Medical Contributions to WWI or WWII
Submission for the Colonel Jon Clasper Award

Word Count: 2886/3000

Author:
Dr Jonathan Dennis MBChB (Leicester 2018)
Capt, 212 Field Hospital (V)

War and Medicine go hand in hand with Hippocrates purported to have said that: "War is the only proper school for a surgeon". The nature of war provides great opportunity for medical advancement with these same innovations being used to support and change the direction of conflict. A reason for these innovations is that conflict provides a large number of subjects on which the healer can practice their art. In total almost 40 million died in the First World War (1914-18) and 72 million people died in the Second World War (1939-45). It must be noted however medicine has been perverted into a less therapeutic direction. Over the course of this essay I will demonstrate how medicine has contributed to War in both ethical and unethical manners. The main theme around which this will be based is the effect that medicine had on the troops as, after all, the main effort of war time medicine is to help maintain a fit and effective fighting force. Whilst this essay will focus on World War II, it is important to recognise that the lessons learnt from previous conflicts such as World War I were carried forward to benefit. Medicine's contributions affected everything from selection of soldiers to the end of life care they received.

The theme of this essay is the ability of medicine to support morale. The knowledge that if you are injured you will be cared for is an essential aspect to supporting the fighting force. Whilst morale is used in many settings the British Army has quite a specific take on it which is included below. Maintaining morale is one of the biggest contributions that medicine has had to WWI and WWII.

"Morale is a positive state of mind – a will to win – which depends on strong leadership. It consists of fighting spirit, moral cohesion, discipline, comradeship, pride in self and unit, confidence in equipment and sustainment, and a firm spiritual foundation. High morale enables a land force to fight offensively and overcome the privations of conflict, not only for a single battle or engagement, but for a campaign. It can inspire an army from the highest to the lowest ranks. Success in land operations depends as much on moral factors as physical ones. "

For medicine to contribute to World War Two it had to build on the skills and technologies developed in previous conflicts. The First World War triggered a medical renaissance by allowing modern military medicine to develop sadly at the price of many lives. The trench conflict with a high Butchers' bill led to a Malthusian necessity to develop solutions. The concept of ambulances was pioneered in Roman conflicts, rediscovered in the Napoleonic wars and further developed during conflicts that followed especially WW1. The introduction of mandatory immunisation, delousing, anaesthesia and psychiatry all contributed.

Medication played a key part in how Medicine contributed to World War II. The beginning of World War II was marked on the 1 September 1939 by the Invasion of Poland. Here Wehrmacht troops undertook a rapid advancement. It is alleged that was in part due to the use

of performance enhancing medication: Pervitin, better known as a form of Methamphetamines. “Panzerschokolade” or tank chocolate was used to allow troops to function on reduced sleep. This was done based off the recommendation of German army physiologist Otto Ranke. It should be noted that Wehrmacht forces were not the only forces reported to have used this substance. It was used by Allied and Axis Forces. This medication came into use in part due to medicine but more due to the opinion of senior military figures that it increased the emotional state required for combat. Interestingly, towards the end of the War, a move was made by Third Reich health officials to remove its use as it was felt to be counterproductive. The idea that this was a miracle medication led to neglection of the side effects it caused. Whether this medication had a positive or negative contribution is uncertain, but its use is part of military and medical history now.

Compared to methamphetamines use the contribution of infection control is far more certain. Despite the second world war being fought on a much larger scale and with more destructive weapons there was a lower casualty rate than in World War One. This is mainly attributed to reduction in deaths from infectious diseases. This went from 16.5 per 1000 to less than 1 per 1000. The measures undertaken to prevent the spread of infectious diseases led to the development of mobile laboratories and promotion of vaccinations. The main areas of medication use were in malaria prophylaxis, the use of Dichlorodiphenyltrichloroethane for preventing louse-born typhus, tetanus vaccinations, analgesia in the form of morphine injections, and antibiotics. Antibiotic use significantly improved survival rates. The 1936 class of Sulpha drug use and 1939 Penicillin reduced deaths from infectious disease. Soldiers were issued with antibiotic powders which were to be placed into wounds after cleaning to reduce the risk of infections. The use of antibiotics reduced the number of amputations meaning that soldiers, once healed, could return to service.
Sulfa drugs were widely used by soldiers in World War II to beat infections due to the ability of their main ingredient, sulfanilamide, to kill lethal bacteria. Sulfanilamide, a precursor to sulphonamides, was first mass distributed in 1936 and eventually became widely used during World War II to fight not only strep infections, but also meningitis and pneumonia, which had been killing and weakening tens of thousands of soldiers. The sulpha drugs, as medicines containing sulphonamide and sulfanilamide were called, helped prevent many deaths. Soon, it became routine for soldiers to carry powdered sulfanilamide in their first aid kits; the powder could be easily poured on cuts and scrapes to prevent life-threatening infections. Some historians credit sulfanilamide with helping the Allied Forces claim victory in World War II since it kept soldiers healthy. Morphine played a key role in helping injured soldiers by being a reliable and effective pain killer. The morphine Syrettes developed in conjunction with Squibb allowed ease of administration.

Public health intervention to maintain an effective fighting force also related to sexually transmitted infection. There were high rates of sexually transmitted disease in the army which caused enough concern that in the American Forces they underwent a vigorous campaign against commercial sex. Slogans such as “A German bullet is cleaner than a whore” were used as part of the public health message. Whilst in World War I condoms were not provided, in World War II they were in order to reduce the risk of infection . Alongside this sex workers were subjected (rightly or wrongly) to regular screenings.

American soldiers who were stationed in the South Pacific were at high risk of malaria. The lack of quinine-based drugs available led to the requirement for another medication. This came in the form of Atabrine which was effective at preventing malaria. Unfortunately, there

were side effects from this medication, but it's uses enabled an effective fighting force to be maintained.

As mentioned earlier ambulances and casualty evacuation played a key role in conflict. The use of motorised ambulances, field hospitals and aeroplanes led to rapid evacuations with vast reductions in the numbers of wounded dying before reaching a medical facility. Whilst evacuation to suitable facilities, and especially aeromedical evacuation, allowed rapid recovery to safe areas the overuse of this led to loss of fighting troops with remediable conditions. A key example of this is the evacuation of the North African eighth evacuation hospital. Furthermore, by not having evacuations of patients requiring long term care from field hospitals to maintain flow, it meant that troops who could have been managed locally were evacuated back to the United Kingdom with a "Blighty Wound" due to the lack of beds. This led to draining of manpower. Brigadier Lim Meng Kin of the Singapore Armed Forces Medical Corps states that: "Combat medicine, improperly understood and executed, can be a conduit that bleeds the fighting force". Situations such as above demonstrate this. Despite over-evacuating, the used of advanced field hospitals, motorised ambulances and aeromedical evacuations greatly improved casualty survival rates and morale. This allowed an effective fighting force to be maintained.

Motorised ambulances were developed to allow evacuation from front lines during conflict. Initially casualties were evacuated to regimental aid posts from where they could be taken by stretcher bearers/ambulances to casualty clearing stations and then further onto field hospitals. This was directed by medical officers (such as those of the Royal Army Medical Core) who triaged patients at the regimental aid post. This allowed prompt treatment and access to surgical capability. The development of mobile surgical units (indeed an idea which is being revisited with forward surgical capability today) allowed greater patient care. The further development and increasing portability of mobile X-ray units from WW1 allowed WWII soldiers to be imaged with greater speed, allowing prompt identification of bullets, shrapnel and fractures. By bringing the patients and surgeons closer together it allowed surgery to occur within a 12-hour window for 75% of those in need. Novel methods of fracture fixation were used by Nazi forces who utilised metal plates to stabilise fractures. This innovation allowed open reduction and internal fixation which enabled stabilisation of fractures allowing service personnel to return to active duty.

The development and common introduction of blood transfusion allowed soldiers to be transfused reducing death by hypovolaemia and allowing surgery to take place. The new techniques of refrigeration and plasma storage allowed the development of blood banks so that there was an increased supply. This was based on work of Mr Geoffrey Keynes a WW1 surgeon who developed a portable blood transfusion machine. The introduction of sodium citrate by Dr Hustin to preserve blood and the 1930s invention allowing separation of plasma and red blood cells also contributed to this development. Dr Charles Drew developed the Blood for Britain programme which prepared and transported nearly 15,000 units of plasma to Europe over a five-month time period. This saved many lives improving morale.

The expansion of the Royal Army Medical Core and the development of the Royal Army Dental Core allowed greater patient care to be provided closer to the battlefield. World War II saw the introduction of the Modular Dental Unit which allowed dental needs to be met locally rather than at a Field Hospital. They consisted of a caravan kitted out to the same standard as a dental centre at the time. Dental pain sapped morale and being able to provide care was invaluable. Due to their attachment to forward units the Army Dental Core often

became prisoners of war alongside there compatriots meaning that they continued to care for the dental health of the forces in these environments. In the Far East it is noted that they provided care by improvising equipment and extracting teeth under hypnosis.

The military development of submarines and aeroplanes during the First World War and their widespread use during the Second led to the growth of aviation and underwater medicine. An important medical contribution was the self-righting life vest. Prior to this cork vests or flotations aids were used however in the event of an individual being unconscious they would likely drown. As a result, this allowed airmen and mariners who were in water to be supported in the correct manner even if unconscious. By increasing survivability, it allowed skilled pilots and mariners to be recovered. This is primarily due to the work of Dr Edgar Pask who is called “the bravest man in the RAF who never flew an aircraft”. His work encompassed three roles. In 1941 he worked to develop a life vest which as described above self-rights. To do this he had to understand how an unconscious human body performed in water. This was achieved by allowing himself to be anaesthetised and then cast into a swimming pool with prototypes to assess how the human body and different buoyancy aids performed. Despite requiring hospital admission after each experiment this occurred until a suitable life vest was developed. This contributed to saving lives. Dr Pask further contributed by developing a protective suit for use of pilots immersed in cold water. These survival suits were used by pilots across the Royal Air Force. He tested this by being parachuted into the sea off the coast of the Shetland Islands. Survival suits and effective life vests increased survivability of those exposed to the sea. The final contribution he made was for the use of Eve’s rocking board method which was used as a precursor for cardiopulmonary respiration. This method was adopted to allow artificial ventilation which provided a chance where otherwise there would be certain death. To train pilots for high altitude bombing, experiments were undertaken inducing hypoxia in medical students by exposing hm to the same atmospheric conditions and asking them to perform various tasks. As a result, an awareness of the requirement of oxygen at high altitudes came forth.

Submarine use introduced a new area of medical innovation as the living conditions greatly affected submariners and reduced combat effectiveness. A key example of this was eye strain which was a common complaint amongst submarine personnel. It is reported that conjunctivitis, headaches, and sun blindness were frequently seen in crews following wartime patrols. As a result, a screening programme was developed to address and remedy this allowing crews to continue to operate. Tuberculosis was also an area of serious concern amongst submariners and the Bureau of Medicine and Surgery. As a result, Doctors put in a large amount of public health measures including regular screening with periodic Chest X-ray examinations and the policy of transferring all individuals suspected to have tuberculosis away from submarines. This included all those attached to the submarine programme. The World War II incidence rate of the American submarine force was 0.43 as compared to an entire fleet incidence of 0.32. Without these measures it would likely have been much higher an increase than this and reduced effectiveness of the force.

The risk of chemical and gas warfare meant that gas masks had to be used. As a result, the work of Dr John Haldane, a Scottish physiologist, was used. Developed in World War I, and then further refined in World War II, his work allowed protection from deadly agents which would otherwise have killed/maimed soldiers. By allowing individuals to function in adverse environments he helped a fighting force to remain flexible.

One area where Medicine was lacking during WWI and started to remedy during WW2 is in that of post-traumatic stress disorder. Terminology such as “shell shock” for WWI and “battle fatigue” for WWII did not take into account the horrendous situations the individuals were exposed to. This would occur at a later date with psychological testing and assessing the suitability of a soldier. During the Second World War (1939-45) psychiatrists in the United States used psychological testing to determine a recruit’s suitability to be a soldier. Despite these tests, the effects of battle were still hard on soldiers. Many demonstrated symptoms of high levels of stress, a condition referred to as battle fatigue. These soldiers were removed from the fighting and rested. More women were closer to the front lines than in previous wars, but the authorities still thought they were less suited to being close to the fighting than men. A number of men and women were discharged from the forces in the Second World War as they were considered unsuitable for the military. Guides were produced and rehabilitation undertaken.

Medicine contributed in justifying the WW2 conflict as well. Between WW1 and WW2 eugenic/cultural purity movements existed in both Germany and the United States athough the Nazi regime was far in advance. In 1933, Germany created the Law for the Prevention of Genetically Diseased Offspring which allowed forced sterilisation and related to those diagnosed with; “feeblemindedness, schizophrenia, manic-depressive disorder, genetic epilepsy, Huntington’s chorea, genetic blindness, genetic deafness, severe physical deformity, and chronic alcoholism.”. This paved the way for the holocaust as we know it. The Jewish population was not the only one to be targeted and between 1.5 – 2 million Roma were also exterminated. The ideology behind the Aryan race as the superior race came about in part due to American Eugenics as referenced by Hitler in his 1934 book “Mein Kampf”. The work of Dr Josef Mengele further developed this idea and contributed to the war crimes in World War II. These ideas were also used by the Japanese Special Research Unit 731 who undertook unethical and immoral research. However, medicine also contributed by allowing those affected by the atrocities to be supported both physically and emotionally when they were rescued from these settings. The testimony of medical experts such as Drs. Andrew Ivy and Leo Alexander allowed the Nuremberg Prosecution to successfully prosecute during the Doctor’s Trials.

During the course of this essay I have shown examples of how medicine contributed to World War I and World War II, both as specific developments, and the overarching effect of promoting morale and survivability thus maintaining an effective fighting force. Medicine also contributed to the ideas which were used to justify the strive for racial purity amongst the Nazi forces. Whilst it had a positive contribution the research which was undertaken shows that medicine can be detrimental as well.

References:

References

Army Doctrine Publication: land operations (updated 31 March 2017). (2017). Land Warfare Development Centre, Army Doctrine Publication AC 71940.

Broughttolife.sciencemuseum.org.uk. (2020). *War and medicine*. [online] Available at: http://broughttolife.sciencemuseum.org.uk/broughttolife/themes/war [Accessed 20 Jan. 2020].

Biography. (2020). *Charles Drew*. [online] Available at: https://www.biography.com/scientist/charles-drew [Accessed 21 Jan. 2020].

Duffy, J., Gabriel, R. and Metz, K. (1993). A History of Military Medicine. Volume I: From Ancient Times to the Middle Ages. Volume II: From the Renaissance Through Modern Times. *The Journal of Military History*, 57(1), p.133.

The Royal College of Anaesthetists. (2020). *Dr Edgar Alexander Pask*. [online] Available at: https://www.rcoa.ac.uk/dr-edgar-alexander-pask [Accessed 21 Jan. 2020].

Association of anaesthetists heritage centre. (2020). *Edgar Pask*. [online] Available at: https://anaesthesiaheritagecentre.wordpress.com/past-exhibitions/what-we-did-during-the-war/edgar-pask/ [Accessed 21 Jan. 2020].

Fabienne Hurst, D. (2020). *Crystal Meth Origins Link Back to Nazi Germany and World War II - DER SPIEGEL - International*. [online] Spiegel.de. Available at: https://www.spiegel.de/international/germany/crystal-meth-origins-link-back-to-nazi-germany-and-world-war-ii-a-901755.html [Accessed 21 Jan. 2020].

Geist, E. (1919). SOME OF THE THINGS THAT ORTHOPEDIC SURGERY HAS DONE FOR THE WAR. *Journal of the American Medical Association*, 73(12), p.875.

HISTORY. (2020). *Eugenics*. [online] Available at: https://www.history.com/topics/germany/eugenics [Accessed 23 Jan. 2020].

Keegan, J. and Holmes, R. (1985). *Soldiers: A History of Men in Battle*. London: Hamish Hamilton.

Meng Kin, L. (2016). Military Medicine through the ages. *SAF Medical Corps Monograph*.

Now, C. (2020). *Medical Perspectives on World War 2*. [online] Circulating Now from NLM. Available at: https://circulatingnow.nlm.nih.gov/2017/04/27/official-documents-of-world-war-ii-a-medical-perspective/ [Accessed 27 Jan. 2020].

Ushmm.org. (2020). *Nuremberg Code — United States Holocaust Memorial Museum*. [online] Available at: https://www.ushmm.org/information/exhibitions/online-exhibitions/special-focus/doctors-trial/nuremberg-code [Accessed 21 Jan. 2020].

Porter, R. (1999). *The Greatest Benefit to Mankind: A Medical History of Humanity from Antiquity to the Present*. 1st ed. New York: Norton Paperback.

Rasmussen, N. (2011). Medical Science and the Military: The Allies' Use of Amphetamine during World War II. *Journal of Interdisciplinary History*, 42(2), pp.205-233.

Sekhar, K. and Rao, S. (2014). John Scott Haldane: The father of oxygen therapy. *Indian Journal of Anaesthesia*, 58(3), p.350.

Submarine medicine practice. (1956). 1st ed. Washington: U.S. Govt. Print. Off., pp.Chapter 20 Pages 298 - 310.

The Museum of Military Medicine. (2020). *History of the Royal Army Dental Corps*. [online] Available at: https://museumofmilitarymedicine.org.uk/about/corps-history/history-of-the-royal-army-dental-corps/ [Accessed 21 Jan. 2020].

Tobey, R. (2020). *Advances in Medicine During Wars - Foreign Policy Research Institute*. [online] Centre for the Study of American and the West. Available at: https://www.fpri.org/article/2018/02/advances-in-medicine-during-wars/ [Accessed 21 Jan. 2020].