

From manpower to motor vehicles; development of patient transport*

İnsan gücünden motorlu taşıtlara; hasta taşımalarının gelişimi

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ABSTRACT

Aim: The aim of this study is to examine the transportation of patients from antiquity to the present day from an evolutionary perspective and to reveal the factors affecting its development.

Method: This study was conducted as a scoping review to explore patient transportation from historical ages to the present time and was undertaken from 2016-2019. For this purpose, we collected pieces of evidence from historical texts, articles, and books to websites from ancient times up to the present on patient transportation and the review findings were assessed chronologically.

Results: There was only one finding from ancient times, this first data was included in the war directives of the king of Macedonia, the second was using animals such as camels, horses, third was litters, cars and wagons, and after that technology was used to transport sick cars, trains, boats and finally ground and air ambulances have been developed.

Conclusion: These developments have occurred parallel to advances in medicine, and examination of these methods reveals another facet of the history of medicine. For example, modes of patient transport provide information regarding the value that societies place on the sick and/or injured, how patient welfare is ensured, and where and under what conditions medical intervention takes place. In addition, this study also explains which of these methods are used in what geographies, which are preferred under what kinds of conditions, and presents details concerning the level of medical science during times of war or major outbreaks in which advances in patient transport were made. The history of ambulance helps us to explore human history and also to improve new ideas to help patients.

Keywords: Patient transport, ambulance, stretcher, medical history

ÖZ

Amaç: Bu çalışmanın amacı, hastaların antik çağlardan günümüze geçişini evrimsel bir bakış açısıyla incelemek ve gelişimini etkileyen faktörleri ortaya koymaktır.

Yöntem: Bu çalışma, tarihsel yaşlardan günümüze hasta ulaşımını araştırmak için kapsamlı bir derleme olarak gerçekleştirildi ve 2016-2019 arasında yapıldı. Bu amaçla, eski zamanlardan günümüze kadar hasta ulaşımına ilişkin tarihsel metinlerden, makalelerden ve kitaplardan web sitelerine kanıt parçaları toplandı ve inceleme bulguları kronolojik olarak değerlendirildi.

Bulgular: Çalışmada antik çağdan yalnızca bir veriye ulaşılabildi, bu ilk veri Makedonya kralı savaş direktiflerinde yer almaktaydı, ikincisi deve, at gibi hayvanlar kullanıyordu, üçüncüsü litre, araba ve vagonlardı ve bundan sonra teknoloji hasta arabalar, trenler, tekneler ve nihayet nakliye için kullanılmış kara ve hava ambulansları geliştirilmiştir.

Sonuç: Bu gelişmeler tıptaki ilerlemelere paralel olarak gerçekleşmiştir ve bu yöntemlerin incelenmesi tıp tarihinin bir başka yönünü de ortaya koymaktadır. Örneğin, hasta taşıma yöntemleri, toplumların hasta ve/veya yaralılara verdiği değer, hasta refahının nasıl sağlandığı ve tıbbi müdahalenin nerede ve hangi koşullar altında gerçekleştiği hakkında bilgi sağlamaktadır. Ek olarak, bu çalışma aynı zamanda hangi yöntemlerin hangi coğrafyalarda kullanıldığını, hangi şartlar altında tercih edildiğini açıklamakta ve savaş zamanlarında veya hastanın ilerleyişinde ortaya çıkan büyük salgınlarda tıp biliminin seviyesine ilişkin detayları sunmaktadır. Ambulansın tarihi, insanın tarihini keşfetmemize ve ayrıca hastalara yardımcı olacak yeni fikirleri geliştirmemize yardımcı olmaktadır.

Anahtar Sözcükler: Hasta taşıma, ambulans, sedye, tıp tarihi

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Introduction

The history of patient transport began before ancient times and even before the invention on the wheel however, since there are no written sources of prehistory, we do not have any knowledge of this period. Correspondingly, we know that in ancient times the wounded began to move to receive treatment.

For as long as the practice of medicine has existed, medical transport has been critical in bringing together patients and healers as a result, various methods have been devised to transport the sick and/or wounded^{*.1} Over millennia, healers have developed standards of care for patients based on their experience. Although medical transportation has existed for millennia, there is no clear evidence as to where and when it first began. According to historical records, medical transport has evolved in parallel with advances in technology in general and, specifically, means of transport. Geographic conditions and natural disasters have both played important roles in the development of methods of patient transport. Many of the advances in medical transport have occurred during wartime, such as hammocks^{*}, the use of animals (e.g., horses, camels), chariots, ambulances, and air helicopters.

Over millennia, healers have developed standards of care for patients based on their experience. Although medical transportation has existed for a long time, there is no clear evidence as to where and when it first began. According to historical records, medical transport has evolved in parallel with advances in technology in general. Geographic conditions and natural disasters have both played important roles in the development of methods of patient transport. First records of medical transport have occurred during the time of war, such as hammocks^{*}, the use of animals (e.g., horses, camels) and chariots to advanced transports such as ambulances, and helicopters.

Given the issue of patient transport is very important, there were only a few articles about patient transport mentioned or there are articles and books dealing with a certain time period alone (e.g., The Wellcome Institute/library has published books and reports on this topic certain time period of UK; the famous French military surgeon Larrey DJ is featured in "Memoirs of military surgery"; there are a few studies on the USA, Australia, and Ottoman State). As a result, there are some time-limited studies on patient transportation that have been published on books and websites. Therefore, the conducted study sought to explore patient transportation from an evolutionary perspective. In addition, the aim of this study is to reveal patient transportation evolving in parallel with the developments in science and technology which play an important role in the development of medicine by touching on the breaking points. Correspondingly, this study wants to present an overview of the evolution of patient transport through medical history placing an emphasis on factors that has affected its development and in what ways.

This study is also significant in revealing the cognitive evolution on a historical scale. In this context, we searched for answers to the questions; Have scientific, technological developments and wars contributed to the development of patient transport? Are patient transport techniques parallel to the knowledge and skills of time?

Method

This study was conducted as a scoping review to explore patient transportation from historical ages to the present time and was undertaken from 2016-2019. For this purpose, we collected pieces of evidence from historical texts, articles, and books to websites from ancient times up to the present on patient transportation and the review findings were assessed chronologically. We then determined key words and

* The first rule is to keep the patient comfortable while preventing further injury during transport. Moving a wounded person can cause additional injury and pain and may complicate his/ her recovery, so the patient should be moved as little as possible, and sudden twists and turns should be avoided when changing direction. Unless absolutely necessary, the wounded should not be moved from the scene of their injury, but rather treated either at the site or as close as possible to it.

searched on academic internet web sites and libraries such as Academi.edu, Wellcome Institute, e-books, Google scholar, PubMed and Science direct, and also from web sites that take official data into consideration. After that, pieces of evidence were collected, separated, associated and qualified according to their references. Finally, we arranged and examined the documents in chronological order including various patient transports and motor vehicles were compared with developments in the various places and the Ottoman State and Republic of Turkey. And, all results were collated, summarized and reported in three sub-titles; transportation: Medical Evacuation and Organization; Vehicles of evacuation and transport: stretchers, litters, carts, and wagons; Air ambulance journey.

Results and Discussion

Patient transport is a critical component of medical evacuation and requires good organization. The transport of wounded people to safe places where they can be treated and/or the transport of caregivers to the wounded to provide medical intervention are of vital importance, especially during wartime. The goal of military health services was always to reduce suffering, injuries and death caused by wars.² Societies have had to create functioning medical systems for military purposes as well as for use in peacetime. Thus, medical implements, medicines, temples for praying, medical tents or other buildings, and medical education were developed not only to treat the sick and injured during peacetime but also to treat wounded soldiers.

Transportation: Medical Evacuation and Organization

Archaeological evidence such as engravings, sculptures, and inscriptions show that people have aiding the injured or sick since prehistoric times. Evidence of ancient medicinal practices includes Mesopotamian (Sumerian, Assyrian, and Babylon) tablets describing the use of plants and minerals to make potions, unguents, lotions, salves, etc., as well as surgical interventions and mystical approaches to healing. Sumerian tablets contain the first written medical practices; however, these practices also involve cultural transfer from earlier prehistoric societies. The existence of these tablets indicates that the medical knowledge and practices of previous civilizations were preserved and passed down to later generations and even to other societies/civilizations. However, there is no evidence of any organized efforts to evacuate the wounded from battlefields; it appears that the seriously wounded people were either killed or left to die on the battlefield. The transport of the wounded to safety was effected either through their own efforts or by those of other individuals most likely known to the wounded themselves. People used their hands, arms, laps, and backs to carry the sick and injured to a safe place for treatment.

In Ancient Greece and Anatolia (home to the Hittites (17-11 BC), Lycians (15-14 BC), Phrygians (8-7 BC), Hurrian-Urartians (8-7 BC), and Lydians (2-1 BC), as well as being a colony of Greece and later Rome), there is no evidence among ancient art or artifacts (e.g., icons, inscriptions, reliefs, etc.) of medical transport. However, it is known that Philip II (382-336 B.C.), the king of Macedonia and father of Alexander the Great, rewarded his stretcher bearers for evacuating men wounded in battle³ indicating that although wounded and sick people were being removed from battlefields, it was not standard procedure, hence the reward. This may be due to the fact that the concept of organized patient transport had not yet been developed, and doctors visited patients at home during those periods. Roman period (1 BC-5 AD), temporary hospitals were established in addition to the permanent hospital (valetudinaria) due to problems in sending the wounded home.³ Although there were field hospitals for their armies, there was no organization in place for the evacuation of wounded soldiers. The organized transport of patients to where they could safely be treated emerged later, along with a deeper understanding of the needs of patients.

Vehicles of evacuation and transport: stretchers, litters, carts, and wagons

The earliest written information regarding the evacuation of injured and sick soldiers and civilians for treatment purposes date to the last century of antiquity. The famous Roman Emperor, Julius Caesar (100 BC-44 BC) undertook the reorganization of the army corps. During that period, the Roman Empire Army

corps had begun to transport the sick and wounded.⁴ Chariots were used to evacuate wounded soldiers from the battlefield; however, there is no mention of the use of stretchers or litters in Roman texts. This evacuation system also continued to be used during the Byzantine Empire. Emperor Mauricius (582–602 AD) employed squads of horsemen to carry wounded men to medical tents prepared for their care.³ These systems provided the model for those used by later civilizations. However, no detailed evidence is available regarding this evacuation system and the devices and vehicles employed therein.

There was no system for regulating the evacuation and transport of the sick and wounded until the 18th century in Europe for the following reasons: 1. Surgeons had limited treatment capabilities, and following treatments soldiers were not able to return to battle because the medical treatment they received was usually inadequate; 2. The process of evacuation was not functional or efficient, resulting in a waste of time as well as medical resources; 3. There was a certain amount of natural selection at play, as wounded soldiers who did not fully recover would require long-term care and could thus be viewed as a burden on society (relatives of soldiers who died in battle did not receive financial recompense); 4. The army corps did not have a proper transport system and vehicles for medical evacuation; 5. Patient transport and evacuation were not considered a medical responsibility.⁵ Therefore surgeons only treated wounded soldiers who were able to reach medical help on their own, without assistance, or those carried by friends.

The domestication of animals enabled people to travel greater distances more easily than on foot. Animals such as horses and camels were used extensively in transport, including that of the sick and injured. Horse-drawn carts specially designed to carry patients first appeared in the 900s. After A.D. 900, the hammock came into use along with the horse-drawn wheeled wagon.⁶ Over time the hammock, which was utilized in numerous societies, later transformed into a hand litter and a cacolet (stretcher carriage)? The stretcher and litter were critical in the transport of the sick and wounded to dressing stations or doctor offices to receive medical treatment. Indeed, stretchers and similar implements are still in use today. Over the years, stretchers have been made of various materials such as tree branches, boards, and different types of cloth. The hammock-wagon can be considered another important vehicle in the transport of wounded soldiers and civilians⁽⁷⁾. Over time, however, the disadvantages of litters and carts drawn by horses, mules or camels became apparent, as they were frequently not secure enough to transport patients' long distances, especially over rough roads, thus often exacerbating injuries.⁷ The Seljuk Sultans established the use of portable tent-hospitals, carried by 100-200 camels, between the XIth and XIVth centuries; similar systems were also employed in other countries.⁸ During this time the Seljuks also set up mobile hospitals using camels for their armies in Anatolia and Syria (Sultan Melikshah himself had a portable hospital, complete with medical instruments, carried by 100 camels). However, they did not have an organized ambulance system for patient transport.⁹ In the XIth century, crusaders provided wagons to carry their wounded and sick soldiers to tents. Later, this practice was expanded to provide institutional care for the sick throughout Europe.¹⁰

During the XVth century in Spain when Moorish civilization was coming to an end, specially constructed wagons (ambulances) for transporting wounded soldiers and mobile army hospitals, located close to the battlefield, were used, providing immediate care to the wounded.³

Portable tent-hospitals were also used during the Ottoman Empire. Murad IV (1623 - 1648) ordered mobile hospital tents to be set up beside his own sidewalk outside of Baghdad and ordered the maximum attention to the treatment of the wounded. On occasion he would visit the wounded in an attempt to raise morale.¹¹ However, no specific information is available as to how the sick and wounded were transported to the hospital tents; it is possible that horse- or camel drawn carts were used.

As a number of the above examples attest, different societies have adopted a number of quite similar methods of patient transport. Wars in particular have played an important role in spurring developments in healthcare, including new approaches and new tools.

The first known ambulant hospital system was begun by the French in 1759 to provide transport for sick and wounded soldiers.¹² In 1792, Napoleon's private surgeon Baron Dominique Jean Larrey created a two-wheeled horse-drawn ambulance, with gun carriages and a driver, termed a "flying ambulance". Dr. Larrey's goal was to remove the wounded from the field of battle without incurring further injuries. Injured soldiers transported by ordinary carts seemed to experience greater blood loss and their injuries were often exacerbated. Larrey then formed a special "lifeguard association" with Pierre François Percy, the principal surgeon of the French Army. Larrey also invented the triage system (the assignment of degrees of urgency to wounds or illnesses to decide the order of treatment of a large number of patients or casualties), enabling medical teams to provide more effective medical assistance to more soldiers.^{13,14} William Dupré in 1801 described the ambulance as a house constructed according to the movements of the army to carry the sick and wounded (Dupre 2015). For this reason, temporary tented hospitals were also referred to as 'ambulances' until the mid-nineteenth century.

The hand litter and cacolet were widely-used methods employed to transport the sick and wounded. Camel or mule-drawn cacolets were utilized for field transport of wounded soldiers in challenging natural conditions such as deserts, mountains, and rugged terrain. While the hand litter, which resembled a stretcher, was used by two persons to carry a patient, the cacolet was a kind of chair or bed placed on both sides of a mule, horse or camel for carrying travelers or the injured. The cacolet was first used by the French army to transport wounded soldiers during the Crimean War (1854-1855) from the battlefield to the field hospital on the backs of mules. Horse ambulance services were used in many places in the 1800s, such as the territories of the Ottoman, British, and French Empires.^{3,15,16}

In February 1876, during the reign of Sultan Abdul Aziz, new model stretchers were purchased for hospitals in order to transport sick and wounded soldiers in the Ottoman Empire.¹⁷

The aforementioned developments in patient transport, including stretchers, litters, and animal-drawn carts, indicate that the (ideally) safe and swift transport of the sick and wounded to where they could receive medical treatment was considered of vital importance across many societies.

Unfortunately, along with advances in medicine and medical transport designed to help save people, more dangerous weapons were also invented, leading to more severe wounds to ever greater numbers of people. In 1803, Lieutenant General Henry Shrapnel of the British Army developed the eponymous shells (earlier invented by the Chinese) that contained a large number of bullets, resulting in more wounds of a more severe nature. In 1836, American inventor Samuel Colt developed a "revolving gun" (the revolver), which could be reloaded faster than any other firearm.¹⁸ These developments necessitated the development of more systematic emergency and ambulance systems in response to the more numerous and severe injuries inflicted by such weapons.

Weapons of mass destruction, such as rapid fire or repeating rifles, began to be used as artillery fire during wars (e.g., the American Civil War). These advanced weapons caused greater casualties and put greater demands on ambulances. The effects of technological developments are rarely limited to one single field but, by triggering novel ideas in other areas as well, tend to lead to transformations in many aspects of life.^{19,20} This is known as "cognitive evolution". In the case of patient transport, the original "tool" (i.e. the development of a new weapon), by increasing the number of injuries/deaths incurred, leads to the emergence of new approaches and tools in transporting the sick and wounded.

During the American Civil War, the Union Army modelled its medical system on Larrey's system in France. Union Army Surgeon Major Jonathan Letterman, in order to combat casualties, completely reorganized the military field medical service system. Letterman's plan involved the establishment of a uniform system of ambulances in the army. This plan was ratified by the U.S. Congress in 1864. The act declared ambulances to comprise a special corps in the army with a physician as commander, employees in distinctive special uniforms, and wagons.⁷ The American Civil War changed the meaning, function, and perspective of the

ambulance system. Its development, originating out of necessity, was an important step in patient transport, and codified into law.⁷ Thus the ambulance system gained official status, becoming an integral part of field medicine. Under the management of a military doctor, the status of employees changed and precautions were detailed to help the wounded, prioritizing their transport so that they could receive immediate medical attention. In Cincinnati, a hospital-based ambulance service was started in 1865. The first municipally-based emergency medical service (EMS) began in New York City in 1869.³

The International Committee of the Red Cross (ICRC, or simply the “Red Cross”), a new system of medical assistance, was founded in Geneva, Switzerland in 1864 by Henry Dunant and Gustave, in response to developments in weapons and the number of casualties of wars. In 1874, twenty-two national societies in European countries joined the ICRC. In 1876, during a war between the Ottoman Empire and Russia, the former accepted an offer of assistance from the Red Cross, but suggested changing the name to Red Crescent for religious purposes. Since then, the Red Crescent emblem has been used by most Islamic countries*.^{21,22}

These developments are important because ambulance services provided by the Red Cross and Red Crescent during wartime became official policy with the coordination of the League of Red Cross and Red Crescent Societies in Geneva in 1919 after the end of World War I. During that conflict, all Red Cross Societies of the combatant countries organized hospitals and ambulances to care for wounded soldiers.

Prior to World War I, which began on July 28, 1914 and ended on November 11, 1918, a number of developments in ambulance services took place. In 1909, James Cunningham began to manufacture the first mass-produced ambulance, equipped with electric lights, a cot for patients, and two seats for the ambulance attendants, in addition to standard splinting and traction to immobilize fractures.²³ In the early 1900s in the United States and Canada, patients could call ambulances by telephone or telegram. Such developments led to increased expectations regarding ambulance service. During World War I, the Canadian Army used a gasoline-powered ambulance (the Palliser Ambulance), which was armored and had a single steering wheel and tracks.²⁴

The Ottoman Empire was also involved in the First World War, and lost many soldiers and territories. For example, during the battle for the Dardanelles, mobile war hospitals and ambulances were used to treat wounded and sick soldiers.^{25,26} These services help to prevent the spread of infectious diseases and enabled the wounded to receive care as soon as possible. However, Western Europe ambulances were more equipped than Ottoman ambulances due to the lack of technology. During the First World War both the Ottoman Army and Hilal-i Ahmer (the Red Crescent) still used horse-drawn ambulances, and had limited access to automobiles, train, and ships[†] for use as patient transport[‡]. Developments in patient transport used in some countries were not always immediately adopted in other countries.

Air ambulance journey

The term of "air ambulance" started to use for an airship (balloon) named the Albatross in 1866 and first air ambulance was used during the Siege of Paris in 1870.^{27,28}

Regarding air transport of patients, out in the XIXth century the limitations of transporting patients solely by means of roads, trains, or ships became apparent. According to documents, air vehicles began to be

* “Ottoman Red Crescent society considered the needs of the fixed and a mobile hospital in the facade, our society has actively dispatched stretchers, beds, bed sheets and drugstore medicine and flags to the hospitals through tea houses-café-” (Ulugtekin&Ulugtekin 2013).

[†] Many ship ambulances were used to transport wounded (Anonymous. Çanakkale Acı İlaç. İst., 2005, Deva İlaç)

[‡] According to Red Crescent report, there were number of Stretcher 1966, Portable Bed 550, Patient transport Car 1 (1914-1918). (Osmanlı Hilal-İ Ahmer Cemiyeti 1335-1919 Senesinde Münakit Hilal-İ Ahmer Meclis-İ Umumisi Heyet-İ Muhteremesine Takdim Edilen 1330- 1334 [1914-1918] Senelerine Ait Merkez-İ Umumi Raporu) (Ulug&Ulug 2013).

employed to transport the wounded and sick the wounded in the 1860s. Balloons (air ambulances) were used to evacuate more than 160 soldiers during the Siege of Paris in 1870. During the First World War, military organizations tested air ambulances, but concluded that they were of limited efficacy.²⁸ The French and English Air Services made air ambulance flights during World War I. The French demonstrated that if wounded could be evacuated by air at most within six hours, the mortality rate would decrease from 60 percent to less than 10 percent.²⁹

An organized military air ambulance service was employed during the Spanish Civil War in 1936.³⁰ After the Second World War, ambulance services were organized by fire brigades due to the disappearance of military and security organizations in many European countries, especially Germany, as well as due to the increasing importance of fire brigades during and after the war. This situation improved ambulance service at the civil level. Following the end of the Second World War, the first civilian air ambulance service in North America was established in 1947. During the Korean and Vietnam Wars, air ambulance services were expanded by the United States; in the Korean War alone, over 18,000 wounded soldiers were transported by helicopter.³⁰

A major change in the design of ambulances came about following a train crash in Great Britain in 1952 which resulted in many deaths.³¹ This incident highlighted the importance of having readily available well-equipped ambulances in order to save lives. Ambulances were beginning to be restructured both as transport and as mobile hospitals. Larger and better-equipped ambulances were needed to implement new lifesaving techniques (cardiopulmonary resuscitation, defibrillation, oxygen delivery, etc.).²⁴ In this way ambulances turned into mobile hospitals.

The first permanent civil air ambulance helicopter service was begun in Germany in 1970, followed by the United States in 1972 and Canada in 1977.³²

When we examine the historical development of ambulance services, there are fundamental differences appear between each country that is specific to their local conditions. In particular, Turkey has employed some reforms and improves the patient transportation respectively. The Republic of Turkey, which was established in 1923 in place of the Ottoman Empire which was widely served by horse-drawn ambulances,³³ and also by motorized ambulances to a limited extent, whereas; motorized ambulances had for the most part already replaced by the horse-drawn patient transport in western countries such as: in England, the United States, Germany, and France. Therefore, Turkey struggled with some various issues particularly in social, economic, health service etc. in its early years. Consequently, apart from the Red Crescent ambulances, Turkey was later on able to solve issues such as the organization of ambulance services organization. Turkey established first aid centers in the 1950s and mobile ambulance services were started in the 1980s. The first helicopter ambulance in Turkey began operation through the Ministry of Health in 2008.³⁴

The XXIst century began when science and advanced technology rapidly developed, at the same time disasters, migrations and national and international conflicts intensified around the world. Therefore, it has become a necessity to transport patients and injured people in a shorter time and to perform the first intervention quicker. Given this reason, the first aid team started to develop and prepare medical-technical guides in addition to medical knowledge as well as increasing their equipment. At present time, the emergency team use full equipment ambulances and medical helicopters to rescue patients or injured persons in various places including the wilderness, war or disaster area. Therefore, emergency medical intervention and rescue operations are quickly initiated. The aim was no longer initiating a medical intervention, but performing necessary advance medical treatment to reduce medical risk and cost.³⁵ For this reason, some countries established a department responsible for only patient transportation in hospitals or related places,³⁶ triage offices and developed simulation programs.³⁷ In addition to ambulances, the use of helicopter ambulances has increased and these ambulances are technically more

suitable for heart attacks, strokes, and for other emergency interventions.³⁸ Briefly, the technical development of ground and air ambulances (strengthening their safety, increasing their speed), was also increased. Since the importance of patient transfer is more clearly understood, several academic studies have begun to discuss the appropriateness of transfers as emergency and non-emergency.³⁹

Limitations

The synthesis of historical qualitative data may involve more than the data's context but also in different contexts or interpretation. Therefore, chronological evaluation and comparison are very important for review-historical studies. In addition, for systematic reviews, the primary resources are important, that's why we tried to reach original texts or searching for texts with original references and the data were collected from academic sites (e.g., Academi.edu, Wellcome Institute/library, e-books, Google Scholar, PubMed, and Science direct,) and also from web sites that take official data into consideration and compared. However, there was a possibility of some unreachable resources.

Conclusion

The increasing of knowledge, scientific methodology, and technological developments have led to advances in patient transport, from carrying the sick and wounded with the use of stretchers, litters, cacolets, horse-drawn carts, and balloons, to the well-equipped ambulance cars and (for more rapid transport) air ambulances (helicopter ambulances) being used at present. The emergency team use full equipment ambulances and medical helicopters to rescue patients or injured persons in various places including the wilderness or disaster area in a short time. Therefore, emergency medical intervention and rescue operations are quickly initiated and can transport them in a safer way. In the future, science and technology are expected to drive innovation in patient transport, making it even faster and safer, and able to provide more life-saving services. Where emergency medical teams will not only initiate medical intervention, but they can also implement necessary advance medical treatments while on transit.

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