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Firefighters' knowledge of the knowledge of procedures for clearing the respiratory tract in an injured person with suspected infection with biological material (SARS-CoV-2) — a nationwide cross-sectional study

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ABSTRACT

Introduction: The aim of the study was to assess the knowledge of the procedure for clearing the respiratory tract and updated qualified first aid (QFA) 1a and 2a procedures by firefighters serving in State Fire Service (SFS) rescue and firefighting units, and their knowledge of the transmission of the SARS-CoV-2 virus.

Material and methods: The cross-sectional study covered 19 408 firefighters (officers serving in SFS rescue and firefighting units from all over Poland). The study was conducted using the diagnostic survey method, the Computer Assisted Web Interview (CAWI) technique consisting of a set of particulars regarding a specific officer and the appropriate medical part of the survey.

Results: In the group of 19,408 respondents, 99.31% were men (n = 19,275), while women accounted for 0.69% (n = 133; $p < 0.001$). The age of the respondents was in the range of 18–66 years, and the average age was 35.88 ± 7.14 years. The length of service was 11.95 ± 6.44 years. The knowledge of procedures 1a and 2a declared by the respondents [OR = 1.51 (95% CI: 1.22–1.86), $x^2 = 14.76$], the ability to operate a suction unit [OR = 1.73 (95% CI: 1.44–2.08, $x^2 = 34.58$)], the frequency of airway clearance training ($p < < 0.001$, $x^2 = 61.74$). Only 15% of respondents used a suction unit on an injured person during operations.

Conclusions: The knowledge of firefighters in the subject matter covered by the analysis is diverse, some firefighters have additional experience and practice from working in health care units. Professional development in the field of QFA supplemented with procedures 1a and 2a may translate into a lower risk of infection associated with airway clearing in the era of the pandemic. There is a visible need for constant training of SFS officers in terms of medical activities to maintain the knowledge of firefighters at a high initial level.

Key words: Airway clearance, SARS-CoV-2 biological hazard, State Fire Service, rescue and firefighting units

Introduction

Maintaining airways in pre-hospital conditions is a key element of rescue operations for unconscious victims, determines the effectiveness of actions and affects further prognosis. The effectiveness of this part of rescue operations allows for the implementation of further elements of pre-hospital care, improving the prognosis of victims in a life-threatening state.

Methods of airway clearance and effective resuscitation in the event of out-of-hospital cardiac arrest (OHCA) are recommended and published periodically in the form of guidelines and updates by the European Resuscitation Council (ERC), the American Heart Association (AHA) [1].

In emergency medical services, two methods of airway clearance are distinguished: instrumentless (bending the head and lifting the mandible or manual efforts to extend the mandible upwards), and with instrumentation, i.e. using specialized medical equipment (oropharyngeal tubes, laryngeal masks, laryngeal tubes, intubation tubes, suction units) [2].

Medical activities undertaken by firefighters are regulated by the Rules of the Organization of Medical Rescue in the National Rescue and Firefighting System (NRFS), the last update of which was carried out in June 2021. These principles (the main document and 11 annexes) define medical rescue in the professional structures of firefighters, i.e. the State Fire Service (SFS) and firefighters of the Volunteer Fire Brigades (OSP). Firefighters conduct medical rescue operations (MRO) on two levels. The basic level includes qualified first aid (QFA) procedures. At the advanced level, firefighters carry out health services other than medical rescue activities, going beyond the QFA procedures [3, 4].

In more difficult medical emergencies, firefighters should clear or maintain the airway. They can do this without instruments, manually. However, greater effectiveness of actions in maintaining the airway clearance of the injured person is obtained by using appropriate equipment available to them, e.g. suction units or supraglottic airway devices (SAD) [5].

Since March 2020, the biological threat of the SARS-CoV-2 virus has been an additional challenge during all medical activities, regardless of the level. The time of the pandemic has brought with it many new challenges in the daily practice of rescue units. The risk associated with working directly with a patient with the SARS-CoV-2 virus causing COVID-19, fear of infection, unpredictability of events, fears in the performance of normal professional duties are variable elements of work that rescue entities must face.

The greatest risk is posed by people who are infected, during the incubation period, spreading the virus shortly before the first clinical symptoms. Infected but asymptomatic people are also a big threat. According to the estimated data provided by the World Health Organization (WHO), the average rate for asymptomatic and oligosymptomatic patients is 80%, for people with mild symptoms — 15%, for people with severe symptoms — 5%. The mortality rate for the entire population in the course of COVID-19 is at the level of 3–4% and differs in values in individual countries [6, 7].

When providing medical assistance, firefighters do not know whether the patient is infected with SARS-CoV-2, especially when clear symptoms are imperceptible. In many cases, the interview with the injured person or direct witnesses of the event is inaccurate, uncertain, and unreliable. An additional difficulty and risk for firefighters is the fact that about 20–30% of people undergo SARS-CoV-2 infections asymptomatically, or oligosymptomatically, as demonstrated by population seroprevalence studies showing an estimated number of asymptomatic people expressed as a percentage of the population [8].

Emergency responders during medical operations should take appropriate safety measures in accordance with procedures. Even a patient who is conscious and does not report any ailments and disturbing symptoms suggestive of infection during the intervention may be an infectious patient (be during the incubation period of SARS-CoV-2 infection). All QFA procedures related to oxygen therapy and airways require increased rescuer precautions, adequate self-protection, and adequate knowledge. The rules of the organization of medical rescue in the CRSG refer to such situations (intervention with increased biological risk) in the form of procedures 1a and 2a, which are an extension of procedures 1 and 2 in connection with the epidemic threat of SARS-CoV-2. The aim of the authors was to check the knowledge of the SFS officers directly involved in the activities with the participation of injured persons about the above-mentioned procedures [9].

The content added to procedure 1, related to the risk of SARS-CoV-2 transmission, is: 'mouth and nose covering with a surgical mask', while content added to procedure 2 is: 'airway opening mechanism dependent on the event' at the airway clearance assessment stage, and 'breath assessment by chest or abdominal observation' at the breath assessment stage. All shifts in SFS units throughout Poland were familiarized with the new rules within one month of their introduction [3].

Aim of the study

The aim of the study was to assess the knowledge of the procedure for clearing the respiratory tract and updated qualified first aid (QFA) 1a and 2a procedures by firefighters serving in State Fire Service (SFS) rescue and firefighting units, and their knowledge of the transmission of the SARS-CoV-2 virus.

Material and methods

Research using the diagnostic survey method, using the online survey technique, was carried out on

1–14 December 2021. 19,408 officers were qualified for the analysis, who correctly filled out and completed the questionnaire. The study did not include firefighters who were on longer leave or sick leave during the period in which the survey was active in the system and could not complete the survey on the company computer. The research tool was the author's own online questionnaire Computer Assisted Web Interview (CAWI). The survey was made available to respondents online using the SFS's Main Headquarters (MG) survey system, thanks to which it reached each unit, each work shift. The well-functioning internal SFS system provided a large number of respondents in a short time. The firefighters filled the questionnaire on the company computers during the service (training classes).

The questionnaire consisted of a set of particulars outlining the profile of a specific officer and the substantive (medical) part of the questionnaire. The questionnaire was based on a 5-point VAS scale, Likert scale, MCQ and TFQ questions. The questions included knowledge of QFA procedures for airway clearance and the associated biological hazards (e.g. the risk of SARS-CoV-2 transmission).

The study results were statistically analysed. The survey was prepared as fully anonymous, and participation in the survey was voluntary, about which the respondents were informed. On November 25, 2021, the consent of the Deputy Chief Commander of the SFS was obtained to conduct a survey in the population of firefighters from firefighting and rescue units from all over Poland. The actual study was preceded by a pilot study on 23–24 November 2021 with three randomly selected SFS units from the Mazowieckie Voivodeship. There were no changes between the pilot version and the version made available for the whole of Poland, and all the questions turned out to be clear and understandable. The relevance of the original content was based on the assessment of the methods used to estimate the relevance of the content [10]. All changes, corrections and the final version of the survey for respondents were approved during the consultation phase of the research team.

Data analysis

All calculations were performed using STATISTICA software version 13.3 (Tibco Software Inc. Palo Alto, California, United States). The collected data after initial processing in MS Excel (Microsoft Corporation, Albuquerque, New Mexico, United States) was searched for unusual and erroneous records and cleaned up with automatic data analysis tools.

Descriptive statistics were used to present quantitative and categorical (order and nominal) variables. The following measures were determined to describe quantitative variables: mean (M) and standard deviation (SD). However, the number (N) and frequency (%) were used to describe categorical variables.

In order to determine what features determine the knowledge of QFA procedures, an analysis of cross tables was performed with the calculation of the Pearson chi-square test. In the case of dichotomous variables, an additional odds ratio (OR) was determined along with a 95% confidence interval (CI). The testing of null hypotheses was carried out for all analyses with the assumed *a priori* level of statistical significance of 0.05.

Test size and power

Organizational structure of SFS in Poland:

- 16 voivodship headquarters (VH SFS);
- 335 poviat (county-level) headquarters (PH), city headquarters (CH) of the SFS;
- 5 firefighting schools (including 5 firefighting and rescue SFS);
- Central Museum of Firefighting in Mysłowice;
- Scientific and Research Centre for Fire Protection National Research Institute SRC-NRI) in Józefów;
- 504 firefighting and rescue SFS units — the survey was addressed to these entities and personnel serving at them.

The SFS employs more than 31 000 officers, including almost 6000 in the daily system (8 hours, and more than 25 000 in the shift system [11]. Thus, the obtained sample comes from approx. 80% of the population of firefighters serving in the shift system.

Results

In the group of 19,408 respondents, 99.31% were men (n = 19,275), while women accounted for 0.69% (n = 133; $p < 0.001$; $x^2 = 4.84$). The age of the respondents was in the range of 18–66 years, and the average age was 35.88 ± 7.14 years. The length of service was 11.95 ± 6.44 years. A detailed breakdown of the demographic characteristics of the respondents is presented in Table 1.

Respondents were asked about the QFA procedure for dealing with a person suspected of being infected with an infectious biological agent or a person with a confirmed infectious biological agent during medical rescue operations (procedure 1a and 2a). The percentage of officers declaring knowledge of the above-mentioned procedures is 95.00%. In order to verify this knowledge, further questions were asked, consisting in indicating the correct method of clearance of airway obstruction and the method of assessing the patient's breathing, in accordance with the above-mentioned procedures. Statistically significant factors affecting

Table 1. Demographic characteristics of respondents (n = 19,408)

Characteristics	Value			
	N	%		
Gender				
Female	133	0.69		
Male	19 275	99.31		
Age, years			M	SD
18–25	1 579	8.14		
26–35	7 455	38.41	35.88	7.14
> 35	10 374	53.45		
Education				
Secondary education	9 975	51.40		
Post-secondary	1 513	7.80		
Higher education	7 920	40.81		
Place of residence				
Village	10 429	53.74		
City < 100k	6 094	31.40		
City > 100k	2 885	14.87		
Length of service, years			M	SD
< 5	3 277	16.88		
5–15	10 774	55.51	11.95	6.44
> 15	5 357	27.60		
Nature of most frequent service				
Rescue personnel	5 766	29.71		
Commander	6 231	32.11		
Driver	7 411	38.19		
Emergency Responder or Nurse				
No	17 652	90.95		
Yes	1 756	9.05		
Last KPP recertification				
Before 01 March 2020	11 338	58.42		
After 01 March 2020	7 289	37.56		
Exempt from recertification	781	4.02		

the correct way of airway clearance and respiratory assessment were, among others: the nature of the most frequently performed service (commander, $p < 0.001$, $x^2 = 18.99$), education (higher, $p < 0.001$, $x^2 = 13.30$), declared knowledge of procedures 1a and 2a [OR = 1.51 (95% CI: 1.22–1.86), $x^2 = 14.76$], declared ability to use a suction unit [OR = 1.73 (95% CI: 1.44–2.08, $x^2 = 34.58$)], and frequency of professional development in the field of airway clearance ($p < 0.001$, $x^2 = 61.74$). The distribution of responses is shown in Figures 1 and 2. Statistically more often ($p < 0.001$, $x^2 = 26.57$), the correct answers to the above questions were given by people with medical qualifications (paramedic, nurse) than people without such qualifications [OR = 1.45 (95% CI: 1.26–1.67), $x^2 = 26.58$].

When asked about the frequency of airway clearing during professional development in SFS firefighting and rescue units, only 1.47% of respondents say that they have not practiced airway clearing in the last year. The remaining percentage of respondents (98.53) declare

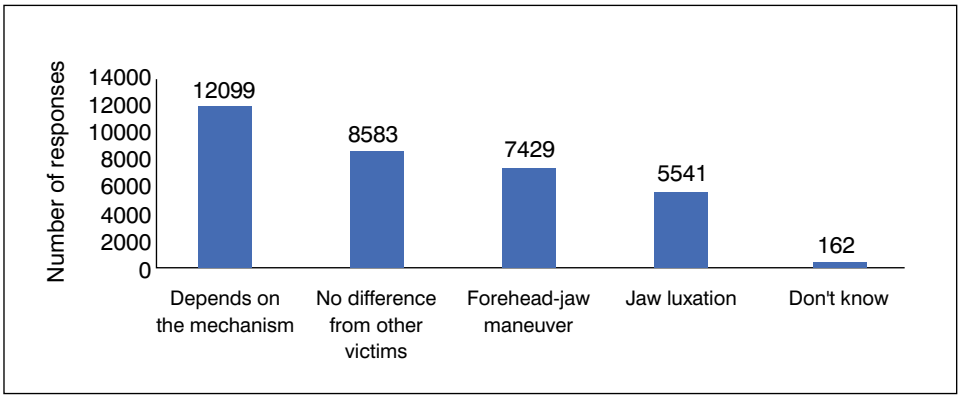

Figure 1. Question: "Indicate the correct way to clear the airways in case of suspected infection with an infectious biological agent (e.g. SARS-CoV-2 coronavirus)". Source: own study

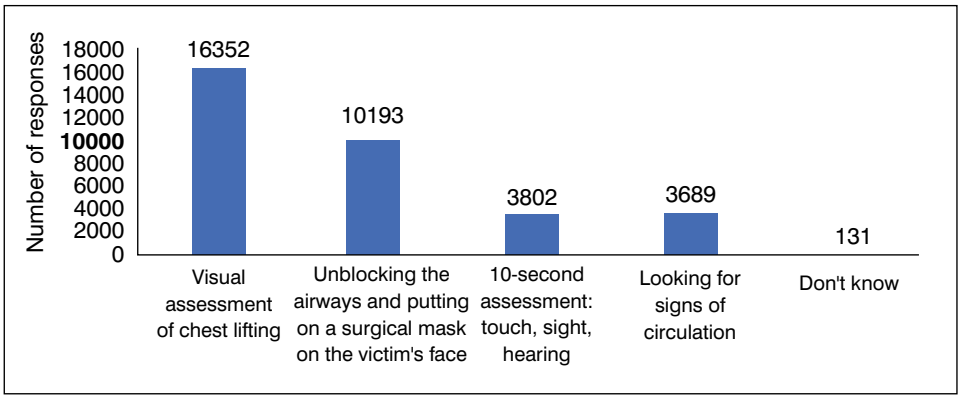

Figure 2. Question: "Indicate the correct way to assess respiration in an unconscious patient suspected of being infected with an infectious biological agent (e.g. SARS-CoV-2 coronavirus)". Source: own study

participation in airway clearing exercises in the last year, while 39.11% declare such exercises at least 10 times in the last year (Fig. 3).

The majority of respondents (92.27%) at least once in the last year practiced procedure 1a and 2a during professional development in at their SFSunit, but as many as 27.94% declare participation in such exercises more than 10 times since the beginning of the SARS-CoV-2 pandemic in Poland. Only 7.73% of respondents did not practice airway clearing in a patient suspected of being infected with an infectious biological agent (Fig. 4).

"How many times since the beginning of March 2020 (the beginning of the pandemic in Poland) have you cleared a patient's airways during rescue and firefighting activities?" Slightly more than half of the respondents (54.77%) did not use the knowledge acquired during professional development in this field. The remaining part used the acquired skills in practice at least once since the beginning of the pandemic in Poland, of which 11.56% of respondents did so more than 5 times (Fig. 5).

7923 respondents stated that they used procedures 1a and 2a during rescue and fire-fighting operations. (Fig. 6)

Questions based on Likert's 5-point scale asked the respondents whether, in their opinion, the risk of transmitting the SARS-CoV-2 virus during airway clearing using traditional methods (instrumental, non-instrumental and suction unit) is greater during the pandemic. The respondents had the choice of responses in the range of 1–5 (1 meant a definite lack of risk, 2 slight risk of infection, 3 no opinion of the respondent, 4 some risk of infection, 5 a definite risk of infection). Does the use of personal protective equipment in the form of a protective mask and a visor (or protective glasses) hinder rescue operations (1 — definitely does not hinder, 2 — rather does not hinder, 0 — no opinion, 4 — rather hinders, 5 — definitely hinders) . The distribution of answers to the above questions is presented in Table 3.

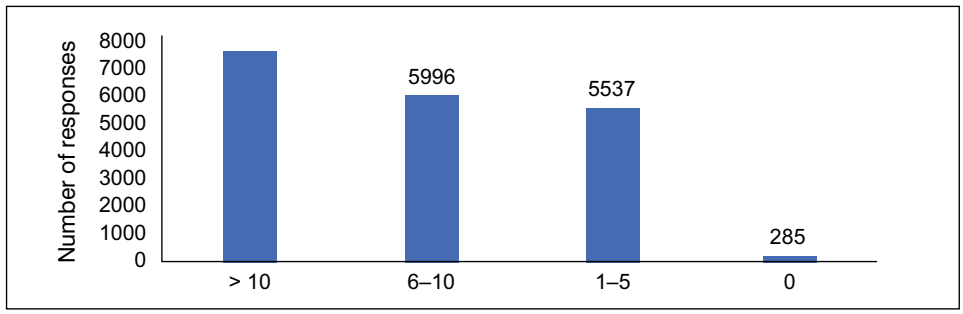

Figure 3. Question: "How many times per year do you practice airway clearing during your career development at your SFS unit?". Source: own study

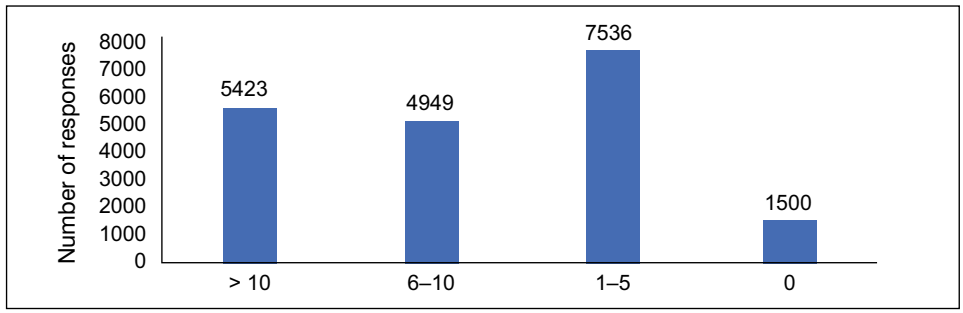

Figure 4. Question: "How many times since March 2020 (the beginning of the pandemic in Poland) have you practiced airway clearing in an unconscious patient with suspected infection with an infectious biological agent (e.g. SARS-CoV-2 coronavirus) during professional development at your SFS unit?". Source: own study

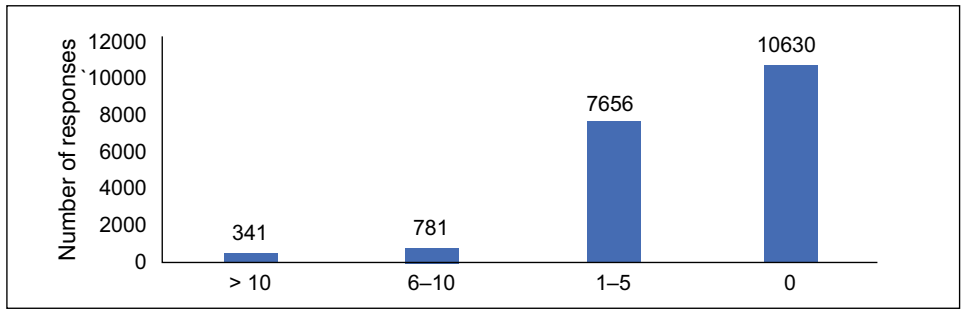

Figure 5. Question: "How many times since the beginning of March 2020 (the beginning of the pandemic in Poland) have you cleared an unconscious patient's airways during rescue and firefighting activities?" Source: own study

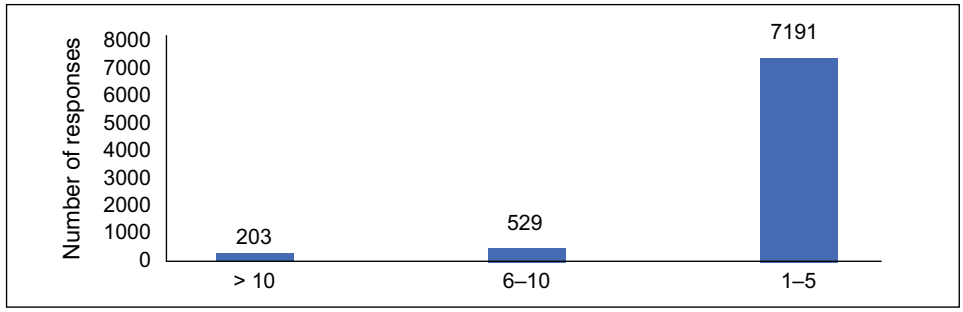

Figure 6. Question: "If you selected an answer other than 0 in the question above, how many times did you use procedure 1a and 2a?". Source: own study

Table 2. Distribution of responses on the Likert scale

Question	1 definitely does not involve	2 rather does not involve	3 no opinion	4 rather involves	5 definitely involves
In your opinion, does airway clearing in a patient in the era of the pandemic involve the risk of SARS-CoV-2 infection?	9.12%	19.24%	35.44%	19.52%	16.67%
In your opinion, does airway clearing in a patient during the pandemic with a suction unit involve a higher risk of SARS-CoV-2 infection than with other techniques?	16.79%	27.64%	34.83%	13.24%	7.49%
	1 — does not hinder at all	**2**	**3**	**4**	**5 — hinders substantially**
In your opinion, does the use of personal protective equipment in the form of a protective mask and a visor (or protective glasses) hinder rescue operations?	10.92%	19.01%	33.32%	22.40%	14.35%

Only 15% of respondents used a suction unit to clear the airways of the injured person during rescue and firefighting activities (Fig. 7). Some firefighters with medical education work additionally in the State Emergency Medical Services. In answering this question, firefighters were allowed to use their experience in medical facilities. The purpose of this question was to check the general use of the suction unit. The survey did not specify under what circumstances.

When asked "Do you know how to prepare a reusable suction unit (contaminated with patient's secretions) for the next use, so that it is safe for the rescuer and the next patient?" 93% of the respondents answered yes [OR = 1.73 (95% CI: 1.44–2.08), $x^2 = 34.58$] (Fig. 8).

The opinion of the respondents on the transmission of the SARS-CoV-2 coronavirus through a single-use face mask for passive oxygen therapy with a one-sided valve varies. 46.74% of the respondents responded that it limits the transmission of the coronavirus (Fig. 9).

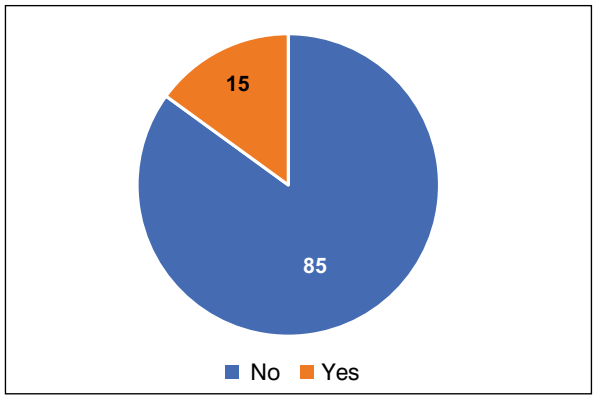

Figure 7. Question: "Have you used airway clearing with a suction unit since the beginning of the SARS-CoV-2 pandemic during rescue and firefighting operations?" Source: own study

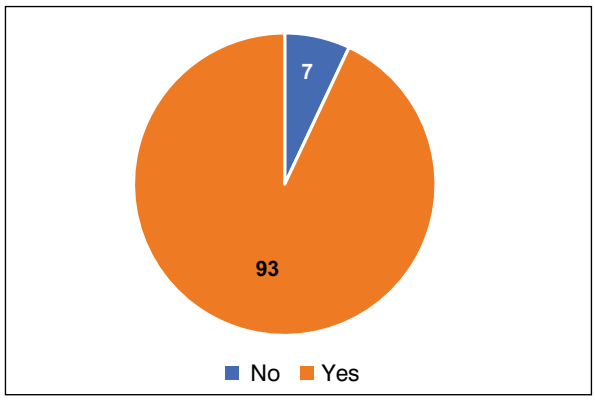

Figure 8. Question: "Do you know how to prepare a reusable suction unit (contaminated with patient's secretions) for the next use, so that it is safe for the rescuer and the next patient?" Source: own study

Discussion

The SARS-CoV-2 pandemic affected many aspects of social life, private enterprises, and state institutions. The scale of the phenomenon forced governments and institutions to change rules and regulations, and obliged the public to specific duties and orders. The procedures of rescue entities, including the QFA procedures implemented by fire protection units (FPU), also needed to be modified. With reference to these changes, the authors of the study asked the respondents about procedures 1a and 2a, the content of which was introduced for use during the pandemic. These procedures directly relate to the risk associated with the transmission of the coronavirus. Rescue procedures

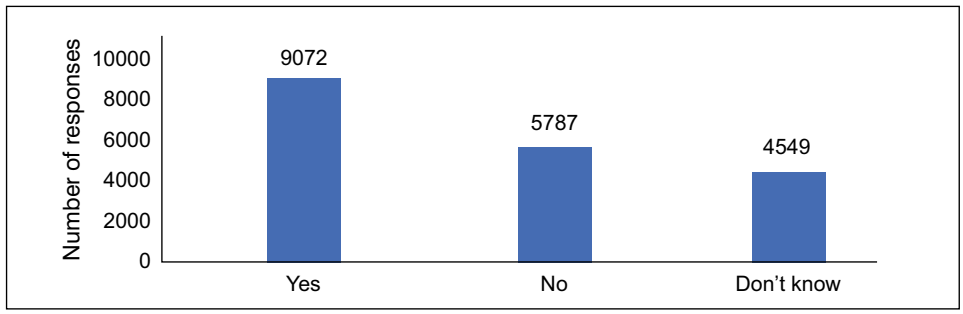

Figure 9. Question: "In your opinion, does a single-use passive oxygen mask with a one-way valve limit the transmission of the SARS-CoV-2 virus?" Source: own study

were adapted to the threat on an ongoing basis with the development of the pandemic, e.g. the European Resuscitation Council issued COVID-19 Resuscitation Guidelines in April 2020 [12]. Changes in procedures and new guidelines were formed in many other fields of medicine and then recommended for use globally by the WHO and locally by medical consultants and scientific associations [13–15].

The purpose of the updated guidelines is to help patients effectively and to eliminate the infection of medical and emergency services personnel. The risk presented in this study resulting from the respiratory tract clearance of people infected or suspected of infection applies to many specializations of medicine. Marek T. et al. [16] describe the recommendations of the procedure aimed at reducing the risk of SARS-CoV-2 transmission in endoscopic laboratories. In order to reduce exposure to biologically harmful agents, they recommend the use of basic personal protective equipment (PPE). These include gloves, aprons, protective goggles or face shields (visors) and respiratory protection (masks that protect against respiratory secretions, saliva or mucus droplets and microbes). Similar observations were made by the authors of a 2021 study [17]. They noted that endoscopic procedures are associated with a high risk of COVID-19 infection for staff and subsequent patients as a result of exposure to aerosols. Therefore, it is necessary to use advanced personal protective equipment and follow the rules of sterilization of endoscopes.

Cook T. [18] also describes the risk of infection of medical personnel. Personal protective equipment should be logically matched to the potential route of transmission of the virus during patient care — contact, droplet or airborne, and airborne precautions include a fitted high-filtration mask, which should be reserved for procedures at risk of aerosol production. In this study, firefighters were asked about their knowledge of procedure 1a, which concerns mouth and nose covering as a prevention against droplet infection.

Madzała [19] noted that under the first aid certification, firefighters are entitled to use supraglottic methods of airway clearance after passing a course in this field. The dominant share of respondents in this study comprised firefighters serving in SFS units without medical education (90.95% — Tab. 1). This type of education is desirable because firefighters with SFS firefighting and rescue units are most likely to implement QFA procedures for airway clearance and to be exposed to SARS-CoV-2 transmission. Despite the risk to rescuers, QFA procedures for airway clearing are important for the patient's survival and prognosis.

The classical position in the literature on the subject is the work of Krzyżanowski [20]. The author concludes that the use of appropriate techniques of upper respiratory tract clearance which are adapted to the patient's condition, in particular instrumental techniques, can significantly improve the quality of ventilation. The proper flow of air (oxygen) through the respiratory tract is one of the elements determining the optimal functioning of all systems and organs.

Published in 2015, the study showed that firefighters in some states of the USA are trained in the following advanced skills: insertion of an intravenous line, administration of oral nitroglycerin and aspirin, establishment of supraglottic airways [21].Our analysis showed that since the beginning of the SARS-CoV-2 pandemic, over 8,000 officers have cleared airways at least once (Fig. 5). This includes the multiple use of supraglottic instrumentation methods, which form part of the equipment of SFS units and which constitute an alternative method of airway clearance of a patient in a state of sudden cardiac arrest; scientific research confirms the effectiveness of ventilation of patients using these devices [22–24]. However, the exact method of clearance was not the subject of this analysis.

Conclusions

The knowledge of firefighters in the subject matter covered by the analysis is diverse, some firefighters have additional experience and practice from working

in health care units. Regular professional development in the field of qualified first aid, supplemented with procedures 1a and 2a, is recommended, which may translate into a lower risk of infection associated with airway clearing in patients during the pandemic. There is a visible need for constant training of SFS officers in terms of medical activities to maintain the knowledge of firefighters at a high initial level.

Conflicts of interests: *None.*

Funding: *None.*

References

1. Kleinman ME, Goldberger ZD, Rea T, et al. 2017 American Heart Association focused update on adult basic life support and cardiopulmonary resuscitation quality: an update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2018; 137(1): e7–e13, doi: 10.1161/CIR.0000000000000539, indexed in Pubmed: 29114008.
2. Sundstrøm T, Asbjørnsen H, Habiba S, et al. Prehospital use of cervical collars in trauma patients: a critical review. J Neurotrauma. 2014; 31(6): 531–540, doi: 10.1089/neu.2013.3094, indexed in Pubmed: 23962031.
3. Komenda Główna Państwowej Straży Pożarnej. Zasady organizacji ratownictwa medycznego w Krajowym Systemie Ratowniczo-Gaśniczym. https://www.gov.pl/web/kgpsp/wykaz-wazniejszych-zasad-obowiazujacych-w-ksrg (8.12.2021).
4. Rozporządzenie Ministra Spraw Wewnętrznych i Administracji z dnia 3 lipca 2017 r. w sprawie szczegółowej organizacji krajowego systemu ratowniczo-gaśniczego. Dz.U. 2017 poz. 1319. https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20170001319 (11.06.2022).
5. Gucwa J, Madej T, Ostrowski M. Zaawansowane zabiegi resuscytacyjne i wybrane stany nagłe. Medycyna Praktyczna, Kraków 2017: 39–99.
6. Saif L, Wang Q, Vlasova A, Jung K, Xiao` S. Diseases of Swine. In: Zimmerman JJ, Karriker LA, Ramirez A, Schwartz KJ, Stevenson GW, Zhang J. ed. Coronaviruses. John Wiley & Sons, Inc, Hoboken, NJ 2019.
7. Pejsak Z, Tarasiuk K, Tokarz-Deptuła B. Wybrane dane na temat zakażeń koronawirusami, ze szczególnym uwzględnieniem SARS-CoV-2. Medycyna Weterynaryjna. 2020; 76(5): 258–262, doi: 10.21521/mw.6403.
8. Rosińska M, Sadkowska-Todys M, Stępień M. Suplement do Rozdziału 7. Epidemia COVID-19 w Polsce na wiosnę i w lecie 2020: Badanie seroprewalencji w populacji ogólnej i w grupie pracowników medycznych. https://www.pzh.gov.pl/wp-content/uploads/2021/02/Suplement-do-Rozdzialu-7-seroprewalencja.pdf (8.12.2021).
9. Rozporządzenie Ministra Spraw Wewnętrznych i Administracji z dnia 16 września 2008 r. w sprawie szczegółowych warunków bezpieczeństwa i higieny służby strażaków Państwowej Straży Pożarnej. Dz.U. 2008 nr 180 poz. 1115. https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20081801115 (8.12.2021).
10. Almanasreh E, Moles R, Chen TF. Evaluation of methods used for estimating content validity. Res Social Adm Pharm. 2019; 15(2): 214–221, doi: 10.1016/j.sapharm.2018.03.066, indexed in Pubmed: 29606610.
11. Komenda Główna Państwowej Straży Pożarnej. Nowy statut i nowa struktura organizacyjna Komendy Głównej PSP od 1 października 2021 r. https://www.gov.pl/web/kgpsp/nowy-statut-i-nowa-struktura-organizacyjna-komendy-glownej-psp-od-1-pazdziernika-2021-r (8.12.2021).
12. Van de Voorde P, Biarent D, Bingham B et al. Podstawowe i zaawansowane zabiegi resuscytacyjne u dzieci. in: Europejska Rada Resuscytacji. Wytyczne COVID-19. https://prc.krakow.pl/ERC_Gaudlines/PL/ERC_covid19_pages_section4PL.pdf (8.12.2021).
13. Flisiak R, Horban A, Jaroszewicz J, et al. Management of SARS-CoV-2 infection: recommendations of the Polish Association of Epidemiologists and Infectiologists as of March 31, 2020. Pol Arch Intern Med. 2020; 130(4): 352–357, doi: 10.20452/pamw.15270.
14. Meijer A, Webster CWR. The COVID-19-crisis and the information polity: An overview of responses and discussions in twenty-one countries from six continents. Information Polity. 2020; 25(3): 243–274, doi: 10.3233/IP-200006.
15. Alhazzani W, Møller MH, Arabi YM, et al. Surviving Sepsis Campaign: guidelines on the management of critically ill adults with coronavirus disease 2019 (COVID-19). Intensive Care Med. 2020; 46(5): 854–887, doi: 10.1007/s00134-020-06022-5, indexed in Pubmed: 32222812.
16. Marek T, Reguła J, Kamiński MF, et al. Wytyczne Polskiego Towarzystwa Gastroenterologii i Konsultanta Krajowego w dziedzinie gastroenterologii dotyczące wykonywania endoskopii przewodu pokarmowego w związku z epidemią COVID-19 (z dnia 16.03.2020 roku). Gastroenterologia Kliniczna. 2020; 12(1): 1–6.
17. Haczyński J, Trojniak A, Jarowicz K, et al. Functioning of Health Care During the COVID-19 Pandemic – Review of Literature. Problemy Zarządzania. 2021; 2(92): 64–86, doi: 10.7172/1644-9584.92.4.
18. Cook TM. Personal protective equipment during the coronavirus disease (COVID) 2019 pandemic - a narrative review. Anaesthesia. 2020; 75(7): 920–927, doi: 10.1111/anae.15071, indexed in Pubmed: 32246849.
19. Madziala M. Supraglottic airway devices as a method of airway management in prehospital setting. Disaster and Emergency Medicine Journal. 2019; 4(1): 29–30, doi: 10.5603/demj.2019.0006.
20. Krzyżanowski K, Ślęzak D, Jastrzębski P, et al. Airway Management with the Use of Instruments – New Competences for Fire Service Paramedics. BiTP. 2017; 47(3): 112–123, doi: 10.12845/bitp.47.3.2017.9.
21. Boland LL, Satterlee PA, Fernstrom KM, et al. Advanced clinical interventions performed by emergency medical responder firefighters prior to ambulance arrival. Prehosp Emerg Care. 2015; 19(1): 96–102, doi: 10.3109/10903127.2014.942477, indexed in Pubmed: 25153541.
22. Deakin CD, Diprose P, Majumdar R, et al. An investigation into the quantity of secretions removed by inflated and deflated laryngeal mask airways. Anaesthesia. 2000; 55(5): 478–480, doi: 10.1046/j.1365-2044.2000.01363.x, indexed in Pubmed: 10792143.
23. Czyż R, Zawłodzki M, Czyż I. Supraglottic devices as alternative equipment to airway management in state of sudden cardiac arrest. J Educ Health Sport. 2017; 7(8): 202–208, doi: 10.5281/zenodo.845753.
24. Gaszyński T, Bielański M, Jakubiak J. A comparison of four face masks for mechanical ventilation in a mannequin model. Anestezjologia i Ratownictwo. 2012; 6: 389–395.