ABSTRACT

The article sheds light on the plight of war casualties, both the wounded and diseased, in times of unsettling conflict and details the rise and fall of military medical systems which were set in place to resolve them. While the question of whether man or microbe had been a more threatening enemy to the military, an examination of historical records and statistics will reveal that the greatest threat on the battlefield is actually microscopic. However, efficient systems should be set in place for evacuation and the treatment of wounds as these factors are of paramount importance in determining the outcome of a war. From the dismantling of elaborate medical structures following the fall of the Holy Roman Empire, to the establishment of the first School of Nursing by Florence Nightingale, readers are given a thorough insight of the development of military medicine through the ages.

He who would become a surgeon should join an army and follow it

- Hippocrates

Military medicine has its roots in antiquity. Evidence of war surgery in ancient Egypt is afforded by mural paintings and bas-reliefs found in the temples of Kranak and Luxor. The Edwin Smith papyrus which dates back to 3000 BC, contains detailed descriptions of the treatment of commonly encountered war wounds such as the following concerning head injury:

Instructions concerning a gaping wound in his head, penetrating to the bone: “Thou should lay thy hand upon it and palpate the wound. If thou should find his skull not have a perforation in it, thou should say regarding him—an ailment I will treat.

Instructions concerning a gaping wound in his head, smashing his skull: “Thou should palpate the wound. Should thou find that smash in his skull deep and sunken under thy fingers, and he discharges blood from both nostrils and ears, and he suffers from stiffness in the neck, thou should say concerning him—an ailment not to be treated. He should rest and be kept at his mooring stake.”

Hippocrates himself, the father of medicine, almost certainly derived his surgical skills from the battlefield. In fact, war was the only school of surgery in his day because the Athenians, in
their idealism to ‘make gentle the life of the world’ had decreed that bearing of arms by civilians was not consistent with civilisation. Professional soldiering, of course, was something else—hence Hippocrates’ advice to follow the army to perfect one’s surgical skills.

The treatment of war wounds also received mention in the Chinese classics. An interesting account is given of the legendary physician Hua T'o treating an arm wound of General Kuan Yu of the Three Kingdoms’ fame, by cutting his flesh and scraping the bone. As the proper attitude toward pain was to bear it without any sign of emotion, much was made of the insouciance of the general who played chess while the surgeon operated.©

No less military-minded was India’s Susruta (4 BC) whose medical treatise includes a chapter on advice to the physician accompanying the army on the march. According to Susruta, he should be fully equipped with a supply of medicine, making sure he is situated forward ‘so that those wounded may find him.’ The doctor’s preventive role in sniffing out environmental hazards is also mentioned:

A common practice of the enemy is to poison the wells on the roadside, the articles of food, the shades of trees, and the fuel and forage for cattle; hence it is incumbent on a physician marching with the troops to inspect, examine and purify these before using any of them, in case they are poisoned.©

But concerning field hygiene, none matched the Old Testament Jews whose wars were governed by regulations as binding as the Mosaic code. Detailed instructions pertaining to the prevention of the spread of communicable diseases were spelt out, right down to the nitty-gritty of sanitary waste disposal:

Designate a place outside the camp where you can go to relieve yourself. As part of your equipment have something to dig with, and when you relieve yourself, dig a hole and cover up your excrement.©

Another not-so-recent idea is health and fitness promotion. The fitness of the ancient Greek armies was ‘founded upon daily exercise from earliest youth to ripe manhood, under the supervision of experienced and practised leaders.’ Healthy diets and gymnastics were prescribed for the prevention of bodily ills and as an auxiliary in the treatment of general or organic disorders.©

But when healthy and fit young men are thrown into battle, many would inevitably become casualties. Xenophon, the general who led the epic retreat of the Ten Thousand Greeks (415-400 BC), noted that casualties were a costly drain on fighting strength: ‘There were many unfit for action—namely the wounded,
those carrying the wounded, and those who bore the arms of such carriers. The wounded were usually carried on the backs of comrades. On one occasion, Xenophon publicly scourged a bearer for trying to bury a wounded man to get rid of his burden.

The motivation for care of the wounded was not solely humanitarian. The Romans recognised it as a military necessity. ‘Roman’ medicine was largely imported from Greece, but the significant Roman contribution was undoubtedly the organisation of military medical support. At about 100 BC, as the Romans began to structure the 6000-man legion, the military medical system became part of this structure. At legion headquarters was an office-doctor, variously titled as Medicus Legionis or Medicus Militarus. Under him, for initial medical care at the 500-man cohort level, was a Medicus Ordinarius, a non-commissioned medical officer. Still under him, at the century level of 60 to 100 men, were the Capsarri, or wound dressers. Unarmed sanitary personnel called Deputati followed the fighting columns at a distance of 200 feet in order to bring the severely injured out of danger during an engagement. The saddles of their horses had two ladder-stirrups on the left side and flasks of water were carried to revive the faint. The bearers received a piece of gold for every wounded soldier rescued.

As time went on, an extensive military hospital system – the Valetudinarium – was built, one per legion. The standard floor plan had 60 wards or one per cohort, with special rooms for surgery and the storage of drugs. Thus we see in the Roman model, a foreshadowing of the modern concept of echeloned medical care along an evacuation chain.

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Give all the care you possibly can to your wounded, for if you neglect them, you will make your soldiers timorous and cowardly before a battle, and, not only that, but your personnel whom you might preserve and retain by proper consideration for their health and welfare, will be otherwise lost to you through your own negligence.

The dismantling of the Holy Roman Empire after Charlemagne’s death in 814 AD, coupled with the advance of feudalism in Europe, led to the splintering of large armies and with that, their elaborate medical structures as well. During the Middle Ages, medicine, along with scientific inquiry, sank to low levels, remaining there for several centuries. As scholars of the church picked over the bones of classical antiquity and argued over religious dogma, many well developed medical procedures, mainly Hellenistic in origin, were lost. Prayers, unctions and laying of hands were the order of the day. Pharmacology regressed to a simplified herbalism practised in monasteries.

The pharmacopoeias of the day consisted mainly of ingredients compounded from the parts of different animals. Field medical chests of the period included oils of vipers and angeworms, beetles, ear-wigs, powdered mummies, etc. Perhaps the only positive development in this age of Faith was that the Crusades (1096-1272) gave rise to religious orders such as the Knights Hospitaller and the Teutonic Knights, which did valiant work in the Holy...
Land and upon returning home, would later exert great influence upon the establishment of hospitals in Europe.\textsuperscript{15}

As opposing armies marched and counter-marched all over Europe, the epidemics spread, killing countless thousands of civilians as well. It was a sober reminder that the larger struggle for earthly existence was with lower forms of life.

In keeping with the medieval spirit of the age, the few capable physicians and surgeons of the day were attached to great personages such as kings, popes, nobles and other feudal overlords. They faithfully accompanied their masters of military campaigns and were richly rewarded for their services. Medical attendance thus became the privilege of leaders, not combatants. According to Keegan:

\begin{quote}
Men of high rank were brought off the field by their squires, and treated rapidly by their own surgeons. The overwhelming majority of wounded were likely to lie where they had fallen for hours or even days, at the mercy of their wounds, the weather and, not least, the sinister swarm of pillagers who descended upon battlefields... stealing money, jewellery and clothing, silencing a wounded man’s pleas or protests with a knife thrust.\textsuperscript{16}
\end{quote}

Nothing whatsoever was done for the health and well-being of the individual soldier, who was left in the hands of ‘wandering incisors, barber-surgeons and quacks of outcast status.’\textsuperscript{17} As late as the sixteenth century, Montluc declared that the best thing that could happen to a fighting man in battle was to be “killed outright by a good arquebusade.”\textsuperscript{18}

It was against this backdrop that Ambroise Pare, a barber-surgeon serving with the French Army, distinguished himself. In 1536, Pare had witnessed an old sergeant cutting the throats of three helpless, wounded men ‘gently and without malice’ to put them out of misery.\textsuperscript{19} The episode affected him as profoundly as the boiling oil and red hot irons liberally applied to wounds up till then. Pare introduced gentler, more humane and more effective treatment methods for gunshot wounds and amputation of limbs which were revolutionary for his time. He pioneered the use of ligature (tying up of the artery following amputation) and a multitude of ingenious innovations, including artificial eyes, arms and legs, and even implanted teeth. He published papers which are classic works, marking a new era in the history of surgery. Pare is today, with justification, revered as the father of modern surgery. He is also remembered for his humble line: \textit{Je le pansait; Dieu le guarit} (“I dressed him; God healed him”).\textsuperscript{20}

Amidst the unsettling conditions of the 16\textsuperscript{th} century (and the early stirrings of the Renaissance), another major front opened. Smallpox, measles, typhus, yellow fever, diphtheria, whooping cough and influenza erupted with a vengeance, in epidemic form.\textsuperscript{21} Typhus and smallpox, in particular, became the principal scourges of army camps and wherever large concentration of troops gathered.

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as well. It was a sober reminder that the larger struggle for earthly existence was with lower forms of life.

It was hard to tell which was more lethal—man or microbe. Apparently, few accounts were taken. Reliable records of battlefield losses during the 16th and 17th centuries are scarce, contrasting with the Greek and Roman historians of earlier periods from whom we have firm statistics of battle losses. The Roman practice of numbering the troops before and after a battle, coupled with the recruiting of armies by the census, provided a check against the numbers purportedly engaged and lost.

The impact of disease on military outcomes should not be underestimated. According to Plutarch, Mark Anthony’s army in 35 BC lost more than half of its force through disease—“a proportion not unusual in the ancient world.” The army of Alexander the Great suffered similar ravages of disease and privation. Typhus, typhoid, dysentery and pneumonia, in combination with the wintry cold, decimated Napoleon’s Grande Armée during his ill-fated invasion of Russia in 1812. Indeed, analyses of statistics compiled for the whole of the 18th and 19th Centuries show that on average, at least four soldiers perished from disease for every one killed by enemy action. Historians are generally in agreement that in the entire history of armed conflict, far greater numbers have been brought down by the minute carriers of disease rather than perished by the sword.

Even seemingly innocuous conditions like scabies, the ‘tormenting itch’ caused by tiny mites burrowing into the skin, although not fatal, can incapacitate whole regiments. During the Seven Years’ War (1756-63), half of the armies of Frederick the Great were thus affected—“Hardly anybody escaped, neither officer, nor physician, nor surgeon.”
And, during Napoleon’s Italian campaign (1796-97), scabies sufferers could be counted by the hundred thousands. According to one eyewitness, “Whole regiments of soldiers, the moment they were encamped for the night, threw off their knapsacks and scratched en masse. The officers suffered no less than the soldiers; their commander-in-chief was no exception, scratching himself with a vengeance until blood appeared.”

The wars of the 19th century, such as the Napoleonic wars, the Crimean War and the American Civil War, produced several famous personalities who left lasting impressions on military medicine.

Napoleon’s chief surgeon, Larrey, was said to have performed no less than 200 amputations (speed was of the essence in an era of limited anaesthesia) during a 24-hour period in the Russian campaign. He also wrote vivid descriptions of trench foot, scurvy and contagious eye infections. But he is best remembered for creating his famous ‘flying ambulances’ i.e., horse-drawn wagons fitted with removable stretchers – in effect, re-introducing organised casualty evacuation and treatment while the battle was on, a practice that had been lost since Roman times. Each division sent forward was accompanied by a troop of ambulance personnel headed by a surgeon. These men and their equipment boosted morale tremendously. Larrey himself was present in no fewer than 60 battles and was wounded at least three times.

The ambulance concept was further developed during the American Civil War by Letterman, Medical Director of the Army of the Potomac. He had been so appalled by the misery caused by fleeing stretcher bearers and unruly ambulance drivers during the initial conflicts that he took steps to ensure that future ambulance staff were better trained and organised. He also introduced
the concept of triage, i.e., the sorting of casualties by severity, at medical clearing stations close to the battle line, from whence casualties would be evacuated rearwards to receive echeloned medical care. It was a simple principle which was eventually adopted by all armies of the world.

But, perhaps no other practical advance has brought greater comfort to millions of sick and injured in the world than the nursing profession founded by Florence Nightingale. In 1854, she witnessed the shocking conditions in the military hospital at Scutari where the British war-wounded were kept. She imposed her ideas of nursing care on those in authority and on her return from the Crimea, established the first School of Nursing in the world. She was also responsible for many later innovations which made military barracks safer and more sanitary.

A few years later, another great humanitarian movement was born. In 1859, Swiss banker Henri Dunant visited the scene of the Battle of Solferino shortly after the fighting had ceased and witnessed the carnage and gross neglect of the wounded. The sight of tens of thousands of wounded soldiers still lying unattended on the ground so moved him, that he persuaded the victorious French commanders to free the captured Austrian military surgeons to care for the injured of all three nations, i.e. France, Italy and Austria. Tuti fratelli (all brothers), he kept repeating when local civilians resisted helping the enemy wounded. He later wrote a book called Un souvenir de Solferino in which he described the scenes he had witnessed. The revelations so shocked the civilised world that the International Red Cross, mainly through Swiss initiative, came into being five years later. At Geneva, 16 signatories agreed to abide by humanitarian principles such as treating the war-wounded regardless of nationality and giving protection to medical personnel and hospitals.

The First World War saw the massive application of modern medicine—widespread immunisation, ritual delousing, motorised ambulances, management of shock, surgery under modern anaesthesia, prevention and treatment of chemical warfare casualties, the identification of ‘shell-shock’ as a psychiatric disorder, and so on. Traditional threats like typhus, plague and cholera had been rendered controllable. But, wound infection was rampant and this led to vigorous developments in antisepsis and antisera. The introduction of the aeroplane and the submarine as weapons of war also surfaced new medical problems and gave impetus to the development of aviation and underwater medicine. When the ‘Great War’ ended, the world was by no means at peace. Nationalistic revolutions threatened to re-ignite Europe and large tracts of Asia were still left in disorder. Preparedness was the watchword, following the realisation that “to steal away a nation’s sword is the surest enemy of peace.” But, in terms of overall medical preparedness, the world, in the words of Taylor, had “not yet attained to a comprehensive grasp of the requirements or possibilities of military medicine.”

The Second World War, although fought on a larger scale and with more powerful weapons, actually incurred a lower casualty rate than did World War One (WWI). This was mainly attributed to the dramatic reduction of deaths from infectious diseases from 16.5 per thousand men to less than 1 man per thousand. The war also stimulated and accelerated a number of medical advances: Dichlorodiphenyltrichloroethane (DDT) for preventing louse-born typhus,
malaria prophylaxis, antibiotics, large-scale whole blood transfusion in the field, treatment of burns and aeromedical evacuation from the combat theatre. Still, mistakes were made, too many to be listed here. But, one deserves mention—in North Africa, disorganised evacuation resulted in massive over-evacuation and under-return to duty of soldiers with simple, remediable conditions. In France and Belgium in the fall of 1944, the term ‘million dollar wound’ was coined as the lightly wounded were air-shuttled to England while the seriously wounded filled the mobile hospital beds. Combat medicine, improperly understood and executed, can be a conduit that bleeds the fighting force!

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The Korean War shattered the uneasy peace that followed the end of WWII. The medical war was about Mobile Army Surgical Hospital (MASH) units and helicopters, vascular surgery and blood banks and combating endemic diseases like typhus, infectious hepatitis, malaria and even frostbite. It also demonstrated the problems associated with mothballing of medical services between armed conflicts. The Americans faced critical medical manpower shortages and inadequate equipment and drugs. Despite the recent experience of WWII, there was an expensive re-learning by young inexperienced surgeons of the old lessons of wound treatment.

The Chinese People’s Liberation Army fared much worse, experiencing severe problems of evacuation in the bitter winter cold and severe shortages of medicine. Lacking efficient transportation means, it took an average of 25 hours for the wounded to reach first-line, division-level field hospitals. As the war progressed, this time interval was shortened to 13-14 hours, which was still far from satisfactory. For Mao Zedong’s exhortation to ‘rescue the dying, heal the wounded, and practise revolutionary humanitarianism,’ to be practicable, better logistics back-up would be needed.

Vietnam was undoubtedly the epitome of high-tech combat medicine. Virtually immediate evacuation by ‘dust-off’ helicopter ambulances, usually within one hour of wounding, was commonplace. Some of the best combat surgery ever performed was in air-conditioned, semi-permanent hospitals with equipment and medical staff comparable to civilian trauma centres in the United States (US), but located close to the battle areas. Only 1% of the wounded reaching a medical facility died, a figure which compares favourably with the 2.2% and 4.5% in WWII. Preventive medicine, although not without flaws, was good enough to keep infectious diseases and non-effectiveness rates at the lowest levels of any war.

Another major contributor to this success was the improved medical command system. In previous wars, US Army medical units were
subordinated under the control of logistics commanders, an arrangement which was also in existence from 1964 to 1966 in Vietnam. But by 1970, the superior effectiveness of a separate theatre medical command, with strong professional medical control at each echelon and central control of medical assets by senior medical commanders directly responsible to the supported line commander, was clearly demonstrated and implemented.  

We end, as we began, near the cradle of civilisation. In January 1991, with more than a million troops arrayed in the Persian Gulf in readiness to do the ‘mother of all battles’, casualty estimates ran high—10,000 dead and 35,000 wounded for US troops alone, according to one source.  

The desert environment was essentially hostile, and medical concern centred around natural threats like heat stress, dehydration, snake/insect bites and infections, as well as military threats like chemical and biological weapons. As it turned out, many anticipated problems did not arise, thanks to the brevity of the ground war, the non-employment of Iraq’s extensive arsenal of chemical weapons, and the extensive preventive health measures taken.

With the emergence of the New World Order—post-Gulf, post-Wall and post-Evil Empire—and despite the promise that it holds for greater world disarmament, warfare appears now to be entering a new phase of protracted, low-intensity conflicts fuelled by ethnic and religious strife. It is, as yet, too early for nations to beat their swords into ploughshares. There remains much to be fully grasped concerning the ‘requirements or possibilities of military medicine...’
ENDNOTES


30. Letteege J: Medical recollections of the Army of the Potomac, Appleton, New York, 1866.


