

Chapter 2

Historical Perspectives in the Ambulance Service

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Introduction

The *Concise Oxford English Dictionary* defines an ambulance as ‘a vehicle equipped for taking sick or injured people to and from hospital’. Its nineteenth-century origins come from the French, ‘hôpital ambulant’, a mobile field hospital (Stevenson and Waite 2011, p. 41). In the history of the ambulance, almost any kind of transport has been employed to move the sick and injured, including stretchers, modified hand-carts, carriages and wagons drawn by oxen, horses, donkeys or mules, motorised vehicles, trains, ships and different types of aircraft. Non-emergency cases whose infirmity prevents their use of everyday transport may also use ambulances. The first military ambulance service provided injury stabilisation with ongoing necessary interventions en route, besides extraction from the location of the incident and conveyance to a place of care. These concepts were later developed at varying rates over the next 200 years in military and civilian contexts, although for most of the period ambulances were simply modes of patient transport with few refinements.

The Wounded in Battle

From the earliest times of human conflict, wounded soldiers were usually left on the battlefield, often for days, to die of thirst, cold or their wounds, being vulnerable to summary execution and looting by their enemies. Those who were recovered were transported by their compatriots to a place of care by whatever means was available

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to carry them. Potentially salvageable patients were lost because of long delays which caused the condition of survivors to deteriorate greatly. Philip II (382–336 BC), the father of Alexander the Great attached doctors and surgeons to each of his fighting units ('numeri', equivalent to a modern battalion of 350–400 men) and rewarded his stretcher bearers for bringing in men wounded in battle. Roman armies also gathered and cared for their wounded in battle. In the sixth century AD, the armies of the Byzantine Emperor Mauricius had squads of horsemen set aside with suitably modified saddles to take wounded men to medical tents prepared for their care (Bell 2009, pp. 3–10). In the eleventh century, crusaders provided wagons to carry their wounded and sick soldiers to tents specially erected for them to provide a place of treatment at the baggage train before being transported to hospitals in Jerusalem. Later, their carers were formed into nursing orders who continued to provide institutional care for the sick throughout Europe in the centuries which followed. Around 1476, Queen Isabella of Spain ordered the creation of specially constructed wagons for transporting wounded soldiers, and the concept was adopted by different armies throughout Europe (Bell 2009, p. 11).

By the mid-eighteenth century, most of Europe's armies had accompanying physicians and surgeons, as well as different forms of fixed and ambulant hospitals (Haller 2011, p. 11). However, none of them had ambulance services to remove the wounded from the field. Dominique-Jean Larrey, a French surgeon working in Napoleon's army in 1792, witnessed the fate of French soldiers at the battle of Limbourg, where the wounded lay for more than 24 h before attempts were made to recover them. To remedy this situation, Larrey devised a comprehensive ambulance service to avoid delays, with surgeons and attendants (*escouades volants*) treating casualties under fire before removing them on special carriages designed by him (Williams 1843, p. 225). They were called 'ambulance volantes', being based on a Napoleonic horse-drawn two-wheeled gun carriage which was taken onto the battlefield to evacuate the wounded to the safety of temporary tented hospitals for further treatment before removing them to conventional hospitals if necessary. Such temporary tented hospitals were also called 'ambulances' until the mid-nineteenth century after which time the term 'field hospital' was appearing and the word ambulance being applied to the means of transport. Larrey's transport system competed with Baron Percy's 'wurst wagon' which was a horse-drawn wagon packed with surgical instruments and dressings upon which surgeons and medical attendants were conveyed to the battlefield (Bell 2009, pp. 18–22). Larrey also designed four-wheeled wagons for transporting wounded on uneven terrain. His ambulance system of on-site treatment, evacuation and mobile field hospitals became a model for modern military ambulance services.

Wellington's army, in the 1808–1814 peninsular campaign against Napoleon, had no form of ambulance service whatsoever. When his soldiers were wounded, they were carried back to a dressing station, taking four men out of the fighting line. Twenty-four stretchers were provided initially for the campaign, but they were too heavy to carry, soldiers preferring improvised stretchers made of poles and blankets or just blankets, to evacuate the wounded from the field to be treated at dressing stations behind the lines, by regimental surgeons. Accounts of the circumstances

under which they worked suggest that chaos was the order of the day and officers were preferentially treated before the ranks (Howard 2008, pp. 48–73). When James MacGrigor, Wellington’s chief of the medical department was injured by a kick from a horse and could not keep up with the army, Wellington sent his personal carriage to pick him up, there being none other available (*The Lancet* 1900). Wellington objected to the use of any vehicle which could get in the way of his manoeuvres and was reluctant to provide dedicated wagons for casualties. However, after discovering that the army’s own military wagons were almost unusable in the field, he allowed his surgeons to use them for transporting wounded after surgery. Locally hired ox-carts and wagons were also employed. At the end of this war, there were British soldiers in many hospitals all over the Iberian Peninsula where the fighting had taken place. None of the failures of care for British casualties led to public criticism in the UK, and it was 60 years after Waterloo that the British army formed a proper trained ambulance corps (Howard 2008, pp. 102–109).

The British army went to war in the Crimea in 1853 with 20 two-wheeled wagons and 20 four-wheeled wagons for transporting wounded from the battlefield to field hospitals, but, at times, they were not in the right place at the right time. The design of the ambulance wagons in use during the Crimean War was criticised in the medical correspondence of the time for being heavy and lumbering, and a proposal was made that it be redesigned to be lighter and more manoeuvrable (*British Medical Journal* 1858). At the start of the British army’s campaign, advanced skirmishing parties commandeered local farm vehicles for ambulance purposes (Haller 2011). The task of removing the wounded from the field had been entrusted to drummer boys and musicians in the time-honoured way using stretchers and litters. Mules with baskets, called ‘cacolets’, strapped on to each side were also used to evacuate the wounded on stretchers. Later, a local railway was employed to remove their wounded for further care. By comparison, the French brought Larrey’s system with them to the Crimea, and their ambulance service was more effective. In the American Civil War, in 1861, the armies on both sides were no better equipped than the British had been in 1853 and struggled throughout its duration to provide an adequate ambulance service for all their wounded (Bell 2009, pp. 30–42).

Sick and Injured in the Streets

In 1240, the wool porters of Florence inaugurated what eventually became the Company of the Brothers of Mercy to provide ambulance services for the city. It still exists today. They removed fever patients to a charity hospital or dead persons to a chapel on stretchers borne shoulder-high by volunteers dressed in long robes, their faces covered by hooded masks (Bell 2009, pp. 5–10). There is no record of other ambulance enterprises in the cities of Europe in the next almost 500 years. At the beginning of the eighteenth century, in Leipzig and Edinburgh, some hospitals offered portage of the sick and injured in sedan chairs. In 1777, the Middlesex Hospital Board in London provided a horse-drawn type of wheeled sedan chair to

uplift injured patients and in Manchester in 1796, the Manchester Board of Health provided a sedan chair (with a washable removable lining) to uplift fever patients to their new quarantine hospital (Bell 2009, p.15). The Chelmsford Board of Health in Essex ordered a modified cart to convey patients to hospital during the cholera outbreak of 1852. Some health boards hired wagons to take patients home (Hart 1978). It is possible that in different cities in the UK, there were second-hand cabs provided by a hospital to transport patients, but their existence is not recorded.

In 1866, Edward Barry Dalton, a former civil war army surgeon, was appointed superintendent for the Metropolitan Sanitary District in New York City and surrounding counties (Bell 2009, pp. 54–66). Shortly after his appointment, a cholera outbreak occurred, and in response Dalton devised a system whereby all suspected cholera cases were notified to the police who organised an immediate visit by sanitation inspectors to confirm the diagnosis using the telegraph. They then instructed the police to summon a disinfection team in a wagon which transported the patient to a hospital which was expecting the patient. The four elements of the Dalton system were: police as first-line agents, a supporting infirmary, medical wagons on standby and dispatch of information by telegraph. The individual parts of Dalton's system would change with time, but his four principles established from this episode would become the basis of modern ambulance provision. In 1869, a modern ambulance service was started by Bellevue Hospital in New York. The police were the first responders who telegraphed details about injured or ill patients who had been taken to their precinct station, and the hospital then sent an ambulance with an attendant to transport the patient to be admitted (www.emsmuseum.org 2008).

In 1862, an appeal for the provision of ambulances to bring the sick and injured to hospital was recorded in the *British Medical Journal* suggesting that hospitals should provide them (Dr Bristowe 1862, p. 389). It was largely ignored, and later in the century, ambulance development was sporadic and reactive, and in some places, there were good services but not in all. Most emergency cases requiring surgery were due to accidents, and these were transported in cabs, carts and stretcher arrangements. Rough handling exacerbated many injuries. A leading article from the *British Medical Journal* of 1860 tells of the famous surgeon Percival Pott, who had sustained a broken leg by falling out of his carriage. Lying on the ground, he fought off well-intentioned helpers with his stick. He refused to be moved until a door could be provided to carry him home for treatment. The case of a Mr Robertson, a building worker, who had fallen off a scaffold fracturing his femur, is also described. He was taken in a cab to a doctor's house and from thence to hospital. On admission, he was undressed, and it was discovered that the fracture was or had become compound, possibly due to the unsuitable mode of carriage to hospital. It was felt that more careful handling might have avoided amputation with all its dangers (*British Medical Journal* 1860).

British society in the mid-nineteenth century was concerned about infectious illnesses and provided fever hospitals in an attempt to prevent further spread within the community. The serious problem arose of how a person suffering from a fever might be safely conveyed to hospital without infecting others en route. There being no ambulances, the cab was the only transport choice for infected people who

could afford it, but other options were two-wheeled handcarts, horse-drawn carts or wagons. Concerns arose that healthy members of the public could become infected in cabs which had been occupied by fever patients (*Association Medical Journal* 1856). An Act of Parliament passed in 1866 required cabbies to disinfect cabs which had carried infected persons, but this was practically unenforceable, and, in any case, there was no agreed method of disinfection specified by the act (*British Medical Journal* 1869). A penalty of a fine of £5.00 could be imposed upon any person who knowingly used a cab whilst suffering from an infectious disease (*British Medical Journal* 1866). The last cholera epidemic in London was in 1866, but, in Paris in 1882, when they suffered a cholera epidemic, its five ambulances proved inadequate, and the number was increased to 40 (*The Lancet* 1884). The Sanitary Act of 1866 placed responsibilities upon the vestries of the metropolitan districts of London to provide smallpox and fever ambulances. The process began in 1868, and by 1881, the Metropolitan Asylums Board that administered the poor-law facilities in London were providing dedicated ambulances to transport patients with infectious diseases. This body was later to organise a significant part of metropolitan London's ambulance service until 1930. Parish authorities had ambulances and disinfection procedures before 1881, but the Asylums Board's arrangements were centralised and better organised (*British Medical Journal* 1881).

In the streets, accidents were common, and it fell largely to the police authorities to organise the transfer of victims to hospitals either in a cab for those who could afford it or on two-wheeled barrows called litters. There were many different designs of these available, but Dr John Furley, one of the founders of the St John Ambulance Association, designed a modified ambulance litter which was adopted by many police forces throughout the land. Its design won a prize at the Brussels International Exhibition in 1877 (Fletcher 1979). The St John's Ambulance Association, inaugurated in 1877, initiated the first-aid training nationwide. Coalmines, iron works and railways in the northeast of England enthusiastically established workplace first-aid centres. The term, 'First Aid', was invented by the Association, and its handbook sold 28,000 copies in its first 3 years. The work of the St John's Ambulance Association became international, and by 1881, its sponsored courses were being taught all over the world, from Russia to New Zealand (Haller 1990). In 1882, in Scotland, the St Andrews Ambulance Association was formed with the same ideals. Members of the police joined first-aid classes to improve their skills in the handling of injured people.

The St John's Ambulance Brigade was established in 1887 to provide first-aid services by trained volunteers at large public gatherings. In 1888, Queen Victoria awarded it its first Royal Charter in recognition of services rendered during her golden jubilee celebrations. Outside London, the St John Ambulance Brigade invented other forms of patient transport. In Leicester, in 1892, its cycling division designed a stretcher fixed between two bicycles. In Birmingham, in 1895, a quadricycle ambulance using a stretcher between two tandems was developed, and in 1906, an unusual bicycle capable of being converted into a hand litter was introduced for country policemen (Batten 1996, p. 7). The St John's Ambulance Brigade was the

first organisation in the world to organise a simulated accident exercise when it organised a ‘disaster’ scenario at Kings Cross station in 1899 (Fletcher 1979).

In 1882, Benjamin Howard, a contemporary of Edward Dalton, wrote in *The Lancet* proposing an ambulance service for London’s metropolitan area. He was English but had emigrated to the USA, where he trained to be a doctor. His article included plans for a network of ambulances linked by telephone from police stations to hospitals similar to that existing in New York, and he and others arranged a conference for London hospital authorities to be presided over by the Duke of Cambridge (Mapother 1870, p. 78). Howard criticised the London police’s wheeled litters, but perhaps this is not surprising since he was proposing a horse-drawn ambulance of his own design (Howard 1882). Howard’s plans met with limited responses, and people continued to be transported to hospital as before until around 1890 when the Metropolitan Asylums Board ambulances began to transport injured people from the London streets to the nearest hospital. The last horse-drawn ambulance to be employed by them was in September 1912.

The problem for ambulance provision in the UK was funding. Parliament took the view that if local ambulances were required, then their cost was the responsibility of the local authorities. Nothing more was achieved in the nineteenth century in terms of establishing an ambulance service for London, but other cities such as Liverpool and Manchester did copy the New York example, and pressure grew on Parliament to do something about ambulance provision for the London metropolitan area. This was at a time when the small local authority area of the City of London had an efficient modern service in place, run by the police and paid for out of their police fund budget (Pollock 2013). Accidents were becoming a major problem everywhere in London with many people being killed and injured in street accidents (Hardy 1910). It took two Acts of Parliament, in 1906 and in 1914, to establish a London Ambulance Service which was a working reality by the end of the First World War.

Twentieth-Century Ambulance Services: Military and Civilian

Wars act as drivers for accelerated change in technological advancements, and the Great War brought into action modern means of dealing with the wounded. A total of 120 days after the outbreak of war, the military medical provisions for the front-line troops were debated in Parliament (Consolidated Fund Bill 1914). This Hansard report gives an excellent picture of the British army’s casualty evacuation chain from the front to the hospital. A casualty was taken from the field, by stretcher or on foot, to a regimental aid post at the front, staffed by a battalion medical officer, orderlies and stretcher bearers. If necessary, he was taken from thence to an advanced dressing station approximately 400 yards behind the lines and transferred to hospital if his condition required it. Survivors were either repatriated for convalescence or returned to active service. Ambulance trains took the most seriously

wounded to ports where they travelled in ambulance ships to England and thence by train to hospitals near their home towns. At the start of hostilities, there were three horse ambulances for every seven motorised ambulance, but within a year, horses had been replaced by motors.

During World War I, the British army was assisted by civilian volunteers organised by the Red Cross/St John's Ambulance collaboration as individual ambulance corps. Included among them was the First Aid Nursing Yeomanry (FANY), formed in 1907 as a female volunteer first-aid link to bring the wounded from the front line to field hospitals. Women also operated as ambulance drivers on the home front, and in 1915, they created and operated an ambulance unit in London, the Women's Reserve Ambulance (Scharff 1999, p. 91). It first saw action after a Zeppelin attack in September of that year, and in 1916, the first female-only ambulance convoy served in the British army in France. Another such civilian corps, the Munro Ambulance Corps, established in 1914 by Dr Hector Munro, included women members working as drivers on the Belgian front, several of whom were decorated for bravery. Civilian ambulance corps transported the injured from the advance dressing stations to hospitals out of the battle zone. Other volunteer ambulance corps operated under the American Red Cross, the Norton-Harjes Ambulance Corps and the American Field Service before and after the USA became involved in the war (McCallum 2008, pp. 12–14). Among the many volunteer drivers were the writers Ernest Hemingway and Somerset Maugham and the film-makers Walt Disney and Jean Cocteau, as well as others who later achieved national and international fame in other walks of life.

After the war ended, over 300 surplus military ambulances were distributed throughout the country on a county basis and the Home Ambulance Service came into being, controlled by a central co-ordinating committee from the British Red Cross Society and the St John Ambulance Brigade in London. It was organised at county level and run by voluntary committees. Patients with the means paid for the service. For the first time, rural areas were served by an ambulance service which transported all ill and injured patients. Children and pensioners also benefitted from a patient transport service taking them to and from hospital. In 1920, they reported their first year's activities (*British Medical Journal* 1920a, b, p. 866). Major Paget, a veteran of the First World War, was its principal advisor (*British Medical Journal* 1924). By 1925, there were 375 ambulance stations in England and Wales, and the *British Medical Journal* gives the account of possibly the first major incident dealt with in the UK by a rural ambulance service. A charabanc carrying 25 people crashed in the Yorkshire Dales killing 7 people and injuring 16 others. A party of first aiders were driven in the Skipton Hospital ambulance 15 miles to Dibbles Bridge to provide services to the injured and dying on site and made four journeys to transport the victims back to Skipton (*British Medical Journal* 1925a).

After 1925, it began to be required that ambulance drivers and attendants be trained in first aid under medical supervision (*British Medical Journal* 1925b). The Home Ambulance Service later became the basis of today's service, but it should be remembered that there were also services provided by local authorities, the police, fire brigade and other voluntary organisations. Most ambulances were crewed

by unpaid volunteers. Birmingham had four providers of ambulance services, the police still being responsible for transporting accident victims until 1948 (Batten 1996). In 1930, the ambulance service for London was unified under the control of the London County Council and the Metropolitan Asylum Board abolished. As a civil defence measure before the war, an auxiliary ambulance service for London was inaugurated and both services worked valiantly in the face of the blitz. After 1948, responsibilities for provision of ambulance services were apportioned to county councils as part of the National Health Act, copying the London County Council pattern.

The State of Ambulances in the UK National Health Service

Under the new National Health Service (NHS), in England and Wales, there were 146 separate ambulance services run by local authorities, one in Scotland and four in Northern Ireland (Caple 2004, pp. 18–36). There was no formal organisational structure initially, but later control was organised by either a medical officer working in a local authority health department or alternatively the local chief fire officer. Volunteer ambulance drivers continued to be used for the first 26 years of the NHS, but towards the end of this period, they had virtually all been replaced by paid employees. Their ambulances provided the most basic of facilities for patients, essentially being a ‘scoop and run’ service in a vehicle which was a converted van and driven by a man with only a first-aid certificate and a clean driving licence until 1968 (Caple 2004, p. 10). Gradually, ambulance drivers underwent training, and by the mid-1960s, this became a requirement for employment. The Millar Report of 1966 made extensive suggestions about training and equipment which took several years to implement. Vehicle design continuously improved and radio communications were introduced in the 1950s, beginning with amplitude modulation (AM) frequencies. These began to be replaced after 1972 by frequency modulation (FM) frequencies, and in 1974, the emergency reserve channel was introduced which allowed radio communication virtually everywhere in the UK and is still used.

In 1974, the NHS underwent a massive reorganisation with ambulance service providers being reduced from 145 to 51 for the UK. Until this time, ambulance services had been isolated and localised with no status other than as transport services for patients. The reorganisation gave an opportunity for recognition and representation of ambulance services at a national level, and regional ambulance officers, for the first time, had a say in the development of standards and increasing the professionalism of the service. Senior ambulance officers now represented the service in the Department of Health’s policy and medical divisions and could influence decisions which affected the NHS at the executive level. As a consequence of the changes which followed upon the 1974 reorganisation of the NHS, ambulance workers were eventually recognised as healthcare professionals in their own right. The policy of high-quality training led to uniformity of standards for all ambulance person-

nel appropriate to their roles. In 1986, a nationally agreed programme of training for paramedics was inaugurated, based upon advanced training schemes which had been piloted in Wessex, Brighton, Bournemouth and Bristol. These schemes had been heavily influenced by paramedic training schemes in the USA. By 1993, ambulance technicians and paramedics, both male and female, were deployed in every front-line ambulance. The NHS underwent two more reorganisations in the twentieth century, in 1982 and in 1991, with further reduction in management bodies to 40 which by 1995 had become NHS Trusts in their own right with full independence and responsibility for their own planning and budgeting. By this time, those tasked with operational responsibilities were called metropolitan and area chief ambulance officers (Caple 2001).

The Role of Air Ambulances

The first reported air ambulance evacuation was on 16 November 1915 when a French pilot, Captain Dangelzer, flew a wounded Serbian officer out of the battle zone and later he and five other pilots evacuated 11 other casualties (Sheehy 1995). After World War I, military air transportation of battle casualties became relatively common (*The Lancet* 1933). In 1928, Australia's Flying Doctor Service began to fly doctors to ill or injured patients in Queensland and later airlifted those whose condition required it. The first use of air ambulances in the UK was in 1933 when a fisherman with peritonitis was flown from Islay in the Western Isles to Glasgow for surgical treatment (Hutchison 2009). Ever since, Scotland's Air Ambulance Service has been evacuating sick and injured patients using aircraft of different kinds from her remote communities to centrally located hospitals.

The first use of a helicopter to evacuate a wounded serviceman was in 1945 when a wounded American pilot was extracted by helicopter from the Burmese jungle (Bell 2009, p. 166). In the Korean War, helicopter evacuation became common because combat circumstances made their use obligatory, and the wounded were transferred to well-equipped modern field hospitals called mobile army surgical hospital (MASH) units where they had the benefit of the best trauma surgery available. These units have been instrumental in advancing trauma techniques which now benefit all wounded and injured people (King 2005). The American army has employed MASH units in every overseas war in which it has been involved since and has continuously improved the ambulance concept first proposed by Larrey, treating men where they lay, expeditiously removing them from harm and dealing with life-threatening injuries at a nearby substantial mobile facility before evacuating them to fixed hospitals. Variations on the MASH pattern are used by all regular armies today.

The first civilian helicopter ambulance was stationed in Santa Monica Hospital in September 1954, and helicopter ambulances were soon established in the USA. In the UK, military ambulances were available in London for emergencies in the 1970s, being replaced in 1989 by civilian helicopters. In 1987, a civilian helicopter

ambulance was provided in Cornwall followed by one in Dundee 2 years later. Their success has led to the provision of helicopter air ambulances throughout the UK. They are now commonplace in most of the developed world as a means of patient transport, but there have been deaths in air crashes (*Hospital Aviation* 1989, p. 22).

Conclusion

The history of the development of ambulance services is one of continuous change with interchange of ideas benefitting successive generations. An example is seen in the pioneering work of Dr James Francis Pantridge who inaugurated the Belfast Coronary Care Scheme on 1 January 1966 using an ambulance equipped with coronary care equipment, including a defibrillator, and staffed by a doctor and coronary-care nurse (Pantridge and Wilson 1996). Research had shown that most patients died within the first hour of a heart attack and if they were to be saved, then early diagnosis and treatment, including possible use of a defibrillator, was indicated (Pantridge 1974). Pantridge's model produced such good results that it has been copied throughout the world.

The repertoire of paramedic skills continued to grow as more were trained to deal with many emergencies giving necessary resuscitation and stabilising and monitoring their patients' en route to hospital. In 1991, the London Ambulance Service provided fully equipped motorcycles for paramedics to use at times of severe traffic congestion to stabilise patients until a conventional ambulance could arrive on site. Emergency control vehicles were provided for major incidents as were emergency-equipped vehicles. There was an ongoing programme of improvement and investment to bring ambulance services to the sick and injured, and in 2001, at the initiative of one paramedic, in London, bicycling paramedics were introduced for suitable cases where heavy traffic caused access problems, and these have proved very successful and are environmentally friendly. Continuing innovation has brought 'volunteer community responders' carrying cardiac resuscitation equipment in most towns and villages in the UK, attending patients with chest pain before an ambulance can reach them. Computer-aided dispatch systems, satellite tracking and predictive analysis are new tools which have been introduced to reduce ambulance response times. Patient transport services (PTS) continue to be a feature of modern ambulance provision as are volunteer car drivers who assist in hospital outpatient transport.

The NHS has provided the testing ground for the development of an ambulance service which has been capable of responding to the needs of the sick and injured in the UK for more than 60 years, proving it to be a greatly appreciated, resilient and innovative service, responsive to changing needs. There seems to be no limit to technological innovation in health care or in electronic communication devices which can be selectively utilised for the benefit of the sick and injured who require urgent hospitalisation. Few would have foreseen trained lay volunteers using defibrillators on their neighbours to save their lives or electrocardiographic traces being

sent by mobile phone by an ambulance paramedic for cardiac diagnosis in a receiving hospital. Larrey and Dalton's foundations begun 200 years ago will continue to be built upon as ambulance services strive to improve standards.

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