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REVIEW ARTICLE

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Emergency medical service through the centuries — the Polish perspective

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ABSTRACT

Gradually progressing civilizational development and the creation of advanced forms of social organization affected the number and scope of potential threats to which societies were subject. Thus, these threats have led to the organization of medical rescue systems that are capable of providing effective assistance in the event of a sudden threat to life and health.

The first organized forms of providing medical assistance in emergencies date back to antiquity and should be sought in military organizations and warfare. In turn, medieval religious communities are considered to be the prototype of organized medical assistance provided to the sick and injured. However, it was only at the end of the 19th century that emergency services were created, the organization and operation of which are still evolving, adequately to social expectations resulting from the scope of potential threats.

Keywords: medical rescue system, emergency medical service, emergency medicine, paramedic, ambulance, history

Introduction

Gradually progressing civilization development and more and more advanced forms of social organization affected the number and scope of potential threats to which societies were subject. Wars, catastrophes and epidemics forced the development of systematized forms of medical assistance, also in emergency situations.

The development of medicine, and thus the development of skills and principles of providing medical assistance in life and health-threatening situations, was based on the experience of many generations and societies [1]. On the other hand, the formation of emergency medical systems is largely related to the gradually increasing social expectations resulting from possible threats and the effectiveness of such systems in the event of sudden diseases and injuries that threaten human life or health.

Historical view

The protection of human life and health has been one of the important elements of the existence of individual societies since the dawn of time. Palaeolithic rock drawings from Lascaux in France already show the dangers to which primitive man was exposed on a daily basis [2].

The first ways to help in the case of illnesses and injuries resulted from the observation of the surrounding nature. Prehistoric medicine was based on observing the behaviour of animals, the therapeutic use of plants and natural substances, and knowledge obtained by trial and error [3, 4].

Then, to understand and explain the phenomena occurring in the world around people, magic and magical behaviour began to be used [3]. Archaeological finds prove that effective medical interventions have been performed since prehistoric times [5]. In the Mesolithic

period, 10–12 thousand years ago, trephination of the skull was performed, often with positive results [6]. Also in Poland, as in other parts of the world, a number of skulls with drilled holes were found, the oldest of which date back to the Mesolithic era [7].

Eventually, with the development of religion, man became independent of magic. As a result of the fact that the priests were writing down their knowledge resources, it was at the temples that medical aid was provided to the needy [3].

The first civilizations were based on agriculture and organized power and army. The military organizations they created had structures to provide medical assistance to the victims of wars. Thus, the organization of today's medical rescue systems should be found in the experience from centuries of observation of the organization of battlefield medicine. The origins of organized forms of providing medical assistance can be found in the structures of the ancient Egyptian army, which included priests — doctors [8].

However, the main model of organized medical care for the sick and injured was medieval religious communities, which are inextricably linked with the Crusades and pilgrimages to the Holy Land. The Middle Ages was also an era in which numerous plague, cholera and leprosy epidemics occurred. For this reason, during this period we can find the beginnings of infectious disease prophylaxis, isolation and quarantine orders [1].

In medieval Poland, at least in armed units, there had to be some basic form of military medical service, and the wars had to emerge such a structure. However, the proper provision of medical aid to the wounded took place only after the fighting ceased, or after nightfall.

Thus, the first description of trepanation of the skull performed in Poland, from the *Polish Chronicle* of Gallus Anonymous (born in the 11th century — died after 1116), indicates that it was performed by the physician of King Bolesław Wrymouth (1086–1138) on a wounded knight during the armed expeditions [8]. However, according to the chronicle of Jan Długosz (1415–1480), after Bolesław the Bold's expedition to Ruthenia in 1074, "*King Bolesław, after loading the wounded on the carts and burying the dead, returned to Poland with the victorious army*" [9].

In turn, after the Battle of Grunwald (July 15, 1410) between the Polish-Lithuanian and Teutonic armies, it rained all night and it cooled down significantly, which caused many wounded to die as a result of the cold and leaving on the battlefield [11]. As the chronicler himself says, many of the combatants could be saved if they were taken from there and provided with medical assistance. It was only the next day, when the weather was sunny, that the wounded from both sides of the fighting were transported to the camp and appropriate measures were taken to heal them.

The first organized system of evacuation of the wounded, field hospitals and ambulances was established in Spain in 1476 [12, 13]. Isabella of Castile (1451–1504) created a field hospital consisting of tents, doctors and the staff and equipment necessary for their functioning. In addition, wagons equipped only with bedding were created to transport the wounded. The system of tents and carts was called *ambulancias* (from Latin *ambulare* — to follow).

Also in Poland, the first activities regarding the organization of medical assistance in emergency situations can be observed. During the reign of King Stefan Batory (1575–1586), ordinances were issued specifying the rules for helping the wounded and their transport [14]. The transport of the wounded was to take place in wagons in the presence of a surgeon, whose role, apart from treatment, was to find a place to organize hospitals. Hetman Jan Zamojski (1542–1605) ordered the transport of the seriously wounded outside the fighting area, while the less wounded were to remain in the camp so that after healing they could join the fighting units as soon as possible. Hetman Stanisław Żółkiewski (1547–1620) also lent his own carriages to transport the injured [15].

In 1604, a monastery was founded in Sandomierz, whose monks, as one of their tasks, were to help drowning people after being fished out of the Vistula River [16].

The main foundations for the formalization and organization of medical assistance were laid by the wars in the Napoleonic period. At the turn of the 18th and 19th centuries, France, which was involved in numerous wars, introduced a number of changes in the organization of the military to health and the principles of providing effective medical assistance in order to minimize losses caused by diseases and injuries. The chief surgeon of the Napoleonic army, Pierre Francois Percy (1754–1825), created a system of helping the wounded during warfare [13, 16–19]. The system was based on providing medical assistance as close as possible to the place and already during the fighting, initial treatment at designated frontline points and final treatment in hospitals on the back of the battlefield.

Similarly, in order to reduce mortality and increase the effectiveness of medical care, military surgeon Jean-Dominik Larrey (1766–1842) created so-called flying ambulances "*ambulances volantes*", by which was meant a mobile hospital, not a vehicle for transporting the wounded [13, 14, 16–19]. On the other hand, two- or four-wheeled carts with stretchers, used to transport

2 to 4 wounded, were one of the important elements of the "flying ambulances". The emergence of ambulances volantes resulted from the need to assist as soon as possible from the moment the injury occurred, and it had to be provided no later than within 24 hours. In addition, Larrey is considered to be the founder of medical segregation, he believed that first aid should be provided to the seriously injured, which significantly reduced the mortality rate among the injured.

Jean-Dominique Larrey also stayed in Poland from 1806 to 1807 [21]. He trained doctors, managed ambulances, educated their crews, and provided medical assistance during and after combat. After the Battle of Pułtusk in 1806, he emphasized the advantages of two-wheeled flying ambulances that operated in very difficult weather conditions.

In turn, in the Duchy of Warsaw, in 1809, the provision of medical assistance to soldiers was tried to be regulated by the document "*Establishment of hospitals for the armies of the Duchy of Warsaw*" [17]. On the battlefield, it was proposed to create "running hospitals". It was a plan to introduce two- or four-horse carts equipped with medical supplies. In addition, these carts were to transport the wounded if necessary. The staff of the "running hospital" was to move around on horseback and be equipped with basic tools and dressings, and in some situations, a doctor was to travel to the wounded. It is safe to say that the concept of the Polish "running hospital" is one of the prototypes of ambulances.

During the Polish-Russian war of 1830–1831, thanks to the chief physician of the Polish army, General Karol Kaczkowski (1797–1867), a trained service called the brankardiers was created, who carried out the wounded from the battlefield. On the other hand, doctors deployed in battalions treated the wounded already on the battlefield, in horse ambulances, or field hospitals [15, 20].

Similarly, during the January Uprising (1863–1864), efforts were made to help wounded Polish insurgents already on the battlefield. However, due to the nature of the combat operations, dressing and treatment points were located in manors, peasant cottages and monasteries [15, 22].

Given the observed development of military technology and armies composed of many thousands of soldiers, which translated into significant mortality and injuries on the battlefields, there was an urgent need to develop forms of providing organized and regulated medical assistance to the wounded. Based on the experience gained during organizing and providing medical aid to the wounded in the Battle of Solferino (June 24, 1859) on the initiative of Henry Dunant (1828–1910) on October 29, 1863, the International Committee for the Care of the Wounded (later the International Committee of the Red Cross) was established [16, 22].

Gaining experience resulting from warfare led to the conclusion that only formalized and organized provision of medical assistance in the event of a threat to life and health is able to ensure effective assistance.

The lack of effective medical assistance to the wounded during battles during the Civil War caused the surgeon general Jonathan Letterman (1824–1872) to create the first organized system of treatment and transport of the wounded in the United States, based on field hospitals, a network of ambulances and the distribution of medical supplies [23]. The effectiveness of this system was soon noticed in the United States also in civilian conditions.

In 1865, the hospital in Cincinnati created the first hospital emergency medical service providing paid transport services [16, 18]. In 1869, a military doctor and sanitary inspector, Edward Dalton (1834–1872), organized the world's first municipal ambulance service in New York, based on horse-drawn carriages, the basic equipment of which, apart from a stretcher, was dressing materials, a straitjacket and brandy [24].

In Vienna, as a result of the great fire of the opera house on December 8, 1881, he founded the Viennese Volunteer Rescue Society the next day. The first patient was not helped until May 2, 1882, he was a waiter who was carried down from the 4th floor and transported on a two-wheeled stretcher to the hospital by two volunteers and two servants [25, 26]. However, it was not until 1883 that the Society launched a rescue station in Vienna, which was the first ambulance service in Europe.

The Vienna Rescue Service had a significant impact on the development of the idea of creating emergency services in Europe, as a result of which a number of stations in various countries were created based on its experience.

On June 6, 1891, based on Viennese experiences, the first ambulance station in Poland and the second in Europe was established in Kraków. One of the main reasons for its creation was the numerous fires and fatalities recorded in the previous year. The initiators of the creation of the Krakow Rescue Service were doctors Arnold Bannet, Alfred Obaliński (1843–1898), Karol Nałęcz-Brudzewski (1868–1935) and the head of the Krakow Fire Service Wincenty Eminowicz (1832–1906). Initially, the ambulance fleet consisted only of horse-drawn ambulances, which were replaced by cars with the development of motorization [27].

In addition, during the partitions, ambulance stations were opened in Lviv — 1893, Warsaw — 1897, Łódź — 1899, Vilnius — 1902, Bydgoszcz — 1902, Katowice — 1904 and Lublin in 1917 [15, 16, 28].

The First and Second World Wars influenced further advances in emergency medicine and the organization of emergency medical services, although they were usually transferred to civilian emergency services with a significant delay [23].

In 1935, the German professor Martin Kirchner (1878–1942) recommended that the doctor come to the injured person, and not the injured person to the doctor [28]. This laid the foundations for the formation of medical rescue organizations in most European countries based on the French-German model. This model assumes that providing medical assistance consists of stabilizing the patient's condition at the scene of the incident, with the participation of paramedics, by the "stay and stabilize" principle [29, 30]. Ambulances are equipped with specialized equipment necessary for medical activities at the scene of the incident and during transport.

In the Anglo-Saxon countries, an important role in the organization of emergency medical services was played by the report published in 1962 by Harry Platt (1886–1986) [31]. Platt presented recommendations regarding the organization of the rescue system in Great Britain. The publication of the report Accidental Death and Disability: The Neglected Disease of Modern Society in 1966 was of similar significance, and together with the National Highway Traffic Safety Act (1966) was the standard for organizing emergency medical services in the United States [32]. At the same time, both of these reports can be seen as the origins of the Anglo-American model of emergency medical services. The Anglo-American model, by the "scoop and run" principle, is based on the principle of transporting the patient to the emergency department as soon as possible [29, 30]. In the case of this model, patients most often go to emergency departments, rarely staying at the call point. Ambulances are equipped with basic medical equipment and are staffed by trained paramedics performing basic rescue activities.

Ultimately, since the 1970s, the organization of emergency medical systems has been shaped around these two main models [30]. Currently, most systems around the world, although they have different structures depending on local conditions, are based on the Anglo-American or French-German model.

One of the important elements of medical rescue has also become the concept on which effective medical assistance is based. In 1961, the American military surgeon Adams Cowley (1917–1991) developed the concept of the "golden hour" [33]. It assumes that the most effective treatment of people in a life-threatening condition is provided that they receive specialist medical assistance within an hour from the moment of the threat.

In turn, in 1970, the German professor of anaesthesiology, Friedrich Wilhelm Ahnefeld (1924–2012), introduced the concept of the "rescue chain" [34, 35]. In it, he indicated that the effectiveness of providing medical assistance to the injured depends on the correctly implemented, successive stages of assisting, starting from notifying the emergency services and ending with hospital treatment.

Also after the First World War, medical rescue services developed in Poland. On January 18, 1919, just after regaining independence, the Polish Red Cross Society (PTCK) was founded. Admittedly, Red Cross organizations had been established on Polish lands earlier, but they were dependent on the invaders. The PTCK took care of, among others, the organization of hospitals, ambulance stations, and first aid education. In 1927, PTCK changed its name to the Polish Red Cross (PCK) [18, 22].

In the interwar period (1918–1939) more ambulance stations were established, including in Poznań, Gdynia and Białystok. In addition to the PCK, ambulance services were also created by social institutions [15, 16, 36].

In turn, the year 1924 can be indicated as the beginning of medical aviation in Poland, but it was not until the next year that the first medical flight was performed [37, 38].

During the Second World War (1939–1945) the activity of the ambulance station was significantly limited by the occupation authorities. The ambulance service in Warsaw was transferred to the German receivership [37]. The crew of the ambulances was still Poles, but the management and administrative functions were handed over to the Germans. In Łódź, the ambulance service was subordinated to the German Red Cross, giving the Germans priority in obtaining medical assistance [28, 39]. Often, the ambulance staff, risking their own lives, were involved in actions consisting of helping detainees detained by the occupant in street round-ups, transporting them outside the gates of staging camps, and detention centres, or releasing them from deportation to forced labour [28, 36, 37, 39, 40]. Eventually, after the end of the war, the ambulance stations were left with shortages in the fleet of cars, medical equipment, medicines and personnel.

With the end of the Second World War, the reconstruction of the ambulance station began. The tasks

assigned to the stations were organized and carried out by the Polish Red Cross, social insurance companies and municipal authorities [40]. The first station was organized from scratch in Warsaw, but already in the first months of its operation, the station was nationalized [15].

In the years 1945–1946, there were only 12 ambulance stations in Poland, in 1947 there were 17, and a year later there were 40. In 1948, the PCK was commissioned to create new ambulance stations located throughout the country. Ultimately, by the end of 1950, the Polish Red Cross organized 177 stations [22].

In 1948, the principles of health care were changed, and free state health care, financed from the state budget, was introduced [41]. This model of health care survived in Poland until 1991. In this way, from April 1949 to August 1950, 157 ambulance stations were taken over from the Polish Red Cross and nationalized [42–45].

In the following years, 1951–1953, the authorities dealt with the legal regulation and further organization of providing medical assistance in emergency situations and the rules of operation of the medical rescue station. In addition, in 1951, the Columns of Sanitary Transport were organized. Columns, as independent budgetary units subordinated directly to the competent voivode, were obliged to provide free transport and communication services for health care units [15, 28].

In this way, until 1961, 219 district, municipal and provincial ambulance stations were organized. In 1970, there were 442 stations all over the country, located according to the administrative division of the time and constituting an integral part of healthcare facilities [40]. Then, the sanitary transport was reorganized and, by the new administrative division introduced in 1975, 49 Provincial Sanitary Transport Columns were created [46].

The operation of ground ambulance stations was complemented by the establishment of medical aviation. Its structure and operating formula were approved at the end of 1955. It was assumed that a Sanitary Aviation Team would be stationed in each province [38].

With the end of the political system of the Polish People's Republic in 1991, the health service was also reformed [47]. In addition to public healthcare facilities, non-public ones were also allowed to exist, with health services. in addition to the free ones, they could also be provided for a partial fee or a full fee. At the same time, the rules of operation of the ambulance service and the Provincial Sanitary Transport Columns were partially regulated.

The first construction of a modern rescue system in Poland began in 1999 when the program of building a new system began to be implemented. In 2001, the main assumptions of the system focused on the creation of emergency call centres, hospital emergency departments and a network of emergency ambulances [48, 49].

Finally, in 2001, the first law on State Medical Rescue was passed. While establishing the rules for the operation of the system, the Act also indicated that ensuring obtaining medical rescue measures for people in an emergency is one of the tasks of the state [50].

However, the introduced act did not meet the expectations placed on it. After 5 years, on September 8, 2006, a new law on State Medical Rescue was passed [51]. The purpose of the system's operation was to assist every person in a state of sudden health risk. The principles of organization, operation and financing of the system were defined. In addition, the legislator defined key terms for the operation of the entire system, e.g. such as first aid, qualified first aid, medical rescue activities, a state of sudden health threat, system doctor, system nurse, paramedic, hospital emergency department, medical rescue team, medical dispatch room, etc. This Act is still in force today, however, due to a number of challenges faced by modern medical rescue has been amended many times.

The analysis of the Polish emergency medical system shows that it is largely based on the Anglo-American model adapted to Polish conditions. At the same time, it is recognized that the Anglo-American model is the most effective and modern model of organization and operation of emergency medical services [52, 53]. In addition, the Polish emergency medical system is based on the standards of the "golden hour" and the concept of the "chain of survival".

Summary

The need to develop medical rescue systems was influenced by the arrival of new threats, their increasing number and the creation of more and more developed forms of organization of societies.

The origins of organized medical care can be traced back to ancient armies. In turn, medieval religious communities are the prototype of organized structures providing medical assistance to the sick and injured. However, it was only in the 19th century that the first ambulance services were created on a grass-roots basis, and finally, it was in the 20th century that individual countries started organizing emergency medical systems.

It should be remembered, however, that emergency medical systems are still evolving, adapting to new circumstances resulting from social expectations, which

are based on contemporary threats. At present, most of the systems in the world are based on two basic organizational models — Anglo-American or French-German. In addition, the effectiveness of modern emergency medical systems is based on evidence-based medicine, including properly implemented concepts of the "golden hour" and "chain of survival".

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