Experience of the Polish Medical Air Rescue Service During the First Year of the COVID-19 Pandemic and Measures Taken to Protect Patients, Medical Staff, and Air Crew from SARS-CoV-2 Infection

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Background: The emergence of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) and the sudden inflow of patients with severe COVID-19 (coronavirus disease 2019) symptoms increased demand for hospital and pre-hospital care, the latter being provided by emergency medical teams. The Polish Medical Air Rescue Services include the Helicopter Emergency Medical Service (HEMS) and the airplane-based Emergency Medical Service (EMS). This study aimed to present the experience of the Polish Medical Air Rescue Service during the first year of the COVID-19 pandemic and measures taken to protect patients, medical staff, and air crew from SARS-CoV-2 infection.

Material/Methods: We conducted a retrospective analysis of missions completed by the Polish Medical Air Rescue crews with respect to confirmed SARS-CoV-2 cases. We analyzed data from the medical records of the Polish Medical Air Rescue Service, which included flights to accidents and emergencies, and air patient transport missions, where medical assistance was provided to patients with confirmed SARS-CoV-2 infection in the first year of the pandemic in Poland.

Results: Among the COVID-19 patients, the most common comorbidity was acute respiratory failure (41.58%). Emergency missions more often concerned older patients with sudden cardiac arrest, dyspnea, upper respiratory tract infection, stroke, and acute coronary syndromes.

Conclusions: During the first year of the COVID-19 pandemic in Poland, the Polish Medical Air Rescue Service implemented procedures to protect patients, medical staff, and air crew from SARS-CoV-2 infection. This study highlights the importance of using single-patient isolation units for patient transport between hospitals and for emergency hospital admissions when the SARS-CoV-2 status of the patients were unknown.

Keywords: Air Ambulances • SARS-CoV-2 • Severe Acute Respiratory Syndrome Coronavirus 2 • Transportation of Patients

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Background

In December 2019 the first cases of atypical pneumonia in humans were identified in China, attributed to a previously unknown coronavirus, later termed SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2). The set of symptoms produced by infection with this pathogen was named COVID-19 (coronavirus disease 2019). The SARS-CoV-2 virus rapidly spread across continents, causing an unprecedented wave of new cases worldwide. This is why on March 11, 2020, the World Health Organization (WHO) declared it a pandemic [1-3]. In Poland, the first confirmed case of the infection with SARS-CoV-2 was reported on March 4, 2020 [3,4]. The pandemic affected all aspects of daily life, causing widespread fear, social isolation, and psychological problems [5]. Furthermore, it necessitated the introduction of fast-paced and far-reaching changes in the health care sector, which affected the medical services provided, due to the need to protect the infected patients, other patients, and healthcare professionals [5,6].

SARS-CoV-2 does not always produce symptoms. The literature has reported numerous documented cases where a patient with a positive SARS-CoV-2 test exhibited no clinical signs of infection. Researchers estimate that the percentage of such asymptomatic cases may range between 17.9% and 57% [7-9]. Coughing, fever, muscle pains, and headache are the most frequently reported COVID-19 symptoms. Other well-documented symptoms include diarrhea, sore throat, or impaired taste and smell sensation. Sadly, none of the above symptoms are specific to or diagnostic of SARS-CoV-2 [10].

On the other hand, even when clinical manifestations of COVID-19 appear, the spectrum of symptoms may be heterogeneous. In most cases, the disease is expected to have a mild course, with no or minor inflammatory lesions in the lungs. This course is observed in 81% of patients, while 14% of patients have a severe course of COVID-19, with dyspnea, hypoxemia, and lesions affecting over 50% of the lungs in radiographic imaging. A critical course, with acute respiratory failure, symptoms of shock, or multiple organ failure, has been reported in 5% of cases [11].

The literature has identified a number of factors predisposing patients to severe disease, including age, sex, and comorbidities [12-15].

A severe course of the disease caused by the novel coronavirus is associated with complications. The most common ones include acute respiratory distress syndrome (ARDS); cardiovascular, thromboembolic, neurological, and inflammatory complications; and secondary infections. It is thus clear that COVID-19 is not just a respiratory disease leading to acute respiratory failure. A whole spectrum of symptoms is observed, including cardiac arrhythmias, cardiomyopathy, heart failure, venous thromboembolic disease, extensive deep vein thrombosis, pulmonary embolism, encephalopathy, motor and sensory disorders, or convulsions [16-25]. Secondary infections associated with COVID-19, commonly described in the literature, include respiratory tract infection, bacteremia, aspergillosis, and mucormycosis [21-23].

The above considerations further highlight the scale of the problems and hazards that emergency medical professionals face on the front-line of the fight against the pandemic.

Patients tend to delay visiting their primary care physician or reporting to a hospital. On the one hand, this may be associated with a lack of adequate access to health care due to the added burden of the pandemic on the health care system. On the other hand, the multiple, heterogeneous symptoms lead to uncertainty, prompting patients to adopt a “wait and see” approach, often until they are no longer able to reach the nearest health care facility on their own. In these cases, medical emergency teams play a key role, and should be ready to provide assistance to the infected patients where they are [6,24]. Furthermore, the transport of SARS-CoV-2 patients in a critical condition due to COVID-19 is difficult and demanding, and it also poses a risk to medical professionals who are responsible for the safe transportation of these patients, which has been a subject of several studies [26-28].

Within the Polish system of medical emergency response, pre-hospital care is provided by ground medical emergency teams and the Helicopter Emergency Medical Service (HEMS) [6,25]. HEMS and airplane-based EMS teams form the Polish Medical Air Rescue, an organization acting as the operator and dispatcher of these units. The members of the HEMS crew include a professional pilot, a physician, and a nurse or an emergency medical technician. Airplane-based EMS missions are conducted by 2 professional pilots, a physician, and a nurse or an emergency medical technician. In Poland, there are 22 Polish Medical Air Rescue bases, including a seasonal base which operates in the summer and an EMS airplane base. Four bases operate on 24-hour alert. Operations are carried out by 2 types of aircraft: Piaggio P.180 Avanti airplanes and EC 135 helicopters [25].

Modern emergency medical services showed a low level of preparedness in the first stage of the pandemic. The challenge was the lack of sufficient knowledge about the new pathogen and an insufficient supply of personal protective equipment (PPE). The priority was to rapidly develop procedures of action and then update them depending on the spread of the pandemic and the emerging new variants of SARS-CoV-2. As part of preventive actions within the Polish Medical Air Rescue Service, an expert team was established. Its main task
was to develop practice guidelines for HEMS crews and EMS teams. These guidelines were set out based on the recommendations issued by the Ministry of Health, the Main Sanitary Inspectorate, and the National Institute of Public Health – National Institute of Hygiene.

The Polish Medical Air Rescue Services include the Helicopter Emergency Medical Service (HEMS) and the airplane-based EMS. Therefore, this study aimed to present the experience of the Polish Medical Air Rescue Service during the first year of the COVID-19 pandemic and measures taken to protect patients, medical staff, and air crews from SARS-CoV-2 infection.

**Material and Methods**

**Data Collection**

The study involved a retrospective analysis of missions by Polish Medical Air Rescue crews concerning confirmed SARS-CoV-2 infections in Poland. The analysis included flights to sites of accidents and other emergencies, as well as air patient transport missions, where medical assistance had been provided to patients with confirmed SARS-CoV-2 infection between March 4, 2020 and March 4, 2021. We excluded cases of cancelled orders or missions which were not performed because of technical problems or weather conditions. Based on the study criteria, 202 cases were ultimately included in the analysis. The use of data for the present analysis received approval from the Director of the Polish Medical Air Rescue. We submitted the study protocol to the Bioethics Committee of the Medical University of Warsaw, Poland. The committee stated that the retrospective nature of the study did not necessitate obtaining informed consent (AKBE/105/2021).

Queries were run against the HEMS and EMS operational and medical records. The following information was extracted: patient sex and age, date of the mission, the main diagnosis based on the International Classification of Disease version 10 (ICD-10), patient clinical parameters, emergency procedures performed, and other intervention characteristics.

**Statistical Analysis**

The material obtained from documentation analysis was analyzed using Statistica version 13.2 software (Tibco Software, Inc., Palo Alto, CA, USA). Quantitative data are expressed numerically (n), as percentages (%), the mean (M), and standard deviation (SD). Kolmogorov-Smirnov and Lilliefors test were performed to assess normal distribution and quantitative variables. Statistically significant differences between qualitative variables were analyzed using the chi-squared test, and the Mann-Whitney U test was used for non-parametric analysis. Linear correlations between quantitative variables were identified using Pearson’s correlation coefficient. Correlations and differences were regarded as statistically significant at P<0.05.

**PPE Used by the Medical Personnel**

One characteristic of pre-hospital interventions is the crews’ inability to obtain reliable, verified information on the infection status of the patient. Furthermore, the confined space on board the aircraft and the multiple medical interventions performed on site and during transport increase the risk of viral transmission compared to similar interventions in other health care facilities [29-32].

Understanding the risks associated with the SARS-CoV-2 virus, the HEMS and EMS crews studied made efforts to limit the risk of infection during the pandemic by wearing protective suits, disposable gloves, and protective eyewear or face shields during each intervention.

**Patient Isolation Units**

Many medical equipment vendors offer solutions allowing for patients posing an infection hazard, including those infected with SARS-CoV-2, to be effectively isolated. In the early days of the pandemic, demand for PPE vastly exceeded supply, which considerably limited the possibility of satisfying the need for protection. As regards the Polish Medical Air Rescue crews, there were also additional constraints on the use of these types of equipment on board the aircraft.

During the pandemic, Polish HEMS and EMS crews transported patients with the novel coronavirus using NP-320 isolation units and barrier tents [33,34].

The NP-320 isolation unit is a reusable installation used for transporting patients with infectious diseases, which can be used with stretchers and equipment for monitoring the patient’s condition during transport. The suction fan with inlet and exhaust filters allows for producing negative pressure inside the unit, with constant fresh air supply, air circulation, and protection from any internal or external contamination. The use of these isolation units allowed the Polish Medical Air Rescue HEMS and EMS teams to rapidly restore mission readiness and limit risk for crew members [35].

Another accessory used for reducing epidemiological risk during Polish Medical Air Rescue missions within a pilot program was a barrier tent. It is a disposable solution developed by a team of experts from the Medical University of Warsaw, which limits the spread of infectious agents both on board and off the aircraft. As the inside of the tent is not fully isolated from the outside, PPE must still be worn [36,37].
| Variable                          | Total  | Type of mission | p-value |
|----------------------------------|--------|-----------------|---------|
|                                  |        | Emergency       | Inter-hospital transport |
| Time of year – n (%)             |        |                 |         |
| Spring                           | 28 (13.86) | 18 (16.67) | 10 (10.64) | 0.0578 |
| Summer                           | 24 (11.88) | 7 (6.48)      | 17 (18.09) |
| Fall                             | 104 (51.49) | 59 (54.63)   | 45 (47.87)  |
| Winter                           | 46 (22.77)  | 24 (22.22) | 22 (23.40)  |
| Sex – n (%)                      |        |                 |         |
| Female                           | 58 (28.71)  | 35 (32.41) | 23 (24.42)  | 0.2135 |
| Male                             | 144 (73.76) | 73 (67.59)  | 71 (75.53)  |
| Age – M (SD)                     | 61.03 (17.80) | 64.18 (18.13) | 57.43 (16.79) | 0.0073 |
| Diagnosis – n (%)                |        |                 |         |
| Acute respiratory failure        | 84 (41.58)  | 22 (20.37) | 62 (65.96)  |
| Sudden cardiac arrest            | 25 (12.38)  | 25 (23.15) | 0 (0.00)    |
| Dyspnea/respiratory tract infection | 18 (8.91)  | 17 (15.74) | 1 (1.06)    | 0.0000 |
| Stroke                           | 16 (7.92)    | 10 (9.26)  | 6 (6.38)    |
| Acute coronary syndrome          | 12 (5.94)    | 11 (10.19) | 1 (1.06)    |
| Other                            | 47 (23.27)  | 23 (21.30) | 24 (25.53)  |
| Clinical findings – n (%)        |        |                 |         |
| Dyspnea                          | 60 (29.70)  | 42 (38.89) | 18 (19.15)  | 0.0022 |
| Apnea                            | 41 (20.30)  | 21 (19.44) | 20 (21.28)  | 0.7468 |
| Cyanosis                         | 33 (16.34)  | 27 (25.00) | 6 (6.38)    | 0.0004 |
| Paresis                          | 15 (7.43)    | 10 (9.26)  | 5 (5.32)    | 0.2867 |
| Medical emergency procedures – n (%) |        |                 |         |
| Intravenous cannulation          | 155 (76.73) | 91 (84.26) | 64 (68.09)  | 0.0067 |
| Tracheal intubation              | 90 (44.55)  | 32 (29.63) | 58 (61.70)  |
| Sedation                         | 79 (39.11)  | 15 (13.89) | 64 (68.09)  | 0.0000 |
| Mechanical ventilation           | 71 (35.15)  | 16 (14.81) | 55 (58.51)  |
| Urinary catheterization          | 59 (29.21)  | 3 (2.78)   | 56 (59.57)  |
| Muscle relaxation                | 47 (23.27)  | 12 (11.11) | 35 (37.23)  |
| Airway suctioning                | 41 (20.30)  | 11 (10.19) | 30 (31.91)  | 0.0001 |
| Chest compressions               | 28 (13.86)  | 27 (25.00) | 1 (1.06)    | 0.0000 |
In the period analyzed, HEMS and EMS crews intervened in 202 cases of patients infected with SARS-CoV-2, most of them in the fall (51.49%). In the group studied, most patients were male (73.76%) and the mean patient age was 61.03 years. Among the COVID-19 patients, the most common comorbidity was acute respiratory failure (41.58%), accompanied by dyspnea (29.70%) or apnea (20.30%). During the intervention, most patients required intravenous cannulation (76.73%), the most commonly administered drug was propofol (20.79%), and the most frequently used protection measure was a barrier tent (20.30%). The mean total duration of patient care on site and during transport was 86.43 minutes. Over 50% of the patients were transported to hospital by air (64.36%), and ultimately, a vast majority (90.66%) arrived at a hospital providing the full spectrum of care required. Death from COVID-19 symptoms or comorbidities was reported in 9.90% of the patients. Detailed results are presented in Table 1.

The analysis showed significant differences between emergency missions and inter-hospital transports. The emergency missions more often concerned older patients with sudden cardiac arrest, dyspnea, respiratory tract infection, stroke, and acute coronary syndromes. The mean duration of patient care was shorter, and those patients who could not be transported by air were more often handed over to ground emergency medical teams for transfer to hospital. Patient deaths were only reported during emergency missions, and more patients were transported to the nearest hospital in this type of missions. These relationships were statistically significant, and detailed data are reported in Table 1.

Table 2 lists patients’ detailed clinical parameters. The clinical condition of patients receiving HEMS/EMS intervention differed widely among cases.
Statistical analysis considering the mission type showed that patients transported during emergency missions had lower RTS scores both at the initial examination and at handover to hospital. On the other hand, PEEP and CPAP pressure values needed to restore normal hemoglobin saturation values were lower in this patient group.

Our analysis demonstrated a statistically significant but weak negative correlation between the patient care duration and the RTS (r=-0.1971) and GCS scores (r=-0.3116). This indicates that longer duration of care, which includes longer duration of transport, is associated with poorer clinical condition of the patient, evidenced by the lower RTS and GCS scores. We also observed a statistically significant but weak positive correlation between the duration of patient care and NACA score (r=0.2350), indicating that longer duration of out-of-hospital patient care was associated with higher NACA scores (Figure 1).

Table 2. Characteristics and analysis of correlations between the type of mission and selected findings and measurements.

| Findings and measurements       | Total          | Type of mission | p-value |
|--------------------------------|----------------|-----------------|---------|
|                                | Total          | HEMS            | EMS     |         |
| GCS* – M (SD) [points]         | 11.20 (5.06)   | 10.76 (5.15)    | 12.43 (4.65) | 0.0736 |
| RTS* – M (SD) [points]         | 9.37 (4.27)    | 8.91 (4.61)     | 10.66 (2.79) | 0.0272 |
| GCS** – M (SD) [points]        | 11.65 (4.99)   | 11.26 (5.15)    | 12.71 (4.41) | 0.1319 |
| RTS** – M (SD) [points]        | 9.42 (4.44)    | 8.90 (4.86)     | 10.79 (2.68) | 0.0382 |
| Spontaneous respiration rate – M (SD) [1/min] | 18.50 (7.37) | 18.81 (7.80) | 18.02 (6.72) | 0.8451 |
| NACA – M (SD)                  | 4.82 (1.25)    | 4.73 (1.46)     | 4.91 (0.97)  | 0.1123 |
| Blood glucose – M (SD) [mg%]   | 198.34 (111.99) | 195.30 (99.62) | 209.67 (153.44) | 0.7142 |
| Volume – M (SD) [mL]           | 524.51 (90.16) | 537.50 (69.52)  | 520.73 (95.55) | 0.6252 |
| Ventilator respiration rate – M (SD) [1/min] | 16.04 (5.81) | 12.31 (1.92) | 17.13 (6.12)  | 0.0004 |
| FiO2 – M (SD)                  | 0.84 (0.21)    | 0.89 (0.23)     | 0.83 (0.21)  | 0.1709 |
| PEEP/CPAP – M (SD) [cmH2O]     | 10.00 (4.22)   | 8.06 (4.45)     | 10.56 (4.02) | 0.0467 |
| Saturation* – M (SD) [%]       | 91.58 (8.75)   | 91.26 (9.17)    | 91.99 (8.26) | 0.9698 |
| Saturation** – M (SD) [%]      | 93.94 (5.89)   | 93.96 (5.97)    | 93.91 (5.84) | 0.9016 |
| Capnography* – M (SD) [mmHg]   | 39.00 (15.45)  | 38.31 (15.39)   | 39.68 (15.68) | 0.4651 |
| Capnography** – M (SD) [mmHg]  | 38.08 (12.91)  | 39.33 (14.80)   | 36.82 (10.75) | 0.5000 |
| Systolic blood pressure – M (SD) [mmHg] | 131.71 (30.37) | 133.82 (29.95) | 129.14 (30.89) | 0.5749 |
| Diastolic blood pressure – M (SD) [mmHg] | 78.29 (19.87) | 79.47 (20.12) | 76.86 (19.60) | 0.4545 |
| Heart rate* – M (SD) [bpm]     | 97.03 (24.84)  | 97.13 (24.71)   | 96.91 (25.17) | 0.7449 |
| Heart rate** – M (SD) [bpm]    | 96.77 (24.45)  | 97.17 (24.68)   | 96.29 (24.32) | 0.6375 |

* Value at arrival on scene; ** value at patient handover to hospital. GCS – Glasgow Coma Scale; RTS – Revised Trauma Score; NACA – National Advisory Committee for Aeronautics; FiO2 – Fraction of inspired oxygen; PEEP/CPAP – positive end-expiratory pressure/continuous positive airway pressure.

Discussion

Our study showed that among the 202 COVID-19 patients receiving Polish Medical Air Rescue interventions, most were male and elderly. The most common comorbidity found in the group was acute respiratory failure, with symptoms including dyspnea and apnea. Looking just at emergency missions, these more often concerned women and elderly patients with sudden cardiac arrest, dyspnea, respiratory tract infection, stroke, and acute coronary syndromes. It needs to be emphasized that studies on the risk factors of SARS-CoV-2 infection, development, and prognosis are particularly important in research on the COVID-19 pandemic. Among predictors of a severe course of this disease, age, sex, and comorbidities have been well-documented. Older age not only predicts a more severe course of COVID-19 [38-40], but is also an independent predictor of higher mortality [41,42]. Similarly, demographic
Figure 1. Correlation between patient care duration and NACA (A), RTS (B), and GCS (C) scores.
analyses showed a more severe course and higher mortality in male patients [43,44]. Comorbidities are another significant factor, which similarly affects the course of the infection and the prognosis. These include cardiovascular disease, diabetes mellitus, chronic obstructive pulmonary disease, cancers (especially blood cancers), chronic kidney disease, history of organ transplantation, obesity, and nicotine addiction [45-52]. Albrecht et al (2020) reported on the experience of Rega, which is the Swiss air rescue, concerning the transportation of COVID-19 patients and those with other highly contagious diseases. In the period studied by Albrecht et al (2020) in Switzerland, there were 83 transports of severely ill COVID-19 patients, most of whom were male [33]. Another interesting study was performed by Spoelder et al (2021) in the Netherlands, presenting an innovative aero-medical operation, including the working methods and safety procedures used during the ongoing pandemic. Sixty-seven confirmed COVID-19 patients requiring mechanical ventilation were transported by the Lifeliner 5 unit. Most patients were male and the mean age was 63 years [52]. Rikken et al (2020) described the Dutch HEMS teams’ experience at the beginning of the current pandemic, and reported that most COVID-19 patients studied were adult and female [53].

In the next part of the analysis, we focused on the duration of care, duration of transport, and their significance for the clinical status of the COVID-19 patients. In our study, the clinical condition of patients receiving HEMS/EMS intervention differed widely among cases. We found that the mean duration of care provided by Polish Medical Rescue crews to the COVID-19 patients they transported was 87 minutes.

In their study, Albrecht et al (2020) found that since the beginning of the SARS-CoV-2 pandemic in Switzerland, flights with severely ill COVID-19 patients took between 5 and 59 minutes. Our analysis also demonstrated that the mean duration of patient care was shorter in emergency missions than in inter-hospital transports, and those patients who could not be transported by air were more often handed over to ground emergency medical teams for transport to hospital. Furthermore, we found that longer duration of patient transport, and thus longer overall duration of patient care, was associated with lower RTS and GCS scores and higher NACA scores, indicating a poorer clinical condition of the patients at handover to hospital. In their study, Rikken et al (2020) reported that patients with COVID-19 had a mean NACA score of 4 [53]. Similar results were shown by Albrecht et al (2020), with most COVID-19 patients scoring 4 or 5 on the NACA scale [33]. A multi-center study by Hilbert-Carius et al (2020), which focused on pre-hospital medical services for and inter-hospital transfers of COVID-19 patients provided by European HEMS teams since the beginning of the pandemic, suggests that it is more likely for the patients transferred between hospitals to have confirmed COVID-19, be younger, and have a more severe course of the disease evidenced by a higher NACA score [34].

In the period analyzed, the medical intervention performed most often by the Polish Medical Air Rescue HEMS and EMS crews was peripheral intravenous cannulation. Similar findings were reported by Rikken et al (2020), Hilbert-Carius et al (2020), and Spoelder et al (2021) [34,52,53]. In addition, Hilbert-Carius et al (2020) found that patients requiring inter-hospital transfer received considerably more interventions during the mission [34], which is corroborated by the findings from our study.

During the SARS-CoV-2 pandemic, research on viral transmission pathways and risk reduction is particularly important, also with respect to medical air rescue crews, which has been of interest to such authors as de Wit (2021), Braude et al (2021), Meng et al (2021), Bredmose et al (2020), Albrecht et al (2020), or Spoelder et al (2021) [33,52,54-57]. A study by Berry et al (2021), analyzing HEMS transportation of COVID-19 patients in the USA during the first wave of the pandemic, demonstrated that the majority of organizations participating in the survey decided to transport patients with confirmed or suspected COVID-19. Furthermore, safety practices adopted by these organizations included staff education on COVID-19, an analysis of COVID-19 risk for patient transports, requirement to use N95 respirator masks or PAPRs (powered air-purifying respirators) by crew members, separation of pilots from health care providers, also during downtime, and disinfection [27]. In the analyzed material comprising interventions during the pandemic, HEMS and EMS crews routinely used complete personal protective wear and equipment to prevent SARS-CoV-2 transmission and minimize the risk of infection among the medical personnel. In addition, in cases of inter-hospital transport and longer emergency missions, the crews were more likely to use precautions such as patient isolation units or the innovative barrier tent solution. The importance of using patient isolation units for carriers of the SARS-CoV-2 virus on board aircraft is also highlighted by Hilbert-Carius et al, who concluded that the use of isolation units improved crew safety during the transport of patients infected with SARS-CoV-2 and allowed the crews to rapidly prepare for another mission, as the aircraft did not require a long disinfection process after completing such a transport [34]. Schwabe et al (2020) conducted a retrospective study, analyzing experience with the use of portable medical isolation units (PMIU) for 13 patients with COVID-19 transported by air over long distances. They found that the transportation of patients with COVID-19 in PMIUs is feasible even in long-distance missions, but requires careful individual risk and benefit analysis to be performed in each case before transport [58].

This is the first Polish retrospective analysis of the activities performed by the Polish Medical Air Rescue in the first year of the SARS-CoV-2 pandemic, between March 4, 2020 and March 4, 2021. Further research regarding pre-hospital care provided by air crews is warranted and seems necessary to achieve...
a deeper understanding of the topic and offer the best quality of care for patients with COVID-19.

We are, however, aware of certain limitations in the study. The analysis pertaining only to the information included in the HEMS and EMS crews’ records and did not take into account the subsequent management or survival of the COVID-19 patients. However, we believe that these limitations do not affect the quality of the study.

Conclusions

During the first year of the COVID-19 pandemic in Poland, the Polish Medical Air Rescue Service implemented procedures to protect patients, medical staff, and air crew from SARS-Cov-2 infection. This study has highlighted the importance of using single-patient isolation units for patient transport between hospitals and for emergency hospital admissions when the SARS-Cov-2 status of the patients were unknown.

Most of the studied patients with confirmed SARS-Cov-2 infection were male, with the mean age of 61 years. The most common comorbidity in the COVID-19 patients receiving HEMS or EMS intervention was acute respiratory failure. Emergency missions were associated with a poorer clinical condition and higher mortality of the patients. The longer a patient was receiving out-of-hospital care, the poorer their clinical condition. This further validates the use of aerial transport for patients with severe COVID-19.

Declaration of Figures’ Authenticity

All figures submitted have been created by the authors, who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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