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ORIGINAL ARTICLE

Characteristics of medical procedures performed by firefighters.

Rafał Wiszniewski [1] ORCID https://orcid.org/0000-0002-3434-3445,
Chiara Gorgone [2] ORCID https://orcid.org/0000-0002-4485-8215.

[1] *Voluntary Fire Services, Komarówka Podlaska, Poland.*
[2] *Università degli Studi di Catania, Catania, Italy.*

ADDRESS FOR CORRESPONDENCE:

Rafał Wiszniewski,

Voluntary Fire Services

str. Derewiczna 88,
21-311 Komarówka Podlaska,
Poland;
e-mail: rwiszniewski15@interia.eu

ABSTRACT

INTRODUCTION: National Firefighting Rescue System (NFRS) often supports the Emergency Medical Service (EMS) units. If EMS is not yet at the scene, firefighters are able to perform necessary medical procedures while waiting for an ambulance. The aim of the study was to define the profile of patients based on experience of Polish Professional Fire Services (PFS).

MATERIAL AND METHODS: 123 interventions were studied when firefighters arrived on the scene before ems, carried out in 2017 by PFS unit located in centre of Poland. For this retrospective study were analyzed a total of 100 complete and readable "rescue procedure charts" filled out by PFS firefighters. They were studied time of arrival, patients' demographic (age and sex), type of injury/ illness, type of medical procedures carried out by firefighters and duration of taking care of the patient before EMS arrival as well as types of equipment used during interventions.

RESULTS: A total of 100 patients were included in the analysis (34 woman and 66 men). The mean age was 40.3 years (SD ± 16.56). The average time from arrival at the scene to initiation of medical procedures was 1.24 (SD ± 0.47) minutes. Before EMS arrival, firefighters were taking care of the patient for an average of 5.88 (SD ± 4.45) minutes. The most common type of injury was cervical spine trauma (41.34%), and the rarest condition was a hypothermia (19.23%). Cardiopulmonary resuscitation were performed in four cases. The most commonly used equipment were gloves (67.60%). The most common activity during taking care of patient were: psychological support (34.33%).

CONCLUSIONS: During the interventions, firefighters perform rescue procedures mainly in case of injuries. The most common types of injuries include cervical spine and head trauma. Despite the fact that medical equipment is standardized in PFS units, some of the equipment are not used as often as the situations requires, which may result in a decrease in the effectiveness of rescue procedures.

KEY WORDS: fire service, firefighters, medical rescue, patient, trauma, equipment.

INTRODUCTION

The Emergency Rescue System, operating since January 1, 2007, is responsible for interventions in cases of health- and life-threatening medical conditions [1]. National Firefighting Rescue System (NFRS) plays an crucial role in ensuring internal security of Poland. NFRS is responsible for saving health and lives of citizens, property and the environment in emergency situations, natural disasters and other local threats [2]. NFRS closely cooperates with other units responsible for homeland security as well with the Emergency Rescue System. NFRS is based on Professional Fire Services (PFS) and Voluntary Fire Services (VFS).

PFS and VFS often supports the Emergency Medical Service (EMS) units. If EMS is not yet at the scene, firefighters are able to perform necessary medical procedures while waiting for an ambulance. These activities includes mainly recognizing health- and life-threatening conditions, carrying out medical segregation ("TRIAGE") as well as using available rescue equipment [3]. After interventions, "rescue procedure charts" is filled out. The document mentioned includes all activities performed by the firefighters, personal data of the patient, duration of intervention as well as code name of emergency medical service unit which subsequently took care of the patient [4].

National Headquarters of the State Fire Service defined the list of obligatory and additional (optional) rescue equipment [5]. Minimum requirements for medical equipment (A – basic level):

- ► Oropharyngeal airways;
- ► Adult and pediatric bag valve mask (with filters);
- ► Manual and electric suction device;
- ► Oxygen Supply Kit (with cylinder and regulator);
- ► Colorimetric CO2 indicator;
- ► Laryngeal tube (LT) / laryngeal mask airway (LMA);
- ► Long spine board;
- ► Soft stretchers;
- ► Cervical collars;
- ► Kramer Wire Splint;
- ► Wound and burn dressings;
- ► Asherman Chest Seal;
- ► Tactical Tourniquet;

- ► Gloves;
- ► Protection glasses;
- ► Rescue Scissors;
- ► Emergency Eye Washer;
- ► Medical Waste Bags and amputate bag;
- ► Hand sanitizer;
- ► Natrium Chloratum 0,9%;
- ► Rescue blanket;
- ► Seat Belt Cutter;
- ► Body bag;
- ► Transport bag.

Additional (optional) equipment may include:

- ► Pediatric long spine board;
- ► Scoop stretcher;
- ► Kendrick extrication device;
- ► Vacuum mattress and vacuum splints;
- ► AED (Automated External Defibrillator);
- ► Triage Kit.

The aim of the study was to define the profile of patients based on experience of Polish Professional Fire Services. A retrospective analysis of data, which allowed to indicate the most common injuries and illnesses among mentioned group during PFS interventions were carried out.

MATERIAL AND METHODS

123 interventions were studied when firefighters arrived on the scene before ems, carried out in 2017 by PFS unit located in centre of Poland. For this retrospective study were analyzed a total of 100 complete and readable "rescue procedure charts" filled out by PFS firefighters. They were studied time of arrival, patients' demographic (age and sex), type of injury/illness, type of medical procedures carried out by firefighters, duration of taking care of the patient before EMS arrival as well as types of equipment used during interventions. The results will be shown in a form of arithmetic means and standard deviations.

RESULTS

A total of 100 patients were included in the analysis (34 woman oraz 66 men). The mean age was 40.3 years (SD ± 16.56). The average time from arrival at the scene to initiation of medical procedures was 1.24 (SD ± 0.47) minutes. Before EMS arrival, firefighters were taking care of the patient for an average of 5.88 (SD ± 4.45) minutes.

Table 1. Types injuries and illnesses.

Types injuries and illnesses	Number (n)	(%)
Cervical spine trauma	43	41.34%
Head trauma	20	19.23%
Lower Extremity Injuries	9	8.65%
Upper Extremity Injuries	9	8.65%
Inhalation poisoning	5	4.82%
Airway problems	4	3.85%
Cardiac arrest	4	3.85%
Chest trauma	3	2.88%
Hemorrhage	2	1.92%
Burns	2	1.92%
Dead on arrival	2	1.92%
Hypothermia	1	0.97%
SUMMARY:	**104**	**100.00%**

Table 2. Types of Equipment used during interventions.

Equipment	Number (n)	(%)
Gloves	386	67.60%
Gauze	49	8.58%
Cervical collar	41	7.18%
Bandage	33	5.78%
Long spine board	20	3.50%
Net Bandage	14	2.45%
Oxygen mask	13	2.28%
Kramer Wire Splint	5	0.88%
Bag valve mask and Oropharyngeal airways	4	0.70%
Burn dressing	3	0.53%
Rescue blanket	2	0.35%
Filter (for bag valve mask)	1	0.17%
SUMMARY:	**571**	**100.00%**

The most common type of injury was cervical spine trauma (n = 43), and the rarest condition was a hypothermia (n = 1). Cardiopulmonary resuscitation were performed in four cases. Types of injuries and illnesses are presented in table 1. The collected data allowed to carry out an analysis of types of equipment which have been during interventions. The most commonly used equipment were gloves (n = 386). Contrarily, only in one case a filter (for bag valve mask) has been used. Types of Equipment used during interventions are listed in table 2. The most common activity during taking care of patient were: psychological support (n = 92), cervical spine immobilization (n = 52) and wound dressing (n = 25). Lower extremity immobilization, observation / monitoring and Basic airway management (n = 1) were carried out once. Table 3 contains the list of medical procedures performed by PFS firefighters.

Table 3. Medical procedures performed by PFS firefighters.

Procedure	Number (n)	(%)
Psychological support	92	34.33%
Cervical spine immobilization	52	19.40%
Wound dressings	25	9.33%
Long spine board immobilization	20	7.46%
Oxygen therapy	19	7.09%
Upper extremity immobilization	13	4.86%
Stable position	6	2.24%
Horizontal position	6	2.24%
Sitting position	6	2.24%
Cardiopulmonary resuscitation	4	1.49%
Oropharyngeal airway insertion	4	1.49%
Evacuation	4	1.49%
Compression dressing	3	1.12%
Burn dressing	3	1.12%
Passive leg raise	2	0.75%
Hypothermia prevention	2	0.75%
Withdrawal of cardiopulmonary resuscitation	2	0.75%
Manual head stabilization	1	0.37%
Recovery position	1	0.37%
Lower extremity immobilization	1	0.37%
Observation / monitoring	1	0.37%
Basic airway management	1	0.37%
SUMMARY:	**268**	**100,00%**

DISCUSSION

Every PSF firefighters is skilled in medical procedures which can be implemented before EMS arrival. It is worth mentioning that arriving at the scene and initiation of medical procedures in a timely manner increases chances of survival without adverse sequelae. Firefighters form Minneapolis (Minnesota, USA) arrived before EMS in 9,001 calls (88%) [3].

Polish PSF units over the period analysed were dispatched mostly to injured patients. Only six cases were not related to trauma (inhalation poisoning, hypothermia). Most common type of injury were cervical spine trauma. These results are consistent with literature - it is well known that this is one of the common injuries during traffic accidents [6].

The most commonly used equipment were gloves, which proves that every firefighter takes care of own safety during medical procedures. The most common activity during taking care of patient was psychological support (34.33%). Due to this fact, efforts should be made to ensure proper training in communication skills. Psychological support is crucial because it reduces the impact of the traumatic situation on the quality of life after the incident.

The mean age of patients included in this analysis was 40 years, and most of the victims were men. The average was time from arrival at the scene to initiation of medical procedures was under two minutes. Before EMS arrival, firefighters usually take care of the patient for about 5-6 minutes.

Minimum requirements for medical equipment should be reconsidered because cardiopulmonary resuscitation were performed in four cases. Adding the automated external defibrillator to obligatory equipment may increase survival rate. Neither laryngeal mask airway nor laryngeal mask were used. It is widely known that the use of supraglottic airway devices may increase ventilation efficiency [7]. Reasons may include lack of the experience and inadequate training. Refresher training is an important issue which give the opportunity to consolidate knowledge and skills as well as possibility to learn current guidelines [8].

CONCLUSIONS

During the interventions, PFS firefighters perform rescue procedures mainly in case of injuries. The mean age of patients included in this analysis was 40 years, and most of the victims were men. The most common types of injuries include cervical spine and head trauma. The most commonly used equipment are gloves and dressings. Despite the fact that medical equipment is standardized in PFS units, some of the equipment are not used as often as the situations requires, which may result in a decrease in the effectiveness of rescue procedures. The most common procedures performed by PFS firefighters are psychological support, cervical spine immobilization and wound dressings.

Disclosure statement

The authors did not report any potential conflict of interest.

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