ORIGINAL RESEARCH

Effect of the First Wave of the Belgian COVID-19 Pandemic on Physician-Provided Prehospital Critical Care in the City of Antwerp (Belgium)

Tina Lavigne, MD;[1] Brecht De Tavernier, MD, Febem;[2] Niels Van Regenmortel, MD, PhD;[3] Wouter De Tavernier, PhD;[2] Jan Christiaen, MD;[2] Ives Hubloue, MD, PhD;[4] Kurt Anseeuw, MD, MSc[5]

1. Vrije Universiteit Brussel, Faculty of Medicine and Pharmacy, Brussels, Belgium
2. Emergency Department, GZA Hospitals Campus Sint-Vincentius, Antwerp, Belgium
3. Intensive Care Unit, ZNA Stuivenberg, Antwerp, Belgium
4. Emergency Department, University Hospital Brussels, Free University of Brussels, Brussels, Belgium
5. Emergency Department, ZNA Stuivenberg, Antwerp, Belgium

Correspondence:
Tina Lavigne, MD
Albrecht Rodenbachstraat 13 bus 4
2140 Borgerhout, Antwerp, Belgium
E-mail: tinalavigne@gmail.com

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Abbreviations:
ACS: acute coronary syndrome
COVID-19: coronavirus disease 2019
CVA: cerebrovascular accident
ED: emergency department
EMS: Emergency Medical Service
ICD-9-CM: International Classification of Diseases, Ninth Revision, Clinical Modification
GCS: Glasgow Coma Scale
GZA: Gasthuiszusters Antwerpen
HR: heart rate
MICU: Mobile Intensive Care Unit
MUG: Mobiele Urgentiegroep (Mobile Emergency Group)
NEWS: National Early Warning Score
PCR: polymerase chain reaction
RR: respiratory rate
SBP: systolic blood pressure
SMUR: Service Mobile d'Urgence et de Réanimation (Mobile Emergency Group)
SpO2: peripheral oxygen saturation
ZNA: Ziekenhuis Netwerk Antwerpen

Abstract

Introduction: There is evidence to suggest that patients delayed seeking urgent medical care during the first wave of the coronavirus disease 2019 (COVID-19) pandemic. A delay in health-seeking behavior could increase the disease severity of patients in the prehospital setting. The combination of COVID-19-related missions and augmented disease severity in the prehospital environment could result in an increase in the number and severity of physician-staffed prehospital interventions, potentially putting a strain on this highly specialized service.

Study Objective: The aim was to investigate if the COVID-19 pandemic influences the frequency of physician-staffed prehospital interventions, prehospital mortality, illness severity during prehospital interventions, and the distribution in the prehospital diagnoses.

Methods: A retrospective, multicenter cohort study was conducted on prehospital charts from March 14, 2020 through April 30, 2020, compared to the same period in 2019, in an urban area. Recorded data included demographics, prehospital diagnosis, physiological parameters, mortality, and COVID-status. A modified National Health Service (NHS) National Early Warning Score (NEWS) was calculated for each intervention to assess for disease severity. Data were analyzed with univariate and descriptive statistics.

Results: There was a 31% decrease in physician-staffed prehospital interventions during the period under investigation in 2020 as compared to 2019 (2019: 644 missions and 2020: 446 missions), with an increase in prehospital mortality (OR = 0.646; 95% CI, 0.435 – 0.959). During the study period, there was a marked decrease in the low and medium NEWS groups, respectively, with an OR of 1.366 (95% CI, 1.036 – 1.802) and 1.376 (0.987 – 1.920). A small increase was seen in the high NEWS group, with an OR of 0.804 (95% CI, 0.566 – 1.140); 2019: 80 (13.67%) and 2020: 69 (16.46%). With an overall decrease in cases in all diagnostic categories, a significant increase was observed for respiratory illness (31%; P = .004) and cardiac arrest (54%; P < .001), combined with a significant decrease for intoxications (-58%; P = .007). Due to the national test strategy at that time, a COVID-19 polymerase chain reaction (PCR) result was available in only 125 (30%) patients, of which 20 (16%) were positive.

Conclusion: The frequency of physician-staffed prehospital interventions decreased significantly. There was a marked reduction in interventions for lower illness severity and an increase in higher illness severity and mortality. Further investigation is needed to fully understand the reasons for these changes.

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Introduction

Since the start of the coronavirus disease 19 (COVID-19) pandemic and the implementation of public health measures, there have been multiple reports of a strong decline in emergency department (ED) visits and ED hospital admissions for non-COVID pathology throughout Europe and the United States.[1–7] This drop occurred not only in low-acuity conditions, but also in conditions such as acute coronary syndrome (ACS), heart failure, arrhythmia, stroke, seizure, and appendicitis.[1–4,6,7]

This has raised the concern that patients might delay medical attention for potentially serious and time-dependent pathologies, leading to worse outcomes, complications, and even death.

The Emergency Medical Service (EMS) in Belgium has a three-tiered system, which comprises of ambulances, Paramedical Intervention Teams (with an emergency care nurse), and an emergency physician and nurse staffed car (Mobiele Urgentiegroep [MUG] or Service Mobile d'Urgence et de Réanimation [SMUR]). The EMS dispatch center dispatches one or more of the EMS resources responding to an emergency call, based on fixed protocols. Most MUG-services depart from hospital EDs.

Two hospitals are located in the urban Antwerp City area: Ziekenhuis Netwerk Antwerpen (ZNA) Stuivenberg (400-bed general hospital with an annual ED attendance of 40,000) and Gasthuiszusters Antwerpen (GZA) Sint-Vincentius (300-bed general hospital with an annual ED attendance of 29,000). They serve a population of roughly 210,000 inhabitants. Both hospitals supply a MUG, each providing physician-staffed prehospital care in the (sub)urban area and port of Antwerp.

The first COVID-19 case in Belgium was confirmed on February 29, 2020, after which time cases increased significantly. Public health measures were implemented on March 14, 2020, with a complete lockdown four days later. During this first wave, the highest incidence of cases in Belgium and in the Antwerp province occurred in week 15 (April 6 - April 12, 2020), respectively, with 11,092 new cases/week and 1,386 new cases/week. Afterwards, there was a gradual decline in incidence and public health measures were gradually lifted from May 4, 2020 onwards.

Delays in health-seeking behavior could increase the disease severity of patients in the prehospital setting. This effect, combined with an additional workload due to the COVID-19 pandemic, could increase the total number of physician-staffed prehospital interventions. Furthermore, an increase in prehospital mortality and more pronounced severity of illness could be expected.

This study aimed to investigate a change in frequency in physician-staffed prehospital interventions in the city center of Antwerp during the first wave of the Belgian COVID-19 pandemic. Secondary endpoints included prehospital mortality, illness severity, and prehospital diagnosis.

Methods

A retrospective chart review of all physician-staffed prehospital interventions from ZNA Stuivenberg and GZA Sint-Vincentius from March 14, 2020 through April 30, 2020 was performed. The same period in 2019 (ie, March 14 – April 30, 2019) was used as a reference.

The study protocol was reviewed and approved by the Internal Review Board of the Ethical Commission of both hospitals, namely: Commissie voor Medische Ethiek ZNA; Institutional Review Board – ZNA/OCMW Antwerpen (study number 5536) and Commissie Medische Ethiek GZA Ziekenhuizen; Toetsingskamer (study number 200604MASTER).

All patients from consecutive MUG interventions, dispatched from ZNA and GZA, were included. Aborted missions (mission aborted before arrival on scene or no patient found at scene) were excluded from further analysis. The following data were collected for each patient: age, gender, prehospital vital signs, prehospital diagnosis (coded in the International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM]), disposition, and COVID-19 infection (polymerase chain reaction [PCR] test). All data, except the COVID-19-PCR test, were directly extracted from the national EMS database "MUGREG," a federal mandatory registration tool for all prehospital interventions provided by all MUG-services in Belgium. The aim of the MUG-registration is to support health policy regarding prehospital services and to collect information regarding the emergency call, the intervention, the patient and their clinical features, clinical interventions performed, and disposition. A standardized form is filled in by the physician with each intervention. Registration occurs through a web-application with real-time error check and is performed by one of the prehospital team members within seven days of the intervention. Every MUG service has access to their own data. The COVID-19 PCR test result was extracted from the relevant hospital database if performed after the intervention. The result of a second test, where applicable, was also included, because of the existence of false negative results. On one site, personal identifiers were used by a second investigator to link PCR test results to a certain intervention. For the other hospital, this information was extracted from existing hospital databases with use of the intervention number. No personal identifiers were present in the data used for the final analysis.

Additionally, a modified National Health Service (NHS; London, England) National Early Warning Score (NEWS) for each intervention was calculated to assess for disease severity. The NEWS is an early warning score using six physiological findings (heart rate [HR], systolic blood pressure [SBP], respiratory rate [RR], peripheral oxygen saturation [SpO2], temperature, and oxygen requirement) and Glasgow Coma Scale (GCS). Every parameter generates a score between zero (normal) and three (strongly deviating). Based on the aggregate score, patients are risk stratified into low (total zero to four), medium (total five to six, or score three in any individual parameter), and high clinical risk groups (total score of seven or more). In this study, NEWS was calculated by using the first recorded vital signs by the MUG. The GCS was converted to the Awake - Voice - Pain - Unresponsive (AVPU) scale in the same way as described in previous studies.[8,9] With respect to RR, modifications were made to ensure that the prehospital and NEWS charts aligned. A score of three was given if the RR was >29 breaths per minute (bpm) or <10 bpm. A RR within the range of 10-29 bpm was scored as a one in case the separate indicator "abnormal breathing" was present; otherwise, it was scored as zero. No NEWS was calculated if data for GCS, HR, SBP, RR, SpO2, or oxygen requirements were missing. If the temperature was missing, it was assumed to be in the normal range, leading to a score of zero for that parameter. All interventions flagged as "cardiac arrest" received a maximum NEWS, since a disproportionate amount of missing data were expected in these interventions.

The primary endpoint of this study was frequency of physician-staffed prehospital interventions. Secondary endpoints were prehospital mortality, illness severity during prehospital interventions, and prehospital diagnosis.

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	2019	2020	P Value	OR (95% CI)
Missions				
Total Departures	644	446		
Mission Aborted[a]	59	27		
Total Effective Interventions	585	419		
Emergency Centre				
GZA Sint-Vincentius	325 (50.5%)	241 (54.0%)		
Interventions/Day	6.77	5.02		
ZNA Stuivenberg	319 (49.5%)	205 (46.0%)		
Interventions/Day	6.65	4.27		
Total	644	446		
Gender				
Male	339 (58.0%)	238 (56.8%)	.719	1.048 (0.813–1.350)
Female	235 (40.0%)	170 (40.6%)	.896	0.983 (0.761–1.270)
Total	585	419		
Age Group (years)				
0–10	31 (5%)	24 (6%)	.772	0.921 (0.532–1.593)
11–20	42 (7%)	14 (3%)	.009	2.238 (1.206–4.153)
21–30	55 (10%)	39 (10%)	.960	1.011 (0.657–1.556)
31–40	57 (10%)	38 (9%)	.719	1.082 (0.703–1.666)
41–50	56 (10%)	48 (12%)	.332	0.818 (0.544–1.230)
51–60	75 (13%)	48 (12%)	.516	1.137 (0.772–1.672)
61–70	79 (14%)	54 (13%)	.779	1.055 (0.728–1.530)
71–80	78 (13%)	77 (19%)	.029	0.683 (0.485–0.963)
81–90	85 (15%)	58 (14%)	.757	1.058 (0.738–1.517)
91–100	17 (3%)	9 (2%)	.453	1.363 (0.602–3.089)
Missing Data or >100	10 (2%)	10 (2%)		0.711 (0.293–1.725)
Total	585	419		

Table 1. Comparison of MUG/SMUR Interventions in Antwerp from March 14 - April 30, 2019 versus 2020
Note: Pearson Chi2 Age Group = 13.135; P value = .216.
Abbreviations: GZA, Gasthuiszusters Antwerpen; ZNA, Ziekenhuis Netwerk Antwerpen; MUG, Mobiele Urgentiegroep (Mobile Emergency Group); SMUR, Service Mobile d'Urgence et de Réanimation (Mobile Emergency Group).
[a]Mission aborted before arrival on scene, no patient on scene.

Categorical variables and descriptive statistics are expressed as numbers and percentages. All reported P values are two-tailed, with values less than .05 indicating statistical significance. The Z-test was used to compare independent proportions and the Chi-square test to compare distributions across categories (age, NEWS). Odds ratios (OR) and their 95% confidence intervals (CI) were calculated to present effect sizes. All statistical analysis was performed in a Microsoft Excel spreadsheet Version 16.50 (Microsoft Corporation; Redmond, Washington USA).

Results

From March 14 through April 30, 2020, there were 198 (31%) fewer MUG missions compared to the same period in 2019. In absolute numbers, the missions decreased from 644 in 2019 to 446 in 2020 (Table 1). A similar proportional decrease was noted in the aborted missions.

No significant changes were observed between the two study cohorts, except for an increase in patients within the age range 71-80 years and a decrease in the proportion of teenagers in the 2020 cohort.

For the majority of patients (294; 70%), no COVID-19 PCR test result was available. Of the remaining 125 (30%) patients, 20 (16%) had a positive PCR test result.

The proportion of patients with a low NEWS score decreased significantly from 33.0% in 2019 to 26.5% in 2020 (P = .027; OR = 1.366; 95% CI, 1.036 – 1.802). The proportion of deceased patients increased from 9.0% in 2019 to 14.0% in 2020 (P = .029; OR = 0.646; 95% CI, 0.435 – 0.959; Figure 1 and Table 2). Though the proportions of the medium and high NEWS scores respectively decreased from 20.0% in 2019 to 15.5% in 2020 (P = .059; OR = 1.376; 95% CI, 0.987 – 1.920) and increased from 13.5% in 2019 to 16.5% in 2020 (P = .219; OR = 0.804; 95% CI, 0.566 – 1.140), these changes were not significant.

In 2020, there was an overall decline in all interventions, except for patients in the respiratory category (+11 [+31%]; P = .004), compared to the same period in 2019 (Table 3). Within the respiratory category, more cases were observed of pneumonia and acute respiratory decompensation (+4 [+44%] and +4 [+80%], respectively), with a decrease in pulmonary oedema (-3 [-43%]), though not statistically significant.

NEWS	2019	2020	P Value	OR (95% CI)
Low	193 (32.99%)	111 (26.49%)	.027	1.366 (1.036–1.802)
Medium	118 (20.17%)	65 (15.51%)	.059	1.376 (0.987–1.920)
High	80 (13.67%)	69 (16.46%)	.219	0.804 (0.566–1.140)
Deceased	54 (9.00%)	57 (14.00%)	.029	0.646 (0.435–0.959)
Missing Data	140 (23.93%)	117 (27.92%)		
End Total	585	419		

Table 2. NEWS and Mortality during MUG/SMUR Interventions, 2019 versus 2020
Note: Pearson Chi2 NEWS = 11,818; P value = .008.
Abbreviations: NEWS, National Early Warning Score; MUG, Mobiele Urgentiegroep (Mobile Emergency Group); SMUR, Service Mobile d'Urgence et de Réanimation (Mobile Emergency Group).

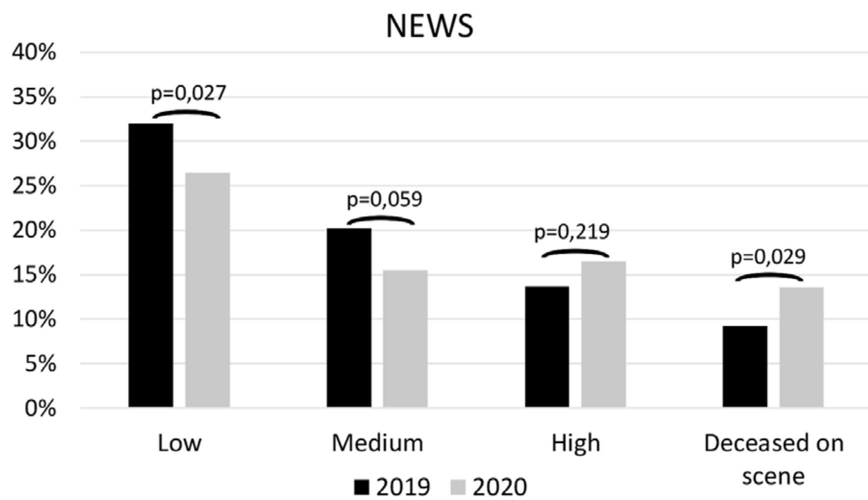

Figure 1. NEWS and Mortality during MUG/SMUR Interventions, 2019 versus 2020.
Abbreviations: NEWS, National Early Warning Score; MUG, Mobiele Urgentiegroep (Mobile Emergency Group); SMUR, Service Mobile d'Urgence et de Réanimation (Mobile Emergency Group).

Of note is the significant decrease in intoxications (-45 [-58%]; P = .007).

Though there was no statistically significant change in the category cardiovascular (93 [15.9%] in 2019 and 77 [18.38%] in 2020; P = .303), a significant increase in patients with cardiac arrest occurred (+15 [+54%]; P < .001).

Fewer patients presented with unspecified chest pain (-7 [-32%]; P = .881) while no change was seen in patients diagnosed with ACS.

Discussion

This retrospective cohort analysis demonstrated a 31% decline in physician-staffed prehospital interventions during the study period. Similar outcomes were observed in Nantes (France), where there was a 25% reduction in Mobile Intensive Care Unit (MICU) activations during the pandemic.[10] Conversely, the number of dispatched MICUs in the Seine-Saint-Denis Department of greater Paris increased by 220% during the first weeks of the pandemic.[11] New York City (USA) saw EMS activations increase by 24% during the surge in COVID-19 cases, with a six percent increase in high-acuity calls, which would have typically been performed by the MUG in Belgium.[12]

The use of different EMS systems and dispatch protocols makes further comparison with other countries difficult. However, looking at studies about overall EMS activation during the first wave of the pandemic, the same contrasting results appear. Some studies report a decrease in ambulance services dispatched to the scene of 29.0% (Nantes) and 26.1% (United States National EMS Information System),[10,13] whereas other studies report increases in EMS missions with a peak of 210% (Seine-Saint-Denis), 52% (Bergamot and Brescia), 10%-22% (Pavia), and 10%-20% (Switzerland).[11,14–16] A study performed in Venice (Italy) showed no difference in total amount of EMS missions and no change in distribution according to illness severity.[5]

Within the present study, patients treated by physician-staffed prehospital intervention teams tended to have a higher acuity during the COVID-19 pandemic, as reflected by a decrease in the low and medium NEWS score and an increase in the high NEWS score group. These results seem to be supported by the findings of Prezant, et al[12] who recorded an increase in high-acuity call types, whereas others found no change in illness severity.[5] The prehospital mortality in this study increased from 9.0% (54) to 14.0% (57; P = .029; OR = 0.646; 95% CI, 0.435 – 0.959) during the pandemic. Other studies have also shown an increase in prehospital mortality during the pandemic, ranging from 2.77% (United States National EMS Information System) to 246% (Lombardy region).[12–14] The changes could also be

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ICD-9-CM Diagnosis	2019	2020	% Change	P Value	OR (95% CI)
Category: Symptoms	157 (26.84%)	124 (29.59%)	–21%	.337	0.873 (0.660–1.153)
Syncope and Collapse	24 (4.10%)	17 (4.06%)	–29%	.968	1.012 (0.536–1.908)
Unspecified Chest pain	22 (3.76%)	15 (3.58%)	–32%	.881	1.052 (0.539–2.054)
Hyperventilation	14 (2.39%)	16 (3.82%)	14%	.190	0.618 (0.230–1.280)
Breathing Disorder	15 (2.56%)	14 (3.34%)	–7%	.465	0.761 (0.363–1.595)
Category: Cardiovascular	93 (15.90%)	77 (18.38%)	–17%	.303	0.840 (0.602–1.170)
Cardiac Arrest	28 (4.79%)	43 (10.26%)	54%	<.001	0.440 (0.268–0.720)
ACS	17 (2.91%)	17 (4.06%)	0%	.317	0.708 (0.357–1.403)
CVA	18 (3.08%)	8 (1.91%)	–56%	.250	1.631 (0.702–3.787)
Arrythmia	10 (1.71%)	2 (0.48%)	–80%	.075	3.626 (0.790–16.636)
Category: Accidents and Injuries	80 (13.68%)	53 (12.65%)	–34%	.638	1.094 (0.754–1.587)
Category: Intoxications	78 (13.33%)	33 (7.88%)	–58%	.007	1.800 (1.173–2.761)
Alcohol Intoxications	41 (7.01%)	18 (4.30%)	–56%	.072	1.679 (0.950–2.966)
Drugs/Medication Intoxications	27 (4.62%)	11 (2.63%)	–59%	.103	1.795 (0.880–3.660)
Carbon Monoxide	10 (1.71%)	4 (0.95%)	–60%	.204	1.804 (0.562–5.793)
Category: Respiratory	35 (5.98%)	46 (10.98%)	31%	.004	0.516 (0.326–0.816)
Pneumonia	9 (1.54%)	13 (3.10%)	44%	.095	0.488 (0.207–1.152)
Unspecified Pulmonary Oedema	7 (1.20%)	4 (0.95%)	–43%	.719	1.256 (0.365–4.320)
Acute Respiratory Decompensation	5 (0.85%)	9 (2.15%)	80%	.087	0.393 (0.131–1.180)
Category: Neurology	38 (6.50%)	23 (5.49%)	–39%	.509	1.196 (0.701–2.040)
Seizures	36 (6.15%)	20 (4.77%)	–44%	.347	1.308 (0.746–2.294)
Category: Psychiatry	21 (3.59%)	12 (2.86%)	–43%	.522	1.263 (0.614–2.596)
Category: Endocrinology	18 (3.08%)	12 (2.86%)	–33%	.841	1.077 (0.513–2.260)
Hypoglycemia	15 (2.56%)	10 (2.39%)	–33%	.857	1.076 (0.479–2.420)
Category: Obstetrics	11 (1.88%)	5 (1.19%)	–55%	.390	1.587 (0.547-4.601)
Other Categories	25 (4.27%)	21 (5.01%)	–16%	–.582	0.846 (0.467–1.533)
Total ICD-9 Completed	556 (95.04%)	406 (96.90%)			
Missing ICD-9 Data	29 (4.96%)	13 (3.10%)			
Total Interventions Completed	585	419	–28%		

Table 3. ICD-9-CM Diagnosis in MUG/SMUR Interventions in 2019 versus 2020
Abbreviations: ACS, acute coronary syndrome; CVA, cerebrovascular accident; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; MUG, Mobiele Urgentiegroep (Mobile Emergency Group); SMUR, Service Mobile d'Urgence et de Réanimation (Mobile Emergency Group).

attributed to statistical effects. The majority of cases in both cohorts are within the NEWS low and medium group. As the total number of missions decreased drastically, the balance between the different NEWS groups could be influenced, resulting in a relative shift towards higher NEWS scores. Further research is needed to fully clarify if these changes are based on statistical effects only, or if there are genuine health care effects.

The variation in EMS activations can be attributed to several factors. First, and most importantly, this can be the result of a difference in caseload related to the pandemic in different areas. A decline in non-COVID patients in the prehospital setting seems to be present, similar to the one observed in the EDs. This argument is supported by the Lausanne study, which showed a moderate increase in total EMS missions while there was a decrease in non-COVID-related prehospital interventions.[16] Similarly, the total call volume to the 9-1-1 call system in New York increased initially by 60%, to fall below pre-pandemic levels after the pandemic stabilized.[12]

Another factor might be the difference in public health messages and differences in the organization of prehospital and out-of-hospital care. In Italy, for example, public authorities advised patients not to go to the hospital directly, but to call the emergency number.[14] In France, people were advised to call the EMS number to obtain medical information and advice.[11] Conversely, patients in Belgium were strongly advised to call their general practitioner in case of a medical problem, possibly diverting people away from the EMS and acute hospital services. Finally, EMS dispatch centers could have altered their threshold for sending (specialized) teams to the scene. The study in Nantes showed that EMS dispatch physicians more often gave medical advice to the caller and less often sent first aid responders or MICUs on scene during the lockdown period.[10]

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In this study, the COVID-19 PCR test was performed in only 125 (30%) patients. Of these patients, 20 (16%) had a positive test, resulting in an overall infection rate of five percent. The low testing rate is due to the national test strategy at the time, where PCR testing was restricted to hospitalized patients by the Belgian government. Due to the low numbers, further statistical analysis was impossible.

Analysis of the prehospital ICD-9-CM diagnoses demonstrates an overall decline in all diagnostic categories, except for respiratory. There was a significant decrease in intoxications (-45 [-58%]; P = .007) and important decreases in the majority of potentially life-threatening or time-dependent disorders like arrythmia (-8 [-80%]), syncope (-7 [-29%]), cerebrovascular accident (CVA; -10 [-55%]), hypoglycemia (-5 [-33%]), epilepsy (-16 [-47%]), and injuries and accidents (-27 [-34%]), though not statistically significant. These findings are supported by similar data from prehospital and ED studies during the COVID-19 pandemic.[1–5,10,12–14] Public health measures (eg, closing of bars and restaurants) will have influenced frequencies of some pathologies, like alcohol intoxication and injuries. Forced telework might have led to better compliance with medication or a more regular lifestyle, thereby decreasing pathologies like glycemic disturbances, seizures, or ACS. Further research is necessary to address the full effect of these public health measures on the frequency and severity of medical conditions, and hence the EMS effect. Finally, some patients might have postponed medical assistance out of fear of contracting a nosocomial infection or for putting a strain on the EMS and/or hospital. This is most likely to be a factor in the patient group who are less seriously unwell.

Though this study found no statistically significant change within the cardiovascular category between the pre-pandemic and pandemic period (15.9% in 2019 and 18.38% in 2020; P = .303), there was a significant increase in patients with cardiac arrest (15 [+54%]; P < .001). As this code is used for almost all prehospital deaths, regardless of the origin of the cardiac arrest, the exact meaning remains open for further investigation. There was no statistically significant change in absolute number and/or proportion of patients presenting with ACS, however fewer patients with unspecified chest pain (-7 [-32%]; P = .881) were evaluated. Patients presenting with cardiovascular disease during the pandemic differ between studies, with some reporting a decrease in chest pain, ACS, and CVA, while others reported an increase in cardiovascular-related calls.[5,10,12]

In this study, an increase of 11 cases (+31%; P = .007) within the ICD-9-CM respiratory category was observed during the pandemic, with a trend to more pneumonia and acute respiratory decompensation (respectively, +4 [+44%] and +4 [80%]). Given the COVID-19 pandemic and the pulmonary signs of the COVID-19 disease, it seems logical to attribute this increase to COVID-19. This correlation could not be proven in this study due to the low rate of COVID-19 testing that was observed. These findings seem to be supported by the report of Dami and Berthoz, where they describe an increase of COVID-19 missions during the first wave of the pandemic in Switzerland.[16]

Limitations

In this study, a clear distinction between interventions performed for COVID-19-related pathology and non-COVID interventions could not be made. This is related to the strict testing protocols that were in place at the time, due to the limited availability of PCR tests.

The use of the NEWS score is both a strength and a limitation of the study. The NEWS gave the possibility to investigate patients' risk for an adverse outcome, demonstrating the severity of disease during interventions. Unfortunately, the score has not yet been validated in the prehospital setting. However, several studies have been performed to test the accuracy of the NEWS in predicting the risk for adverse outcomes and patient disposition in the prehospital setting with promising results.[9,17–19] Furthermore, modifications had to be made in the scoring system, and no NEWS could be calculated in approximately 25% of cases (2019: 140 [24%] and 2020: 117 [28%]) because of missing data.

Another limitation of the study is the coding within ICD-9-CM. In a prehospital setting, the diagnosis is often not clear, which leads to high interpersonal differences in coding. Moreover, many interventions are being categorized in the less specific group of symptoms, signs, and ill-defined conditions.

Finally, data could only be compared with the previous year. Some observed changes might be due to annual fluctuations. Additionally, possible evolutions were not taken into account, such as the annual increase in ED and EMS activity.

Conclusion

As opposed to the initial hypothesis, this study showed a decline in total physician-staffed prehospital missions of 31% during the first wave of the pandemic. With the decrease presenting mostly in low- and medium-acuity patients, there is a statistically significant increase in prehospital mortality, combined with a trend to higher-acuity patients. Further investigation is required into the effects of public health measures on EMS, while informing the public that it is dangerous to postpone medical care.

References

1. Feral-Pierssens AL, Claret PG, Chouihed T. Collateral damage of the COVID-19 outbreak: expression of concern. *Eur J Emerg Med.* 2020;27(4):233–234.
2. Giamello JD, Abram S, Bernardi S, Lauria G. The emergency department in the COVID-19 era. Who are we missing? *Eur J Emerg Med.* 2020;27(4):305–306.
3. Hartnett KP, Kite-Powell A, DeVies J, et al. Impact of the COVID-19 pandemic on emergency department visits - United States, January 1, 2019-May 30, 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(23):699-704.
4. Lange SJ, Ritchey MD, Goodman AB, et al. Potential indirect effects of the COVID-19 pandemic on use of emergency departments for acute life-threatening conditions - United States, January-May 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(25):795–800.
5. 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;27(4):298–300.
6. Baum A, Schwartz MD. Admissions to Veterans Affairs hospitals for emergency conditions during the COVID-19 Pandemic. *JAMA.* 2020;324(1):96–99.
7. Casalino E, Choquet C, Bouzid D, et al. Analysis of emergency department visits and hospital activity during influenza season, COVID-19 epidemic, and lockdown periods in view of managing a future disaster risk: a multicenter observational Study. *Int J Environ Res Public Health.* 2020;17(22):8302.
8. Smith GB, Prytherch DR, Meredith P, Schmidt PE, Featherstone PI. The ability of the National Early Warning Score (NEWS) to discriminate patients at risk of early cardiac arrest, unanticipated intensive care unit admission, and death. *Resuscitation.* 2013;84(4):465–470.
9. Pirneskoski J, Kuisma M, Olkkola KT, Nurmi J. Prehospital National Early Warning Score predicts early mortality. *Acta Anaesthesiol Scand.* 2019;63(5):676–683.
10. Penverne Y, Jenvrin J, Montassier E. EMS dispatch center activity during the COVID-19 containment. *Am J Emerg Med.* 2020;S0735-6757(20):30678-30681.

11. Lapostolle F, Goix L, Vianu I, et al. COVID-19 epidemic in the Seine-Saint-Denis Department of Greater Paris: one month and three waves for a tsunami. *Eur J Emerg Med.* 2020;27(4):274–278.
12. Prezant DJ, Lancet EA, Zeig-Owens R, et al. System impacts of the COVID-19 pandemic on New York City's emergency medical services. *J Am Coll Emerg Physicians Open.* 2020;1(6):1205–1213.
13. Lerner EB, Newgard CD, Mann NC. Effect of the coronavirus disease 2019 (COVID-19) pandemic on the United States Emergency Medical Services system: a preliminary report. *Acad Emerg Med.* 2020;27(8): 693–699.
14. Fagoni N, Perone G, Villa GF, et al. The Lombardy Emergency Medical System faced with COVID-19: the impact of out-of-hospital outbreak. *Prehosp Emerg Care.* 2021;25(1):1–7.
15. Perlini S, Canevari F, Cortesi S, et al. Emergency department and out-of-hospital emergency system (112-AREU 118) integrated response to coronavirus disease 2019 in a Northern Italy center. *Intern Emerg Med.* 2020;15(5):825–833,
16. Dami F, Berthoz V. Lausanne medical dispatch center's response to COVID-19. *Scand J Trauma Resusc Emerg Med.* 2020;28(1):37.
17. Patel R, Nugawela MD, Edwards HB, et al. Can early warning scores identify deteriorating patients in prehospital settings? A systematic review. *Resuscitation.* 2018;132:101–111.
18. Silcock DJ, Corfield AR, Gowens PA, Rooney KD. Validation of the National Early Warning Score in the prehospital setting. *Resuscitation.* 2015;89:31–35.
19. Endo T, Yoshida T, Shinozaki T, et al. Efficacy of prehospital National Early Warning Score to predict outpatient disposition at an emergency department of a Japanese tertiary hospital: a retrospective study. *BMJ Open.* 2020;10(6):e034602.