

MISSILE INJURIES

Historical Developments in Casualty Evacuation and Triage¹

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EARLY TREATMENT

With the vastly different technology, and almost primitive surgical skills, available to military commanders at the beginning of the nineteenth century, their attitude towards the wounded would appear to be callous. Apart from the commanders themselves, and perhaps some officers of nobility who might depend upon aides or personal servants to recover them from the battlefield,¹ there was rarely any plan for critical care or evacuation of the injured soldier, of which there were commonly vast numbers. Henri II of France developed the concept for a mobile hospital in 1550, but one can readily understand that the contingencies of war during the campaigns of Napoleon Buonaparte would not allow for delays and interruptions necessitated by the care of the wounded. Yet it is precisely during this period in Europe, when Buonaparte was intent upon expanding his empire through military conquest that the most notable efforts were made to institute a system of casualty evacuation.

Napoleon's early campaigns left thousands of dead and dying on the fields of battle, some crying out after the army had moved on for a merciful death. Knowing the practice of local villagers, who plundered anything of value from the casualties left behind, they preferred to seek a swift and humane outcome. Those fortunate enough to find their way to a local shelter or barn might receive medical attention. When it was known that a surgeon like Dominique Jean Larrey was on hand, the casualties could be brought to him with some hope or expectation of treatment within sight and sound of the war.² Dominique Jean Larrey, who served with Napoleon in every one of his campaigns, became not only a skilled surgeon through his military experience but was essentially humane. He was prepared to take surgery to the battlefield, where he ignored the obvious risks to himself. Larrey then devised his flying ambulances, horse drawn carts to carry the wounded from danger to a collective area for treatment. His efforts to evacuate the wounded and his tireless endeavours to relieve their suffering earned

him the respect of officers and men on both sides. But, more important, was the value he placed on the lives of individuals by his concern for their welfare, regardless of rank. It would be reasonable to state that Larrey set a standard of care that was difficult for most other military surgeons to emulate, yet he simply demonstrated the need for early evacuation and treatment if lives were to be saved.

In casualty evacuation, Larrey demonstrated his ingenuity and resourcefulness. After the battle of Bautzen, he wrote " it is important for the head surgeon to study well the countries that the armies cross, in order that he might know to benefit the injured using resources that localities might offer."³ Larrey evacuated 150 wounded from Bautzen to Dresden using wheelbarrows in a single file, utilising local resources. He described medical evacuation as "the salvation of the injured and the conservation of the morale of the soldier."

Once the spectre of Napoleon had disappeared from Europe, there was a period of relative peace and adjustment during which the medical profession addressed their short-comings while the military became progressively more dormant. In the years between Waterloo and the Crimea, a large number of books appeared dealing with gunshot wounds and war surgery (Larrey, 1812-1817; Guthrie, 1815; Dupuytren, 1834; Stromeyer, 1855), particularly in Edinburgh, where the first Chair in Military Surgery was established in 1806 and young surgeons were trained in the management of trauma.⁴

In 1815, two experienced Scottish surgeons were amongst those who visited Waterloo: John Thomson, the first Regius Professor of Military Surgery at Edinburgh University, and Charles Bell, whose illustrations of some of the wounded depict better than words the injuries sustained in this battle.⁵ As usual, inexperienced military surgeons quickly learned how to deal with major trauma. Although their system of triage was possibly as primitive as selectively treating only those who might have a chance of survival, such decisions were not always simple. Limb

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injuries from cannon or musket ball were readily assessed and subsequently were commonly treated by amputation. Their success or survival rate varied from five to sixty-five percent and depended largely on the experience of the surgeon. Head injuries and body cavity injuries from saber, lance or shot were generally considered to be potentially fatal, although there are reports of some miraculous recoveries which no doubt benefitted from being untreated by the surgeons. While we have no statistics on the wounds sustained by those killed in battle, the fate of the injured who could receive treatment was determined significantly by the delay in receiving attention, a delay which could extend to several hours or even days.

It soon became obvious, even to Wellington, that his army had no-one to match the daring or courage of Napoleon's surgeon, Dominique Larrey.⁶ Larrey taught and practiced a form of triage or casualty selection. He was a prolific writer, and in his extensive "Memoires de chirurgie militaire, et compagnes", published between 1812 and 1817, he records "...it is necessary to always begin with the most dangerously injured, without regard to rank or distinction." In practice, of course he could not afford to waste time on the critically wounded where there was no chance of survival. It must also have been obvious and frustrating to Larrey, and to all military surgeons of his time, to realise that selection of casualties for treatment was dictated by their own very limited surgical knowledge and expertise.

TRIAGE

The first military surgeon credited with using a formally graded system of triage under battle conditions was the famous Russian surgeon, Nikolay Ivanovich Pirogov (1810-1881).⁷ Pirogov, who referred to battle casualties as an 'epidemic of trauma', arrived at the Crimea in November 1854, after the battles of Alma and Inkerman, where the sick and wounded numbered in the thousands and established medical facilities were inundated. He came with the blessing of the Grand Duchess, Helena Pavlovna, whose personal concern for the care and welfare of Russian wounded had prompted her to found many charitable institutions including the Sisters of Mercy of the Community of the Cross. This latter organisation is recognised as one of the first professional nursing organisations in the world.

For the first time in the history of military and

field surgery, all nursing sisters and doctors were allocated to functional groups. On Pirogov's orders, the first group was in charge of sorting out the wounded, according to the type and severity of disease or injury, and of keeping a register of their belongings. Thus, the Pirogov plan of triage was put into practice at the first aid stations in Sebastopol, where wounded were assessed in four categories.

The hopelessly sick and mortally wounded were entrusted to the care of the Sisters of Mercy and priests. The seriously wounded, who required urgent surgery, received it at the emergency dressing station in the hospital referred to as the 'Building of the Assembly of Nobles'. With three teams operating, it was possible to perform ten major amputations in an hour and up to one hundred major surgical procedures each day.

The third group was those less seriously wounded who could be transferred for surgery the following day. Finally, those troops who sustained minor injuries were given immediate treatment and returned to their regiments. This enlightened plan was necessary to deal with the large number of casualties and with limited resources. But it is obvious that the Sisters of Mercy played an impressive role in making the system work. Eventual evacuation of amputees and other casualties from the battle zone was by horse and cart over rather rough terrain and significantly long distances.

One positive outcome from this period followed a publication of Jean Henri Dunant (1828-1910), who was present at the battle of Solferino (Un souvenir de Solferino, 1862).⁸ His account of the sufferings of the wounded in that battle led to the Geneva Convention of 1864 and the foundation of Red Cross, both of which would subsequently endeavour to ensure the humane care and safety of prisoners and wounded.

It is unlikely that Pirogov would have used the term 'triage' to describe his method of sorting casualties. In the eighteenth century, the word 'triage' (derived from the Fr verb trier, meaning 'to sort, to select') was applied by traders to the sorting of wool clips, and in the 1820's the term was applied to the sorting of coffee beans. Today, "triage" is used to indicate the application of priorities to injuries/casualties for the sake of management where medical resources may be limited.

Historically, by far the greatest experience in the treatment of mass casualties belonged to the military

where experience and organisation were intended to anticipate the trauma and sickness that befell an army at war. Civilian management of mass casualties from natural disasters has evolved in relatively recent times and draws extensively on that military preparation. But there is evidence that earlier consideration was given to some form of selection in hospital practice.

During the eighteenth century and the first half of the nineteenth century in Britain, where charitable care was made available to large sections of the community who were unable to pay for medical treatment, facilities in most centres were inadequate for the numbers seeking help. At the London Foundling Hospital at Great Ormond Street, for example, a ballot system was introduced which randomly selected those children who could be seen or examined in a session.⁹ In fact, Thomas Coram, the hospital's founder, disapproved of the ballot system as in his opinion it did not contain "...any test by which the merits of each case could be ascertained." Coram obviously would have preferred a system of priority based upon some initial assessment and classification according to degree of urgency, but his pleas were in vain.

The British Army at the Crimea (1854-1856), for all its mismanagement, recorded some important firsts during this campaign. Florence Nightingale, with a small band of women under her tutelage, provided essential nursing care to the sick and wounded at Scutari. Journalists and photographers were allowed to observe and record details of the war first hand, and casualties were further evacuated from the scene by train and ship. However, the railroad was a method of casualty evacuation used more extensively in South Africa (1899-1902), where distances were great,¹⁰ and during World War One in France.

THE AMERICAN CIVIL WAR

Meanwhile, the Civil War in America (1861-1865), which was essentially a war of secession between the North and the South, provided few innovations in casualty collection or management. The numbers of casualties were horrendous, in the region of two hundred thousand dead and over four hundred thousand sick and wounded. As with previous conflicts, the non-battle casualties far outnumbered the wounded, but they all required medical attention and the outcome in terms of mortality was often worse where some diseases were present in epidemic

proportions.¹¹ It is fair to say, however, that the Crimean disease rate was halved in Union camps and hospitals where Sanitary Commissioners constantly demanded better hygiene, better food, more comfort and medical care for the men.¹²

Records show that surgical field stations dealt with limb injuries by amputation, commonly without anaesthetic due to the shortage of supply, while injuries to the head and body cavities were rapidly assessed and considered inoperable. Acute medical cases were managed in field hospitals or transferred with serious or convalescent battle casualties to the nearest town facility. One advantage the Union Army had over the Confederate forces was ready access to established roads and railroads for resupply and for evacuation of casualties. But here again, the shortage of facilities and trained surgeons was compounded by the delayed collection and evacuation of casualties from the battlefield. An Ambulance Corps consisting of horse-drawn wagons was established, but surgeons often elected to operate at field stations close to the field of battle, unwittingly placing themselves and their wounded at further risk. A comprehensive "Medical and Surgical History of the War of the Rebellion", written by George Alexander Otis,¹³ appeared in three volumes between 1870 and 1881.

STRETCHER BEARERS

Throughout all of these conflicts, stretcher bearers played a major role in transporting wounded (Hannibal had provided litters to carry the wounded while crossing the Alps in 219 BC). In the British Army, stretcher bearers became part of the establishment of Regimental Aid Posts (RAP) and Casualty Clearing Stations. Bandsmen attached to a deployed Regiment also filled the dual role as stretcher bearers when required.

Lessons were learned from the British and Colonial forces involved in the South African War (1899-1902), more in terms of preparedness and the management of large numbers of non-battle casualties, but here the main lethal weapon was the rifle with small calibre bullets. The introduction of antiseptics and anaesthetics, together with the earlier treatment of casualties by field hospitals, considerably lessened the suffering of the wounded. Public awareness of progress in the war, or lack thereof, was influenced by the stories submitted by journalists such as Winston Churchill who reported the victories and the blunders

of the British Generals. But not until after the disclosure of incriminating evidence, at two Royal Commissions after the war had ended, was there any significant effort made to reorganise the army medical service.¹⁴ By the commencement of the First World War, this reform was in place.

THE GREAT WAR

During the Great War of 1914-1918, for the first time deaths from wounds now exceeded those from disease. Machine guns were more lethal while shell-fire produced more dreadful wounds and new methods of treatment were devised which included debridement and irrigation with hypochlorite antiseptics.

The new military organisation catered for improved medical and surgical facilities and casualty evacuation, particularly using the new motorised ambulances. But there was room for ingenuity too. The steep hills and gullies of Gallipoli proved ideal terrain for donkey transport of the wounded, as demonstrated to good effect by Simpson and others at ANZAC Cove in 1915. The desert sands covered by Chauvel's Desert Mounted Corps on its way to Damascus provided opportunities for evacuation by camel, and the flimsy aircraft of the day were not

confined to aerial combat but were gradually utilised in suitable conditions for reconnaissance, aerial photography and evacuation of wounded.

Although World War One is considered by some to be the true birthplace of triage, the concept obviously developed over many generations from the experience of military surgeons faced with the prospect of dealing with mass casualties under less than ideal conditions. However, there is no doubt that military doctors in this war were better organised to take advantage of those developments in medicine and surgery that would benefit the troops significantly. The emergence of new specialties in radiology, pathology and various departments of surgery may have resulted from or been promoted by the necessity of war but they also assisted in the process of triage as medical staff could provide earlier and more accurate diagnosis and treatment of injuries. Since then, the processes of casualty evacuation and triage have continued to develop in association with advances in technology and the requirements of modern warfare.^{15,16} It is evident, however, that to an increasing extent, the organisation of emergency services in peacetime and the management of civilian casualties from natural disasters becomes more closely parallel to that of military experience.

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