

Original Paper

History of Leadership through Education and Innovation in the Ambulance Service in Britain

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Abstract

Purpose: This paper tracks the hitherto poorly documented history of the ambulance service in Britain from early military history to the present day identifying the leaders who motivated change and through education and innovation provided significant developments in pre-hospital patient care.

Methodology: Desk research and interpretation of social and medical issues raised.

Findings: The ambulance service developed from an early military need through a period when monks offered care to the local population. Followed by philanthropists and local doctors adapting and funding practices developed elsewhere, to independent hospitals run by doctors offering inbound transport. Subsequently, political pressure forced local authorities to offer pre-hospital care and transportation to hospitals for the sick and injured. The war years saw a military concentration on pre-hospital care followed by the integration of the ambulance service into the newly formed National Health Service (NHS). The profession of the paramedic was formed, technical innovation in communication, transportation, and on-scene patient care encouraged standardization of service. The ambulance service is an integral part of the NHS providing essential pre-hospital medical care.

Originality: A description of the social history of the ambulance service in Britain defining the context, role of education in the motivation for leadership and innovation.

Keywords

Ambulance History, Leadership, Education, Innovation, Pre-hospital Care

1. Introduction

Throughout history, it has been a human trait to assist the injured and sick, and conversely, if a person is ill, knowledge that someone will care and assist. This premise is confirmed by Ravalous (2013) who states that archaeologists in the Scottish islands have discovered ancient skeletons with healed fractures confirming limited medical practice and knowledge passed on from one generation to another.

Mom (2015) pointed out that insufficient attention is given to social aspects and education-motivating actions when reporting historical issues. Divall and Revill (2005) define the understanding of significant social change as determining the origins, development, and consequences that motivate and enable choice and participation in personal and organisational development. In addition, Argote (1999) suggests that developments cannot be confirmed without evidence-based proof of personal or organisational learning.

This paper considers the development of the ambulance service in Britain which is not well documented. Elements are usually seen either in case studies in the social history of assistance to the sick and injured or in technical journals covering the history of medical equipment. Boin et al. (2017) defined the most interesting features in the development of any public service as the provision of leadership or education for development. Such significant developments in the ambulance service have at different times been led by the military, philanthropists, politicians, inventors, prominent medics, and collaboration between two or more of these groups.

Several historical events in Britain have led to significant personal and organisational change in the development of the ambulance service utilizing the consequences of actions by individuals, commercial or charitable organisations and political institutions. Moore (1999) defines a modern ambulance service (Emergency Medical Service (EMS)) as “a comprehensive system which provides the arrangements of personnel, facilities and equipment for the effective, coordinated and timely delivery of health and safety services to victims of sudden illness or injury”. Unfortunately, this was not always the case.

This paper is novel, in so far as it presents a consolidation of the history of the ambulance service in Britain describing where education, social and technical change has contributed to the development of the ambulance service from the early days of a limited transport function to a to the current professional pre-hospital patient care in both life-threatening and emergency situations.

2. Early Military and Industrial History

Batten (1966) recorded that the earliest form of patient support in Britain was in 900 BC when Anglo-Saxon leaders who were injured or ill were moved on hammocks to separate accommodation for care and attention by locals. Such activities were limited to important people who were seen as making a significant contribution to their group. Kyel and Ayikwel (2020) described how in Roman Britain, military leaders ensured that each legion had support groups to the rear of the fighting lines consisting of those too old to fight who gave first aid and recovered the injured on chariots, sleds or canvas sheets to treatment areas. These evacuations only took place when the fighting was over which implied the injured had a good chance of survival. The groups involved in the recovery of the injured received a monetary reward for each life saved. These early military initiatives implied strategies that favored leaders and aimed to maintain the numbers in the fighting force by the selection_of only those likely to survive and be able to contribute in the future.

In early Britain, the sick and injured were looked after by their family and friends in the best way they

could. The population initially learned from the Romans how to transport and treat those who were injured and may survive to be useful to the community. Early Christians in Britain from AD 600 told the story (now documented in the bible - Luke 10:34) of the “good Samaritan” who bound the wounds of an injured traveler before taking him to a local inn.

Religious communities subsequently offered comfort, attention, and herbal remedies to the sick who could either make their way or be carried to their monasteries to find suitable cures for common ailments. From these beginnings, small care units were founded which would send knowledgeable people to collect patients if they needed on-scene attention before transportation. The alternative was that the sick and injured would have to find their way to these care units potentially resulting in further harm as little or no care was provided before arrival.

Early developments in Europe and the Middle East were facilitated by common languages (Latin and Greek) and reported in Britain by travelers and overseas tradesmen leading to similar ideas being employed by a small number of wealthy citizens in populated areas. In early European warfare, according to Bell (2009), the sixth-century Byzantine army had squads of horsemen with modified saddles to move wounded to medical tents. Mitchell (2004) reported that in the eleventh century, the Knights of St. John used horse wagons to move wounded from medical tents to hospitals in Jerusalem. Pollock (2013) identified that in the late fifteenth century the Spanish designed specially constructed wagons for transporting wounded soldiers. Bell (2009) described that in the eighteenth century the French initiated the “ambulance volante” which provided a two-wheeled carriage that was taken onto the battlefield to transport wounded to nearby field hospitals.

These military innovations also recognised that the combination of on-scene first-aid and transportation for clinical treatment would save lives and were tactically motivated by generals to save wounded trained soldiers so they could fight again and maintain morale amongst the ranks. Bristow (1862) suggested that doctors who had returned from Europe to Britain used these techniques for the movement of sick and injured having seen or heard of these skills. In Britain, capitalist owners of rural mining concerns copied these military practices when serious accidents with multiple casualties occurred, collecting them in one place on the surface before transporting them home or to a place of safety.

By the eighteenth century, influential citizens who were sick or injured were taken home in a cart or carriage, for which they had to pay so that they could be attended by a doctor. In some cases doctors were taken to the sick or injured to provide on-scene first-aid but, unlike in military situations, no care was provided while waiting for the doctor. After 1700, philanthropists in small towns (for example, Salt in Bradford and Smedley in Matlock) offered factory-based healthcare. Others throughout rural Britain were concerned that the care of the sick and injured was poor relative to that in cities and those on military service. Philanthropists helped establish local friendly societies called “Oddfellows Lodges” to initially provide funding for burials and subsequently for the immediate medical needs of working men and their families. Funding included both transport by cart for a patient to a doctor or for a doctor to

attend a patient on-site.

3. Early Hospitals

Monks established the first infirmaries in monasteries in Britain employing shared knowledge from combined religious institutions throughout Europe. Patients from the local population were often carried there by any means possible by their families or friends. In 1123 a religious foundation in London used the two military principles of separation of patients from the community and centralisation of medical facilities and found that these practices improved the doctor's productivity; in doing so, they established St Bartholomew's hospital. Later they transported their patients in sedan chairs and established the first direct link between inbound patients and the hospital. This development had a significant impact on patient survival rates; but sadly the BMJ (1860), exposed case studies where rough treatment and handling by both friends and passers-by who helped or transported the patients could lead to additional injury or distress.

In the early 1800s, local prominent doctors established hospitals throughout the major cities and towns and recognised the need to transport patients to the hospital which was the early concept of a civilian ambulance service. Even with dedicated handling and transport equipment the personnel allocated to these tasks by the hospitals were not trained in first-aid or patient handling. Patients received no on-site treatment but the urgency of such movements was recognised by the fact that in cities these carts or carriages used were preceded by boys holding lanterns at night and ringing bells to clear a path establishing the principle of priorities for transporting the patient to the doctor.

4. Public Institutions

The transition from private enterprise to public health institutions was established by the Metropolitan Poor Act of 1867 which created public hospitals in London and defined the local government's responsibility for the sick and injured. Patients still had to make their way to the hospital by whatever means possible. Bristow (1862) advocated that hospitals in Britain should provide suitable transport for the sick and injured; but political will, organisational skill and finance were not forthcoming. This reflected one of the differences between private enterprises which operated for profit, charitable institutions which operated employing donations from benefactors and public institutions funded by local government.

In 1867 the London Metropolitan Asylum Board, under pressure from local politicians who feared a smallpox pandemic, introduced horse-drawn ambulances based at police stations specifically to transport injured patients and those with infectious diseases from dwellings to hospitals. This separation of ambulances from hospitals was motivated by the combination of a need to reach the patient quickly and the development of specialist hospitals for infectious diseases in the capital.

Following the interest by public institutions in hospitals, considerable efforts were placed by inventors with a medical background on how to carry sick and injured people to hospitals and first-aid centers.

The first of these innovations was the “Furley Stretcher” in circa 1876 which was a canvas platform held between two wooden carrying polls. The “Ashford Litter” followed circa 1877 which was a two-wheeled undercarriage fitted with elliptical springs to fit a “Furley Stretcher” for two attendants to walk through the streets pushing and pulling a patient. The Furley stretcher was adapted to have telescopic handles which fold together to reduce the width to make it easier to carry to the scene by one attendant. These stretchers were for use in open spaces but in industrial, construction, or mining settings, space indicated that casualties had to be lifted vertically in a “Lowmoor Jacket” which was a restraining harness that could be fixed to the Furley Stretcher. Those pieces of equipment were used in 1877 when the St. John Ambulance Association introduced the Invalid Transport Corps with both on-scene first-aid and free-of-charge movement to hospitals for the poor. Based upon this success the St John Ambulance Brigade was established in 1887 to provide first-aid trained volunteers at public gatherings in London, and outside London to transport patients to a hospital.

Medics writing in the *BMJ* (1877) recognised that it took some time to request and provide transport for the sick and injured from a hospital site they recommended that Ashford Litters (also known as the St. John Ambulance Litter after the users) should be kept at police stations in London because there were more police stations than hospitals. This practice could be considered the forerunner of the ambulance station.

The *BMJ* (1881) reported that major towns had hospital-based horse-drawn ambulance vans capable of accommodating three patients, a doctor, and an attendant. The largest with four horses was driven by a horseman with a stable lad sitting beside ringing a bell. These vehicles could reach 20mph through clear streets and were mainly used for a hospital doctor and attendant to provide first-aid at the site of accidents where patients were trapped or in need of immediate care. Local doctors would request a horse-drawn ambulance with a nurse to transport seriously sick patients to the hospital. Such developments led to hospital-based ambulance services.

Howard (1882) was critical of the response time taken for an ambulance to reach the scene and proposed a separate horse-drawn ambulance service for London hospitals linking police stations to hospitals by a runner. He also described the first separately organised pre-hospital care from local doctors and hospitals supported by ambulance litters located at police stations. This development was initially limited to London but subsequently copied by local officials in other major towns throughout Britain.

In smaller towns the Poor Law Amendment Act 1868 dictated that parish authorities had responsibilities to transport patients with psychiatric or infectious diseases by whatever means to a hospital, and this task was subsequently extended to include the sick and injured. Ham (2004) states this was the first time the government took responsibility for assistance to the population. Until then even the poor had to pay for transportation or have friends take them to a hospital.

Hardy (1910) described that in 1907 St. Bartholomew’s Hospital introduced an electric-powered ambulance to carry a single patient and was staffed by medical dressers (usually a student medic) to

provide patients with advanced first-aid before and during transport to a hospital. These were the first trained ambulance staff and forerunners to what we now know as ambulance technicians. This development was designed with the assistance of St John Ambulance to tackle the main issues reported by the public in the collection and movement of patients, which were:

- Long response times from alert to arrival on-scene
- No first-aid by trained staff at-scene and during transportation
- No suitable patient lifting and securing equipment for carrying and movement
- Patients were exposed to public view and ridicule
- Variable means of transportation
- Warning hospital staff by means of telephone of the condition of inbound patients

Outside London, the introduction by local politicians of town and cottage hospitals each with defined geographic territories strengthened the link between local politicians and the local population. These hospitals represented a place of safety where patients could be treated and created the opportunity to establish a hospital and community-based ambulance stations. These could provide rapid response with trained first-aiders and doctors (if required) to improve pre-hospital movement methods and timings. From 1912 hospital administrators were replacing horse-drawn ambulances with motor vehicles with van bodies specifically designed to transport single patients in the care of an attendant. Such reorganisation under the combined guidance of politicians and local medics allowed innovation in both equipment and limited pre-hospital first-aid techniques targeted at minimising any post-event harm to patients. Specific measures were adopted for the collection and transportation of psychiatric patients and those with infectious diseases to safeguard the communities in which these patients lived. Until the first world war ambulance staff throughout Britain were essentially manual laborers, with little first-aid training, no clinical control or regulation, and essentially, if not accompanied by a doctor, practiced what later became known as “scoop and run” techniques to transport patients to a hospital.

5. War Years (1914-1918 and 1939-1945)

In 1910 the War Office requested members of the St John Ambulance Brigade to volunteer in the event of war and medics began first-aid training in 1912 at the College of Ambulance in Newcastle-Upon-Tyne. The first world war provided the generals with the stimulus to develop the concept of pre-hospital treatment for the sick and injured. Copying both Napoleon’s army’s use of triage and transport of injured from the battlefield to a first-aid station, plus the lessons learned from the British army repatriation process from Crimea. Military medics developed a methodical evacuation process for wounded soldiers from the European front lines, which for the first time was by priority of patient need. The process included:

- Stretcher or assisted walking to a nearby dressing station with a doctor, then
- To a clearing station by foot or whatever means of transport was available, then
- To a field hospital for immediate treatment by ambulance, then when practical

- To the UK for further treatment or convalescence by ambulance, ship, and train.

The BMJ (1920) reported when the first world war ended the government allocated the motorised ambulances from the military to the British Red Cross and St. John Ambulance Brigade establishing a county-based ambulance service. This combination was named the Home Ambulance Service by the central government and a register of national ambulance stations was created. For the first time, they provided free transport to hospitals for the poor in rural areas from a combination of city ambulance stations and rural cottage hospital sites. Public pressure on politicians continued and the Health Act of 1925 established the use of ambulances for non-urgent patients and both ambulance drivers and attendants were required to be trained in first-aid and the movement of patients.

In 1930 local politicians placed London hospitals under the control of the County Council and a local Ambulance Service was formed by uniting the vehicles from the Metropolitan Asylum Board and the Metropolitan Police. To improve both efficiency and service levels they split the service into two functions; firstly, a unit responding to accidents located at ambulance stations throughout London, and secondly, units located at hospitals providing general non-urgent movement and handling of patients to and from hospitals and their homes.

Experience throughout the two world wars expanded the role of the ambulance staff in first-aid and pre-hospital treatment, especially for the evacuation of severely wounded soldiers. On the home front, air raid victims could be attended by doctors from hospitals with the ambulance in the event of serious incidents where the emphasis was on providing first-aid, minimising post-event harm to patients, and direct movement of patients to hospitals.

Outside London, ambulances were based at hospitals with the notable exceptions of mines, docks, and factories that had their on-site ambulance services and would respond to local emergencies. In 1937, the 999 telephone number was designated for calls to emergency services to improve response times and establish priorities. In 1939 in response to a bombing threat nationally, local Auxiliary Ambulance Services were formed and staffed by volunteers. Throughout the second world war when demand for ambulance resources exceeded supply the public would still use any suitable van or trailer to carry the injured to the hospital.

6. Reorganisation

In the early 1940s, public pressure continued on the politicians and the Beverage Report (1942) proposed a “National Health Service” (NHS), and following a White Paper in 1944 these proposals were extended to the National Health Service Act (1946), which was established in 1948. Initially, the government allocated statutory responsibility for the ambulance service to the county and borough councils. Many of them immediately contracted this work to the voluntary ambulance providers which resulted in substantial local variations in the provision of service, type of vehicles used, equipment available, and the skill of the staff employed.

In 1960 the Council for Professions Supplementary to Medicine (CPMS) was formed to regulate

medical specialists including the new profession of “paramedics” as key ambulance staff. The ambulance service became part of the NHS operating environment and change became a political issue requiring consensus from all and government finance. For example, training ambulance staff was undertaken locally to various standards until the Miller Report (1966) which recognised and recommended that councils adopt a minimum level of equipment and staff training for the ambulance service. These changes emphasized the need for treatment and patient care in the pre-hospital environment which was reflected in the skill of ambulance staff who were known as “Miller Trained”. Ambulances were equipped to a standard that includes splints, pain relief, burns dressings, maternity packs, and first-aid satchels. Training schools were established to cover first-aid, the use of pre-hospital pain relief (Entonox), and the use of oxygen for patients who had difficulty breathing.

Chapman (1966) introduced the idea of clinical classifications for patients with response time targets for separate clinical groupings, although these were not immediately actioned because ambulance staff were largely untrained. Clinical classifications switched the emphasis from staff training to actual patient needs and the idea that targeted first-aid followed by early hospital intervention would reduce the likelihood of further harm to patients and save lives. This concept supported Miller’s view and led to priority being placed upon the standardisation of equipment, staff training, and service levels.

In 1974 the responsibility for the 142 ambulance services in England and Wales was transferred from local authority control to 53 services under NHS regional or area health authorities. The St. Andrew’s Scottish Ambulance was also transferred to the NHS, and in Northern Ireland where the ambulance service was transferred from the hospitals to the Health Boards. These reorganisations eliminated the clinical and transportation differences between the services offered by local authorities and led to significant improvements in communications to activate ambulances by priority to patient needs and to facilitate transportation direct to a specialist medical facility. Emphasis on patient care led to vehicles being designed to minimise vibration, carry only one stretcher patient, and have more equipment on board including portable defibrillators, oxygen equipment and monitoring equipment to observe a patient’s progress in real-time.

7. Emergency Medical Services Systems (EMSS)

Anderson (2005) quoted that the World Health Organisation (WHO) considered pre-hospital care as a key element in community health care, noting that the first contact with an injured or sick person may be responsible for their survival until they are transferred to a health care professional or transported to a hospital. In the early 1960s, a significant change occurred as two separate international approaches were developed to offer comprehensive pre-hospital care.

Firstly, the Anglo-American System (AAS) is characterised by the combination of immediate first-aid and transportation at the earliest opportunity to a hospital (commonly called either “load and go” or “scoop and run”). This system, favored in the UK, offers pre-hospital care and transportation to victims of sudden illness or injury to a hospital and was developed and driven by the medical regulatory

institutions creating professional bodies in the emergency care sector. Dick (2003) describes this approach as employing paramedics and Emergency Medical Technicians (EMTs) with clinical support by phone to transport patients to specialist doctors in the hospital emergency department for further investigation and treatment. This approach offers Basic Life Support (BLS) on-site and during transportation including non-invasive control of bleeding, Cardiopulmonary Resuscitation (CPR), fracture stabilisation, pain relief and provision of oxygen.

Secondly, the Franco-German System (FGS) is characterised as bringing the hospital to the patient and separately despatching a specialist trauma doctor and ambulance to the scene (commonly called “stay and stabilize” or “delay and treat”). Dick (2003) describes this approach as either treating patients in their homes (or at the scene) and then transporting patients in an ambulance with a doctor, paramedic or nurse in attendance directly to the relevant specialist hospital ward. This system, favored throughout Europe, offers both BLS and Advanced Life Support (ALS) including invasive procedures including administration of controlled medicines, endotracheal intubation, and intravenous line attachment with fluid replacement.

The UK has subsequently developed a hybrid system whereby non-life threatening and emergency cases are responded to by resources which could be characterised as from the AAS, but life-threatening cases are responded to by a system similar to the FGS with Critical Care Paramedics (CCP) or Specialist Trauma Doctors (STD) supported by ambulance crews or more recently Air Ambulances (AA) with patients taken directly to the relevant department at a trauma hospital.

8. National Standards

Under financial and performance pressures from the public in 1974, managers in the NHS introduced performance monitoring and established ambulance response time targets. These were based upon a two-tier system with a target of 50% attendance on-scene within 8 minutes of a call being answered by the call handler, 95% attendance within 14 minutes in urban areas, and 19 minutes in rural areas. This implied that if a call took 1 minute to answer, at an average speed of 30mph an ambulance had to be within 3.5 miles of the scene to be within the 50% target. To achieve these targets, ambulance stations, which had originally been co-located with hospitals, were also established in separate urban and sub-urban sites where there were concentrations of population. If ambulance crews required a doctor on-scene a second ambulance would have to be dispatched from a hospital.

Throughout the 1970s the voluntary ambulance sector in Britain adapted from full-time operations to focus on support services in the form of training part-time volunteers who attended mass gatherings, sporting activities, and public events. The NHS supported these developments because these events would otherwise place a strain on the NHS ambulance service both in resources and achievement of their targets. Private unregulated industry-based ambulance services declined as NHS ambulance service response times improved.

In the 1980s political pressure for standardisation throughout Britain led to the National Health Service

and Community Care Act 1990 which saw further consolidation of the ambulance service to 31 county-based Trusts in England and Wales. This allowed standardisation of equipment and training while aligning facilities with regionally organised specialist hospital services. In 2006 pressure to reduce costs led to a further reorganisation reducing the number of Ambulance Trusts to thirteen. Subsequently, the NHS introduced standard reporting systems and regular quality control reviews to compare performance to national targets and operating costs. As an incentive Trusts which performed well were granted “foundation trust status” which offered greater financial freedom to develop their operations as a business.

The objective of the Foundation Trust initiative was efficiency and encouraged the best-performing Trusts to take over adjacent poor-performing operations. Ambulance services split their organisation into “emergency services” activated by 999 calls and “Non-Emergency Patient Transport Services” (NEPTS) where transport to and from an NHS facility had to be pre-booked by a recognised medical practitioner. This split was eventually reflected in the service level provided because the emergency service received the largest proportion of the funds for staff training and equipment. NEPTS had no operating targets and soon became a “poor relation” and both patient service levels and staff morale suffered.

Following political pressure for the NHS to compete with the private medical sector the government introduced the NHS Procurement, Patient Choice and Competition (PPCC) Regulation (Number 2) 2013. The NHS commissioners responsible for the procurement of ambulance services were encouraged by managers in NHS Providers to accept suitable bids for NEPTS work from third-party commercial operators. Commissioners issued Invitations To Tender (ITT) to any suitable organisation with proven skills and who thought they could achieve the defined service levels within a target cost. Initially in an attempt to reduce costs and streamline the NEPTS commissioners accepted bids from commercial operators but after a short initial contract period when a number of the commercial operators either made a loss or reduced customer service to unacceptable levels some NEPTS contracts reverted to the ambulance service. To maintain public accountability the bidding process continued (even between ambulance service trusts for the same work) to confirm that the Commissioners were obtaining value for money.

Some years later to reduce the pressure upon general practice (GP services) similar ITTs were subsequently employed to provide the 111 call-centre services and on-call out-of-hours GP services which were designed to accept non-emergency enquiries from the public. Several ambulance trusts submitted successful bids and subsequently integrated 111 with on-call out-of-hours service and co-located these services with 999 call centers.

9. Service Improvements

With an aging population resulting in continuous increases in demand for the ambulance service the NHS introduced a clinical classification of patient priorities in 1996-subsequently known as Ambulance

Medical Prioritisation Despatch System (AMPDS) which codified patients according to need. A Parliamentary Paper (1997) considered the ambulance service should be included in the NHS modernisation program which led to NHS Executive (1999) publishing plans for quality systems and improvements in high-quality patient care in the ambulance service. This created staff pressures for professional recognition and in 2001 The Health Professionals Council (HPC) was formed to review standards and paramedics were included on the HPC register. The HPC established a staff structure of office-based call handlers, and crews consisting of paramedics and Emergency Medical Technicians (EMT) – also known as Emergency Care Assistants (ECA). Ambulance staff were trained in the three categories of patient care including; “hear and treat” by call handlers, “see and treat” by crews on scene and “see, treat and transport” initially to an appropriate health facility.

Under pressure from senior ambulance service management, the Joint Royal Colleges Ambulance Liaison Committee (JRCALC) and the Ambulance Services Association (ASA) (2000) considered the nature of the role of the paramedic and the equipment and training required. They determined that the nature, timing, and extent of pre-hospital care reduced mortality in those critically injured or seriously ill and upgraded both the status and training of the paramedic which led to the formation of the British Paramedic Association (BPA) in 2001. By 2005 paramedics could be trained at degree level to evaluate, treat and either discharge or refer and transport patients to the appropriate medical pathway.

These initiatives reflected the population demand and political pressure towards improved patient care and recognition that pre-hospital care could save lives and reduce the burden on NHS facilities. In 2008 to politically justify further expenditure on the ambulance service the Secretary of State for Health changed its calculation method for the target ambulance response time such that the “clock” began when a 999 call was connected to the ambulance service rather than when it was answered by the call handler. This placed pressure on the call handlers to answer calls immediately and pass them over to dispatchers to allocate crews. Further NHS reviews in 2012 and 2014 created four response time categories:

- RED 1 – Immediately life-threatening situations (for example; cardiac arrest, failure to breathe, severe bleeding, unconscious, women in labour or drugs overdose) where the clock time starts when the call is connected and the response time target is attendance with the patient in 8 minutes for 75% of these calls irrespective of location.
- RED 2 – Potentially life-threatening situations (for example; burns, choking, stroke, or urgent calls from health care professionals) where the clock time starts 180 seconds after the call is connected to give call handlers time to determine whether paramedics are required and the response time target is attendance with the patient 8 minutes after the ambulance is despatched for 75% of these calls irrespective of location.
- A19 – A suitable ambulance to convey a patient is available on-scene (if required) 19 minutes after such a request is made for 95% of “red calls” irrespective of location.
- GREEN CALLS – Calls not deemed to be life-threatening may have locally agreed time targets

Funding failed to keep pace with demand leading management to seek new ways of improving productivity and reducing costs while reviews focused on challenging targets and performance measures. These targets also created a widespread misunderstanding amongst the general public of the ambulance service offering because they believe that all calls warrant an 8-minute response. Price (2006) indicated this led to substantial pressure on the ambulance service and many ambulance managers concluded they were managing the clock time target as an obsession that had an impact on the care of the patient. The ambulance service response to these targets was initially to dispatch or re-direct one or more crews immediately after a red call was recognised or upon receipt of a call then call off all but the first crew likely to arrive – resulting in significantly lower service levels for all other calls. The public and health care professionals recognised that the only way to achieve a rapid response from the ambulance service was to exaggerate the patient’s condition.

To achieve the clock time, particularly in rural areas, the ambulance service introduced new practices including; solo paramedics in Rapid Response Vehicles (RRVs), Front Line Ambulances (FLA) with a full crew located at roadside “despatch points” at times of the day when traffic congestion occurred, and the use of volunteers, known as Community First Responders (CFRs), trained in first-aid and often equipped with a defibrillator. These practices implied that two or more resources may be despatched to red calls (for example, an RRV or CFR to achieve the clock time and FLA for transportation).

Price (2006) reported that paramedics trained in quality of care and targeting the best outcomes for patients were experiencing clock time as the only target and patient care was being undermined by the deployment of CFRs with the patient suffering long waits until the backup FLA arrived. The national reporting of clock time achievements was thought to destroy the morale of the ambulance staff and led to the highest absence level in the NHS. After the new response time targets were introduced Willett (2015) confirmed that the use of 999 calls increased substantially mainly due to the growth in the elderly population and the propensity of their carers to request ambulance service assistance.

10. Alternatives

Pons and Markovchick (2002) suggest that in a small number of cases after cardiac arrest or severe bleeds a response time of five minutes or less may improve patient outcomes. In general, however, medics failed to understand the NHS emphasis on response times as there was no definitive evidence that response time targets improve patient care or patient outcomes.

The UK system to respond to life-threatening emergencies further developed with Front-Line Ambulances (FLA) being supported by advanced paramedics and doctors in Rapid Response Vehicles (RRVs) operating in urban and suburban environments and local doctors who are members of the British Association of Immediate Care Services (BASICS) operating in rural areas.

Ambulance service management developed alternative options to assist in achieving the response time targets. With public and private sector finance and agreement, they place defibrillators in rural villages, stations, supermarkets, office blocks, and sports venues for first-aiders to access and use in the event of

a heart attack victim not breathing. This concept is also being followed in city centers with the use of bleed control packs for use with patients with severe bleeds which are immediately life-threatening. The ambulance service also adopted contracts for services with third-parties who had first-aid skills including; air ambulance (AA) charities, voluntary ambulance services (VAS), commercial ambulance services (CAS), fire service emergency first responders (FSEFR), search and rescue (SAR), mountain rescue services (MR), and the coastguard/RNLI.

Alongside management emphasis on the response time targets, the NHS monitored the number of 999 calls which were concluded by the call-handlers as “hear and treat” (no other resources required) or settled by the ambulance crew on-scene as “see and treat” (requiring no transportation). Both these categories avoided patients queuing at “minors” in hospital accident and emergency departments (A&E) and minor treatment centers (MTS). Furthermore, based on the view that primary care was overloaded, the 111 service was launched providing a 24-hour telephone option for medical advice. Initially, because the private sector route was open the commissioners awarded 111 contracts to the lowest price private sector operators or ambulance service trusts.

Black and Davies (2005) reported that the NHS wished to increase the number of non-life threatened and emergency patients at home (commonly classified as “see and treat”) and they have introduced the Emergency Care Practitioner (ECP). Woolard (2006) describes the ECP as an advanced paramedic who is a specialist in pre-hospital care and could signpost patients to alternative pathways for further direct in-hospital treatment if required.

NHS management recognised that targets themselves do not save lives but that staff training, relevant equipment, and communications throughout the patient pathway would improve patient service levels and save lives. Following a study into ambulance performance by Sheffield University, the NHS (2017) established new national integrated performance level targets for all 999 calls. Response time categories were redefined and call handlers were allocated 4 minutes from connection to determine which category the call should be placed in before the clock starts. Specifically defined red 1 calls (immediately life-threatening) had 7 minutes from clock start for the most appropriate resource to be on-scene. Importantly, plans were placed so that outcomes would be tracked along the patient pathway for some specific conditions; for example, 90% of eligible heart attack patients should receive definitive treatment at a specialist heart attack centre within 150 minutes of the 999 call by 2022. The response time target from the clock start for other red calls (potentially life-threatening) was 90% attended in 40 minutes, urgent calls 120 minutes, and non-urgent calls 180 minutes.

These targets integrated the performance of the ambulance service into the NHS as a whole and implied that ambulance staff had to take patients to the correct hospital facility (rather than the nearest) and that patient outcomes had to be followed through from the 999 calls to receipt of treatment and discharge.

11. Technology and Education

By 2000 the equipment and software supplies were encouraging ambulance service management to

adopt their products. Technology is employed to enable paramedics to both save lives on-scene and transport the sick and injured through the correct patient pathway. Technology is used to communicate with patients who had special needs particularly; the deaf, blind, disabled, and non-native speakers.

Key developments in the form of information availability have been the enablers in improving the integration of the ambulance service into the NHS culture and routines. Call centre staff had communications systems linking GPS, and mapping technology with geo-fencing so they, the crew, and the hospitals could track the position and progress of FLAs pursuing the quickest route defined by a routing and scheduling algorithm. In the early 2000s crews were equipped with rugged portable computers with on-road internet which could be used to access patient histories, check upon symptoms and treatments, record patient details, and communicate with hospitals while on-scene or on the move. The 999 and 111 call centers have doctors on call to provide clinical advice to ambulance staff on-scene with patients.

There are common communication systems that allow the ambulance service to work with other emergency and voluntary services. The ambulance service has used technology to extend its activities and areas of specialisation. After the London bombings in 2005, they introduced Hazardous Area Response Teams (HART) which include specialist paramedics with expertise in rescue and first-aid in chemical, biological, radiological and nuclear (CBRN) situations. HART also work with specialist fire crews and has decontamination equipment, tracked plus water-born vehicles to access and transport patients in difficult terrains.

Vehicles have been equipped with mechanical handling equipment, piped oxygen, extensive patient monitoring equipment, and numerous first-aid consumables such that the ambulance may offer more equipment than most hospital accident and emergency rooms. Both FLA and RRVs could be 4 x 4 vehicles would be fitted with highly visible blue light front and rear, side lighting to light up the scene, and specifically audible sirens. Ambulance staff also use motorbikes and powered bicycles to reach patients and specialist equipment in the form of helicopters from air ambulance charities, ambulance planes and ambulance boats where appropriate.

NHS performance measures are targeted at patient outcomes with two objectives; the importance of getting patients safely and quickly to the correct medical facility, and keeping patients out of a hospital where alternative forms of treatment are practical. The ambulance service is currently becoming a significant part of the overall NHS service as they fill any gap in primary care to direct and enable patients to be on a particular pathway to receive the correct and timely medical service.

Military medics serving in conflicts such as Afghanistan (the late 1990s) continued to extend the boundaries of pre-hospital care for life-threatening injuries by experimenting and employing new techniques for pain relief and first-aid both on-scene and during transit to a suitable hospital. Such successful techniques are immediately adopted by trauma teams in ambulance services in Britain.

As an integral part of the NHS, the ambulance service now recognises and employs current medical observations and treatments where practical. The service presses forward with the use of alternative

technologies; for example, the use of drones to transport equipment and consumables to patients on-scene and the use of personal jet packs to transport paramedics quickly to patients in remote and difficult terrain. Improvements in staff training allow specialisation in pre-hospital treatment with critical care paramedics and trauma doctors are employed who if necessary could undertake operations for patients in an ambulance or on-scene.

12. Conclusion

The ambulance service in Britain has provided compassionate service to the sick and injured. Developments throughout history have closely followed social changes and the value society placed upon saving lives. From what now seems simple beginnings with the Roman legions, it has through education and innovation developed into a complex professional emergency service dedicated to pre-hospital care and transportation of patients.

Throughout history change in the ambulance service has occurred under two disciplines. Firstly, by “community practice” in which both Brown and Duguid (1991) and Lave and Wenger (1991) argue the change is context dependant; for example, developments motivated by military requirements. Secondly, the “empirical tradition” put forward by Argyris and Schon (1997) and Argote (1999) who argue that change is evidence-based through education; for example, the restructuring of the ambulance service after the Miller Report (1966) to equip ambulances and introduce formal staff training.

Leadership and innovation in the ambulance service, on the other hand, have adapted to the cultural and environmental pressures and capitalised upon the social, clinical and technical opportunities available. History shows, like other public sector organisations, the ambulance service has been motivated not wholly by social concerns but also by financial issues, public health concerns, professionalism, performance targets, productivity, and costs.

Change has been a constant feature motivated with many different highlights including:

- initial military generals need to save soldiers
- through religious orders offering care and compassion
- independent doctors in large towns learning from European military experience
- independent hospitals offering inbound transport
- public bodies and police organising transport to hospitals
- philanthropists creating a transport service to the hospital
- politicians offer safety to the public by arranging transport for those with infectious diseases or the mentally ill
- to public sector and voluntary organisations combining to provide and develop a service utilising the best technology available.

Analysis of the various types of leadership shows characteristics that: military leaders plan; inventors develop equipment; philanthropists adopt practices from elsewhere; local leaders show compassion and care; central government politicians delay costly decisions to await public pressure for change, and

public sector enterprises aim to reduce current costs and be late adopters of proven technology. Significant developments tended to be adaption to cultural and environmental pressures where leaders capitalised upon social, clinical, equipment and technical opportunities.

Innovation initially responded to public demand for pre-hospital patient care or the need for medical equipment for the ambulance service. In recent years commercially or medically available innovations used elsewhere have been adopted or adapted for the ambulance service.

The ambulance service task may now be summarised as providing a 24/7/52 service that could determine the patient need, despatch the right ambulance crew, to a defined location, within the national and local response time target, and for the crew to prepare, convey and hand over the patient to the correct NHS facility (or place of safety) for further treatment (if necessary) without the patient incurring further harm.

Success or failure in some cases has been the difference between life and death, and pre-hospital patient care and transportation is one of the most difficult public sector management challenges encountered and reflects the value society in Britain places upon the ambulance service.

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