

The British sector of the Western Front, 1914-18: injuries, treatments and the trenches—Knowledge Organiser

Historical Context of medicine in the early 20th Century	
Antiseptic Surgery	Joseph Lister first developed antiseptic surgery with the use of carbolic spray to prevent infection in 1865. His work was based on understanding of Pasteur’s Germ theory.
Aseptic Surgery	By 1890’s Lister’s work had laid foundations that led to aseptic surgery. Most operations by 1900 were carried out using aseptic methods. These involved: Use of steam sterilisation to sterilise surgical instruments/Air sterilised in operating room/Rubber gloves and gowns worn/Staff washed hands, face and arms prior to entering theatre.
X-Ray	Developed by Wilhelm Roentgen in 1895, by 1896 radiology departments were opening in British hospitals. The potential for carrying out diagnosis before operations made use important on Western Front.
Development of Blood Transfusions	James Blundell first experimented with transfusions in 1818 and developed many of the techniques and basic equipment used up to the First World War. As blood could not be stored transfusions were carried out with the donor being directly connected to the recipient by a tube.
Problems of Blood Transfusions	Clotting - Professor Almroth Wright concluded that the soluble solution of certain acids could prevent clotting. Rejection of transfused blood - Karl Landsteiner discovers blood groups in 1901 and Reuben Ottenberg becomes first doctor to match a donor and a recipients blood in 1907. He also discovers blood group ‘O’ as a universal blood group. Infection - Introduction of aseptic surgery had largely solved this problem in hospital conditions by 20th century.

The context of the British sector of the Western Front

1914: The First Battle of Ypres	12th October—11th November. The British lost 50,000 troops holding Ypres from German attacks on positions to East and North East of Ypres. Holding Ypres allowed British to hold Channel Ports important for supplies and reinforcements
Use of mines at Hill 60	Hill 60 was a man-made hill south east of Ypres held by Germans from Dec 1914. Its height gave a strategic advantage in the area and British used mining and 5 mined explosives to recapture in April 1915.
1915: The Second Battle of Ypres	A sequence of battles over a month after the capture of hill 60, from 22nd April—25th May. Is significant as it’s the first battle where the Germans used Chlorine Gas on the Western Front. British losses during the month were about 59,000. By the end of the battle the Germans had moved about 2 miles closer to the town of Ypres on the eastern side of the salient.
Tunnels, caves and quarries at Arras	.Arras is a chalky area—easy to tunnel through and quarries and tunnels had existed since Roman times. In 1916 the British decided to link existing tunnels, caves and quarries as shelters against German attacks. 2.5 miles of tunnels were dug in 5 months by British and NZ miners, which were able to house 25,000 men. Included fully functioning hospital.
1917: The Battle of Arras	In April 1917 24,000 men that had been hiding in tunnels near the German trenches attacked. An initial breakthrough of German lines achieved an advance of about 8 miles but progress slowed. By end of offensive in May 160000 British and Canadian troops were casualties.
1917: The Third Battle of Ypres	The purpose of June attack was to break out of the Salient and remove the higher ground from the Germans. Firstly preparing through the battle of Messines and driving the Germans off this ridge, the main attack centred on Passchendaele. Initial advance of 2 miles quickly slowed as heavy rainfall waterlogged the ground. Lasting until November the British moved the edge of the salient back by 7 miles costing 245000 British casualties.
1917: The Battle of Cambrai	Launched October 1917 attacks were spearheaded by the first large scale use of tanks—nearly 500 were used in battle. They were able to move easily across the barbed wire and their machine guns were effective.

The work of the RAMC and FANY

RAMC	Royal Army Medical Corps. Branch of the army responsible for medical care and was formally founded in 1898.
FANY	First Aid Nursing Yeomanry. Founded in 1907, was a women’s voluntary organisation providing frontline support for medical services such as driving ambulances and engaging in emergency first aid.
Regimental Aid Post (RAP)	Located within 200 metres of frontline, in communication trenches or deserted buildings. Made up of Regimental Medical Officer supported by stretcher bearers with first aid knowledge. Wounded would walk in or be carried by other soldiers. Purpose was to give immediate first aid and get soldiers back to fight. Serious injuries went to next stage.
Dressing Stations (ADS + MDS)	Advanced Dressing Station in theory 400 metres back from RAP, whilst Main Dressing Station a further half a mile back. Where possible located in abandoned buildings, dug outs or bunkers for protection. Station manned by 10 medical officers plus medical orderlies and stretcher bearers of the RAMC.
Casualty Clearing Stations (CCS)	CCS were located a sufficient distance from front line to provide safety but close enough to be accessible by ambulance wagon. Would be able to specialise in most critical operations such as those to chest. Often located near to railway lines and had a triage system to help staff make decisions about treatment.
Base Hospitals	Base hospitals located near French and Belgian coast allowing casualties easy evacuation back to Britain.
Underground Hospital at Arras	Fully working hospital in tunnels at Arras included space for 700 stretchers and included an operating theatre.

Experiments in surgery and medicine	
Wound excision or debridement	The cutting away of dead, damaged and infected tissue around a wound. Needed to be done quickly to prevent spread of infection. After excision the wound would be closed by stitching.
Amputation	If excision or antiseptics did not prevent infection spreading the only way to deal with it was amputation. By 1918, 240000 men had lost limbs—many as a way of preventing infection spreading.
The Carrel-Dakin method	Antiseptics such as carbolic could not treat gas gangrene. By 1917 the agreed treatment was Carrel-Dakin method. This used sterilised salt solution fed into wound through a tube. Solution lasted for 6 hours and was often difficult to make as needed due to large numbers of wounded men.
The Thomas Splint	80% of shrapnel wounds to leg resulted in death due to compound fracture. This was due to blood loss and increased chances of infection. To try and improve survival rates a Thomas splint designed to stop joints from moving was used from 1915. Its introduction raised the survival rate from 20 to 82%.
Use of Mobile X-Ray units	X rays were used from the start of the war. Main use was identifying shell fragments and bullets in wounded which could cause infection. Two x-rays would be taken from different angles to accurately identify location.
Blood Transfusions	First developed by Lawrence Bruce Robertson from 1915 at Base hospital in Boulogne as indirect method using syringe and tube to stop patient going in to shock before surgery as a result of blood loss. By 1917 this method had spread to CCS as routine measure for shock. Geoffrey Keynes designed a portable blood transfusion kit used close to the front line in 1915, but did not use stored blood due to difficulties in storing blood.
Blood Bank at Cambrai	In 1915 US doctor Richard Lewisohn added sodium citrate to blood and donor to donor transfusion was no longer necessary. In the same year Richard Well discovered this meant blood could now be refrigerated for 2 days. In 1916 Rous and Turner added citrate glucose to blood allowing storage for 4 weeks. This was first utilised at Cambrai by pre storing blood and showing its potential.
Increase in Head Injuries	20% of all wounds in the British sector of Western Front were to neck, face and head as this was the most exposed part of the body in trench warfare.
Brain Surgery	At start of war injuries to brain were mostly fatal. US neurosurgeon developed new techniques on Western Front such as use of magnets to locate shrapnel and use of local rather than general anaesthetic.
Plastic Surgery	Developed largely by NZ doctor Harold Gillies who went to Western Front in 1915 and becoming interested in facial reconstruction. By end of war nearly 12000 operations performed—many at new hospital, Queens in Sidcup, Kent.

Conditions requiring medical treatment on the Western Front

Trench Foot	Painful swelling of feet caused by standing in cold mud and water. In the second stage gangrene developed —gangrene is the decomposition of body tissue due to a loss of blood supply.
Trench Fever	Flu like symptoms with high temperature, headache and aching muscles. Major problem as it affected an estimated half a million men on the Western Front.
Shellshock	Symptoms include tiredness, headaches, nightmares, loss of speech, uncontrollable shaking and complete mental breakdown. It has been suggested that about 80000 British troops experienced shellshock.
Rifle and explosive wounds	58% of wounds caused by high explosive shells and shrapnel—60% of these injuries were to arms and legs. Bullets were responsible for 39% of wounds.
Shrapnel injuries	A shell explosion scattered fragments of metal casing known as shrapnel which travelled at fast speeds over a wide area, increasing the number of injuries caused.
Wound infection	When metal would penetrate the body a wound caused by shrapnel or bullets would include the fabric of the uniform. The soil of the region had been farmed intensively using large quantities of fertilizer, which contained the bacteria for both tetanus and gas gangrene. Infection therefore was common. Gas gangrene had no cure and could kill a victim in a day.
Head injuries	At the start of war the headgear worn by soldiers was a soft cap. A trial of a steel Brodie helmet with a strap preventing it being thrown off in an explosion reduced fatal head wounds by 80%. This led to distribution to all soldiers fighting on the Western Front.
Effect of gas attacks	Gas caused great panic and fear but only 6000 soldiers died from gas attacks. All British soldiers from 1915 were given gas masks which became more sophisticated over time.