comparatively assessed the type, frequency, demographic, location, and refusal rate of all medical emergency incidents during the COVID outbreak in March/April 2020 with equivalent period 2019.

### 2.2. Study procedure

This was a comparative before and after study using data from the MDA database derived from the Control and Command (CC) technological platform, which records, monitors, and audits all MDA activities. Our primary before and after focus was on incidents during the 2019–2020 March/April periods.

Incidents were defined as emergency medical events beginning with 101 call to MDA and concluding with arrival of MDA team on site. We assessed the type and frequency of incidents in both time periods. We excluded all calls that were information-only COVID-19 calls. As mentioned above, MDA created a call center designated for all COVID-19 related queries such as sampling information, isolation guidelines, and MOH lockdown instructions. In cases of a medical emergency, the call was diverted to the usual 101 MDA emergency number. This enabled the enormous and unprecedented influx of COVID-19 related calls to be addressed separately from the routine emergency calls.

### 2.3. Measurements

The sum total of incidents during March/April of 2016–2020 was identified. Incidents from March/April 2019 and 2020 were categorized by medical type, and demographics (age and gender). Medical type refers to the medical assessment made by the EMS team on-scene. For various control purposes, all diagnoses in the CC system are categorized. Our study looked at the following categories: Psychiatry (including anxiety, psychotic episodes, suicide attempts), Endocrinology (including hypo/hyper glycaemia), Urology, Traumatic Injury, Ob-Gyn, Neurology (including loss of consciousness, syncope, TIA/CVA), Environmental Emergencies, Allergy and Anaphylaxis, Overdose, Burns, Cardiovascular, Respiratory, Neurological, Gastrointestinal, Infectious Disease, Cardiac Arrest, Labor and Delivery. Traumatic Injury incidents were also sub-categorized for site of occurrence due to the lifestyle changes enforced by the pandemic affecting patients' typical locations.

### 2.4. Refusals rate

MDA, Israel's national EMS operates on the Anglo-American model. This is the “scoop and run” response, minimizing pre-hospital time and requiring hospital transport in every case, unless met with patient refusal. The MDA team is staffed by paramedics and senior Emergency Medical Technicians (EMTs) rather than physicians. The team has no authority to decline a transport to the Emergency Department. A refusal indicates that a call was made to MDA, a medical team was dispatched, but the patient refused transport to hospital despite team's recommendation. A patient may have multiple incidents of transport refusal per study period. We also identified cases where the refusal was followed by a subsequent transport or a death. Within that category we also identified those incidents where within one hour to eight calendar days from the initial refusal, MDA was called back to the same patient, and the incident ended in transport to hospital or death. We divided all refusals into three tiers. The first category included all patients who refused transport. The second, all refusals followed by call-back leading to transport or death. The third, refusals followed by call-back with transport or death within one hour to eight days of the refusal. We also performed an analysis of the demographics of the transport refusers.

### 2.5. Statistical analysis

The statistical analysis used was the SPSS version 25. The mean increase trend of incidents during March April 2016–2020 was calculated. Descriptive statistics and delta calculation (decrease/increase in percentage) were used to describe the number and prevalence of each medical code during March and April of 2019 and 2020. Differences in prevalence of each medical classification by year was analyzed using Chi square test referring to each medical classification as a binary outcome e.g. respiratory incident (yes vs no) \* period (2019 vs 2020). The “no's” represent all other types of incidents. Refusal proportions and their outcomes (death or hospital transport during March/April of 2019 and 2020). Chi square analysis and delta calculation were also applied to site of traumatic injury occurrence in cases of trauma medical codes. *P* value < .05 considered statistically significant. Gender and age differences between 2019 and 2020 (March/April) in general and in refusals was analyzed by Chi square and independent sample *t*-test, respectively.

## 3. Results

### 3.1. Routine medical EMS incidents

From 2016 to 2019 an average annual increase of 9.2% in the volume of incidents during March and April was observed. Although in 2019 we observed an atypical, unexplained slowing of the upwards trend, even

then the trend towards increase continued. However, this trend changed during the equivalent time in 2020. We see a decrease of 2.6% in the volume of incidents during March/April 2020 (99,174) compared to 2019 (101,847). (Fig. 1).

When comparing age and gender demographics we found the following similarities between 2020 and 2019 incidents, 53.4% males in 2019 and 51.3% in 2020 and mean age of 52.1 in 2019 compared to 51.6 in 2020.

Table 1 presents the prevalence and percent of incident types by on-scene medical category during 2019 and 2020. In 2020 we observed a significant increase in infectious diseases, cardiac arrests, psychiatric incidents, Ob-Gyn, labor and deliveries with a pre-hospital delivery increase of 14% (142 vs. 165 deliveries). A significant decrease was observed in neurology, cardiovascular, trauma, overdose and endocrinology (diabetes). When sub-categorizing traumatic injury by site of occurrence, a 33% decrease in workplace related trauma ( $p < .001$ ) and a 44% decrease in road accident related trauma ( $p < .001$ ) was observed.

Traumatic injuries occurring at home showed an 8.6% increase in 2020 ( $p < .001$ ) (Table 2).

### 3.2. Refusals

During March/April 2019, the number of patients' refusals to transport was 13,637 (13.4% of incidents). Comparatively, during this time in 2020 the number of patients' refusals was 19,763 (19.9% of incidents). The results are statistically significant ( $\chi^2 = 1550.29 p < .001$ ). This is an almost 50% increase in refusals, potentially resulting in deterioration of patients' health. When comparing demographics and dispatch medical categories (on-scene medical classifications are not used in cases of refusal) we found the following differences between 2020 and 2019 refusals. In 2020 the age of refusers was higher (mean of 49.8 with standard deviation equal to 29.9 vs. mean of 45.6 with standard deviation equal to 32.2 respectively); more female (48.3% vs. 43.3% respectively) and the most frequent dispatch medical category Adult Disease (72.8% vs. 61.3% respectively). Of the 19,763 refusals in 2020, 9.8% ended in a subsequent transport compared to 8.6% in 2019 ( $\chi^2 = 12.91 p < .001$ ). There was no difference in proportion by time period in refusals resulting in call-back and ending in pre-hospital deaths ( $p = .44$ ), recalling MDA within one hour to 8 days ( $p = .16$ ). Of the pre-hospital deaths following refusal, 75.0% occurred within one hour to eight days in 2020, vs. 57.9% in 2019 ( $\chi^2 = 3.04 p = .08$ ) (Fig. 2).

## 4. Discussion

Since the start of the coronavirus pandemic, the public has been exposed to many sources of COVID-19 information and misinformation [15-17]. The fear of contagion has led to many behavioral changes. Personal health decisions have also been affected by fear of contagion [18,19]. Globally, EMS organizations have begun to assess the areas in which the pandemic has affected routine EMS work [1,11,12]. MDA, Israel's national EMS organization, has evaluated the differences in

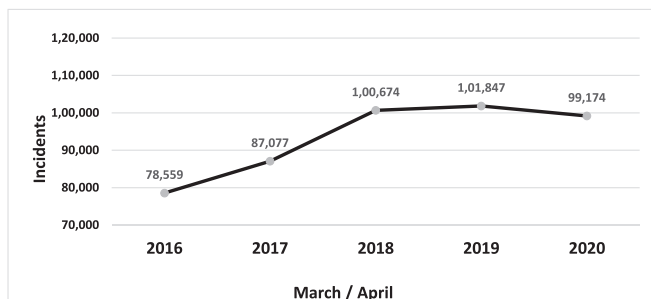


Fig. 1. Number of incidents during March and April 2016–2020.

Table 1  
Medical incidents frequency and proportions 2019 vs 2020

Type of medical incident	2019		2020		$\Delta$	$\chi^2$	p-value
	N = 101,847		N = 99,174				
Respiratory	12,429	12.2%	15,010	15.1%	+20.8%	347.90	<0.001
Neurology	21,569	21.2%	19,107	19.3%	-11.41%	127.10	<0.001
Cardiovascular	16,275	16.0%	14,972	15.1%	-8.01%	35.80	<0.001
Traumatic injury	20,539	20.2%	16,663	16.8%	-18.87%	399.75	<0.001
Cardiac Arrest	4899	4.8%	5674	5.7%	+15.82%	78.53	<0.001
Psychiatry	2088	2.1%	2177	2.2%	+4.26%	4.31	0.038
Infectious Disease	1446	1.4%	3135	3.2%	+116.80%	674.40	<0.001
Labor and Delivery	2081	2.0%	2412	2.4%	+15.91%	32.63	<0.001
Urology	897	0.9%	859	0.9%	-4.24%	0.22	0.64
Ob-Gyn	483	0.5%	600	0.6%	+24.22%	15.32	<0.001
Overdose	1886	1.9%	1440	1.5%	-23.65%	51.59	<0.001
Endocrinology	800	0.8%	607	0.6%	-24.13%	22.71	<0.001
Environmental	636	0.6%	584	0.6%	-8.18%	1.26	0.26
Emergencies							
Allergy and Anaphylaxis	856	0.8%	862	0.9%	+0.70%	0.34	0.56
Burns	162	0.2%	238	0.2%	+46.91%	16.13	<0.001
Gastrointestinal	3516	3.5%	3553	3.6%	+1.05%	1.83	0.18
Other/Not classified	11,285	11.1%	11,281	11.4%	-0.04%	2.73	0.10

frequency, type, and demographic of incidents and transport refusals during March and April 2020.

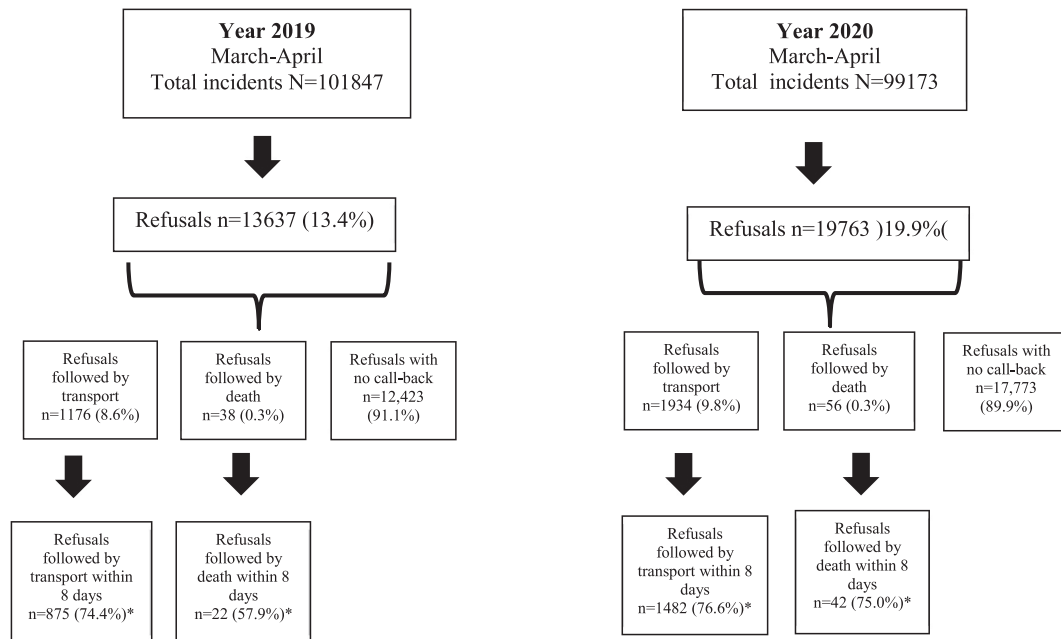
Our findings show that the overall volume of incidents during March and April 2020, at the height of the national lockdown, decreased compared to the parallel time in 2019. The fear of hospital contagion seems to have caused people to ignore symptoms and health concerns in favor of the seeming safety of home. Two categories, Cardiovascular and Neurology, showed a decrease in incidents. A similar finding was seen in the USA, in a preliminary analysis of STEMI during the early stages of the COVID pandemic [1]. An estimated 38% reduction in STEMI activations in hospital catheterization labs, possibly due to avoidance of medical care because of isolation and contagion fear was observed [1]. The reduction in Cardiovascular and Neurology MDA incidents may indicate that emergent situations were not reported to MDA in time due to fear of contagion, leading patients to ignore warning signs leading to increase in damage from untreated and unidentified cardiac and stroke cases. We assume that the higher rate of Cardiac Arrest codes indicates that cardiovascular events were reported only after an escalation in urgency.

In the category of Traumatic Injury we observed an overall decrease in traumatic events. 2020 showed a 14.7% decrease in total of traumatic injuries, as quarantine, lockdown, and restrictions meant minimal driving and traveling with less exposure to injury-prone locations. Similar findings were observed globally in many pre-hospital and in-hospital studies. In the USA, fewer vehicle related incidents and orthopedic incidents were noted [20,21]. In Asia and Australia a decrease in orthopedic emergencies and surgeries was observed indicating a similar finding [22,23].

In Israel, when traumatic incidents were classified by site of occurrence (work, road, home) an increase was observed in trauma occurring at home, in contrast to work and road traumatic injuries where a marked decrease was observed. This correlates with the lockdown and

Table 2  
Site of traumatic injury occurrence 2020 vs. 2019

Place	2019	2020	$\Delta$	$\chi^2$	p-value
Work	504	336	-33%	8.64	<0.001
Road	6064	3398	-44%	532.27	<0.001
Home	6040	6561	+8.6%	573.41	<0.001



**Fig. 2.** Refusals rates and outcomes (transport or death) 2020 vs. 2019. \*The percent of refusals followed by transport/death within 8 days was calculated from the total refusals followed by transport/death (875/1176 in 2019 and 1482/1934 in 2020 for transport; 22/38 in 2019 and 42/56 in 2020 for death).

quarantine demands, which placed people in their homes for extended periods.

According to our results, certain medical category incidents increased during the COVID pandemic. The increase in psychiatric incidents, including anxiety, suicidal thoughts, psychotic episodes, corresponds to the general increase in anxiety and depression resulting from the pandemic and restrictions. Additionally, the quarantines, lockdowns and travel restrictions decreased the accessibility of support resources for patients suffering from poor emotional health [17].

Another category showing an increase in incidents was Labor and Delivery with more EMS attended out-of-hospital births, possibly reflecting patients' hesitancy to enter the hospital. The number of out-of-hospital births delivered by MDA increased by 14% in 2020. Although MDA is prepared for out of hospital births they highly recommend avoiding this medical scenario. There is scant data on COVID19 related out-of-hospital EMS delivered births. Globally, out-of-hospital births in general have fluctuating reports of neonatal and maternal morbidity and mortality. While a Finnish report did not observe neonatal mortality [24]. A longitudinal study in Slovenia [25] and a French study [26] found hospital births to be dramatically safer than out-of-hospital deliveries.

The number of patients' refusals to transport to hospital despite MDA recommendation rose in 2020 corroborating the assumption that patients' medical decisions were driven by fear of contagion in the hospital. This has been shown to be a global concern, and patients showing signs of medically neglected conditions admitted that fear of contagion led them to avoid hospitalization [9]. Additionally, doctors are slow to treat conditions with borderline urgency, to minimize patients' exposure to contagion. Which can lead to avoidable deaths [10].

Some of the MDA patient refusals were shown to be medically inappropriate in 2020. This was indicated by 9.8% of refusals being followed by call-backs to MDA within an hour to eight days, with subsequent hospital transport or pre-hospital death, compared with 8.6% such scenarios in 2019. The incidence of call-backs within an hour to eight days resulting in pre-hospital deaths, although not statistically significant (probably due to small numbers), was far higher in number during March–April 2020 than during March–April 2019. Patient reluctance to call EMS, and greater reluctance to agree to transport in a timely fashion, brought outcomes of more deaths and medical damage that may have

been avoidable had patient followed EMS recommendation. This indicates that fear has cost lives and health.

Due to the general concern over patients' over or under use of EMS and hospital ED services, and accelerated by the COVID-19 extreme needs, MDA has launched a new model of EMS care. The Community Paramedicine model has been in development at MDA since 2018. However, the actual launching of the model in real-time operation took place in October 2020. The COVID-19 pandemic was the trigger pushing the operative implementation of the model. Community Paramedicine is a telehealth technology based EMS model using mobile, remote diagnostic tools. MDA ambulance teams typically include paramedics and senior EMTs but not doctors. The remote Community Paramedicine MDA model offers video doctor examinations and real-time on-scene diagnostic readings and measurements. MDA doctors can suggest to suitable patients alternate care options. Inversely, when patients with emergent or urgent conditions refuse transport, the remote doctor-led model can assist in urging transport. The medical information provided via the remote-doctor model helps the on-scene MDA team to offer other care routes, cooperate with the primary care plan, or urge hospital transport. The model also provides a greater scope of practice for the team paramedics, who closely followed by the remote doctor, are authorized to provide diagnosis, make decisions, provide prescriptions, and follow-up as needed.

Increasing awareness among the population regarding the risks of refraining from calling for EMS help or refusing transport, even during pandemics may save lives and prevent damage. By identifying the populations suited for diverse models of EMS, especially during pandemic times, ED visits may be reduced thus minimizing exposure of patients and staff. Conversely, during pandemic, team awareness and remote doctor support may reduce risky refusals for patients in urgent or emergent conditions, minimizing mortality and morbidity.

## 5. Limitations

The study is based on a relatively short study period, however this correlates to the period of the first wave of the pandemic when the shock of assimilating the information and misinformation as well as emotional repercussions was the greatest. In cases of death following



refusals within eight days while we cannot be certain that the cause of death was the same as the cause for the initial call (as no specific medical code is given for cardiac arrest), we can assume that the close chronology of the calls indicates a connection to the initial medical code.

### Funding statement

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

### Author contributions statement

All authors contributed to visualization, writing - original draft, writing - review & editing. MST and TP provided formal analysis and investigation. OB and RS supervised.

### Data sharing

The data belong to the MDA organization. Data will be made available from the corresponding author upon reasonable written request.

### Ethics approval

Not applicable.

### Clinical trial registration

Not applicable.

### Declaration of Competing Interest

None declared.

### Acknowledgment

The authors wish to thank Ms. Moran Maoz-Hartov for data mining and variable defining.

### References

- [1] Garcia S, Albaghdadi MS, Meraj PM, Schmidt C, Garberich R, Jaffer FA, et al. Reduction in ST-segment elevation cardiac catheterization laboratory activations in the United States during COVID-19 pandemic. *J Am Coll Cardiol.* 2020 Apr;9.
- [2] Stella F, Alexopoulos C, Scquizzato T, Zorzi A. Impact of the COVID-19 outbreak on emergency medical system missions and emergency department visits in the Venice area. *Eur J Emerg Med.* 2020 Aug 1;27(4):298–300.
- [3] Waldmann V, Beganton F, Narayanan K, Lafont A. Out-of-hospital cardiac arrest during the COVID-19 pandemic in Paris, France: a population-based, observational study. *Lancet Public Health.* 2020 May;27.
- [4] Lerner EB, Newgard CD, Mann NC. Effect of the coronavirus disease 2019 (COVID-19) pandemic on the US emergency medical services system: a preliminary report. *Acad Emerg Med.* 2020 Aug;27(8):693–9.
- [5] Rajput K, Sud A, Rees M, Rutka O. Epidemiology of trauma presentations to a major trauma centre in the North West of England during the COVID-19 level 4 lockdown. *Eur J Trauma Emerg Surg.* 2020 Sep;30:1–6.
- [6] Basu S, Karmakar A, Bidhan V, Kumar H, Brar K, Pandit M, et al. Impact of lockdown due to COVID-19 outbreak: lifestyle changes and public health concerns in India. *Int J Ind Psychol.* 2020;8(2).
- [7] Cancellato R, Soranna D, Zambra G, Zambon A, Invitti C. Determinants of the lifestyle changes during COVID-19 pandemic in the residents of Northern Italy. *Int J Environ Res Public Health.* 2020 Jan;17(17):6287.
- [8] Satty T, Ramgopal S, Elmer J, Mosesso VN, Martin-Gill C. EMS responses and non-transports during the COVID-19 pandemic. *Am J Emerg Med.* 2020 Dec;31.
- [9] Moroni F, Gramegna M, Ajello S, Beneduce A, Baldetti L, Vilca LM, et al. Collateral damage: medical care avoidance behavior among patients with acute coronary syndrome during the COVID-19 pandemic. *JACC Case Rep.* 2020 Aug;2(10):1620–4. <https://doi.org/10.1016/j.jaccas.2020.04.010> Epub 2020 Apr 23.
- [10] Rosenbaum L. The Untold Toll—The Pandemic's Effects on Patients without Covid-19.
- [11] Dafer RM, Osteraas ND, Biller J. Acute Stroke Care in the Coronavirus Disease 2019 Pandemic.
- [12] Roffi M, Guagliumi G, Ibanez B. The obstacle course of reperfusion for STEMI in the COVID-19 pandemics. *Circulation.* 2020 Apr;21.
- [13] Daniels MJ, Cohen MG, Bavry AA, Kumbhani DJ. Reperfusion of STEMI in the COVID-19 era—business as usual?. *Circulation* 2020 Apr 13.
- [14] Jaffe E, Strugo R, Bin E, Blustein O, Rosenblat I, Alpert EA, et al. The role of emergency medical services in containing COVID-19. *Am J Emerg Med.* 2020 Apr;18.
- [15] Barua Z, Barua S, Aktar S, Kabir N, Li M. Effects of misinformation on COVID-19 individual responses and recommendations for resilience of disastrous consequences of misinformation. *Prog Disast Sci.* 2020 Dec 1;8:100119.
- [16] Mian A, Khan S. Coronavirus: the spread of misinformation. *BMC Med.* 2020 Dec;18(1):1–2.
- [17] Rossi R, Socci V, Talevi D, Mensi S, Niolu C, Pacitti F, et al. COVID-19 pandemic and lockdown measures impact on mental health among the general population in Italy. *Front Psych.* 2020 Aug 7;11:790.
- [18] Tartara F, Cofano F, Zenga F, Boeris D, Garbossa D, Cenzato M. Are we forgetting non-COVID-19-related diseases during lockdown? *Acta Neurochir.* 2020 May;7:1.
- [19] Gualano MR, Corradi A, Voglino G, Bert F, Siliquini R. Beyond COVID-19: a cross-sectional study in Italy exploring the Covid Collateral Impacts. *Eur J Public Health.* 2020 Sep;30(Supplement\_5) ckaa165–209.
- [20] Hassan K, Prescher H, Wang F, Chang DW, Reid RR. Evaluating the effects of COVID-19 on plastic surgery emergencies: protocols and analysis from a Level I trauma center. *Ann Plast Surg.* 2020 Jun;2.
- [21] Stoker S, McDaniel D, Crean T, Maddox J, Jawanda G, Krentz N, et al. Effect of shelter-in-place orders and the COVID-19 pandemic on orthopaedic trauma at a community level II trauma center. *J Orthop Trauma.* 2020 Sep;1.
- [22] Probert AC, Sivakumar BS, An V, Nicholls SL, Shatrov JG, Symes MJ, et al. Impact of COVID-19-related social restrictions on orthopaedic trauma in a level 1 trauma centre in Sydney: the first wave. *ANZ J Surg.* 2020 Oct;13.
- [23] Wong JS, Cheung KM. Impact of COVID-19 on orthopaedic and trauma service: an epidemiological study. *JBJS.* 2020 Jul 15;102(14):e80.
- [24] Pirneskoski J, Peräjoki K, Nuutila M, Kuisma M. Urgent EMS managed out-of-hospital delivery dispatches in Helsinki. *Scand J Trauma Resuscit Emerg Med.* 2016 Dec 1;24(1):94.
- [25] Lazić Z, Takač I. Outcomes and risk factors for unplanned delivery at home and before arrival to the hospital. *Wien Klin Wochenschr.* 2011 Jan 1;123(1–2):11–4.
- [26] Nguyen ML, Lefèvre P, Dreyfus M. Maternal and neonatal outcomes of unplanned deliveries. *J Gynecol Obstetr Biol Reprod.* 2015 Mar 25;45(1):86–91.