A History of
Emergency Medical Services
&
Medical Transportation Systems
in America

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Nomenclature

As with any technical subject matter, the history of emergency medical services (EMS) and medical transportation (MT) systems in the United States must begin with an understanding of its unique vocabulary. The lexicon for this topic includes;

**System:**
The word system can have many meanings based on its context, but for the purpose of assuring the discussion of the subject at hand is lucid, it is initially interpreted in this text to mean: *An assemblage or combination of things or parts forming a complex or unitary whole* [Latin, from systēma and Greek, from σύστημα, a whole combined of several parts].

The meaning of this word will change during the course of this text and become more honed as the discussion approaches the late 1960’s and early 1970’s. At that point, it will reach its definitive meaning, which was established by description in federal public law 93-154 (usually referred to as the *EMS Systems Act of 1973*). It determined that an EMS system provides for the arrangement of personnel, facilities, and equipment for the effective and coordinated delivery of health care services in an appropriate geographical area under emergency conditions. These emergency conditions may occur as a result of the patient's condition, a natural disaster, or similar situation. It also identified the following 15 components as essential to an EMS system; communications, training, manpower, mutual aid, transportation, accessibility, facilities, critical care units, transfer of care, consumer participation, public education, public safety agencies, standard medical records, independent review and evaluation, and disaster linkage.

Disagreement exists among experts in the field regarding whether an EMS system includes the medical activities and facilities associated with patient care within the hospital setting. Some contend “proper” EMS is concerned only with the pre-hospital environment, as envisioned early on by the federal government and described in the *National Highway Traffic Safety Act of 1966*. Others believe the intent of the federal government changed over time and eventually include every aspect of medical care, from incident detection through post-discharge rehabilitation, but most especially the Emergency Department and Critical Care Units of hospitals. This position is supported by the federal *EMS Systems Act of 1973* (referenced above), some components of which, are clearly part of hospitals or post-hospital entities.

**Ambulance:**
For the purposes of this text, an ambulance means a vehicle or other mobile mechanism, of any kind, which is used to transport the sick or injured from the site of occurrence or invalidity, to a medical or other treatment location or facility. Of more recent tradition (circa 1899), it is defined as “a specially equipped motor vehicle, airplane, ship, etc., for the carrying of sick or injured people, usually to a hospital.” [French, from hôpital ambulant, mobile (hospital),

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1 The federal Highway Safety Act of 1966, which established the office of Emergency Medical Services within the National Highway Traffic Safety Administration of the Department of Transportation, outlined six core aspects, or system functions, of emergency medical services. They were; detection, reporting, response, on-scene care, care in transit and transfer to definitive care.

2 The first motorized ambulance in the United States began operation at the Michael Reese Hospital in Chicago, Illinois. It was donated by five local businessmen, weighed sixteen hundred ponds, was battery powered and traveled at a speed of 16 miles per hour.
from Latin ambulāns, ambulant- present participle of ambulāre, to walk. See ambhi- in Indo-European Roots.\textsuperscript{5}

In early military terms (prior to the 18\textsuperscript{th} century), an ambulance connoted a mobile hospital, not a vehicle, which stayed with an army in the field to provide for the collection, triage, treatment and care of the wounded and sick, until they could be moved to stationary hospitals farther away. The term “ambulancias”\textsuperscript{iii}, from which ambulance derives through the Spanish language, related, militarily, to special tents where medical supplies and equipment where brought and stored, and where soldiers received care for their wounds or illness. King Ferdinand and Queen Isabella of Spain used it in this way as early as the 15th century. Today we refer to such facilities as “field hospitals” or “MASHs (Mobile Army Surgical Hospitals)”

**Hospital:**
In the framework of the modern day EMS system (which began after 1966\textsuperscript{iv}), a hospital is a permanent structure which houses the appropriate facilities, equipment and personnel necessary to provide immediate diagnostic services and emergent, definitive and sustaining medical care for those patients whom arrive, by whatever means. Hospitals may be categorized into several levels based on their ability, or inability, to adequately deal with patients who have specialized medical or trauma needs\textsuperscript{v}. They are often referred to by the suffix “Center” to designate their advanced capability of medical provision in a particular designated area of expertise. These types of hospitals include; Trauma Centers, Burn Centers, Spinal Cord Centers, Children’s Hospitals, and more recently, Chest Pain Centers\textsuperscript{vi} and Stroke Centers\textsuperscript{vii}.

**Emergency Medical Services:**
The phrase, emergency medical services, did not exist as a familiar expression defining a specific application of medical care prior to the 1960s. Generally, it now means the provision of medical care by specially trained and authorized personnel to the suddenly ill or injured prior to, and in the absence of, a hospital setting. Contemporarily, it refers to anyone of a variety of clinically

\textsuperscript{iii} It is believed that the word “ambulance” was first used by King Ferdinand and Queen Isabelle of Spain in the 15\textsuperscript{th} century.

\textsuperscript{iv} Virtually all medical authors and EMS experts agree that modern day American emergency medical services began in 1966 with the publication, in September of that year, of “Accidental Death and Disability: The Neglected Disease of Modern Society”, a report by the Committees on Trauma and Shock of the Division of Medical Sciences, National Academy of Sciences/National Research Council.

\textsuperscript{v} While hospitals began specializing at their very inception in the United States (circa 1750), the concept of categorizing hospitals based on their ability to meet the needs of emergency patients was first “officially” elucidated, albeit in a rudimentary way, in the landmark white paper by the NAS/NRC titled “Accidental Death and Disability”, referenced earlier.

\textsuperscript{vi} The Society of Chest Pain Centers (SCPC) was established on September 18, 1998 It is a professional society which claims to be dedicated to “patient advocacy and focusing on ischemic heart disease”. Central to its mission, the SCPC promotes standardized medical treatment based on established protocols, delivered through Chest Pain Centers, to care for patients affected by acute coronary syndromes and heart failure. They also promote the adoption of “process improvement science” by healthcare providers.

\textsuperscript{vii} The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) now recognizes and has established a criteria based assessment process called the Primary Stroke Center Certification Program which is based on recommendations from the Brain Attack Coalition and American Stroke Association. According to the JCAHO, achievement of this certification signifies that the services provided by a named hospital have the critical elements necessary to achieve long-term success in improving outcomes.
different levels of medical care\textsuperscript{viii}, provided to those who become unexpectedly incapacitated, whether from a chronic or acute illness or injury.

\textit{Medical Transportation:}
Medical transportation in current parlance refers to \textit{the movement of patients to, from or between medical facilities of any kind, including physicians’ offices, ambulatory care centers, specialized medical facilities such as dialysis centers and hospitals}. It usually concerns patients who are not experiencing emergent medical conditions, although not always. Some individuals requiring transport to a higher level of definitive medical care, may be moved from one hospital to another, tertiary care hospital and may be in a critical and/or unstable state. The mode of transport may vary according to the level of medical attention and care needed during movement. The patient’s medical status dictates not only the type of vehicle used (e.g. mobility assistance van\textsuperscript{ix}, ambulance, helicopter, airplane, etc), but also the number and training of the personnel accompanying them (e.g. EMT, Paramedic, Nurse, Respiratory Therapist, etc). The phrase, medical transportation, typically does not refer to EMS activities and is almost exclusively relegated to describing the activities of patient movement that occur after they are initially treated at a hospital.

\textit{Levels of Medical Professionals:}
The maturation of EMS in the United States has created a categorization of medical care-givers, called pre-hospital or EMS personnel. They are separated by the degree of their medical education and clinical training and, thus, their level of certification or licensure. This classification determines the extent of treatment they may provide, the medical devices and supplies they may use and is accompanied by specific titles to denote their role. While each state has developed their own, distinctive catalog of providers, they tend to fall into the following groups;

\textit{First Responder-} normally refers to Police or Fire Department personnel who have received minimal first aid, or limited basic emergency medical care, training. They are nominally educated to provide Rescue Breathing\textsuperscript{x}, CPR, defibrillation using AEDs\textsuperscript{xi}, as well as to control bleeding, administer oxygen and stabilize fractures.

\textsuperscript{viii} The sophistication of the medical care comprised in EMS today is separated into multiple levels of expertise. From citizen first aid, through First Responder, EMT-Basic, EMT-Intermediate, to Paramedic, pre-hospital medicine is regulated in virtually all states and includes specific categories of training and certification that delineates the role, responsibility and type of care an individual may provide.

\textsuperscript{ix} Also known as invalid or wheelchair coach.

\textsuperscript{x} Formerly called Artificial Respiration, invention of the phrase Rescue Breathing is attributed to the American Heart Association.

\textsuperscript{xi} AEDs, Automatic External Defibrillators, were developed to ease the use of administering a regulated electric shock to the victim of sudden cardiac arrest for the purpose of resuscitation. They have been simplified and fool proofed to a point that even untrained civilians are able to adequately use them. Originally, they were reserved for use by hospital and trained EMS personnel, but have now been advanced substantially. Today, they are lightweight, durable and equipped to give audible instructions to the operator. Once applied, they sense and interpret the patients EKG rhythm and prepare themselves to discharge an appropriate electric shock to the patient. Intervention by the operator is minimal. Because of this, and studies dating back to Weaver, et al in the \textit{New England Journal of Medicine} in 1988 that revealed speed to defibrillation within the first ten minutes of SCA dramatically improved a patient’s survival, AEDs have become part of the care given by First Responders.
EMT-B/D (Emergency Medical Technician-Basic or Defibrillator)- these individuals are trained to meet a nation standard of EMS\textsuperscript{xii} care which subsumes that of the First Responder, and, in addition, includes a more thorough education in anatomy and physiology, rudimentary assessment of a patient’s condition, splinting of fractures, application of cervical spine immobilization devices, various forms of victim extrication, lifting and movement, airway management and maintenance, various specific treatments of a variety of medical and trauma conditions, care of the obstetrical patient and delivery of babies. They also receive training in triage and elementary management of mass casualty incidents.

EMT-I (Emergency Medical Technician-Intermediate)- essentially, EMT-Is are more highly trained than EMT-B/Ds, but less so than Paramedics. Beyond the ability of the EMT-B/D, Intermediates can administer a few medications that are time critical in truly life-threatening situations. These usually include; intravenous lines (I.V.s) for either fluid replacement in patients suffering from traumatic shock or as a direct route to the circulatory system for the administration of other vital drugs, epinephrine (adrenaline) in anaphylactic shock (severe allergic reaction) cases, and dextrose by intravenous route for critically symptomatic diabetics. Also, some EMT-Is are permitted to insert devices, such as endotracheal tubes, to secure a patient’s airway and provide artificial ventilation in those individuals who have stopped breathing on their own (respiratory arrest) and to use blood-glucose analysis devices (glucometers).

Paramedics (EMT-P or Emergency Medical Technician-Paramedics)- they receive far more extensive education in the biological processes of the human body as well as advanced medical treatment techniques than First Responders or EMTs. In addition to the skills and drugs available to less trained providers, paramedics can administer an extensive variety of medications (in some locales more than 60) via several routes, including, subcutaneous, intramuscular, intravenous, endotracheal and intraosseous (access in children under 3 years through the femur bone). Often, they are allowed to provide other forms of therapy, usually reserved for the clinical setting of a hospital, such as nebulizer treatments (medication delivered by aerosol mist for respiratory disorders), external cardiac pacing (minor external electric shocks given to control dangerous heart activity), chest decompression (insertion of a needle into the chest cavity to re-expand a collapsed lung), and cricothyrotomy (also insertion of a needle, this time in the throat to by-pass a blocked airway).

Specialty Care Transport Paramedics and Nurses- A relatively new provider level, these individuals are trained in and allowed to perform certain duties beyond their respective normal scope of practices. They usually staff advanced medical care transport ambulances that specialize in the transfer of patients needing sophisticated monitoring and treatment, between medical facilities. They maintain a continuum of care, by virtue of their additional skill sets and use of complex medical equipment, as identical as possible to the patient’s hospital of origin. They do

\textsuperscript{xii} This national standard was first developed in 1968 by The Task Force of the Committee on EMS of the NAS/NRC. Published by Dunlop and Associates, it was called Training of Ambulance Personnel and Others Responsible for Emergency Care of the Sick and Injured at the Scene and During Transport. This was superceded in 1971 by the American Academy of Orthopedic Surgeons’ text: Emergency Care and Transportation of the Sick and Injured. The standard training program for Basic and Advanced EMS is now promulgated by the National Highway Traffic Safety Administration of the U.S. Department of Transportation.
not normally function in a pre-hospital (EMS) setting but are usually found in the inter-facility medical transport arena.

**History**

*Medicine before America:*

To comprehend and fully appreciate the history of American EMS and medical transportation, it is important to understand the nature of medicine around the world in the 1600s and the centuries leading there, in particular the state of hospitals, pre-hospital emergent medical care and patient transportation.

Throughout ancient times, civilizations around the world developed their own specific medical cultures, often derived from or in tandem with, their evolving religious beliefs. A lack of reference or documentation indicates little attention was paid to the movement of patients from the location of incipient need to the physician or, later, the hospital. Historical records do rarely mention, with scarcity and generalized descriptions, some apparatus used during these times to transport ill or injured individuals. However, even early on, certain peoples designed specific devices, customized to provide efficient, or at least convenient, movement of the incapacitated.

Stories from the early Roman and Greek epochs mention the use of chariots and two wheeled carts as vehicles for the transport of injured soldiers. In some cases, soldiers were carried off the battlefield on their own shields. None of these instruments were especially designed with the transport of ill or injured in mind. They were simply used, on an ad hoc basis, because they were readily available and conveniently suited to the task. There seems to be no special focus at this time in history on specializing a transport device specific to the needs of the incapacitated.

In Homer’s Iliad and Odyssey, circa 1250 B.C., descriptions of battlefield wounds and treatment clearly indicate that severely wounded were not moved from the site of their injury. Rather, medical personnel, usually surgeons, came to the scene and treated the patient where they lie, prior to transport. Medical care would be administered even during the fighting. This is substantiated by ancient artwork and pottery images. As an example, a kylix dated at about 490 B.C. by the Greek artists Euphronios (c.520-470 BC), depicts Achilles bandaging the arm wound of Patroclus, another soldier, apparently on the field of battle (see figure 1).

The first known institutions that focused on providing cures for illnesses were recorded as Egyptian temples, circa 4000 B.C. Treatment was mostly self-directed, incorporating religious beliefs of the culture, such as prayers to specific gods. Later, Greek temples dedicated to the physician god Asclepius (Latin: *Aesculapius* see figure 2) served in a similar way but also might allow the ill to stay overnight while they awaited guidance in the context of dreams. Many of these temples eventually expanded into Asklepieia (Asclepieion see figure 3), which were a

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xiii A detailed analysis of the Iliad and Odyssey by Frohlich revealed that of the 147 wounds mentioned in the great works, 106 were inflicted by spears with a fatality rate of 80%, 17 by sword with 100% mortality, 12 by arrow with 42% fatal and 12 by slingshot, 66% resulting in death.

xiv An ancient Greek drinking vessel.

xv He was a Greek artist who spent his early career as a painter, working mainly in the red-figure style. Later he was known primarily as a potter.
A group of buildings, constructed on adjoining, staggered terraces, the higher retaining their religious function and the lower acting as what we would now consider a hospital. The lower sections of the Asklepieia maintained rooms for hydrotherapy, physical therapy and treating fractures.\textsuperscript{10}

The earliest known facilities that were dedicated solely to admitting and treating the sick or injured were hospitals that arose by 431 B.C. in Sri Lanka (or Ceylon as it was known before 1972) and referred to now as Brahmanic hospitals.\textsuperscript{11} At about the same time, Hippocrates (c. 460 B.C. – c. 377 B.C.) is teaching and publishing the concepts of medical ethics and basic medical philosophy in Greece. He uses the foundations of medicine previously espoused by Acragas (c. 490 B.C. – c. 430 B.C.) in 450 B.C. that four bodily humors: blood; phlegm; cholera (yellow bile); and melancholy (black bile) must be maintained in balance to result in health. Greek surgeons build and maintain their own offices, called \textit{iatreia} and often separate from their personal residences, during this period.

The first mention of a system of medical facilities, however, does not occur until the second century B.C. and is generally credited to the Buddhist King Ashoka (also: \textit{Asoka}) (273-232 B.C.), ruler of the Mauryan dynasty in India.\textsuperscript{xvi} He issued a series of edicts, inscribed on rocks and pillars throughout his kingdom, some of which described two kinds of hospitals and medical care, one for humans and the other for animals. They also memorialized that healing herbs were imported, grown and made available for medical treatment purposes throughout the empire. In the end, he had established a series of 18 hospitals throughout Hindustan many staffed with doctors and nurses and all supported by state funds.\textsuperscript{xvii}

Romans established \textit{valetudinaria}, or military medical treatment facilities, for slaves, gladiators and soldiers about 100 B.C. They were located and moved with the armies they served. Normal citizens sought out care from physicians individually, either at special offices the doctor’s had established or by summoning him to their home.

Beginning in about 1080, a sect of monks, whom would eventually become a military fraternity, provided evacuation from the field of battle, medical aid and convalescent comfort, for both pilgrims and crusading knights, as a primary function of their order.\textsuperscript{xviii} The exact method they

\textsuperscript{xvi} Inscriptions dating from the third century B.C. by Asoka include statements that hospitals had been established. According to his scribe, Samhita, there were elaborate dispensaries in their own compounds, set apart from state buildings. One of the hospital structures was usually a maternity facility where patients could stay throughout delivery and postpartum care. A second contained distinct areas for apprentices to examine patients before reporting to the court physician, a pharmacy for the preparation and dispensing of medications, and an operating room away from areas patients frequented.

\textsuperscript{xvii} Some dispute this claim, citing works by King Duttha Gamani, a later ruler of the same region, in which he takes credit for establishing a group of 18 hospitals.

\textsuperscript{xviii} A hospital was founded in Jerusalem, in about 1080 AD, by the Brothers of the Benedictine Monastery of Saint Mary Latina to provide medical aid and comfort for the throngs making pilgrimage to the Holy Land. This group of monks, being granted gradual sovereignty by a succession of popes, eventually became the Knights of St. John. They transformed from a religious order into a military group, fighting on behalf of Christianity during the crusades. It is reported that they also took on the role of evacuating injured colleagues and enemies from the battlefield and rendering medical aid to them, including long term hospital care. Their emblem eventually became the Maltese Cross, the universal insignia of fire departments around the world supposedly because they extinguished fires caused by the enemies use of naphtha and provided rescue and emergency medical care to victims. The hospital was
used to extricate the injured is not readily documented, but probably involved traditional conveyances of the time. It is one of the first validated examples of what could be called, in today’s terms, a regional EMS system, incorporating the basic elements of detection, response, assessment, treatment, transport and definitive care.

**Medical Transportation before America:**

Prior to the sixteen hundreds, several methods of moving the debilitated were in use around the world. In what would become the United States, Native Americans used the travois\(^{13}\) (see figure 4), which was essentially a stretcher affixed at one end to a horse or large dog to pull, as a conveyance for materiel or disabled people. In India, dhoolies\(^{14\text{xix}}\), or covered stretchers (see figure 5), were used to transport the sick or injured. In Egypt, camel stretchers called panniers\(^{15}\) (which were used in many regions around the world with alternate beasts of burden such as mules) were the method of choice, even through the Napoleonic period\(^{xx}\), to move the non-ambulatory.

As mentioned earlier, in the 15\(^{th}\) century, King Ferdinand and Queen Isabella of Spain were instrumental in the deployment of “*ambulancia*” (mobile field hospitals) to provide rapid medical aid to their soldiers. They were staffed by physicians and surgeons and were primarily used for the storage of medical supplies and the treatment of the wounded. *Ambulancia* were relocated often to follow the army and maintain a close geographical relationship to the battlefield in order to reduce transport time from the site of injury to the point where medical intervention could take place. As the conveyance for the wounded, transporting them to the strategically placed field hospital, the Spanish army employed horse drawn carts or wagons, with attendants, as early as April of 1487 during the 40 days Siege of Malaga\(^{xxi}\).

**The Colonial Period:**

Beginning with the landing of the Mayflower on November 11, 1620 in Provincetown, Cape Code, the Colonial Era of American history began. Even though two of the settlers were physicians (Captain Myels Standish and Dr. Samuel Fuller\(^{xxii}\)), American medicine did not enjoy a propitious beginning. At first, and for a significant period of time thereafter, early Americans did not emulate their ancestors from Europe regarding medicine or medical technology. In fact, colonial medicine was significantly less advanced than what could be found on the European continent during this period. While hospitals and medical schools had been well established for decades in England, France, Italy, the Middle East and even Russia, none existed in America until L’Hospital des Pauvres de la Charite (also known as St. John’s Hospital of the Poor see purported to have operated along contemporary Greek theories of medicine and was divided into wards. It may have had as many as two thousand beds during the height of Christian control. The introduction of advanced Arab medicine to the hospital enhanced western European knowledge of medical care considerably.

\(^{xii}\) Dhooly, doolie is a covered litter, from the Hindi *doli*. It consists of a cot or frame, suspended by the four corners from a bamboo pole, and is carried by two or four men.

\(^{xx}\) Side-saddle panniers were used to carry patients in Baron Jean Dominique Larrey’s (1766-1842) camel ambulance, during Napoleon’s years of war.

\(^{xxi}\) A 15\(^{th}\) century Muslim seaport city and province located on the Mediterranean coast of Spain.

\(^{xxii}\) Samuel Fuller, a physician and surgeon, did not have an opportunity to significantly influence the development of medicine in America since he succumbed to the small pox epidemic of 1633.
Likewise, early Americans did not receive medical care to the standard available elsewhere in “modern societies” around the world. In this regard, America could be considered a developing country. Physicians were among a group of medical practitioners that were neither traditionally schooled nor possessed any formal degrees from established colleges. Other medical caregivers of the time included apothecaries, herbalists, midwives, quacks, surgeons and barbers.

Patients were more often than not treated and cared for by their own families or neighbors. If they saw a physician (or other practitioner), it was usually in the patient’s home or at the site of the accident. Medical practitioners would frequently travel to the scene of an injured person rather than have them transported somewhere since virtually no dedicated treatment facilities existed.

With few hospitals or other specialized facilities for medical care available in America, little need existed for a structured transport system or even medically specialized movement apparatus. Even though in some cases patients would be housed in their physician’s personal residence when their condition warranted, no specialized means of transport developed for some time. If injured or taken suddenly ill away from their home or other shelter, patients needed to arrange for their own transport. Usually, if a significant distance were involved, the victim, or their family or neighbors, would use any available cart, buggy or wagon.

American medicine at this time was quite primitive by toady’s standards. Physicians and surgeons could do little in emergent circumstances and focused mostly on longer-term illnesses. Although they would set simple fractures and periodically amputated limbs affected by multiple breaks, they mostly prepared herbal remedies, bled patients and provided comfort and advice.

The American Revolution:

The American Revolution marks the beginning of the development of EMS systems in what would become the United States. While the Civil War is often cited as this inauguration, it is the American Revolution that rightly holds the distinction because it brought two critical elements of EMS to the forefront for the first time. First, it was recognized by the successive Director Generals of the Continental Army’s Hospital Department (Drs. Benjamin Church, John Morgan, Samuel Bard and others) that the care of the military and its wounded was important to the eventual outcome of the war.

Established by the bequeath of Jean Louis, a French boat building seaman, in 1735, it eventually became known as Charity Hospital and remains operational at printing.

Disagreement exists about this fact. Most authors cite Pennsylvania Hospital, which began operations in 1752 in Philadelphia, as America’s earliest hospital because it was the first in the colonies proper. Some believe Bellevue Hospital of New York was first since it began service on March 31 1736, with a 6 bed facility located on the second floor of a prison (“public workhouse and house of correction”). Others refute this claim because it was not originally a building dedicated to solely serve the sick. Lastly, some insist that Master Jacob Hendrickszen Varrevanger, a surgeon with the Dutch West India Company, established a small hospital that served the 1,000 inhabitants of New Amsterdam (later New York City) in 1658.

Surgeons and barbers were both in the same guild until they separated in 1745. Prior to that, both used a red and white striped pole to advertise their professional place of business.
William Shippen and John Cochran), that a significant need existed for extensive and rapid transportation of the medically needy, especially the battle wounded, to designated medical facilities. Second, a categorization of hospitals, between “camp” and “regimental/general” was devised as a means to sort patients according to the intensity of their medical needs, urgency of medical care required and their burden upon local armies’ medical capabilities and battle readiness.

At the outset, and during the course of the revolution, documents reveal that much thought, and sometimes debate, centered on the proper design of the medical services system for the army. This system included mobile and stationary hospitals, their design, location in proximity to battle areas, staffing, sanitation, supply and medical capability designation; response of appropriate medical care to the wounded on the battle field, including a rudimentary triage process; extrication of the injured to remote treatment sites/facilities; and eventual transportation of patients, based on their needs, between immediate (camp or flying hospitals) and regional, individual colonial military hospitals (Regimental) or Continental Army (General) hospitals.

George Washington recognized early on that the diversified, individual colonial armies’ hospitals and their personnel needed to be incorporated into an overall command structure and operational system. The Continental Congress enacted a series of laws designed to formulate a national military medical system, repetitively and increasingly detailing the components, composition and organizational structure of that system. It became the Director General’s responsibility to assure that the regimental physician/surgeon was supplied with sufficient quantities “of large strong tents, beds, bedding, medicines, and hospital stores” and with “wagons and drivers” whenever patients needed “conveyance” to the general hospital. The latter constitutes the first recorded recognition of need and attempt to establish an EMS and/or medical transportation system.

In January of 1777, George Washington instructed the army’s Hospital Department Director General, Dr. John Cochran, to consult with another well know physician of the day and his future successor, Dr. William Shippen, to reorganize the medical system, including the “flying hospitals”, to accompany his armies in the field. Flying hospitals were equivalent to today’s MASHs (Mobile Army Surgical Hospitals). They were semi-transient field hospitals that...
moved with the regiment or divisional army, providing immediate care to post battle wounded and for the medical ill. Directly after combat they would either dispatch physicians and surgeons from their base camp to the battle filed to triage and treat the wounded or they would send assigned wagons to retrieve the injured for transport back to the flying camp for medical aid there. Once initially treated at the camp hospital, certain soldiers, depending on their need for continued care or convalescence, would be moved again, this time to a regimental or general medical institution.

Throughout the war however, this military medical care system remained in disarray, never being completely or appropriately organized despite increasingly detailed infrastructure design and operational instructions from the Continental Congress, the Hospital Department’s Director General and George Washington himself. With little financial support and a poor initial outline of organizational authority from the Continental Congress, along with few commanders in the field that paid sufficient attention to directives being handed down on how to configure medical care delivery, build and maintain hospitals, staff facilities and store needed supplies, the condition of the military hospitals and the care received by the soldier suffered greatly.

In spite of innovate concepts such as tiered, specialized medical care and priority assignment of wagons as ambulances, the Continental Army was unable to effectuate efficient medical operations. In fact, it was not even possible to adequately maintain a decent standard of medical care. Military hospitals were notoriously unsanitary, understaffed and poorly supplied. Medical transport wagons were never specially designed or equipped (other than the supplies and instruments their occasional physician/surgeons carried) to handle the ill or injured. However, during what we would classify today as “interfacility transports”, physicians or surgeons did sometimes accompany the medically incapacitated during large movements of patients from camp hospitals to regimental or general hospitals. It is arguable that the American revolutionary soldier received worse medical care than his civilian counterpart, even though the latter lived with a more primitive healthcare system.

*Between Wars: The American Revolution – The Civil War:*

Following the Treaty of Paris in 1783, the Continental Army, along with its Hospital Department, was disbanded. Essentially no medical structure remained active in the military of the United States between the end of the revolution and the period just prior to the War of 1812. Although laws and military regulations existed on paper, virtually none were in force. No advancements in pre-hospital care or transportation took place during this time, despite continued combat activity with the Indian Campaigns of the 1790’s.

While America was stagnating in the arena of EMS system development and continued to fail to recognize the need for the creation of effective, customized medial transport mechanisms, others

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"on each side and a chimney at one end. Two such hospitals are to be made for each brigade at or near the center and if the ground permits of it not more than 100 yards distance from the brigade."

xxxii From the Continental Congress documents; LAW OF 30 SEPTEMBER 1780: “That the quartermaster general furnish the hospital department, from time to time, as occasion may require, with such a number of horses and wagons as may be necessary for removing the sick and wounded, and for transporting the hospital stores; but that no other horses than those belonging to the officers of the department, for which forage may be herein allowed, be kept seperately and at the expence of the department.”
in world were moving forward. In 1788, a “Royal Ordinance” was passed in France that required the creation of improved transportation for those wounded in battle. And, on November 12, 1792, the French National Convention declared the need to construct "suspended carts for the transportation of the sick and wounded of the armies." xxxiii

Despite a landmark in world history regarding EMS and medical transportation in 1793, the United States took little notice and failed to incorporate any of its components for decades. Dominique-Jean Larrey (1766-1842), Napoleon Bonaparte’s chief physician and surgeon, conceptualized and implemented a cogent, comprehensive pre-hospital care system that, for the first time, triaged the injured, provided immediate, temporary medical care xxxiv and transported the injured from the battle field to strategically placed medical aid stations in a formal, regulated way using special apparatus. Larrey’s “ambulance volante” (flying ambulances [field hospitals]), were comprised of a corps of surgeons and nurses who accompanied armies into battle and rendered care to soldiers’ wounds both on the battlefield and in mobile field hospitals. Responding to the site of injury (usually the field of battle) and often under continuing enemy fire, they determined who was the most seriously hurt and treated them first. They utilized new, advanced medical techniques for the time (also invented by Larrey), and then moved those in need of continued, or more definitive care, to temporary medical facilities, which were especially equipped and supplied to handle battle trauma. His corp used customized wagons that Larrey designed, which constituted the first specialized and practical conveyance devices to move the injured from point of incapacitation to medical facilities (what we now refer to as ambulances, that he subsequently modified to meet local demands of terrain and specific transport obstacles xxxv see figure 8).

Larrey’s memoirs reveal how he came to realize the need for and first conceptualized the idea of a specialized medical transport vehicle; “I now first discovered the inconveniences to which we were subjected in moving our ambulances or military hospitals. The military regulations required that they should always be one league xxxvi distant from the Army. The wounded were left on the field, until after the engagement, and were then collected at a convenient spot, to which the ambulances speeded as soon as possible; but the number of wagons interposed between them

xxxi A prize was offered for the design that complied the best with the commission's specifications. The criteria included a requirement for the vehicle to be “light, solid, suspended, and comfortable for carrying four or six casualties lying down, eight at most.” However, after 8 months of considering over 29 designs, the commission decided its specifications were unrealistic. Political leaders, nonetheless, forced the committee to pursue a design. The result; an ambulance that was too heavy and impractical for the battlefield. These efforts coincidentally delayed the implementation of Larrey’s ambulance design, which had already been successfully field-tested.

xxxiv From Dominique-Jean Larrey’s writings: “The best plan that can be adopted in such emergencies, to prevent the evil consequences of leaving soldiers who are severely wounded without assistance, is to place the ambulances as near as possible to the line of the battle, and to establish headquarters, to which all the wounded, who require delicate operations, shall be collected to be operated upon by the surgeon-general. Those who are dangerously wounded should receive the first attention, without regard to rank or distinction. They who are injured in a less degree may wait until their brethren-in-arms, who are badly mutilated, have been operated and dressed, otherwise the latter would not survive many hours; rarely until the succeeding day. Besides with a slight wound, it is easy to repair to the hospital of the first or second line, especially for the officers who generally have means of transportation. Finally, life is not endangered by such wounds.”

xxv Larrey altered his ambulance design from a “covered wagon” to a “pannier” or “saddle-bag” type, that was affixed to camels in Egypt. See images in appendices.

xxvi A League is about three miles.
and the Army, and many other difficulties so retarded their progress that they never arrived in less than 24 or 36 hours, so that most of the wounded died for want of assistance...this suggested to me the idea of constructing an ambulance in such a manner that it might afford a ready conveyance for the wounded during battle. I was unable to carry my plans into execution until some time later."\(^{19}\)

Larrey considered several designs for the transport vehicle he had determined was needed to rapidly evacuate the injured to a field hospital. One included stretchers affixed to the sides of horses, as in the fashion of saddlebags, which he was to later utilize in the deserts of Egypt, replacing the horse with a camel (see figure 9). However, at the outset, he settled on covered wagons drawn by horses, with either one (for level ground) or two (for rough terrain) sets of wheels.\(^{20}\) His flying-ambulances were also designed to carry medical equipment, supplies and medicines to aid in the evacuation and in-transit care of the patient.

At the same time that Dominique-Jean Larrey invented and deployed his revolutionary pre-hospital care system, another French surgeon, Baron F.P. Percy, formulated his own concept of EMS. Percy’s system resembled more of a “Mobile Emergency Room” than an ambulance-field hospital system. Baron Percy introduced the idea of a regular corps, specially trained in and equipped for the transport of injured, using stretchers and educated in a formal, regimented course of instruction. Their task was to accompany a large medical wagon\(^{xxxvii}\), capable of treating a large number of patients, to the scene of the battle wounded, and strike out in a radial fashion to rapidly retrieve the injured. Once returned to the mobile hospital wagon, the surgeons would immediately provide medical care to the wounded, treating them sufficiently until they were either ambulatory or could be transported in the wagon.

Back in America, on July 16, 1798, President John Adams signed into law the “Act for the Relief of Sick and Disabled Seamen”, which created the Marine Hospital Service\(^{xxxviii}\), that we now know as the U.S. Public Health Service. A year later the law was extended to cover all officers and sailors serving in the U.S. Navy. Initially, this law established a network of medical care, with a system of hospitals, for the aid of American merchant seaman. Beginning along the northeast coast, it would proliferate to the Great Lakes as well as the Gulf and Pacific coasts. However, it relied on local mechanisms of transportation to move its patients until the system acquired ambulances of its own, circa 1900. Emergent medical care was still provided onboard ship when a seaman took sick or became injured. The Maritime Hospital System served primarily the role of definitive care and convalescence, not EMS.

In the U.S. army, the period between the revolution and the War of 1812 brought no significant improvement, enhancement or expansion of medical care or medical transportation. In fact,

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\(^{xxxvii}\) It could carry as many as 10 persons (surgeons and assistants) with equipment, to critical points in a fluid battlefield. The wounded were then brought to the surgeons, by foot, by a corps of stretcher-bearers. Such duty was not only quite strenuous and dangerous, but also was militarily significant: it relieved the common infantryman of the arduous task of caring for their own wounded. While these were great innovations of this time, Percy's ambulance system never saw widespread battlefield implementation, and thus, never achieved the operational significance of Larrey's system.

\(^{xxxviii}\) This was the first prepaid medical care program in the United States, financed through compulsory employer tax and federally administered. Each seaman had twenty cents every month deducted from his wages to fund the system.
during this time, there was a general atrophying of what had been designed and established prior. The leaders of the country were still reticent concerning an organized military and thus reluctant to enlarge America’s forces. Despite three successive War Department Secretaries who were physicians and some laws still in effect concerning a military Medical Department, the state of medical care in the land militia of the United States regressed.

Legislation in 1799 that created the post-revolution Medical Department did, however, codify some lessons learned during that war. Namely, the need for the “purveyors” (purchasers of medical supplies and equipment) and the regimental surgeons, to be under the control of the Physician-General of the Medical Department and the senior hospital surgeon of an army district. This legislation further detailed patient care assignment responsibilities, hospital staffing schedules and discipline rules, camp sanitation requirements, as well as examination boards for candidates seeking positions within the department. Thus, the importance of having a structure to govern the provision of medical care, at least in urgent circumstances such as battle, was realized. A medical care system had become an integral part of the American military establishment, albeit mostly on paper for the time being.21

Non-dedicated, unspecialized wagons and carriages were still being used during this time to move the wounded and non-ambulatory ill. They were not particularly outfitted to provide comfortable transport or allow for the convenient rendering of medical care in transit. Excerpts from historical documents of the time, as an example the August 20th, 1794 Battle of Fallen Timbers near Fort Defiance in the Northwest Territories reveals; “The wounded… were considered fortunate to be moved from the battlefield in a carriage”, however, “Doctor Carmichael through neglect had the wounded men of the artillery and cavalry thrown into wagons, among spades, axes, picks, etc”.11

The introduction of pre-defined, unit specific medical supply packages occurred now. They were created as means to organize and improve supply distribution within the land militia’s hospital system. Dr. James Mease, followed by Dr. Francis LaBaron, delineated standardized medical supply and drug inventories, designed and built “medicine chests” and packaged the caches for distribution to the various military hospitals of the army.xxxix

Little changed in American EMS during the early part of the 19th century, even though medicine in general was maturing, both in the United States and around the world. Advances in health care, preventative and definitive, were taking place at a rapid pace. The use of anesthesia for surgeries was introducedxli, the stethoscope was born22 (see figure 10), Addison’s, Bright’s, Hodgkin’s, Graves and Parkinson’s diseases were all discovered. Rudolph Virchow, a German pathologist, broke radical new ground by displacing the traditional “Humoral”xlii, “Boerhaave”xxliii

xxxix Each “medicine chest” was designed to serve 500 men and be carried on a baggage wagon three and one-half feet long.
xli In 1842, the American physician Crawford Long discovered the anesthetic effects of ether. In 1844 dentist Horace wells used nitrous oxide as an anesthetic for the first time. Also in the United States, a dentist named William Morton used ether during a tooth extraction in 1846. Anesthetics, were shown to reduce surgical mortality and allow surgeons to perform longer, more complex operations.
xli Aristotle developed the *Humoral* theory in the 4th century. It described four principal fluids (or humors) existing within the body; blood, choler (yellow bile), melancholy (black bile) and phlegm. An equal balance between the
and “Cullen” theories of medicine predominant in the Untied States, showing instead that all disease was based on disorders of the cells. Despite these extraordinary steps forward, no significant changes occurred regarding pre-hospital, emergent care or transportation.

During the War of 1812, dedicated, specially equipped wagons were still not in use for the transport of wounded or sick. The procedures used to retrieve and treat patients was the same it had been during the revolution. The structure of the Army’s Medical Department was unchanged and the designation of field versus general hospitals was identical to that of the Continental Army. It is interesting to note, that in spite of their knowledge of Dominique-Jean Larrey’s pioneering work for Napoleon in emergency medicine circa 1790, the military doctors of the American Army failed to implement any of his innovations.23

In other places, however, EMS development was occurring. Around 1840, a specialized medical transport vehicle was introduced for use in Scotland24. It was a converted Growler or Clarence25 carriage and could carry two to three patients at a time with an attendant nurse. This coupe coach was equipped with large elliptic springs from which the carriage itself was suspended, providing a relatively comfortable ride. It was modified with pneumatic tires to provide an even smoother ride for the patients it was transporting. It became known as the Clarence Ambulance26. In addition, its interior was lined with highly polished butternut wood paneling to facilitate washing for sanitation purposes. It remained in use until the beginning of the 20th century (see appendices for picture).

The Civil War:

The next significant development of American EMS and medical transport was to take place during the Civil War (1861-1865). Finally adopting some of the ideas put forth by Larrey, the Union Medical Department implemented the use of committed, customized horse drawn wagons as ambulances (see figure 11) as well as stretcher litters and pack animal cacolets (see figure 12).27 In addition, a dedicated group of stretcher-bearers and ambulance wagon attendants/drivers was formed, who received specialized training by the Medical department in their tasks28 and a tiered transport system was developed.

The level of medical care afforded soldiers was separated based on intensity needed and the fundamentals of triage. At the location of injury, rudimentary assessment of wound severity was

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footnote 23: Boerhaave believed that disease was based on chemical and physical qualities, such as acidity and alkalinity, or tension and relaxation, not the four humors. A main tenant of his theory was that nature be permitted to aid in any cure.

footnote 24: Cullen believed either an excess (characterized by fever) or an insufficiency (characterized by chill) of nervous tension under lied all disease. Excess was to be treated by depleting regimens including bleeding, a restricted diet, purging, rest and sedation. Insufficiency, the opposite, which called for restorative measures.

footnote 25: Named after the Duke of Clarence (1765-1837), later William IV of England. He had designed a light carriage in the fashion of the Brougham coach, a popular transport device of the time resembling American stagecoaches of the West.

footnote 26: Cacolets were a pair of rigid chairs that hung over the back of mules or other pack animals, in a saddle bag fashion, for the purpose of carrying sick or wounded in a sitting position. They were in use in other parts of the world prior to the American Civil War, such as in the Crimean during that conflict.
performed and rapid transportation, usually by stretcher, was provided to the Field Dressing Stations. These stations were located very close to battle, sometimes on the battlefield itself, and were where the first medical intervention was made. Medical personnel attended to the wounded, applying bandages and administering pain-killing medication (predominantly whisky and morphine). Then the patient was moved by ambulance to the Field Hospital. Here, soldiers were formally triaged and separated into one of three categories; wounded, surgical cases and mortally wounded. The non-fatally wounded were treated with more secure dressings, splints for simple fractures, etc. Surgical cases were usually those requiring amputations, and were performed on-site using either chloroform or ether as anesthetics, if available. Post-surgical cases and the wounded requiring further care were then transported to the General Hospital, located well behind the lines, often in major cities or towns. Here soldiers were provided some definitive medical attention, as well as follow-up and convalescent care.

While the organization of the Medical Department became more structured and effective over time, it initially did not provide for the removal of wounded from the battlefield or their transport to aid stations or hospitals. Surgeon General William A. Hammond decried the lack of this needed component of the military medical care system in a letter to Secretary of War Edwin Stanton on September 7, 1862, “…attention to the frightful state of disorder existing in the arrangement for removing the wounded from the filed of battle. The scarcity of ambulances, the want of organization, ...the total lack of ambulance attendants.”, concluding “An ambulance corps should be organized and set in instant operation…”

The disorganization that burdened the Medical Department is evidenced by events that occurred during and immediately after the Seven Days Battle (Peninsular Campaign of April-July 1862). In the aftermath of fighting, the injured were sent to hastily established gathering points and field hospitals, the ambulance system that did exist, quickly failed and the wounded piled up, many untreated for days.

Hammond appointed Jonathan Letterman as the new Medical Director of the Army of the Potomac. Letterman was instrumental in putting Hammond’s concepts into practice and honed them even further. He established an effective ambulance corps and included techniques in the loading and unloading of patients on stretchers into and out of ambulance wagons. He ordered that all ambulances be staffed with dedicated attendants at all times and be prepared to move immediately and quickly when called upon. Letterman fined tuned the use of ambulances by separating their duties based on their capabilities. He determined that light, two wheeled ambulance carts should be used to retrieve the wounded from the battlefield to the dressing station or field hospital, while the larger, four wheeled wagon ambulances should be held in reserve to move patients to more definitive facilities, general hospitals, rear of the lines. Further, he made it clear that ambulance vehicles were expressly for the sick and wounded and could not be used for other reasons.

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xlvi It is interesting to note that throughout the war, both the Union and Confederate medical services provided care for the opponent not only on the battlefield but often for a significant time thereafter. Triage did not include which side of the conflict a soldier was engaged.

xlvii Hammond’s contemporary, but subordinate, Dr. Charles Tripler (Medical Director of the Army of the Potomac) is also given credit for implementing dedicated ambulance wagons and training attendants.
At the battle of Fredericksburg, Hammond’s and Letterman’s reorganization of the Medical Department’s EMS operations bore fruit. In stark contrast to previous engagements, at Fredericksburg over 9,000 soldiers were transported, treated and hospitalized within 24 hours.

Letterman was also instrumental in improving other components of the system. He streamlined the supply process and established, for the first time in America, automatic delivery of medical provisions, at predetermined levels and according to a specified timetable, to medical facilities on a large scale. He also categorized his medical staff, organizing them by ability and assigning them thusly to dressing stations, collection points (triage stations), field hospitals and rear, definitive care, facilities. He also implemented protocols of triage and echeloned medical care, and maintained the use of detailed medical statistical data throughout his tenure.

As word within the Union Army spread about the efficacy of the ambulance system, other divisions adopted it. Finally, on March 11, 1864, President Lincoln signed into law legislation (“An Act to Establish a Uniform System of Ambulances in the Armies of the United States”) passed by Congress that established a standardized system of ambulance service throughout the military. The law also mandated the use of special uniforms for the ambulance corps and special signs for the ambulances. Regulations issued during the war by both sides, and incorporated into this law, also conventionalized specific insignia and signage for recognition of ambulances and hospitals.

Aside from litters, cacolets and wagons, trains and boats were also employed as medical transportation vehicles, on a regular basis. Ambulance wagons may have taken the wounded and sick from filed hospitals to trains or hospital ships instead of directly to the general hospital. This would have occurred if the general hospital was too far to allow for a reasonable transport by wagon and a train or ship was more convenient. Thus, a stratified system of medical transport and transport vehicles came into existence.

A significant outside influence of the military regarding enhanced medical care during the war was the Sanitary Commission (modeled after the English Sanitary Commission of the same era), latter to become the American Red Cross. It was a private organization, founded by the first woman physician in America, Elizabeth Blackwell, and Dr. Henry Bellows, serving as its first President, ands influenced by Clara Barton. It provided necessary items, such as blankets, food, medicines, etc and also aided in the establishment of field hospitals. The Commission, in addition, trained and provided nurses for the army. But its most important contribution may have
been its codifying of criteria to be used by medical personnel for the maintenance of sanitary conditions in the treatment of soldiers and the environment of the hospitals.

Also at this time, 1863 through 1864 specifically, the Geneva Convention was held in Switzerland. An international meeting of sixteen nations and four philanthropic groups, it was convened to negotiate agreement among the world powers for the treatment of wounded combatants, medical personnel on battlefields and at hospitals and affected civilians during conflicts. The Convention promulgated a treaty that conferred neutrality upon the injured and their caregivers of all countries involved or affected by wars. Provisions of the treaty included requirements governing sanitary and medical supplies, equipment and ambulances, that the world’s nations agreed to follow. The Convention also led to the establishment of the International Committee of the Red Cross and the use of that symbol to signify persons or places of neutrality. Over the years the scope of the Geneva Conventions broadened to include the sick at sea, prisoners of war and protection of civilians. 

The Pre-Modern, Industrial Era:

Following the Civil War, several hospitals throughout the country maintained the ambulance services they had created to transport soldiers of the conflict. In Ohio, Commercial Hospital (founded in 1820 as Commercial Hospital & Lunatic Asylum, now known as Cincinnati General Hospital) established what is generally considered as the first regular ambulance service for the general public in 1865. This service is now operated by the city’s fire department. Other ambulance services immediately followed at Grady Hospital in Atlanta and Charity Hospital in New Orleans (the same hospital established in 1736 and considered by many as the first hospital in America).

In New York City, Bellevue Hospital initiated their ambulance service in 1869 (see figure 13). Organized by Dr. Edward L. Dalton, a former U.S. Army surgeon, his service is notable because it was staffed with physicians and included a significant amount of specialized equipment for the treatment of patients not only at the scene of the emergency but also enroute back to the hospital. The carriage was relatively lightweight, between six and eight hundred pounds, and had a moveable floor that could be pulled out to receive the patient. The horses used to pull the ambulances were stabled nearby the hospital with quick application harnesses to expedite their response, similar to the procedure and apparatus used by fire departments of the day. This service also used an alarm system of sorts to notify the drivers and physicians assigned to the ambulance of an emergency request; A released weight would fall to trigger the lighting of

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a lamp to awaken the sleeping crew. By 1870, the telegraph was used to send requests to Bellevue’s Center Street branch where ambulances would then be dispatched.\textsuperscript{31lv}

Arguably, the design and establishment of the first civilian pre-hospital emergent care system provided by trained non-physician, non-military personnel in the world, occurred in Great Britain in 1872 and is credited to Surgeon-Major Peter Shepard. He invented a special vehicle to transport the sick and injured, called a St. Johns Ambulance (see figure 14) after the altruistic order of Knights who provided medical aid to crusaders and pilgrims in the 11\textsuperscript{th} century, and instructs a group of civilians in its use. Shepard\textsuperscript{lv} also trained them to care for patients both at the scene and in transit to hospitals through a formalized educational program with standardized curriculum. This group formally organized in 1877, calling itself the St. Johns Ambulance Association.

The first civilian-manufactured ambulance (specialized medical transport vehicle) in the United States was produced in 1890 and was built by the Hess-Eisenhardt Company of Cincinnati, Ohio.\textsuperscript{32 lvii} It was a horse drawn wagon specifically designed to move the incapacitated, in need of medical care. Shortly thereafter, the first motorized ambulance was made in Chicago and donated to the Michael Reese Hospital by five local businessmen in 1899. This was quickly followed by St. Vincent’s Hospital of New York, which began operating an automobile ambulance in 1900.\textsuperscript{lviii lvii}

In 1910, the first known aircraft ambulance (a plane modified to carry a patient lying down) was built in North Carolina and tested in Florida. It failed shortly following take-off and crashed after flying only 400 yards in Fort Barrancas, Florida. Captained by George H.R. Gosman and Lieutenant A.L. Rhodes, it flew just 100 feet off the ground before blowing an oil line. By 1929, the U.S. Army Air Corps had been organized and had designed three planes to perform as ambulances. They were built and equipped to carry two patients on stretchers, a pilot and an attendant.

\textsuperscript{lv} By 1893, Bellevue maintained a fleet of nine ambulances. Four drivers and two surgeons were assigned full-time to the ambulance service. Requests for their service were received from the New York City Fire or Police Departments by telephone or telegraph.

\textsuperscript{lv} In 1878 Shepard of the Royal Herbert Military Hospital (Woolwich, London) and another Aberdeenshire military officer, Colonel Francis Duncan, joined forces to teach first aid skills to civilians. Shepard conducted the first class in the hall of the Presbyterian school in Woolwich using a comprehensive first aid curriculum that he had developed.

\textsuperscript{lv} Founded in 1876 as the Sayer-Scovill Company, they initially built custom coaches and carriages. They are also recognized as producing the first motorized ambulances, in 1906, and the first with air conditioning, in 1937. They no longer manufacture ambulances, specializing now in armored vehicles, including limousines for the President of the United States.

\textsuperscript{lvii} The first motorized ambulances were equipped with two-horsepower electric engines able to travel about twenty to thirty miles. The physician attending the patient in the back of the vehicle communicated with the driver by use of a speaking tube. These ambulances also had electric lights, inside and out, of ten candlepower intensity.

\textsuperscript{lviii} On September 6\textsuperscript{th}, 1901, the first American President ever transported in an ambulance was the dying William McKinley after being shot by an assassin at the Pan-American Exposition in Buffalo, New York.
At the dawn of the 20th century, local governments and hospitals in America were continuing to assume the responsibility for the provision of EMS to the public. No particular pattern developed and no standards became customary as each locale invented their own, homegrown version of EMS. The military, likewise, continued to develop and modernize its EMS operations. By the outbreak of World War I (1914-1918), the U.S. Army was well prepared, including a fleet of specially designed, motorized ambulances (see figure 15). The core concepts of emergency pre-hospital medicine remained fundamentally unchanged within the military from those espoused by Larrey and Letterman, while those in civilian America had yet to be fashioned.

Beginning in 1928 with the inauguration of the Roanoke (Virginia) Life Saving and First Aid Crew, founded by Julien Stanley Wise, civilian, non-hospital based EMS became a thriving option in the United States. Even though municipal sponsored services, such as fire department rescue squads, were multiplying around the country, no independent, volunteer organizations had been established until Wise’s Roanoke experiment. Throughout the 1920s and 1930s, numerous volunteer EMS groups incorporated and began serving local areas.

A significant milestone in EMS system development in the United States was reached by 1936. In that year the American Red Cross (ARC) had established nearly 900 dedicated posts, spread along the country's highways, with the purpose of aiding those involved in motor vehicle accidents. These Emergency First Aid Stations (see figure 16) were usually housed in existing facilities such as stores, inns, gas stations and firehouses. Local ARC chapters provided the first aid training to the volunteers involved in staffing the posts, were responsible for first aid kits and medical supplies and guaranteed that the stations met sanitation requirements. Mobile aid units, composed of fleets of trucks, highway patrol cars, and other vehicles were also organized as adjuncts to the stations. The posts, which were required to respond to appeals within their designated region, maintained lists of available doctors and ambulances in the area, to be summoned as necessary. By 1939, there were almost 5,000 posts and mobile aid units with trained volunteers.

During this period, prior to World War II, hospitals were substantially involved in providing ambulance service in many large cities throughout the country. But, during the war, consequent to the severe manpower shortages that resulted, many hospitals found it difficult to maintain these operations. City governments were forced to seek solutions to voids that had thus developed in the emergency medical services within their boarders. In some cases, they turned ambulance service over to the police or fire departments. At this time, no laws are known to have existed in the United States that required any training standard for ambulance personnel, any minimum criteria for ambulance design or construction or mandated any on-going medical oversight requirements. The only noteworthy training program at all that existed in the country

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lix Examples; Phoenix, Arizona F.D. initiates answering “inhalator” calls, L.A. County, California & Columbus, Ohio F.D. begin providing medical response service and Yale-New Haven Hospital begins ambulance operations during this period.

lx Julian Stanley Wise was a leading pioneer in the development of the volunteer EMS in the United States. His idea stemmed from a 1909 accident when he was nine and watched helplessly, with some friends, from the banks of the Roanoke River while two canoeists drowned. It is reported he resolved on-the-spot to become a “lifesaver”. From 1928 on, he devoted his life to spreading the volunteer EMS concept across the nation, and created a movement of international significance.
A History of EMS & MT in America

Vincent D. Robbins

was the American National Red Cross’s basic first aid course. Until the 1960s, little else would change regarding civilian EMS, few advances would be made and virtually no further “systemization” would occur in America.

World War II, the Korean Conflict and the Vietnam War all brought advances in trauma medicine to the military, which flowed into the civilian sector. Some improvements in military EMS organization and operations occurred, most noteworthy of which was the use of helicopters to rapidly retrieve critically injured patients from the battlefield, transporting them to field hospitals (MASH units). Reducing the time from injury to surgical intervention, with on-scene advanced medical treatment, such as intravenous fluids, by non-physicians, marked a milestone in the progression of clinical care. But few of these system attributes trickled into the civilian sector, which had stagnated since the great steps forward gained during the Civil War a century earlier.

The Impact of the Automobile:

The invention of the automobile and its subsequent proliferation would ultimately provide the impetus for the development of modern day EMS in the Untied States. Ever since it appeared on the scene in 1769, the automobile wreaked havoc on pedestrian and occupant alike. The first automobile, the “Fardier à vapeur”, a steam powered apparatus designed and built by French military engineer named Nicholas-Joseph Cugnot, actually crashed against a garden wall. Soon after the first motorized automobile was built and routinely operated in 1885, it caused the first related fatality, a pedestrian in Croydon, England. Then, eighteen months later, on August 17th, 1896 in the Croydon borough of London, England. The accident occurred on the terraced grounds of Crystal Palace. She was hit as she stepped off a curb by a car traveling 4 mph. Witnesses described the car as moving at "tremendous speed". She died of head injuries within minutes. The car was owned by the Anglo-French Motor Car (Roger-Benz) Company and driven by Arthur Edsell, an employee, who was giving public demonstration rides on behalf of the company. He had learned how to drive only 3 weeks earlier (no driving tests or licenses existed at that time). It was purported he tampered with the vehicle, causing it to double its speed. Some witnesses said he was distracted by conversation with one of the passengers. After a six-hour
February 12, 1898 in a neighboring borough of London, the first fatal car accident occurred, in
Surrey.\textsuperscript{lxv}

In America, the first recorded automobile fatality occurred in New York City on September 13, 1899.\textsuperscript{lxvi} The victim was Henry Bliss, 68, who was stepping off a street car at the time and was struck by a taxi cab at West 74th Street and Central Park West. The driver of the electric powered automobile, Arthur Smith, was charged with manslaughter but later acquitted because his actions were deemed untensional. Henry’s chest and head were crushed by the accident and he died the next day at Roosevelt Hospital.

As the morbidity and mortality associated with traffic accidents compounded each year, a series of\textit{National Street and Highway Safety Conferences}\textsuperscript{lxvii} were organized. They focused on the planning and design of roadways and the creation and implementation of uniform codes of vehicle rules. The aspects of the conferences associated with vehicle caused injury and deaths were confined to prevention, with little attention, if any at all, paid to emergency medical services or any aspect of medical treatment.

By the 1950s, fatalities resulting from accidents involving automobiles had reached epidemic proportions, more than 36,000 a year. Even though the rate of mortality had declined steadily since records were initiated in 1922\textsuperscript{lxviii}, which was mostly attributable to the overall general advancement of medicine in society, the aggregate death toll was staggering. As a result, and in spite of his reluctance to interject the federal government into areas traditionally under state authority, President Dwight D. Eisenhower created the\textit{President’s Committee on Traffic Safety}.\textsuperscript{lxix} Its purpose was to coalesce previous recommendations of the Conferences, augment them with new analysis targeted on safety and push forward in developing remedial plans.

Corner’s inquest, the jury returned an "Accidental Death" verdict. Neither the driver nor the company were prosecuted. The Coroner, William Percy Morrison, remarked: “I trust that this sort of nonsense will never happen again.” He is credited with being the first coroner to apply the term “accident” to violence caused by speed.\textsuperscript{lx} This victim’s name was Henry Lindfield, a Brighton businessman, who crashed his car into a tree on Russell Hill Road in Purely section of London, England. He was 42 years old, thrown from his car and trapped underneath the tree. His leg was subsequently amputated at Croydon General Hospital where he died the following morning. His teenage son Bernard, who had been traveling with him, escaped unhurt.\textsuperscript{lxvi}

This was also the first fatal car accident in the western hemisphere. A plaque was dedicated at the site on September 13, 1999, to commemorate the event. It reads:

“Here at West 74th Street and Central Park West, Henry H. Bliss disembarked from a streetcar and was struck and knocked unconscious by an automobile on the evening of September 13, 1899. When Mr. Bliss, a New York real estate man, died the next morning from his injuries, he became the first recorded motor vehicle fatality in the Western Hemisphere. This sign was erected to remember Mr. Bliss on the centennial of his untimely death and to promote safety on our streets and highways.”

\textsuperscript{lxvii} Held in 1924, 1926, 1930, 1934, 1946 and 1954 these conferences were first inaugurated by President Calvin Coolidge, through his then Secretary of Commerce, Herbert Hoover and continued through to the Eisenhower administration.

\textsuperscript{lxviii} In 1922, 14,859 people were recorded as killed by automobile accidents, a rate of 24.08 /100 million VMT (vehicle miles traveled). By 1959 the rate had fallen to 5.17 /100 million VMT.

\textsuperscript{lxix} Informally established on April 13, 1954, Eisenhower provided it with formal status through Executive Order 10858 on January 13, 1960, with the charge to “advance the cause of street and highway safety”.

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While car design and construction were improving and safety devices were beginning to make their appearance\textsuperscript{xx}, the nation continued to enhance its traffic laws and enforce its regulations more stringently. Engineers were building roadways better and educational safety programs, aimed at both the youth and the general public, made their way into the mainstream. However, civilian pre-hospital emergency medical care remained an absent and un-thought-of topic even at this late stage. There was practically no cohesive system of EMS anywhere in the civilian sector of American society; certainly nothing that compared to what was available in the military.\textsuperscript{34}

Significant advances in medicine and the lack of a pre-hospital treatment philosophy promoting aggressive intervention at the scene, led to a default model of rapid recovery and transport of the injured to the nearest facility. The primary providers of this service at the beginning of the 1960s included municipal based operations, such as police or fire departments, some private companies, but mostly funeral homes.\textsuperscript{35} The latter was well suited for the time to supply ambulance service since they had large, fast vehicles capable of transporting bodies in a supine position, were prolifically located near virtually ever community, and were readily available at almost any time.

\textit{Modern Day American EMS is Born:}

A convergence of several landmark events occurred in the mid 1960s that altered the very foundations of EMS in America, commencing a new era of modernity and organization. For decades a crescendo had been building regarding the carnage experienced from automobile accidents on the nation’s highways. Finally, in 1961, President John F. Kennedy declared, "\textit{Traffic accidents constitute one of the greatest, perhaps the greatest, of the nation's public health problems.}"\textsuperscript{36} Instantly, a new focus was established on the need for emergency medical aid for traffic accident victims in the country.

Then, under President Johnson’s administration several crucial events took place. First, in 1965, \textit{Medicare} was created by an act of Congress.\textsuperscript{lxxi} In the original legislation, ambulance transportation was recognized as a covered beneficiary service. In so doing the federal government had established a long term funding mechanism for EMS and medical transportation.

Next, in 1966, the \textit{President's Commission on Highway Safety} in its final report titled “\textit{Health, Medical Care and Transportation of the Injured}” listed emergency care and transportation of the

\textsuperscript{xx} First patented in the U.S. in 1885 by Edward J. Claghorn, seatbelts didn’t appear in American cars until the Tucker in 1947. Ford began supplying them in their general production models as early as 1956.

\textsuperscript{lxxi} Medicare was passed by Congress and signed into law by President Johnson in July of 1965. Officially part of the "\textit{Social Security Amendments of 1965}" it established a two-part insurance program for older Americans. The first part was a program of hospital and related benefits, financed by social security taxes. Key benefits included 90 days of hospital care, 100 days of nursing-home care, 100 home-nursing "visits" in each "spell" of illness, and hospital outpatient service. All benefits were subject to "deductibles," "coinsurance". The second part, a voluntary program of "supplementary" benefits, covered 80 percent of physicians' fees, additional home-nursing services, in-hospital diagnostic and laboratory work, certain kinds of therapy, \textit{ambulance services}, surgical dressings, etc. This supplementary plan would be financed initially through a $3 monthly premium from each beneficiary, matched by the Government out of general revenues. In addition, the act provided for a substantially expanded Kerr-Mills program extending "medical indigent" benefits to other age groups besides those over age 65.
accident victim to be one of its community action programs. This was a recognition that more than just better road design, preventative programs and safety education were needed to curb the death toll accumulating on the highways.

President Johnson championed the cause, declaring support for passage of the federal *National Highway Safety Act of 1966* (Public Law 89-564) and signing it into law that year. It highlighted, for the first time, *emergency medical care* \(^{lxxii}\) as a necessary element to reducing death and disability associated with traffic accidents. Expanding considerably from the “letter of the law”, extensive regulations promulgated pursuant to the Act, created the first comprehensive description of an EMS system, its components and standards \(^{lxxiii}\), defining a system far from one just associated with trauma injuries on highways. \(^{lxxiv}\) The Highway Safety Program Manual included 19 volumes \(^{lxxv}\) ranging from “Periodic Motor Vehicle Inspection” to “Accident Investigation and Reporting”. Volume 11 was titled “Emergency Medical Services” and incorporated eight chapters (with several appendices) that provided the guidelines and descriptions of an EMS system’s elements as well as technical assistance for their implementation. For the first time, America had a national resource tome that created a standard guide for the structure of an EMS system.

With a suddenly burgeoning bureaucracy, initial steps were taken to control, through consolidation, the several new and existing agencies that incorporated roadway safety and EMS as a part of their missions. On November 9, 1966, the National Traffic Safety Agency \(^{lxxvi}\) (authorized by the *National Traffic and Motor Vehicle Safety Act of 1966*; PL 89-563) and the National Highway Safety Advisory Committee \(^{lxxvii}\) (authorized by the *National Highway Safety Act of 1966*; PL 89-564), both in the Department of Commerce, were merged \(^{lxxviii}\) and commenced operations under the direction of Dr. William J. Haddon, Jr. They would ultimately be moved to a newly created Department of Transportation (DOT) on April 1, 1967, as part of the transfer of the Federal Highway Administration (FHWA). \(^{lxxix}\)

It is important to note that a competing government program surfaced shortly after EMS was first inaugurated into the modern era. In 1972, President Richard M. Nixon refocused the mission of

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\(^{lxxii}\) The terms “emergency medical services” or “EMS” never appeared in the legislation. “Emergency services”, “emergency medical care”, “emergency service plans” and “transportation of the injured” were used, but very sparingly. Although many authors attribute great detail to what the law mandated, it was essentially void of any specific language regarding EMS features. It was the regulations issued in 1969, pursuant to the Act, that formally identified EMS and its characteristics.

\(^{lxxiii}\) Referred to as Standard 11 of the “Highway Safety Program Manual” it is the definitive text which first defined an EMS system and delineated its elements. It was published on January 17, 1969 and appeared in Appendix A of the manual under the title “Implementation Guidelines”.

\(^{lxxiv}\) It is most probable that this deviated expansion from the automobile trauma related intent of the 1966 Highway Safety Act was the result of the personalities involved at the time, both in and out of government (Leo Schwartz of DOT’s NHTSA EMS division and David Boyd, then of Baltimore’s Shock Truman Center), and the tandem explosion of cardiac related medical research and cardiac/medical oriented paramedic units surfacing around the country in the late 60’s and early 70’s.

\(^{lxxv}\) It is often misreported that 18 volumes existed. This is because the first volume was number “0”.

\(^{lxxvi}\) Which would become commonly known as the National Traffic Safety Bureau.

\(^{lxxvii}\) Which would become commonly known as the National Highway Safety Bureau.

\(^{lxxviii}\) By Presidential Executive Order 11357.

\(^{lxxix}\) Originally established as the Office of Road Inquiry (ORI) in 1893, the FHWA attained its current name on April 1, 1967.
the Department of Health, Education and Welfare’s (DHEW, predecessor of today’s Department of Health and Human Services) EMS division, operated within the Public Health Service, toward EMS. Congress subsequently expanded its mission even further in 1973 when it passed the **EMS Systems Act of 1973** (PL 93-154). DEMS’s new found assignment would last only seven years, under the leadership of Dr. David R. Boyd, but would have profound impact on the expansion and medical orientation of EMS systems across the country. By virtue of its significant grant appropriations, DEMS would provide monies for over 300 experimental, demonstration EMS systems throughout the nation.

Coincidentally in the 1960s, monumental research would be completed and published, creating a vanguard for the advancement of multi-specialty EMS. Two watershed investigative papers; *Accidental Death and Disability: The Neglected Disease of Modern Society* by the National Research Council of the National Academy of Sciences and *A Mobile Intensive Care Unit in the Management of Myocardial Infarction* by J. Frank Pantridge (1916-2004) and John S. Geddes, scientifically established both the need and the efficacy of pre-hospital emergency medical services for both trauma and cardiac cases. More research would follow expanding even further the types of medical conditions that would benefit from pre-hospital care, but these two documents were the first definitively empirical evidence that America’s lack of a cogent EMS system needed to, and was capable of, change.

The introduction and propagation of pre-hospital medical care, especially advanced clinical treatment, would not wait for government bureaucrats. Often times with no legislation regarding their activities, physicians around the country were spearheading the use of medications, defibrillators and other advanced medical modalities in the field, at the scene of incipient need. Most of these services started with almost a single-minded focus of cardiac emergencies, but rapidly expanded into treating many other medically urgent conditions. The emphasis was shifting from the rapid recovery and transport of victims, to the rapid response of specialized personnel and apparatus and the stabilization of patients before movement to a hospital.

It was during this time and within this context of excited academic camaraderie, that the first advanced life support ambulance in the United States was launched. Credited to St. Vincent’s Hospital in Manhattan, New York and the brainchild of Dr. William J. Grace, this unit was staffed by physicians and responded to the scene of suspected cardiac emergencies. Dr. Grace published his findings with his colleague Dr. John Chadbourne, documenting a reduction in mortality from 21% to 8% with pre-hospital intervention of advanced cardiac treatment. Their Mobile Coronary Care Unit (MCCU) was operational by the late 1960s.

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*lxxx* Although it existed before 1974, DEMS was originally formed to prepare United States medical services for nuclear attack. Its mission was drastically changed by President Richard M. Nixon in his State of the Union address of January 1972 when he directed the DHEW “…to develop new ways of organizing emergency medical services and providing care to accident victims.”

*lxxxi* A total of almost eight million dollars were awarded to five “pilot” EMS programs in Florida, Illinois, California, Ohio and Arkansas. Also, nearly eleven million dollars was authorized by Congress between 1970 and 1972 for the national regional medical program (RMP) initiative.
The first non-physician, mobile, advanced medical treatment service in America was initiated in Miami, Florida in 1968.\textsuperscript{lxxxii} Dr. Eugene Nagel was the visionary who blended the training of surrogate quasi-physicians with radio technology to invent the \textit{paramedic} using \textit{telemetry} communication to receive real-time medical command from a doctor at the hospital. This service was followed shortly thereafter by similar programs in Columbus, Ohio, Jacksonville, Florida, Seattle, Washington and Los Angeles, California.

While the legislative impetus for the birth of modern American EMS was centered almost exclusively on trauma associated with motor vehicle accidents, the simultaneous, and serendipitous, medical research thrust spurring revolutionary, pre-hospital, non-physician, clinical care was targeted on cardiac emergencies (essentially myocardial infarctions and cardiac arrests). Despite this disparity, these two distinct versions of the new EMS paradigm would eventually amalgamate into a single, comprehensive construct. With the passage of the \textit{EMS Systems Act of 1973}, the two divergent themes of pre-hospital emergency care would be reconciled and formally recognized as a single, medically broad based, ideology. Language from the Act officially defined EMS as the provision of “…\textit{health care services under emergency conditions}…”, a substantial expansion of the vague reference in the 1966 \textit{National Highway Safety Act}, whose title and entire context set the parameter for the term it used, “\textit{emergency medical care}”, as related solely to injuries sustained from auto accidents.

By the close of the 1970s, EMS was firmly established in the medical infrastructure of the United States as its own discipline with its own science. During the next several decades it would become more sophisticated, evolving into an industry within its own right. As a result, unique business and economic models would arise to govern its administration, operation and financing. While the clinical and operational natures of EMS have matured substantially in a common direction since 1965, no predominant business scheme has surfaced as the most appropriate or accepted.

From embryonic afterthoughts to well refined, and sometimes complex, integrated organizations, EMS services at the beginning of the 21\textsuperscript{st} century are vastly different from their ancestors. The types and extent of medical care treatments provided in pre-hospital emergencies has expanded significantly over the years. The scope of clinical intervention that EMS caregivers provide today is far advanced from what was initially permitted, or even envisioned, at their inception in the late 60’s. However, the maturity and sophistication of how this care is delivered and how EMS systems are operated today, has developed in a varied and diversified fashion. There is no single theme or predominant system schema considered premier in the United States.

As pre-hospital care has become more advanced, delivery models have become stratified in many parts of the country, with more than one entity responsible for different components of the EMS system (see Chapter XX). These variously layered configurations of EMS provision have generated a multitude of business structures, differing by participant. The segments of EMS

\textsuperscript{lxxxii} It was organized by Dr. Eugene Nagel in collaboration with Drs. J. Miller and Jim Hirchman. The University of Miami Medical School sponsored the first paramedic training classes at the University of Miami and called its graduates "Physician Extenders." By March., 1967, these \textit{paramedics} were operational, transmitting heart rhythms to Jackson Memorial Hospital, with a medical-radio telemetry contraption that weighed 54 pounds, administering medication and defibrillating patients.
delivery are basically divided into; First Response, Basic Life Support, Advanced Life Support and Transport. Who provides each segment and their individual business structure can vary widely and most can be classified into a relative small group of models. We will review the most common in the United States today.

Contemporary EMS component providers can be classified into the following business types (more classically referred to as business models), using four main categories; 1) Tax Status, 2) Provider Status, 3) Funding Status and 4) Employee Status.

1) Tax Status:
   a. Profit
   b. Non-Profit
2) Provider Status:
   a. Private
   b. Hospital
   c. Government-
      i. Police Department (First Service)
      ii. Fire Department (Second Service)
      iii. EMS (Third Service)
      iv. Public Safety (Cross-Trained or Multi-Service)
   d. Hybrid-
      i. Trust
      ii. Utility
      iii. Cooperative/Consortium
3) Funding Status:
   a. Fully Subsidized (taxes, grants, franchises)
   b. Partial Subsidy & Fee-for-Service
   c. Fee-for-Service
   d. Partial Subsidy & Donation
   e. Donation
4) Employee Status:
   a. Paid
   b. Stipend
   c. Volunteer

*Tax status* refers to the legal designation, under the IRS code, of the corporation or entity that is either providing or is responsible for providing the EMS, or its component, in question. While some amalgamations exist, essentially there are only two types of tax status that could be held; For-Profit or Non-(Not-For) Profit. This distinction is important because it determines an organization’s financial motivation. Generally speaking, for-profit corporations exist to serve the financial benefit of individuals, while non-profits do not. Non-profits are more commonly associated with charity care and a mission to “give back” to the community.

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[lxxxiii] While there are technical, sometimes subtle differences between non-profit and not-for-profit organizations, we will consider them the same for the purposes of this text.
Next, the *provider status*, of which there are four main classifications, is considered. *Private* refers to those organizations owned by individuals or corporations (other than hospitals, since they are designated separately for reason), whether for-profit or not, who maintain controlling interest in the entity and exercise final corporate authority. *Hospitals* are highlighted apart from *private* organizations because they constitute a special group of providers with missions specifically recognizing their community and charity responsibilities and because they represent a segment of the larger healthcare industry, of which EMS derives its medical authority. *Government status* simply means the organization is part of a government entity and as such a civil service.

Lastly, *hybrid status* connotes some mixture of the other three categories. For instance, *Trusts* and *Utilities* are organizations structured in such a way that the government usually holds title to substantial assets of the EMS system infrastructure (i.e. ambulances, facilities, major medical equipment, etc.) and maintains control over pricing and quality measures, but contracts out the management of the operation to other providers (usually non-government). *Cooperatives* or *consortiums* are functional consolidations of separate entities, merging their operations to jointly provide EMS while maintaining their separate corporate identity and autonomy. The partners of these cooperatives govern the joint entity. This arrangement can be seen with various mixtures of *tax* and *provider* statuses.

*Funding* status is associated with how the EMS system attains the revenue needed to exist and operate. Again, some fusion of funding sources can occur in the real word, but those listed (subsidy, fee-for-service and donation) are essentially the only streams of income available to support EMS services. Subsidized entities receive revenue from sources other than the patients they serviced or the altruism of the general public. They usually take the form of monies derived from taxes, grants or annuities of some sort.

Fee-for-service simply means revenue is resultant from charges levied against the person receiving care. The provider may be responsible for billing, or that task may reside with a controlling authority, for example when cities or trusts contract EMS out to private services. In any case, the monies needed to operate the EMS come from those who received it.

The last category of *EMS type* is *employee status*. Basically, employees either receive payment of some sort for their services or they don’t. Those that do are either paid a market salary rate commensurate with hours worked, or they are, for all intents and purposes, volunteers that simply receive expense reimbursements or meager stipends to defray costs they encounter in the process.\textsuperscript{xxxiv} Otherwise, the entity’s personnel are true volunteers, receiving no remuneration for their services.

As an example of this matrix, one system type might be a *profit, hospital, fee-for-service, paid* organization. The system type title is both descriptive and self-explanatory. In this case, a hospital, which is for-profit, is directly providing EMS to an area using paid staff and charging

\textsuperscript{xxxiv} Important consideration must be given to the amount of stipends paid to individuals and under what circumstances. Case law exists that clearly delineates volunteers receiving acceptable, nominal stipends, from arrangements that violate federal and/or state labor laws pertaining to “minimum wage” and “payment for hours worked”.

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patients for their services. Their employees are not volunteers and they receive no subsidy from any source. In another circumstance, where the local fire department is operating the EMS system using its career personnel and not billing for the service, the type would be non-profit, government (fire department), fully subsidized (taxes), paid.

Theoretically, any combination of each category’s components could be selected to produce an EMS system type, however, not all exist in the real world to any significant degree. It is possible, also, to create hybrid types by acknowledging those services that mix components, especially employee status. The most common provider business models, by EMS component, will be discussed in more detail.

No comprehensive research exists regarding the overall state of EMS delivery and business structure in America. Some fragmented studies, however, have been done. For several consecutive years, fairly in-depth surveys focusing on the country’s 200 largest cities have been conducted by one leading industry journal. In addition, in 1999 an investigate project targeting Medicare billing by ambulance services in the United States was completed. Finally, in 1995, a director of the Emergency Care Information Center issued a report on the general outline of EMS in America. As a result of comparative analysis and data merging, some fundamental conclusions can be drawn, according to EMS system component.

Based on this information, the following business models seem the most prominent in the country, as a whole. In each of these, most components of the EMS system are provided by one entity, although First Responders constitute the most common fragmentation when the system is divided;

- non-profit, private, partial subsidy & donation, volunteer
- non-profit, private, donation, volunteer
- for-profit, private, fee-for-service, paid
- non-profit, government (EMS-Third Service), partially subsidized & fee-for-service, paid

In the 200 largest American cities, EMS is configured differently. The system is usually stratified, normally along First Responder and Transport lines. In the majority of these circumstances, First Responders are non-profit, government (Fire Department), fully subsidized, paid and do not transport to the hospital. Instead, they hand off patients to for-profit, private, fee-for-service, paid companies in most cases.

The following chapters will detail other aspects of EMS, medical transportation and their systems in the United States.
Pictures

Figure 1:

Figure 2:
Figure 3:

Figure 4:
Figure 5:

![Image 1](image1.png)

Figure 6:

![Image 2](image2.png)

Figure 7:

![Image 3](image3.png)
Figure 12:

Figure 13:
Figure 14:

Figure 15:

Figure 16:


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