1. Pre-hospital Care

1.1 Clinical Care

In 1966 a paper called "Accidental Death and Disability: The Neglected Disease of Modern Society" was published in the USA. The paper commonly known as "The White Paper" concluded that soldiers in Vietnam had a higher probability of survival from trauma than a motorist in an accident on a Californian freeway. This paper was instrumental in taking the established ambulance concept across the globe and adding pre-hospital care in the form of Paramedics. In the UK, pre-hospital care across several ambulance services started in the late 1970s. The professional practice has evolved in response to changing clinical demands and key UK government papers.[1-3] The recognition that mortality and morbidity rates associated with trauma-related deaths and injury could be reduced has led to the introduction of trauma networks and key changes to the delivery of pre-hospital trauma care. Pre-hospital medical care has also seen an improvement with the development of more specialised roles designed to provide alternative care for many medical patients. [4,5,6]

Paramedic practice has developed; education has become University based, local protocols have become national guidelines, and professional registration has led to careful regulation and the protection of the paramedic title. It is not only paramedic practice that has advanced; pre-hospital emergency care is now also recognised as a sub-speciality by the General Medical Council. These higher levels of education and regulation have resulted in enhanced clinical care whilst increasing the pre-hospital research and evidence. With the introduction of wider clinical performance indicators, the emphasis of pre-hospital care now lies firmly on clinical care and standards. [7]

The recognition that many patients require a higher level of clinical care at the point of illness or injury has resulted in many Ambulance and Air Ambulance Services utilising the services of doctors experienced in pre-hospital care. [8] The integration of physicians into traditionally paramedic-led Helicopter Emergency Medical Services (HEMS) units has resulted in improvements in clinical care. Several units now have integrated clinical governance and share best practice on an annual basis.

1.2 The NHS Ambulance Service

The NHS Ambulance Service has had to evolve during the last ten years in response to the NHS changing as a whole. [9] Patients' experiences are now tailored to their individual needs with alternative care pathways utilised to ensure definitive care is given in a timely manner. Whilst performance indicators still monitor response times, the emphasis has transferred to clinical performance indicators to include patient outcome, which will enable us to measure how we are doing clinically by reviewing specific and enhanced care bundles. [7]

Many Ambulance Services employ a mix of clinicians; doctors, nurses, emergency care practitioners and critical care paramedics. These additional roles supplement the more traditional roles of the emergency medical technician and paramedic. These additional roles offer expertise in trauma care, minor injury and illness. Specialist paramedics and HEMS dispatchers working in emergency operations centres allocate the right resource for the right patient at the right time.

With regards to Air Ambulance Units, many now employ a team approach of a doctor and/or specialist paramedic

teams to ensure that all patients receive the highest level of clinical care from the point of illness/injury through to delivery to a definitive care centre. The knowledge and experience that the team possesses allows for not only clinical expertise but also decision-making processes and problem-solving skills critical to many of the cases attended across the country by Air Ambulance Units.

Even though there has been a shift towards clinical outcomes and patient experience, response times are still an important factor for any ambulance service. For cases where speed is of the essence or a double crewed ambulance may not be required, many services utilise solo paramedics, responding in cars, on motorbikes and even on bicycles. This allows for rapid intervention and appropriate resource allocation when required.

In more rural areas many ambulance services have adopted civilian and military community first responders, equipped with automatic defibrillators and a range of basic ambulance equipment to ensure patients receive emergency care in a timely fashion.

Where time is an important factor, ensuring the right level of clinical care is essential. For example, West Midlands Ambulance Service and South East Coast Ambulance Service have worked in partnership with local universities and developed academic awards focusing on critical care and transfer, delivered at Masters level. These qualifications allow paramedics to extend their clinical and cognitive skills, thus providing specially trained staff to complement physicians working with Ambulance Services.

However, caution has been expressed by some physicians and arguments presented that whilst certain techniques can be taught, skills in other areas are based on years of medical training and the development of clinical acumen.[10,11] Equally there is evidence to support the advancement of paramedic practice and it has been recognised that core and advanced paramedic skills are developed further in association with good governance and research. [12,13,14]

1.3 Air Ambulance Services

The sector distinguishes between a **Helicopter Emergency Medical Service (HEMS)** and **air ambulance** missions. A HEMS flight is a mission carried out by a helicopter operating under a HEMS approval and aims to facilitate emergency medical assistance where immediate and rapid transportation is essential, by carrying:

- medical personnel; and/or
- medical supplies (equipment, blood, organs, drugs); and/or
- ill or injured persons and other persons directly involved.

Response to a HEMS mission is solely based on the **clinical condition** of the patient(s). An air ambulance mission is one where the aircraft is used as an extension of the Ambulance Service's land vehicles for the transfer of patients from / to hospital. The introduction of air ambulances in 1987 was a major development in getting to, and treating, patients quickly. Aircraft with two paramedics or Critical Care Paramedic (CCP) teams is a common staffing method and continues to bring enhanced clinical care to the patient more quickly than a road ambulance and offers an extended skills and knowledge base for treatments of specific patient groups.

The principle of a doctor-paramedic team was first used by London's Air Ambulance. This fundamental break from the usual paramedic-only model radically changed the dynamics of the crew and the level of care available to patients in the pre-hospital environment. In 2003, the Great North Air

Ambulance integrated physicians into their team. At the time of writing, several Air Ambulance Services are using this approach to pre-hospital care including Kent, Surrey & Sussex; Great Western; Essex and Herts; East Anglian; Midlands; Thames Valley; and Hampshire and Isle of Wight Air Ambulances.

With the development of the HEMS in London in 1988 and a body of trained practitioners elsewhere, the delivery of care at the point of injury improved markedly, and has been shown to significantly decrease patient mortality and morbidity within an overall system, culminating in definitive hospital treatment. [15,16,17,18,19,20]

The paramedic-physician concept has been the subject of much debate over the years but is now consistently demonstrating increased survival rates and decreased morbidity in regions where it is in use.[17] Correctly utilised HEMS operations target the most seriously injured patients and those likely to benefit most from early medical input regarding scene management, triage, treatment and transfer. Other benefits include providing rapid, controlled and skilled secondary transfers to tertiary centres for further specialist input after initial resuscitation in a non-specialist hospital.

1.4 Major Trauma Networks

1.4.1 Background

In 2008, Lord Darzi's Next Stage Review, reported that there were 'compelling arguments for saving lives by creating specialised centres for Major Trauma' and Strategic Health Authorities were asked to develop regional plans on this basis. [22]

On 1st April 2009 a National Clinical Director for Trauma Care was appointed to lead the development of clinical policy.

There is unacceptable variation in major trauma care in England depending upon where and when people are treated, according to the National Audit Office report published in February 2010. [23]

This led to an NHS Clinical Advisory Groups report in September 2010, which contained advice and recommendations on setting up trauma networks. Trauma networks were included in the NHS Operating Framework. [24]

A system of Major Trauma Networks was proposed – and implemented - for England, with a Regional Major Trauma Network in the West Midlands. Each Major Trauma Network comprises a Major Trauma Centre (MTC) supported by a network of Trauma Units (TUs). A triage tool is used to identify patients who fall into the major trauma category and these patients are taken direct to an MTC if the journey could be made within 45 minutes. If the patient can't be taken direct to an MTC then there is the option to take them to a TU for stabilisation and then an onward journey to the MTC would be arranged.

The Regional Major Trauma Network seeks to ensure that CQC standards relating to patient care are met and outcomes improved for this patient group. For example, by extrapolating national figures it is estimated that 50 to 60 lives a year have been saved in the West Midlands region alone following implementation.

The model means each geographical region has a network of TUs geared to treat trauma patients ranging from those with life threatening conditions to those with less complex injuries. This 'trauma system' integrates pre-hospital care (i.e. the care delivered by paramedics at the scene of the injury), the initial journey to a suitable unit, inter-hospital transfer (where required for patients in need of more specialist treatment), definitive hospital treatment and rehabilitation. Each region has a Major Trauma Plan which defines the pathway of care for severely injured patients, identifies the location and capability of each trust/hospital within the trauma system and outlines ambulance bypass protocols and thresholds for transferring patients to more specialist units. The boundaries of trauma systems are based on patient needs and not current NHS structures.

1.4.2 Definitions

Major Trauma Centre – A Major Trauma Centre (MTC) is a multi-speciality hospital, on a single site, optimised for the provision of trauma care. It is the focus of the Trauma Network and manages all types of injuries, providing consultant-level care.

- It is optimised for the definitive care of injured patients. In particular it has an active, effective Trauma Quality Improvement Programme. It also provides a managed transition to rehabilitation and the community.
- It takes responsibility for the care of all patients with major trauma in the area covered by the Network. It also supports the Quality Improvement Programmes of other hospitals in its Network.
- It provides all the major specialist services relevant to the care of major trauma, i.e. general, emergency medicine, vascular, orthopaedic, plastic, spinal, maxillofacial, cardiothoracic and neurological surgery and interventional radiology, along with appropriate supporting services, such as critical care.

Trauma Unit – A Trauma Unit (TU) is a hospital in a Trauma Network that provides care for most injured patients and:

- is optimised for the definitive care of injured patients. In particular, it has an active, effective Trauma Quality Improvement Programme. It also provides a managed transition to rehabilitation and the community.
- has systems in place to rapidly move the most severely injured to hospitals that can manage their injuries.
- may provide some specialist services for patients who do not have multiple injuries (e.g. open tibial fractures). The Trauma Unit then takes responsibility for making these services available to patients in the Network who need them. Other Trauma Units may have only limited facilities, being able to stabilise and transfer serious cases but only to admit and manage less severe injuries.

Local Emergency Hospital (not designated as TU) – The Local Emergency Hospital (LEH) is a hospital in a Trauma Network that does not routinely receive acute trauma patients (excepting minor injuries that may be seen in an Minor Injuries Unit (MIU)). It has processes in place to ensure that should this occur, patients are appropriately transferred to an MTC or TU.
It may have a role in the rehabilitation of trauma patients and the care of those with minor injuries.

SPECIALIST CENTRES [42]

1.4.3 Paediatrics

Paediatrics is the definition of a patient generally from birth to the age of 16, although some paediatric care pathways will also treat patients up to the age of 18. There are a number of sub-clinical specialisms such as Neo-natal care which can sometimes be included in Paediatrics.

The incidence of paediatric major trauma is low in comparison to major trauma in adult patients. Approximately 16% of patients are paediatric. These patients are taken to the most appropriate centre, be that trauma, burns etc to allow them to enter the most appropriate care pathway.

1.4.4 An Integrated System of Networks

The map on the right shows the correlation between the Major Trauma Networks and shows the expected flows of patients.

There would be some natural flow of patients into and out of each of the Major Trauma Networks to neighbouring Networks; for example a patient may be taken directly from one area to an MTC in a neighbouring network or a patient may be taken to a TU in one network and later transported on to an MTC in a neighbouring network.

Major trauma has been recognised as a leading cause of death and significant injury and disability. [22]

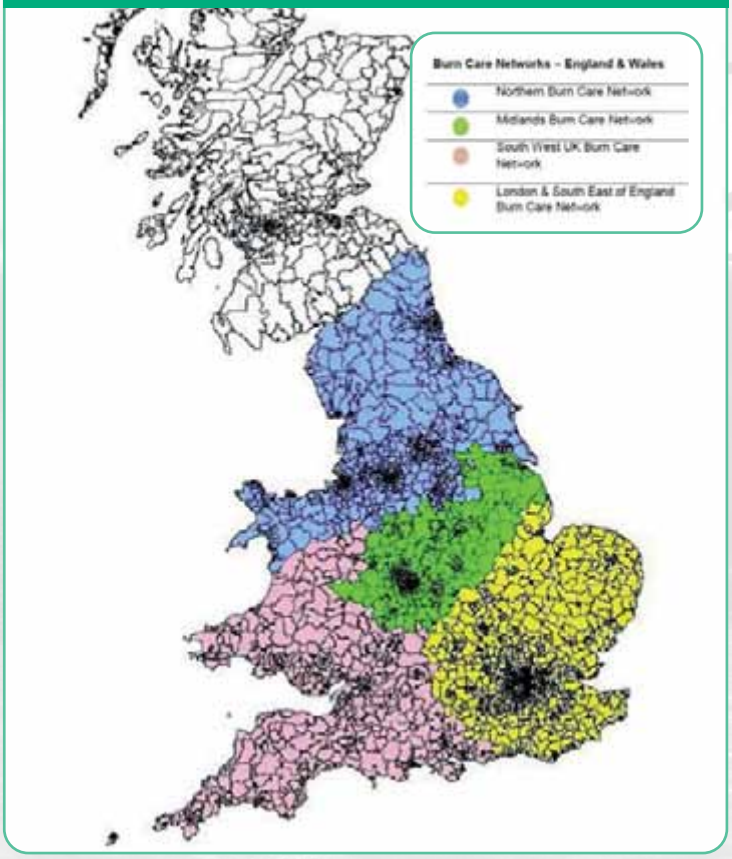
1.4.5 Burns Networks

In England and Wales, there is now a dedicated Burns Network, providing a specialist care pathway. If an attending air ambulance treating a burns patient feels a direct route to a specialist burns unit is the most appropriate course of action, a patient can be taken direct to that specialist unit. However, the method of injury causing the burn is often associated with other life-threatening injuries, resulting in the patient being taken to the MTC or TU first, stabilised and then receiving a secondary transfer.

The diagram on the right outlines the Burns Network in England and Wales. [25]

MAJOR TRAUMA NETWORKS

BURNS NETWORKS



1.5 Air Ambulances Services in the Future

'Taking Healthcare to the Patient: Transforming NHS Ambulance Services' [3] highlighted the increasing role that ambulance services should take in pre-hospital care. Air Ambulances have an important role to play in taking forward this strategy. The deployment of physicians on aircraft is likely to be a feature of more Air Ambulances, so increasing the clinical ability at the scene of an accident.

Increasingly patients who are seriously ill or injured are being treated in specialist centres. These patients include those with serious trauma injuries, injured or ill children, burns, stroke, neuro or major heart attack victims. The development of major trauma and specialist centres will result in an increase in tertiary referrals and require Air Ambulance Services to work closely with the centres to ensure that patients are taken to the correct place from the scene of the incident.

These and other changes will take place within an increasingly regulatory regime and with increasing expectations by patients. Both air and land-based ambulance services will need to ensure that they have in place staff with the relevant clinical training and systems and procedures which ensure that care is given by the right people at the right time and in the right place.