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M E D I C I N E J O U R N A L

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Authors: Lukasz Dudzinski, Lukasz Czyzewski

DOI: 10.5603/DEMJ.a2019.0026

Article type: ORIGINAL ARTICLES

Submitted: 2019-09-28

Accepted: 2019-09-29

Published online: 2019-10-09

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ANALYSIS OF QUALIFIED FIRST AID PROCEDURES FOR INJURIES IN THE ACTIVITIES OF THE STATE FIRE SERVICE IN LUBLIN IN 2016–2018

Lukasz Dudzinski^{1,2} , Lukasz Czyzewski³ 

¹Emergency Medical and Sanitary Transport Station, Independent Public Health Care Centre in Lukow, Poland

²City Headquarters of the State Fire Service in Lublin, Poland

³Department of Nephrology Nursing, Medical University of Warsaw, Poland

Name of the department and institution in which the work was done: Department of Nephrology Nursing, Medical University of Warsaw, Poland

ABSTRACT

INTRODUCTION: The State Fire Service (SFS) medical activities are conducted at the level of qualified first aid (QFA). This is a lower standard than emergency medical services (EMS) implemented by The Polish EMS, however, the number of QFA procedures available to firefighters allows them to conduct effective medical operations in both life-threatening and traumatic and non-traumatic life.

The aim of the study is a comparative analysis of QFA procedures for injured trauma.

MATERIAL AND METHODS: Medical activities of the SFS in Lublin were analysed, from which events and procedures regarding injuries to injured persons and rescuers themselves during activities over a three-year period (i.e. in the years 2016–2018) were separated. In order to analyse the collected results, medical procedures concerning only injuries were identified, which are the most numerous group of procedures. For the purposes of analysis, the procedure was divided into two groups: (1) injuries – burns; (2) injuries.

RESULTS: In 2016, $n = 133$ trauma procedures were implemented among all medical activities. In 2017, $n = 330$ trauma procedures were implemented among all medical activities, while in 2018 $n = 245$ trauma procedures were implemented. In 2016, burns affected people with an average age of 56 ± 14 years, in 2017 — 51 ± 21 years, and in 2018 — 49 ± 19 years. The average for a total of three years of people with burns was 39 ± 19 years.

CONCLUSIONS:

1. Traffic events (accidents, collisions, deductions) constitute the largest number of local threats.
2. QFA procedures well suited to current threats, officers of SFS Lublin in the examined period used 20 out of 22 QFA procedures, including most of the procedures regarding injuries.

KEY WORDS: State Fire Service; qualified first aid; injuries — burns; injuries; firefighters

Disaster Emerg Med J 2019; 4(4): 1–5

INTRODUCTION

The State Fire Service (SFS) medical activities are conducted at the level of qualified first aid (QFA). This is a lower standard than emergency medical

services (EMS) implemented by The Polish Emergency Medical Services (EMS), however, the number of QFA procedures available to firefighters allows them to conduct effective medical operations in

ADDRESS FOR CORRESPONDENCE:

Lukasz Czyzewski, Department of Nephrology Nursing, Medical University of Warsaw, Oczki 8 Str. 02–007 Warsaw, Poland
email: czyzewski_lukasz@wp.pl

both life-threatening and traumatic and non-traumatic life [1, 2].

The entities of the National Rescue and Firefighting System (NRFS) when they first implement medical procedures, significantly improve the prognosis of people at risk, and in the case of trauma victims they start the golden hour standard [3, 4].

Officers of the SFS, being at the place of call, are the first to provide the QFA, then draw up medical records of the assistance provided. In situations when medical rescue teams (MRT) units are in place first, or commutes to the event equally with the NRFS deputies, the MRT members direct the medical action, decide on implemented EMS and keep medical documentation. In this situation, NRFS officers carry out auxiliary medical activities at the MRT's request or order, without creating an additional QFA card. The exceptions are events in which firefighters use equipment from their sets (dressings, hydrogels, the set is oxygen therapy). Then the card is inserted to confirm the wear of the equipment. On this basis, shortcomings are made up after returning to the barracks [1, 5–7].

Equipment that firefighters have at their disposal when using trauma procedures:

1. Immobilization of suspected fractures, dislocations:
 - orthopaedic board — the same pattern as in MRT an Emergency Departments (ED). In practice, it happens to switchboards between SFS and MRT, when firefighters are at the place of the call first, they transfer the victim to their board. According to the guidelines of International Trauma Life Support (ITLS) and Prehospital Trauma Life Support (PTLS), the 'one stretcher' principle is applied from the scene of the incident to the hospital, so the injured person goes through ZRM to ED on the board of firefighters who get a replacement board from MRT. The board has 4 sets of straps to secure the injured person for transport and a set of blocks for immobilizing the head and cervical spine. The transport handles are large enough to allow a handle in the SFS protective glove [8–11],
 - Kramer rail set — for immobilizing limbs and joints, in various sizes. Rails with the possibility of bending for modelling to the existing position of the limb up to 180 degrees. The set consists of 14 pieces of rails in covers

'protective sleeves' of material impervious to liquids, and easily washable,

- orthopaedic collars — disposable of artificial waterproof material, in various sizes. They have the ability to adjust the size, adapt to the victim [1, 12].
2. Wound care, stopping bleeding:
 - sterile gases — in sizes $\frac{1}{4} \text{ m}^2$, $\frac{1}{2} \text{ m}^2$, 1 m^2 ,
 - sterile compresses,
 - elastic bandages of different widths,
 - triangular textile scarves,
 - elastic bandage nets — an alternative to bandaging when time is short. They significantly reduce the time the dressing is placed at the bleeding site, except in the case of a haemorrhage. In intensive bleeding situations, a pressure dressing is applied to the wound using a bandage, the mesh will not provide such pressure,
 - valvular wound dressing for open wounds of the chest — is aimed at removing the air extracted from the pleural cavity, prevents the formation of pneumothorax which arises after the equalization of pressure between the atmosphere and the pleural cavity,
 - one-piece clamp (tactical) — 4 cm wide, with the possibility of smooth adjustment and a place to record the time of putting on visible on. In practice, rarely used during events and injuries with major external bleeding. As a last resort, pressure wound dressing, with subsequent layers added, is ineffective. An important necessity to use it and at the same time sense is during mass accidents, where limb haemorrhage will be revealed during pre-segregation. The segregation standard allows you to devote a minimum of time to one victim, so it would be a waste of time and mistake of the rescue rota conducting segregation to put a pressure dressing (gauze and bandage) on the site of the haemorrhage. Haemorrhage from a limb from a large blood vessel can cause hypovolemic shock and cardiac arrest within a few minutes [1, 5–7, 13].

The aim of the study is a comparative analysis of QFA procedures for injured trauma.

MATERIALS AND METHODS

The study was retrospective. Information was obtained from SFS event reports (trips) in Lublin in

2016–2018, and from the SFS Decision Support System. The SFS Lublin area (land and city parts) was the area of research.

In order to analyse the collected results, medical procedures concerning only injuries were identified, which are the most numerous group of procedures. For the purposes of analysis, the procedures were divided into two groups:

1. injuries (burns) — QFA14, QFA 15;
2. injuries — QFA 5, QFA 6, QFA 7, QFA 8, QFA 9, QFA 10, QFA 11, QFA 12, QFA 13 — Table 1.

Commander of the City Commander's permission to access reports was received. All analysed data are anonymous, both in terms of injured parties, codenames and personal warehouses of SFS

hosts, and services of cooperating services, in accordance with the Act on the protection of individuals with regard to the processing of personal data. The presented results are in such a way as to prevent possible identification of specific events and persons participating in them.

Statistical analysis

Results concerning quantitative variables were presented as average values \pm standard deviation. Qualitative variables (age, sex) were presented as quantity (n) and percentage values of the whole group (%). Statistica 13.3 software (Tibco Inc., Tulsa, USA) was used in the statistical analysis.

RESULTS

During the three analysed years, the hosts of SFS Lublin were available 15 017 times, respectively 4964 times in 2016, 4992 times in 2017 and 5061 times in 2018. In the three years described in 309 events, firefighters conducted 493 medical activities, which constituted 2.05% of all trips. The analysis took into account events in which at least one QFA procedure was implemented, for at least one person injured in the event. In general, trips consist of fires, local threats and false calls, in accordance with the rules of Decision Support System SFS. The two main groups of events, apart from a false alarm, are only divided into types of events depending on the call, the activities carried out and the specialized equipment used.

In 2016, $n = 133$ trauma procedures were implemented among all medical activities.

Procedure number	Name of the procedure
5	Injury and suspected head injury
6	Injury and suspected spine injury
7	Injury and suspected chest injury
8	Injury and suspected abbell injury [unknown??]
9	Injury and suspect of diameter injury
10	Injury and suspected traffic organ injury
11	Wounds
12	Injury amputation
13	Hypovolemic shock — preliminary procedure
14	Thermal burn
15	Chemical burn

2016			2017			2018		
QFA	N	%	QFA	N	%	QFA	N	%
QFA5	17	13.6	QFA5	53	22.5	QFA5	44	33
QFA6	43	34.4	QFA6	85	36.1	QFA6	44	33
QFA7	8	6.4	QFA7	15	6.3	QFA7	24	18
QFA8	2	1.6	QFA8	19	8	QFA8	14	10.5
QFA9	5	4	QFA9	23	9.8	QFA9	12	9
QFA10	20	16	QFA10	49	20.8	QFA10	22	16.5
QFA11	29	23.2	QFA11	72	30.6	QFA11	56	42
QFA12	0	0	QFA12	0	0	QFA12	0	0
QFA13	2	1.6	QFA13	4	1.7	QFA13	17	12.8
QFA14	7	5.6	QFA14	10	4.2	QFA14	12	9
QFA15	0	0	QFA15	0	0	QFA15	0	0

In 2017, $n = 330$ trauma procedures were implemented among all medical activities, while in 2018 $n = 245$ trauma procedures were implemented. Grouping procedures for specific events is important for the study. If there were injuries to many parts of the body with a high-energy mechanism (fall from a height, traffic accident), several trauma procedures were used for one victim.

In 2016, burns affected people with an average age of 56 ± 14 years, in 2017 51 ± 21 years, and in 2018 49 ± 19 years. The average for a total of three years of people with burns was 39 ± 19 years — Figure 1. The average age of people with injuries in 2016 was 38 ± 18 years, similar to injured people without injuries 38 ± 19 years. In 2017, people with injuries were on average 36 ± 18 years old, while in 2018 40 ± 18 years old. The average of three years for people with injuries was 39 ± 18 years. (Fig. 1 and Fig. 2)

Detailed analysis of the event using traumatic procedures

Happening report: bus collided head-on with a passenger car — 7 people injured forces and resources available: 2 SFS (6 people), 4 MRT (12 people), 4 police patrols (8 people) description of the incident: an accident occurred on the scene of a passenger bus carrying seven people and a passenger car in which three people travelled. Based on the diagnosis, it was established that the driver of the passenger bus hit the energy-absorbing barrier for unknown reasons and then rolled over several times. Then the off-road bus hit the off-road Honda at high speed, causing the roof to tear, as well as significant injuries to passengers. At the time of arrival of the SFS, all

victims were already behind the damaged vehicles, three bus passengers the doctor declared dead as a result of injuries, and one person was resuscitated. Additional MRT commuters successively took over other conscious victims, providing them with necessary medical assistance. The actions of the rescuers consisted of securing the place of the incident, dressing and bandaging head and limb wounds, assisting MRT in transporting the injured on medical boards to ambulances, and after taking the injured on the order of the prosecutor proceeded to lighting the area of action to secure evidence.

- injured: 7, injured rescuers: 0, death: 3,
- weather conditions: clear, $+14^{\circ}\text{C}$.

DISCUSSION

In the analyzed period, most of the events with medical activities conducted by the SFS are communication events. This includes collisions of 2–3 cars with reports: 'collision of 2 cars', 'accident of 3 cars', 'bus accident with a passenger car', 'collision of 4 cars', as well as incidents with individual cars with reports such as rollover of a car, 'the vehicle hit a tree', 'the car entered a ditch', 'the car hit a fence/lamppost'. To traffic incidents one should add rare cases of collision of a car with a two-wheeler, an animal (in the examined material there was a collision with a boar, where the driver suffered injuries and required the help of QFA), and several deductions that the SFS reached faster than MRT. Traumatic procedures were used not only for the victims. During the events covered by the analysis of 10 cases, they were injuries to the rescuer during fire-fighting and rescue operations. All cases qualified as a 'lightweight lifeguard

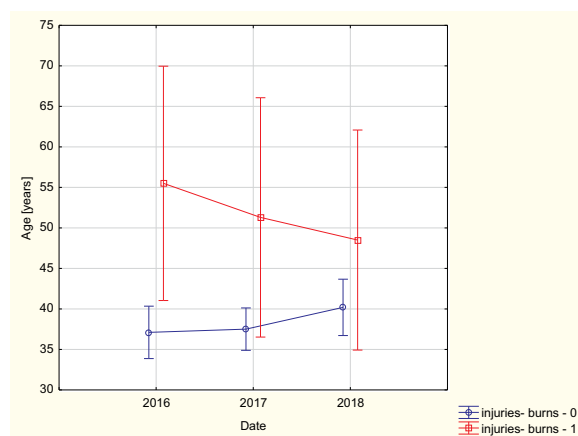


FIGURE 1. Analysis of the age of victims with burns in 2016–2018

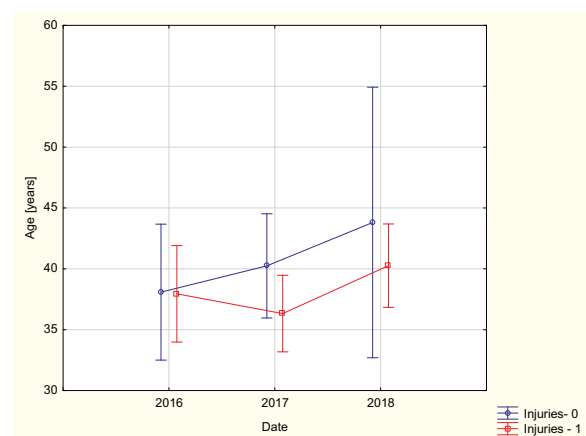


FIGURE 2. Analysis of the age of victims with injuries (injuries) in 2016–2018

accident', granted to QFA at the scene of the accident, transport with the participation of MRT at the Emergency Room. In none of the cases described there was a life-threatening condition or permanent damage to health [14–16].

The most common reasons for calling SFS, in which the injured had at least one trauma procedure implemented in:

- '2 cars accident' — 7 calls,
- 'motor fell into the ditch' — 1 call,
- 'hit by cyclist' — 1 call,
- 'car fell out of the way' — 1 call,
- 'accident, car in a ditch' — 1 call,
- '3 cars collision, unconscious person' — 1 call,
- 'TIR accident on the side' — 1 call,
- 'crushed by a truck' — 1 call.

Among the reasons for disposing of events in which firefighters were injured were fires dominating $n = 6$, the rest of the reasons with equal participation $n = 1$. Among the types of events with injuries to firemen, there is no communication event, which is the most common type of event.

Available data from Road Traffic Office [17] show that over the years 2016–2018 the number of people injured in accidents has decreased. Communication events accounted for 2016 — 63%, 2017 — 73% and 2018 — 61%, respectively, in subsequent years. Most QFA procedures for injuries are used during communication events — QFA5-QFA13 procedures, much less during fires and chemical hazards — QFA14 and QFA15 procedures.

It should be remembered that in the event of a fire, the procedure regarding injuries – burns is not only the procedure used. During fires, injuries, sprains as other causes of trauma procedures are possible, as well as inhalation poisoning as the causes of non-traumatic procedures.

CONCLUSIONS

1. Traffic events (accidents, collisions, deductions) constitute the largest number of local threats.
2. QFA procedures well suited to current threats, officers of SFS Lublin in the examined period used 20 out of 22 QFA procedures, including most of the procedures regarding injuries.

Conflict of interest: None declared.

Source of support: No sources of financial and material support to be declared.

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