Medicine in Britain, c.1250 AD to the present

c.1250-1500: Medicine in Medieval England

Ideas about the cause of disease and illness

Supernatural explanations about the cause of disease

- Supernatural explanations of disease could relate to the planets that were visible in the sky.
- When planets appeared near each other, it was believed they could influence people on Earth.
- The movement of the planets was often thought to have a bearing on the way that the world worked and the cause of the spread of diseases such as Plagues.
- People though that the alignment of the planets could cause illness.
- Guy de Chauliac the famous Medieval Doctor believed the Black Death was caused by the close position of Saturn, Jupiter and Mars three years previous to the outbreak.
- Astrology was also taken into consideration when performing surgery on patients.
- Studies of astrology were translated from Arabic to Latin in the 12th and 13th centuries and soon became part of everyday medical practice in Europe.
- Medieval astrologers believed that the movements of the stars influenced the inner workings of the human body.
- Doctors often carried around illustrated star charts, allowing them to check the positions of the stars before making a diagnosis.
- Surgeons would consult a Zodiac Chart which advised when it was safe to operate.
- Many of these almanacs included illustrations, helping to explain complicated ideas to patients.
- One example was 'zodiac man', which comes from an almanac from 1399. It superimposed the appropriate star sign onto body parts
- The diagram was intended to explain how star signs rule over each part of the body.
- By the end of the 1500s, physicians across Europe were required by law to calculate the position of the moon before carrying out complicated medical procedures, such as surgery or bleeding.
- A manuscript owned by the Barber Surgeons of York has a wheel marked with astrological data and a moving pointer.

- This allowed the physician to align the data according to the position of the sun and moon.

- Operations on the feet were supposedly unsafe during the months associated with Pisces.

Religious explanations about the cause of disease

- God was often thought to be the cause of diseases. In a world in which godliness was off the utmost importance, illnesses were considered to be a punishment from God.

- Methods of prevention and cure would be based upon to please God or atone for ones sins.

- Groups such as the Flagellants would travel around Europe self harming and praying in the hope God would forgive them of their sins and send the plague away.

- The Catholic Church also believed epilepsy and mental illness was due to evil spirits possessing the body.

- When medicine could not help, the faithful often turned to saints, and visited saints' shrines in the hope of miraculous cures.

- The windows of Canterbury Cathedral show pilgrims flocking to Thomas Becket's shrine. They are suffering from illness, injury and even insanity

- In some scenes, physicians with urine flasks turn away in despair, unable to equal the healing power of the saint.

Rational explanations

- Most medieval ideas about medicine were based on the work of Greek physicians Galen (AD 129 - 216) and Hippocrates (460 BC - 370 BC).

- Their ideas set out a theory of the human body relating to the four elements (earth, air, fire and water) and to four bodily humours (blood, phlegm, yellow bile and black bile).

- It was believed that health could be maintained or restored by balancing the humours, and by regulating air, diet, exercise, sleep, evacuation and emotion.

- Doctors also often advised risky invasive procedures like bloodletting.

Hippocrates

- In about 400 BC, **Hippocrates** suggested that diseases have internal, personal, causes; they were not caused by gods or spirits.

- He said that the body contains **four humours** or fluids: black bile, yellow bile, blood and phlegm. Human beings became ill when these humours were unbalanced.

- Hippocrates took care to **observe** and record all the patient’s symptoms.

- He said that people to lead simple, balanced lives in order to keep these humours in balance.

- Hippocrates' ideas were a major **turning-point** he wrote many books and these recorded his ideas.

- His ideas were followed by Galen and formed the basis of medical practice and theory for 2,000 years, in some cases until the 19th century.

- He turned attention away from the gods and the spirits towards the body. Although his ideas were wrong, it meant that further advances were possible.

- He emphasised clinical observation and the importance of keeping records.

- He was the founder of the medical profession. The Hippocratic Oath (That a doctor will always try to save a patient and act only in the patient's interests, without fear or favour) is still taken by all doctors to this day.

Galen

- He was born in 120 AD. His books were used for 1,200 years.

- The Roman authorities did not like the dissection of humans, so Galen worked on pigs and apes. This explains some of the mistakes he made, for example regarding the liver.

- Galen rose to prominence following his appointment as the surgeon to the Emperor's son, Commodus.

- This allowed him to study and teach medicine, which led to his development of ideas and his establishment of new laws of medicine.

- Galen studied the bodies of animals to support his research. He particularly used Barbary Apes which are very similar in terms of anatomy to Humans.

- This type of research, along with the dissection of human remains that he conducted in Alexandria, led to the development of his theory on the Human Body's physiological system.

- This was a remarkable, if slightly incorrect, development which would allow doctors and physicians to clearly understand the effects of the treatments given.

- However, some of Galen's knowledge was so accurate that he must have looked at humans. He may have opened graves or studied the bodies of dead gladiators.

- He was a surgeon at a school for gladiators for a while. There are pictures of surgeons stitching up wounds.

- He took up the Theory of the Four Humours, wrote over 60 books and was the most famous doctor of the Roman world.

- He developed a system of treatments by opposites: treating imbalance in the four humours by giving something opposite to the humour that was in excess. He was also important in the development of surgery.

- Galen's work was painstaking. His writings always dealt with possible objections and criticisms of theories and he regularly reviewed practices.

- The depth of his writings and his belief in a Creator' gained him the support of the authorities, including the leaders of Christianity and Islam.

- This led to his belief in clinical observation and diagnosis becoming the standard practice for doctors in Europe over the course of the next thousand years.

- In medieval universities, books were rare and handwritten. Most universities would only have one copy.

- The leading medical school in Western Europe was at Montpellier University. Teaching consisted of readings from the works of Galen.

- Students wrote down word for word as the reader went through the book.

- Medical knowledge derived from ancient times was largely confined to monasteries and the highly educated.

- For ordinary people, especially those outside towns, it would have been difficult to access professional practitioners.

- Those in need of medical assistance might instead turn to local people who had medical knowledge, derived from folk traditions and practical experience.

Approaches to prevention and treatment

- One of the main ways in which a physician would diagnose illness was by examining stools, **blood** and especially **urine**.

- Many Medieval doctors carried with them a **vademecum** (meaning 'Go-with-me') book of diagnoses and a **urine chart**.

- Usually, they examined the colour, smell and taste of the patient's urine, and made an on-the-spot guess as to what they might be suffering from.

- Physicians were often depicted in images holding a flask of urine up to the light.

- Another area of medical concern was how to treat wounds. Medieval skulls, with bone that has knitted together, show that even serious head wounds were not always fatal.

- John Arderne (c.1307 - 77), an English physician, composed medical works on topics such as the treatment of eyes. He wrote '**The Art of Medicine'** and treated royalty.

- He was considered a master in his field, but his cure for kidney stones was a hot plaster smeared with honey and pigeon dung!

- Pictures from the time make it clear that doctors also did clinical observation, and took their patient's pulse.

- Since they still believed in the theory of the Four Humours, many of their cures involved balancing the 'humours overflowing'.

- They did this by bleeding, applying leeches, or causing purging or vomiting in their patients.

- Other ways of balancing the 'natural heat' included the taking of hot baths, drinking a soup of yellow lentils, or applying water cooled with snow.

- Monarchs thought that by touching patients suffering from the 'King's Evil' (scrofula) they could cure them.

- Peasants prayed to St Roch to cure their toothache or the plague, or turned to St Anthony to cure them of 'St Anthony's Fire' (ergotism).

- John of Gaddesden claimed to be an expert doctor, but most of his cures relied on 'sympathetic' magic, and he clearly knew little about surgery.

- Medieval surgeons realised how to use wine as an **antiseptic**, and they used natural substances (mandrake root, opium, gall of boar and hemlock) as **anaesthetics**.

- Herbal remedies were recorded in Bald's Leechbook. Plantain was an ingredient in 48 different remedies. Plantain is an antibiotic so it would have cured some illnesses.

New and traditional approaches to prevention and treatment

- Doctors were trained by the Church in the teachings of Galen. They thought that Galen had found out all there was to know about anatomy.

- Physicians were seen as skilled people but their work was based on a very poor knowledge of the human anatomy.

- Physicians charged for their services and only the rich could afford them.

- Their cures could be bizarre though some cures, including bleeding and the use of herbs, had some logic to them even if it was very much a hit-or-miss approach.

- There were many wars. Improved military technology increased the number of casualties.

- Surgeons had plenty of hands-on experience and had nothing to lose in trying new techniques.

- Surgery was a craft picked up by apprenticeship to the local barber-surgeon. These men had no contact with the University trained doctors and were looked down on.

- Medieval surgeons could therefore do **external surgery** on problem areas such as facial ulcers and even eye cataracts.

- There was also some **internal surgery** undertaken e.g. to remove bladder stones.

- Deep wounds still caused **death from bleeding, shock and infection**. Some surgeons even believed it was good to cause pus in wounds.

Apothecaries

- The word 'apothecary' is derived from ‘apotheca’, meaning a place where wine, spices and herbs were stored.

- During the thirteenth century it came into use in this country to describe a person who kept a stock of these commodities, which he sold from his shop or street stall.

- The trade in spices and the development of pharmacy led to the emergence of apothecaries.

- These had shops where they stored and sold spices, confectionery, perfumes, spiced wines, herbs and drugs which they compounded and dispensed to the public.

- By the mid-sixteenth century apothecaries had become the equivalent of today's community pharmacists.

- They dealt mainly with the preparation and sale of substances for medicinal purposes.

Public health

- Monasteries developed systems of public health, including fresh running water, 'lavers' (wash rooms), flush 'reredorters' (latrines) with running sewers, clean towels and a **compulsory bath** four times a year.

- Nobles took **regular baths** (perhaps two a year). Towns had **bath houses**, which were also restaurants and brothels.

- People realised that a room next to a privy was unhealthy, and towns paid '**gongfermers**' to clear out the cess pits.

- Medieval kings passed laws requiring people to keep the **streets clean**.

- During the time of the plague many towns developed quarantine laws, and boarded up the houses of infected people.

Hospitals

- During the Middle Ages the first **hospitals** were built since Roman times (e.g. St Bartholomew’s in London).

- Over 700 hospitals were founded in England between 1066 and 1550. Most provided hospitality for pilgrims or travellers. Others were almshouses for the poor and elderly.

- Many provided treatment for the sick and most of these were for sufferers from leprosy.

Case Study

The Black Death

- The Black Death broke out in the middle of the fourteenth century and probably killed between a quarter and a half the population of Europe from 1346-50.
- The first outbreak of plague swept across England in 1348-49. It seems to have travelled across the south in bubonic form during the summer months of 1348.
- It then changed into the even more frightening pneumonic form with the onset of winter.
- It hit London in September 1348, and spread into East Anglia all along the coast early during the New Year.
- By spring 1349, it was ravaging Wales and the Midlands, and by late summer, it had made the leap across the Irish Sea and had penetrated the north.

The course of the Black Death

- The Black Death entered south-western England in summer 1348; the first place affected was Melcombe in Dorset.
- Bristol was the first major town in Britain to be affected, for it had close connections with the continent.
- Bristol was the second largest city in Britain and was the principal port of entry for the West Country. It had 10,000 inhabitants, tightly packed together.
- People had a tendency to empty their chamber-pots out of their windows into the street.
- Many houses owned their own pigs, which were supposed to be grazed outside the city walls, but were often allowed to roam the streets in search of food.
- Most townsfolk drew their water from the river, which was also used for industrial purposes by the local brewers, who were heavily regulated to prevent their fouling the water.
- London, as the country's largest city, had all the problems of overcrowding and poor sanitation.
- The Thames was a polluted mess and cesspits within the city were a constant source of contamination.
- Attempts to improve the sanitation problem were not helped by the Black Death itself.
- In 1349, King Edward III complained to the town council about the state of the streets.

- The council replied that it could do nothing on account of the fact that all of its street cleaners had died of the plague.
- In January 1349, Parliament was closed on the grounds that: 'the plague and deadly pestilence had suddenly broken out'.
- Two ex-Chancellors and three Archbishops of Canterbury all died in quick succession.
- It raged in London until spring 1350 and is generally assumed to have killed between one third and one half of the populace.
- On average, 30-45% of the people died in the Black Death of 1348-50.
- In some villages, 80% or 90% of the population died; in Kilkenny at least, it seems likely that the death-rate was 100%.
- 1350 was not the end of it. Plague came back in 1361-64, 1368, 1371, 1373-75, 1390, 1405 and continued into the fifteenth century.
- Death rates in the later epidemics may have been lower than the Black Death, but the sources reveal that most victims were young people.

Attempts to prevent the Black Death

- Governments felt helpless because they did not know the cause of the disease.
- Some noticed that the disease was worst in areas where there were bad smells.
- This was a correct observation, but it led them to put forward the 'Miasmatic' theory of disease. This blamed disease on bad air which caused bad smells.
- In England, Edward III (1327-1377) and Richard II (1377-1399) both ordered the streets of London to be cleared and the River Thames to be dredged.
- Another method used to try to prevent outbreaks of the plague was to burn barrels of tar in the streets. They thought that the acrid smoke would drive away the disease.
- It was also believed that the plague was punishment from God, so in some places men whipped themselves in public, to punishment themselves.
- Other causes of the plague were believed to be strangers, stray animals and thunderstorms.
- The last major outbreak of Bubonic plague was in London in 1665.

Why was the Black Death so serious?

- No medical knowledge existed in Medieval England to cope with the disease. After 1350, it was to strike England another six times by the end of the century.
- Peasants were terrified at the news that the Black Death might be approaching their village or town.

- The Black Death is the name given to a deadly plague (often called bubonic plague, but is more likely to be pneumonic plague) which was rampant during the Fourteenth Century.

- It was believed to have arrived from Asia in late 1348 and caused more than one epidemic in that century, though its impact on English society from 1348 to 1350 was terrible.

- Up until recently the Black Death was thought to have been caused by fleas carried by rats that were very common in towns and cities.

- When the fleas bit into their victims, it was thought they were literally injecting them with the disease.

- However evidence produced in 2014 from human remains suggests that fleas could not actually have been responsible for an infection that spread so fast; it had to be airborne.

- Once the disease reached the lungs of the malnourished, it was then spread to the wider population through sneezes and coughs.

- Death was often very quick for the weaker victims. By spring 1349, the Black Death had killed six out of every ten Londoners.

- Nearly all the victims died within three days though a small number did last for four days.

Why did the plague spread so quickly?

- In towns and cities people lived very close together and they knew nothing about contagious diseases.

- The disposal of bodies was very crude and helped to spread the disease still further as those who handled the dead bodies did not protect themselves in any way.

- Lack of medical knowledge meant that people tried anything to help them escape the disease.

c.1500 – 1700

Ideas about the cause of disease and illness

Change

- During the Renaissance period of 1500-1750, many superstitious beliefs were challenged.
- Paracelsus challenged the theory of the four humours and Galen's work. He believed illnesses were caused by chemicals.
- Other natural discoveries were made especially in the fields of anatomy and surgery.
- The work of Vesalius and Paré paved the way for scientific discoveries to be made.
- They had little impact in their own time but inspired scientists to develop their own natural explanations for the causes of disease.
- In the late seventeenth century the development of the microscope by Hooke and later by Malpighi meant that microbes could be studied for the first time, even though they were not understood.
- The Roman Catholic Church no longer enjoyed such a tight control over medicine due to the impact of the Protestant Reformation.
- The Protestant churches encouraged people to do good works and many built hospitals and schools with the money that they made.
- In England, the rich also began to use their money to set up schools and hospitals. These educated people and trained doctors.
- During the Renaissance scientific experiment developed. This meant that ideas were tested in practice rather than by discussion.
- Doctors were able to dissect bodies and challenge ancient ideas. It was this that allowed Harvey to make his discoveries.
- The emergence of new technologies and the printing press enabled new medical ideas to be advanced.
- The printing press allowed knowledge to be spread more quickly and cheaply than ever before.
- This meant that more people learnt about discoveries when they were made. This is an example of improved communication allowing medical knowledge to spread.
- Lady Grace Mildmay wrote many medical guides which had a large number of herbal remedies, balms and minerals.
- By 1700, people no longer accepted that being touched by the King (God's representative on Earth) would cure a patient of scrofula ('King's Evil).

- The most important doctor in England in the seventeenth century was **Thomas Sydenham**.
- He did not make any discoveries about the causes of disease, but he did emphasise the importance of careful observation of patients and the keeping of accurate records.
- Sydenham's studies at Oxford were cut short by the Civil War and he was finally licensed in 1663.
- He preferred practical experience over studying books and stressed the importance of bedside practice and observation.
- He rejected on religious grounds the dissection of bodies and the use of the microscope to uncover the hidden causes of disease.
- He believed that God only gave man the ability to observe the outer nature of things with his senses.
- Sydenham valued methodical observation and practical experience of medicine over a search for causes.
- He recommended the use of laudanum as a pain-killer and Peruvian bark (quinine).
- He developed the concept of 'species' of disease to improve medical diagnosis by describing and classifying different illnesses. He was the first doctor to identify scarlet fever.
- He believed that diseases varied according to the time of the years and the climate.
- Treatment could not be carried out until the disease had been identified. However, the main diseases he was able to identify were smallpox, hysteria and gout.

Continuity

- At the same time, many doctors continued to follow the Four Humours; blood-letting remained a standard treatment until the early nineteenth century.
- 5 million leeches a year were imported into England throughout the eighteenth century.
- Miasmatic theory was the widely accepted explanation for the cause of disease.
- This was reinforced by the experiences of people during the Great Plague in 1665.

The Royal Society

- In July 1662, a royal charter created the 'Royal Society of London'. Robert Hooke was appointed as Curator of Experiments in November.
- The society's early meetings included experiments performed first by Hooke and then by John Wilkins and Denis Papin.

- Many of the experiments were trivial, but the Society was important in encouraging the development of knowledge and understanding.

- By royal command, it could investigate any area with the exceptions of religion and politics.

- It attracted the leading scientists of the day, including Sir Isaac Newton and Sir Christopher Wren.

Approaches to prevention and treatment

Continuity

- One of the features of the Renaissance was the increase in the population of Europe.

- Towns and cities became as big as those in Roman times. More people meant more health care and more hospitals.

- Hospitals developed in the period, but usually passed the costs onto patients. This meant that most people could not afford them.

- There was little improvement in the care provided by hospitals; nurses were usually untrained.

Public health

- A major factor in the repeated out breaks of plague in London in the seventeenth century was the presence of large amounts of rubbish in the city's streets.

- This did not of itself cause disease. But it attracted rats, which harboured the plague fleas that spread the epidemic to humans.

- The stench that arose from the city streets reinforced the belief that disease was caused by bad air.

- This miasmatic theory of disease lasted until the middle of the nineteenth century.

- However, there was little change in the actual treatment of disease.

- When the Great Plague broke out in 1665, doctors tackled it in much the same way as they had the Black Death. However, there was less hysteria about supernatural causes.

- Treatments were virtually unchanged. When Charles II fell ill in February 1685, his treatments included 'extract of human skull'. He died.

- The best medical treatment was still offered by wise women using herbs and traditional cures.

- Most doctors still believed in and used the Theory of the Four Humours. It was this that led to the survival of bleeding as a way of treating disease.

- Despite the developments in anatomy and surgery, doctors made no discoveries in the causes and treatment of diseases.

- In 1700, ideas about the causes of disease had hardly changed since 1400.

Change

- The **College of Physicians** was founded in 1518 by Royal Charter. It was confirmed by Act of Parliament in 1523. Physicians now had to be licensed in order to practise.

- This made little difference to treatment, because most doctors still followed the work of Hippocrates and Galen.

Grace Mildmay 1552-1620 was married to a wealthy landowner.

- At this time women were meant to look after the health of their families. If they were rich, the poor people in their area might come to them for advice on medical matters.

- Grace Mildmay learnt traditional methods using herbs, but she also read the most recent medical books. In 1543, she read the English translation of a book by Jean de Vigo on surgery.

- She knew about the work of Avicenna and Galen. She used the Theory of the Four Humours in the treatment of disease.

- She made up her own medicines using local herbs as well as new imported exotic products like tobacco.

- She did not perform surgery; she said that it was too difficult for a woman.

- Grace Mildmay is unusual because she was a well-informed woman healer and secondly she left very detailed records of her activities.

- She combined the understanding of traditional ‘wise women’ and university trained doctors.

- We do not know if Grace Mildmay was typical of women of her time. She may have been exceptional, or she may have been like very many other women, who provided much better medical treatment than so-called ‘doctors’.

Vesalius 1514 – 1564

- The decline in the influence of the Roman Catholic Church meant that he was able to dissect bodies.

- He supported Galen’s belief that you had to learn from dissecting bodies not from reading books.

- He published ‘The Fabric of the Human Body’ in 1543; this was the first major medical text book for over a thousand years. The development of printing meant that it became much more widely available.

- Vesalius showed that Galen was wrong on some points of human an anatomy, and urged doctors to conduct systematic dissections of human corpses themselves.

- His work was very influential for early modern medicine both because it gave doctors more detailed knowledge of human anatomy.

- It encouraged them to investigate critically the claims of ancient medical authorities.

- He also worked closely with artists, to ensure that illustrations were both accurate and attractive.

Why was Vesalius important?

- His work was accurate and was printed, therefore widely available for training doctors. In included many detailed drawings of the human body.

- He as helped by developments in art and painting which introduced more life-like figures.

- He proved that Galen had made mistakes; this encouraged other people to find out more.

Smallpox

- The first successful treatment of smallpox in Britain was carried out after Lady Mary Wortley Montagu returned from Turkey, where her husband had been ambassador.

- She had seen inoculation used as a way of protecting patients against smallpox. This meant putting some pus from a smallpox sore into a cut on the arm.

- The patient caught a mild form of the disease but often survived a major epidemic.

- Lady Mary Wortley Montagu had nearly died of smallpox herself, so inoculated her children.

- She managed to persuade some of her friends to try inoculation, but it was a dangerous process. The patient could die from it.

Case study

William Harvey 1578 – 1657

- Until Harvey, Doctors believed that Galen's belief, that blood moved through the heart by passing through holes in the septum (the central wall of the heart), was correct.

- William Harvey was born in Folkestone, Kent in 1578. He then studied medicine at the University of Padua in Italy.

- On his return from Italy in 1602, Harvey established himself as a physician. His career was helped by his marriage to Elizabeth Browne, daughter of Elizabeth I's physician, in 1604.

- In 1607, he became a fellow of the Royal College of Physicians and, in 1609, was appointed physician to St Bartholomew's Hospital.
- In 1618, he became physician to Elizabeth's successor James I and to James' son Charles when he became king.
- Both James and Charles took a close interest in and encouraged Harvey's research, which was developed through the dissection of animals.
- He used scientific method, measuring the flow of blood through the heart, experimenting on humans and animals.
- He first revealed his findings at the College of Physicians in 1616, and in 1628.
- He published his theories in a book 'An Anatomical Study of the Motion of the Heart and of the Blood in Animals'.
- He explained how the heart pumped the blood in a circular course through the body.
- Blood was pumped by the heart around the body and re-used. The blood moved from the heart to the lungs.
- The veins, arteries and valves made a one way system through which the blood passed around the body.
- Harvey was important not just for his discovery of the circulation of the blood, but also because he had used scientific experiment to prove it.
- His discovery was received with great interest in England, although it was greeted with some scepticism on the Continent.
- Many doctors did not accept Harvey’s findings and continued to use bleeding as a means of treating disease. This lasted until the early nineteenth century.

The Great Plague

- Although there were regular outbreaks of plague in England throughout the seventeenth century, the 1665 outbreak, which killed 70,000 people in London, is the one that is remembered.
- At the time it was blamed on punishment from God, strangers, stray dogs and bad air, just as the Black Death had been in the fourteenth century.
- To protect themselves, people burnt bonfires, put coins in vinegar, carried bunches of sweet smelling flowers and covered themselves from head to foot.
- Miasmatic theories were the most commonly believed.
- The real cause of the plague, fleas, was only discovered when Robert Hooke developed the microscope. He used it to identify plagues fleas.

The development of the Plague

- 1665 had a very hot summer. The only way people had to get rid of rubbish was to throw it out into the streets. As a result, London was filthy and a perfect breeding place for rats.

- A popular belief during the plague was that the disease was caused by dogs and cats.

- The plague was caused by disease-carrying fleas carried on the bodies of rats. A pair of rats in the perfect environment could breed many off-spring.

- The first victims of the plague were found in the poorer districts of the city, people could not avoid contact with either the rats or someone who had the disease.

What were the symptoms of the plague?

- Red circular blotches were found on the skin. These could also develop into large pus filled sacs found primarily under the armpits and in the groin.

- People believed that the plague was spread by a cloud of poisonous gas that was colourless (known as a miasma).

- This miasma could only be stopped, so it was believed, if you carried flowers with you as the smell of the flowers would overpower the germs carried by the miasma.

- There was also another ‘benefit’ to carrying sweet smelling flowers. A victim’s breath started to go off as the disease got worse.

- The final symptom was a sneezing fit that was promptly followed by death. Once the disease took a hold it spread with frightening speed.

Precautions

- Those who could, the wealthy, left London for the comparative safety of the countryside.

- This was not possible for the poor. Militiamen were paid by the city’s council to guard the parish boundaries of the area in which they lived.

- No one was allowed out unless they had a certificate to leave from their local parish. Very few of these certificates were issued.

- The authorities in London decided on drastic action to ensure that the plague did not spread.

- Any family that had one member infected by the plague was locked in their home for forty days and nights.

- A red cross was painted on the door to warn others of the plight of those in the house. No one was allowed in except ‘nurses’.

- The ‘nurses’ were local women with no training; they were paid to visit the homes of plague victims to see how they were. They took food to victims if they could afford to pay.
- Samuel Pepys, who lived in London at this time, condemned the work done by these ‘nurses’.
- He claimed that they used the opportunities presented to them to steal from the homes they visited.
- Searchers were people who were paid to hunt out dead bodies or possible plague victims who had yet to be found by the authorities.
- The collected bodies were then put on a cart and taken to a mass burial pit.
- Plague doctors assessed whether someone had the plague or not. These were not qualified physicians as most real doctors had fled the city for their own safety.
- Their decision was final and would result in your home being chained shut from the outside and the red cross being painted on your door.
- Londoners were also paid to kill dogs and cats as it was assumed that these spread the disease.
- Cures for the plague were pointless but sought after if someone had the money to pay for them.
- Nathaniel Hodges believed that sweating out the disease was a sound approach.
- He encouraged those victims he came across to burn anything they could to create heat and smoke.
- The plague was at its worst in September 1665 when the heat of the summer was at its peak.
- Each parish in London had to produce a week-by-week Bill of Mortality for the authorities.

The end of the Great Plague

- Winter halted the spread of the disease as the weather took its toll on the rats and fleas.
- However, though the worst had passed by the end of 1665, the end of the plague as a major killer only occurred with the Great Fire of London.
- The fire devastated the filthy city areas where rats had prospered. Never again was the city going to be affected so badly by this disease.
- When the city was rebuilt all the buildings had to be of brick or stone. This was very important in preventing further outbreaks.

- But in other ways, public health did not improve. There were few fresh water supplies in London or in other cities and no sewerage.

- Rubbish was still thrown into the streets and was eventually washed away into the nearest river. In London, the Thames was very polluted.

Eyam

- Outside of London, the plague had little effect. In Derbyshire, the plague broke out in Eyam.

- It was caused by a delivery of cloth which contained fleas.

- The villagers agreed to protect the rest of the local community by having no contact with the outside world.

- Most of the villagers died, but plague did not spread to the rest of the county.

1700-1900

Ideas about the cause of disease and illness

Continuity

- Doctors continued to believe in the Four Humours. Throughout the eighteenth century 5,000,000 leeches were imported into Britain every year. They were used to bleed wealthy people.

- The poor had blood let from a vein using a special knife called a fleam. Some people were bled every day and as much as half a pint (about a quarter of a litre) was taken from them.

- At the beginning of the eighteenth century doctors could only identify a handful of diseases. One, plague, was already on the decline.

- There were no major outbreaks after 1665, although parish records continue to mention it well into the century.

- The other known diseases were consumption (tuberculosis), king's evil (scrofula) and smallpox. The last was the major killer disease of the eighteenth century.

Change

- The development of the microscope by Robert Hooke had helped bring about the discovery of germs.

- However, even when they were known to exist, people did not draw the correct conclusion about where they came from.

- When people saw germs under a microscope in rotting matter, they came to the conclusion that germs came 'spontaneously' from rotting matter.

- They thought that things always begin to rot and from this rot came the germs.
- In fact, this is exactly the opposite of what is true. There are germs around us all of the time, but we cannot see them (because they are so small), and when they come into contact with food etc., they cause it to begin to rot.
- According to the **Spontaneous Generation Theory** of disease, germs were the consequence of rotting not the cause.
- The Spontaneous Generation Theory of Disease is a good example of how science applied badly can prevent medical progress.
- Real progress in medical knowledge only became possible when scientific understanding improved.
- In the late eighteenth century, Joseph Priestley discovered oxygen and other gases, including nitrous oxide (laughing gas).
- Although he made little use of his discoveries, he was a key figure in what became known as the 'chemical revolution'.
- During the nineteenth century physics, chemistry and biology all developed as separate sciences.
- This allowed major scientific breakthroughs to be made. The most important of the sciences was chemistry.
- From 1799, when Humphrey Davy demonstrated anaesthesia at the Royal Society using nitrous oxide, chemistry became the key discipline in medical progress.

1861 Louis Pasteur and Germ Theory

- Pasteur was a chemist, not a doctor. He had been working on industrial products and had discovered that: **germs cause decay.**
- In 1863, Louis Pasteur proved that germs cause things to rot (and therefore smell) by conducting an experiment.
- He got two flasks of soup and boiled them for at least ten minutes. This killed all the germs that could have been in the soup.
- The flasks had long twisted necks like a swan. The necks meant that if the soup was not sloshed around, no new air would get into the flask.
- What Pasteur thought was that if the air in the flask did not change then the soup would not rot because there would be no germs in the flask.
- He had two flasks so that he could break the neck of one of the flasks. He thought that the soup in the flask with the broken neck would rot.
- After a few days, it did indeed begin to rot and smell just as he had predicted. The soup in the other flask did not rot and has to this day not rotted.

- From this, he was able to conclude that the germs were not in the soup as the 'Spontaneous Generation' theory predicted, but were in fact in the air all the time, but that we could not see them.

- However it was one thing to prove that germs were the cause of disease, it was another to use this theory in the treatment of disease.

1878 Robert Koch

- **Robert Koch** did a great deal of the work of identifying the individual types of germ that caused specific diseases.

- Koch developed a new experimental method to test whether a particular germ caused a disease.

- He used experiments to isolate the bacteria that was the cause of anthrax

- He tested his findings on mice; this was a new technique, which was needed now that people began to find cures. He also developed techniques for staining bacteria so it could be seen.

- From this, Koch was able to find ways of killing the particular germ that caused a particular disease. One of the diseases he worked on was tuberculosis.

- When doctors found cures for disease, the development of the chemical industry allowed these cures to be mass-produced and so have a greater impact.

- In 1880, **Pasteur** was able to show how inoculation worked. He was working on Chicken cholera and some chickens were accidentally given old, weaker, strains of the disease. They were found to be immune as the body had produced its own resistance.

- In 1885, **Pasteur** produced a vaccine against rabies. He invented the word 'vaccine' as a tribute to the work of Jenner.

- The work of Pasteur was very influential in Britain. Joseph Lister read about his discoveries and used his ideas to develop anti-septic,

Approaches to prevention and treatment

The Medical Professions

- In England in 1784, surgeons became a separate profession to barbers. This allowed surgeons to establish their own training. It was after this date that they became more respectable.

- At the same time, James Hunter became the first professor of surgery in Britain and William Smellie began to train midwives.

- Nothing was done, however, to train nurses. Nursing remained an unpopular and lowly paid profession.

Hospitals and nursing

- Parishes, which were responsible for the poor, began to provide medical treatment in workhouses.
- In 1732, a movement began to build a hospital in every parish; 115 were built. The best known was St. Peter's in Bristol.
- Thomas Guy founded Guy's Hospital in 1724, St George's in 1733 and the great London Hospital in 1740.
- Quakers often built hospitals and founded several for charity in York

Nursing

- During the first half of the nineteenth century nursing was an unpopular and often disreputable profession.
- The factors that brought about change were the Crimean War and the role of Florence Nightingale.

Crimean War, 1854-1856

- At the military hospital in Scutari, there were no trained people to take care of wounded soldiers.
- There were almost no medical supplies so very little could be done to help the sick and wounded.
- Many more soldiers died from disease than from their wounds. Cholera was widespread because of the poor sanitary conditions.
- In the main military hospital at Scutari, patients lay on the floor in filthy conditions.
- The telegraph had been used in Britain since 1843 and it was used all over Europe by the time of the war.
- The Times newspaper had a war correspondent. He sent up to the minute reports that the government did not stop from being printed.
- The public in Britain found out what war was like for almost the first time.
- People in Britain were horrified when they found out what was happening in the Crimea, and this forced the government to act.
- This was one reason why the government allowed a team of nurses, headed by **Florence Nightingale**, to go to the Crimea.
- She was a middle class Englishwoman who went to Germany to train as a nurse.
- She volunteered to go to the Crimea, where she brought order and care to the British Military hospital at Scutari.

- She insisted that wards were regularly cleaned and dressing changed. Windows had to be kept open.
- She also separated wounded men from the sick. Her reforms reduced the death rate from 42% to 2%.
- She became known as the 'Lady with the Lamp' because she walked round the wards every night.
- Florence Nightingale's main contribution to nursing was to improve standards of hygiene. In some other respects she opposed change, particularly in the introduction of new medical techniques.
- A fund was started with contributions from all over the country from rich and poor. By 1859, there was a sum of £45,000.
- The money raised was used to fund the establishment of a school of nursing at St Thomas's Hospital in London: the Nightingale Training School
- Nurse trained at St Thomas's were expected to be hard working and professional. They were housed in a special 'nurses' home and were expected to wear a uniform.
- The Nightingale School at St Thomas's would provide the highly trained nurses that would in turn set up and run other schools of nursing.
- She wrote 'Notes on Nursing' as a textbook for student nurses. This became the standard work on nursing.
- As a result of the work of Nightingale and others nursing became a respectable career for a woman and standards of nursing care in hospitals improved enormously.
- By 1900, there were 64,000 trained Nightingale nurses in Britain.
- However, **Florence Nightingale also hindered** the development of medical knowledge.
- Until she died in 1910, she went on believing in the miasmatic theory and consequently emphasised the importance of fresh air in hospitals.
- She ordered windows to be left open in all weather and this undoubtedly had unfortunate consequences at times.
- She also emphasised discipline and order to too great an extent.

Surgery

- At the start of the nineteenth century, surgery was not very different from what it had been in the Middle Ages.
- Operations were only carried out in emergencies; they were fast and dealt only with physical problems like broken bones etc.

- Surgeons were often not seen as professionals; most people would go to a barber or a blacksmith if they wanted a simple operation, such as a tooth being extracted.

- It was only in the eighteenth century that surgeons began to acquire a better reputation. One of the first surgeons to raise the profile of the profession was John Hunter.

- However, surgeons like Hunter faced three problems. The first was trauma caused by the shock of opening the body without any anaesthetic.

- The second problem faced in surgery was infection. Until the middle of the nineteenth century, many doctors continued to believe that disease was caused by bad air, the 'miasmatic' theory.

- This was reinforced by the outbreaks of cholera, which occurred when the weather was hot and there was rubbish lying in the streets.

- Although Edward Jenner had proved that vaccination could protect people against smallpox, no one had been able to explain why it worked until Louis Pasteur came up with germ theory.

- Some doctors adopted the idea of 'spontaneous generation' but this was of little help in explaining infection.

- The last problem was blood loss. The possibility of transfusions had been understood and practised for many years, but no one had been able to understand why some worked while most failed.

- Doctors were unaware of the existence of blood groups and therefore could not carry out successful transfusions.

- The most common operations were amputations. A curved knife was used to cut through the soft tissue, ligaments and muscles, before a saw was used on the bones.

- The arteries were then sawn up using ligaments made of silk before the wound was closed by wrapping flesh around the stump.

- The ligaments were left hanging out of the stump and would be pulled each day to see if the arteries had healed.

- If the arteries did not heal in time, gangrene could set in and the operation would have to be undertaken all over again, and again, if necessary.

The development of anaesthesia

- In 1799, Humphrey Davy, a student at Bristol, used nitrous oxide as an anaesthetic on himself. The following year he wrote up and published his notes.

What factors prompted Davy to carry out the experiment?

- At the end of the eighteenth century, interest in science and chemistry in particular, was widespread. Experiments were held in public and it was fashionable to attend.

- One of the most famous scientists of the day was Joseph Priestley, who discovered Nitrous oxide, N_2O, a colourless, almost odourless gas in 1793.

- Davy's success was not immediately followed up by surgeons, but he did have a stroke of good luck.

- He was appointed an assistant to another scientist and began to help with public experiments. He became well known and was eventually knighted.

Nitrous Oxide

- Despite initial reluctance, some surgeons did begin to nitrous oxide in efforts to kill pain.

- One problem was that large amounts of nitrous oxide were needed and patients had to be kept in an enclosed chamber for the gas to take effect.

- Henry Hill Hickman also used carbon dioxide, but found that this produced panic attacks and also made patients choke.

Ether

- The first operation using it was carried out in London in December 1846 by Robert Liston.

- However, was not universally well received. As secondary effects, there could be bronchitis, pneumonia, and inflammation of the brain'.

Chloroform

- The substance was discovered in 1831 by Doctor Samuel Guthrie in the USA and almost simultaneously by Eugene Soubeiran in France.

James Simpson

- James Simpson certainly did not discover chloroform, but may well have been the first to use it as an anaesthetic.

- Simpson certainly deserves the credit for getting widespread acceptance of its use in childbirth and operations.

- Simpson was Professor of Midwifery at Edinburgh University and his main interest was in reducing the pain of childbirth.

- In 1847, he became surgeon to Queen Victoria and it was the Queen who eventually used chloroform in 1853 at the birth of her eighth child, Prince Leopold.

- This gave the royal seal of approval to anaesthetics and put an end to opposition to its use on medical, religious and moral grounds.
- Despite the advantages that chloroform had over ether, it soon became clear that it was not the perfect answer.
- Some patients died unexpectedly which led to some surgeons refusing to use it. The problem was that chloroform could stop muscles working and the heart beating.
- Another problem was that patients could be unconscious for days or even weeks. One woman is reported to have three weeks to come round after an operation.
- Consequently, hospital beds were occupied much longer than should have been the case.
- Nitrous oxide, ether and chloroform were all narcotics and could produce hallucinatory effects on patients.
- However, from the 1850s, doctors began to describe the pain-killing properties of cocaine.
- The heart is a muscle; this is why chloroform killed people. This was an important step in making anaesthesia safer.

Dealing with Infection

Joseph Lister

- Joseph Lister was appointed professor of Surgery at Glasgow University in 1859.
- In 1864, he heard about reports of treatments used on sewage at Carlisle. Sewage was usually spread on fields but resulted in a parasitic worm attacking cattle that grazed on the fields.
- This had been stopped by the addition or carbolic acid to the sewage; apparently, this killed the worms and had solved the problem.
- The following year, Lister came across the work of Pasteur regarding germ theory and began to treat wounds with a swab soaked in dilute carbolic acid.
- This resulted in a reduction in outbreaks of gangrene and other infections. He published his findings in ‘The Lancet’ in 1867.
- Lister took his discovery further by using bandages to bind up wounds that had been soaked in dilute carbolic acid.
- He also insisted that his surgeons wore clean gloves for each operation and that they washed their hands in a 5% solution of carbolic acid before and after operations.

- His assistants used the same solution to wash all medical instruments. To prevent infection being spread by the instruments, he ordered that the handles had to be made of a non-porous material.

- Finally, Lister invented the Lister Spray, which was used to kill germs in the operating theatre.

- Lister's methods were successful, but he met much opposition. It takes time for people to accept new ideas.

- It was not until Lister took up a post in London in 1877 that opinion changed. He carried out a complete operation under antiseptic conditions.

- But, surgeons also did not like being sprayed with acid; it got into their eyes, onto their hands and also into the patient. Instruments could become slippery.

- Lister stopped using the spray and reverted to using bandages soaked in anti-septic

- Overall, the most important reason for opposition to Lister's discoveries was reluctance to accept Pasteur's germ theory.

- It was clear that antisepsis saved lives, because deaths in operations fell by 50% as a result of the use of Lister's methods, but was that directly linked to germ theory?

- By the 1880s, antiseptic surgery was widely accepted, but it was impossible to kill all germs in an operating theatre.

- Antiseptic surgery worked on the principle that germs were killed inside the operating theatre; consequently, there was always the risk that some germs might be missed.

- Lister had obviously been aware of this and had therefore insisted that surgeons wash before and after operations.

Lister's methods were successful, but he met much opposition, why?

- It takes time for people to accept new ideas.
- New ideas can mean more work
- New ideas can make those who did things the old way look foolish, or incompetent, or uncaring

- 1890s Robert Koch cultured the pus from patients' wounds. He showed that the pus was caused by germs on the surgeons' hands.

- This paved the way for **aseptic** surgery: the whole operating theatre, equipment and clothes were germ-free before the operation started.

New approaches to prevention

Public Health and Cholera

Problems and improvements in public health

- During the nineteenth century, Public Health became serious problem in Britain for several reasons:

- The combined effects of the agricultural and industrial revolutions allowed the population to double between 1801 and 1851 from 9 million to 18 million. By 1850, half lived in cities or towns.

- Houses were often built without fresh water and proper sewerage. In the early nineteenth century this led to outbreaks of cholera.

- Houses were built quickly and at the cheapest possible cost in order to house the armies of new industrial workers. Houses were jammed together to save space and costs.

- Court dwellings allowed the greatest number of dwellings to be put up with the least waste of space.

- Terraces were common as were back-to-back housing as both saved space and reduced building costs.

- Builders used the cheapest materials and houses were constructed with little concern for health or safety.

- There were no real controls on what buildings were constructed and no planning regulations.

- Profits from the sale or rent of cheap housing were often considerable.

- Workers houses were close to the factories in which they worked. In some cases the factory owner provided them for their workers.

- In some cases this meant good standards but in many cases they were just as bad as those provided by slum landlords. To provide decent homes cost money and reduced profits.

- Many people who could afford no better lived in shared cellars. In Liverpool a cellar could be shared by up to 38 people. There was no effective light, sanitation or facilities to prepare food.

- A 100 or more people might share just one privy (toilet). Many people used ‘potties’ or buckets, which were then empted in the streets.

- Cess-pits were often not emptied and the contents were liable to overflow into cellars or contaminate the water supply.

- Streets were often unpaved and covered in animal, human and other waste.

- Dung heaps were a common feature of many towns and offered another opportunity for slum landlords to make a profit. They also provided opportunities for scavenging animals and vermin.

- Water was got from standpipes or hand pumps, water sellers and from the local river. Often it was only available for a certain number of hours each day.

- Water was rarely clean and was a major cause of a range of diseases from typhus and typhoid to the dreaded cholera.

- A major feature of these cities and towns was not surprisingly their smell. Many people believed in the 'miasmatic' theory of disease.

- Many were industrial towns, with factories employing thousands of people. Without public transport they had to live close to their place of work. This led to terrible overcrowding.

- Low wages meant that people could not afford high rents, so houses were built as cheaply as possible, without sewers or a water supply.

- Older well-built houses were divided so that each room housed a family. Neither had a clean water supply or any good way of getting rid of sewage.

- Sewage built up in the streets and contaminated the water supply. This allowed disease to spread very quickly.

- Governments did not know the scale of the problem, or understand how to deal with it. They were not even sure the problem was anything to do with them: many saw it as a landlords and tenants problem.

- Old diseases like typhus and tuberculosis killed many, but a new disease, cholera, did more to frighten people when it broke out in 1831, 1848, 1853 and 1866. Death from cholera was quick and painful and tens of thousands died.

Why was little done to tackle the problems of public health?

- The scale of the problems created by the rapid growth of these towns had never been experienced before and people did not have the knowledge or organisations to cope.

- There were no real efforts made by governments either local or national to control what was happening in the towns by legislation. Many people thought that it was wrong to interfere.

- Many people believed in the theory of laissez-faire or leave things alone. Those who followed this theory believed that the best government was the least government.

- Slum landlords who made huge profits as things were. Any improvements would increase their costs and threaten their profits.

- Those who gained a living from selling water were also worried of any threat to their business.

- Some people were against any government telling them what to do. One group was called the 'muckabites' or 'Dirty Party'.

- They did not want to be told or forced to be clean. Governments should not interfere with people's freedom.

- People did not want to pay more in tax or local rates for improvements that would cost large sums of money.

- There was ignorance over the cause of disease and this helped prevent any really effective attempts to clean up towns and improve water supplies.

- There were no local councils to make improvements before 1835.

What efforts were made to improve standards of public health?

- The main reforms came as a result of the outbreaks of cholera, which arrived first in Sunderland in 1831.

- This disease more than most others horrified the Victorians its speed and suddenness struck victims of all social classes but especially the poor.

- There were later outbreaks in 1848, 1853 and 1866. More than 100,000 people died during these epidemics.

- Cholera was caused by the pollution of the water supply. Usually this came about because sewage got into water.

- As there was no real cure for cholera, effort was placed on ways of preventing it. With no real idea how it spread, miasma (bad air) was used to justify the cleaning up cities.

Why were there outbreaks of cholera in the nineteenth century?

- Cholera arrived in Britain from abroad for the first time in 1831.

- It spread because many people lived in cramped overcrowded conditions, with water supplies polluted by sewage.

- The worst outbreaks of cholera occurred in poor areas in city centres. There were few outbreaks in rural areas.

- At the time many people believed that the differences between cities and rural areas were the result of cholera being caused by miasmas.

- They believed that the air was polluted by the rubbish that lay in the streets and this caused disease.

The treatment of cholera

- Cures for cholera were often completely useless. One doctor recommended that a wet towel should be wrapped around the waist.

- Other popular cures were avoiding fruit and fresh air.

- There were various concoctions that were sold, but all were useless.

- From the 1830s doctors began to realise that the low incidence of cholera in rural areas was important.

- In 1848 and 1853 newspapers reported that the worst cases were in poor areas of city centres.

The role of Edwin Chadwick

- Edwin Chadwick was worried at the rising cost of poor relief which came about because of sickness.

- The costs came in looking after those who were too weak to work or were the left as widows or orphans.

- Chadwick, the Secretary to the Poor Law Commission, argued that spending money on improving public health would save the country money in the long term.

- Chadwick was responsible for the collection of reports on town conditions, which were to form the basis of his best selling *Report on the Sanitary Condition of the Labouring Population of Great Britain*, which was published in 1842.

- The report clearly established the link between overcrowded housing, poor sanitation, polluted water and disease.

- The Report was in favour of intervention by government to improve matters. It marked another break with the theory of laissez-faire.

- The Report and further outbreaks of cholera led to pressure for the government to take action.

- The result of this pressure was the establishment of a Royal Commission, which reported in 1844.

- Partly as a result of its findings, a Health of Towns Association was set up which included Lord Shaftesbury in its members.

The 1848 Public Health Act

- This was the first real attempt by government to tackle the problem of public health in towns. The Act said that

- A Board of Health should be set up in London with three commissioners who included Chadwick and Shaftesbury.

- The Board had the power to create local boards of health in any area where the death rate was high.

- These local boards could appoint a range of officials including a Medical Officer of Health. They could make sure that new houses were built with drains and lavatories.

- They could also arrange for the clearance of rubbish and cleaning streets. If water could be piped cheaply these boards could force homeowners to install it.

- The board in order to pay for these improvements could collect a local rate.

1848 Public Health Act, inspired by Chadwick's report of 1842

- A Central Board of Health was set up in London. Chadwick became the secretary.

- Any town could have a Public Health Board if it wanted one. A town had to have a Board if one tenth of the voters wanted one or if the death rate reached 23:1000.

- This Act was taken up by some towns and cities, but many did not. The ratepayers did not want to pay for improvement, which, on the whole, did not affect them and which would cost money.

Why was the Public Health Act ineffective?

- It did not compel towns to set up Local Boards of Health.

- There was considerable opposition to the Act partly because people did not want to pay for improvements and partly because of growing opposition to Chadwick.

- Chadwick had the unfortunate habit of annoying people in high places such as Parliament and the editor of *The Times.* The government closed down the Board of Health in 1854.

Chadwick's achievements were mixed

- He made popular the idea of improving sewers by the use of earthenware pipes and connecting them to drains, which help flush the system

- He brought the matter of public health to the attention of the nation

- He did however believe in the miasma theory of disease. He believed that cleanliness and good sanitation could remove all disease.

- He supported dumping waste in rivers such as the Thames, but that could create its own problems by polluting the water supply.

- The problem was that Chadwick believed that miasmas caused disease and so did not realise that clean water was the answer.

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1854 The Central Board of Health was ended. It had only been set up for five years.

- By this date, 182 Local Boards of Health had been set up, but only 13 had done anything about improving public health.

- In 1855, the Local Health Boards were abolished, because people did not think they were needed.

Snow and the Broad Street Pump

- Dr John Snow investigated the outbreak of cholera in London in 1848-49. He came to the conclusion that it was caused by water.

- He produced a report, which pointed out that more deaths had occurred in the southern parts of London than all the other districts put together.

- He suggested that this was because water for the south districts was taken from the River Thames below Vauxhall Bridge.

- The river was polluted by sewage discharged into the Thames higher in its course.

- The other districts of London either abstracted from the cleaner, high reaches of the Thames or from its tributaries.

- In 1853-54, there was another outbreak of cholera, which killed almost 11,000 people in London. The outbreak was centred in the centre of the city

- Snow was determined to find the cause of cholera. He tracked an outbreak of cholera in the Oxford Street area to a contaminated water pump in Broad Street.

- He drew a map showing the location of everyone who had died in the outbreak and proved that they had taken their water from the Broad Street pump.

- He also discovered that workers in a brewery who had not caught cholera had their own water supply.

- He removed that handle from the pump to prevent water being used and it was later discovered that it had been polluted.

- In 1855, the government set up a new Board of Health and put a doctor Dr John Simon in charge of it.

- Local councils could introduce the measures if they wanted but they were not forced to do so and many didn’t.

- In 1858, the Thames was so polluted that Parliament had to stop sitting. This became known as the ‘Great Stink’.

- As a result, in 1859 a new system of sewers was begun in London by Joseph Bazalgette.

- In the 1860s Housing Acts began to be passed that started slum clearance and set standards for the construction of new houses.

- Further legislation such as the **Artisans Dwelling Act of 1875** allowed local councils clear slum housing and replace it with good housing. Using it, over 3,000 slums were cleared in the period before 1900.

The Public Health Act of 1875

- This Act forced councils to build sewers, drains and pavements. Streets had to be lit and regularly cleaned.

- Councils were given powers to deal with infectious diseases and to deal with food safety by destroying food that was unfit to eat.

- Councils could provide public lavatories and washhouses, parks, fire services and libraries.

- As these parts of the Act were not compulsory many local authorities did not introduce them.

- In areas where they did as in Birmingham under Joseph Chamberlain much could be done to make cites healthier, safer and pleasanter to live in.

- Individuals such as Octavia Hill, the American George Peabody and Prince Albert were involved in schemes to provide good quality housing for the poor.

Case study

Edward Jenner and the development of vaccination

- In the late eighteenth century smallpox was major killer and those who survived were often scarred and disfigured. In the 1790s as many as 30,000 people a year died from smallpox.
- Edward Jenner noticed that milkmaids who often suffered from cowpox, a mild disease, never seemed to suffer from smallpox.
- In 1796, Jenner took some of the matter from Sarah Nelmes's cowpox blister. He then inserted this into the arm of a boy James Phipps.
- Later Jenner inserted some smallpox fluid into the boy's arm. The boy did not catch smallpox. He called this vaccination after the Latin word for cow, vacca.
- In fact many other people had made similar observations, but had never followed these up
- Some doctors opposed the new method. Some thought that people who were vaccinated might develop cow like characteristics.
- A popular cartoon of the time shows people growing horn and tails after being vaccinated by Jenner.
- Parliament made a grant to make the 'vaccine' more easily available; the death rate fell dramatically.
- However, in 1850, it was still about 5,000 per year. Many especially in poorer areas were not using vaccination.
- It caught on abroad more than in Britain: Napoleon had all his soldiers vaccinated.
- He was so impressed by Jenner's work that after capturing Vienna in 1809, Napoleon ordered the release of a friend of Jenner who had been taken captive.
- Infant vaccination for smallpox did not become compulsory until 1853 and many parents opposed it.
- Jenner could not explain how vaccination worked. This is good example of how careful observation can aid medical progress.
- Until the middle of the nineteenth century doctors continued to believe that disease was caused by bad air, the 'miasmatic' theory or spontaneous generation.
- This was reinforced by the outbreaks of cholera, which occurred when the weather was hot and there was rubbish lying in the streets.

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1859 Construction of a new sewage system for London, begun after the 'Great Stink'

1875 Public Health Act

- Local Authorities could pull down slums.
- They had to provide sewers, fresh water, clean streets
- They had to appoint a Medical Officer of Health to make sure that all these things were done properly.

1900 to the Present Day

Ideas about the cause of disease and illness

Advances in understanding the causes of illness and disease

- In the early twenty-first century, people have become aware of the impact of life-style on health.
- Lack of exercise and an unhealthy diet can have severe consequences.

Government intervention

- Obesity has become a major problem in the early twentieth century. It is defined as a BMI of 30 or more.
- Governments have tried to tackle obesity by encouraging people to take more exercise: cycle lanes; Boris bikes; the legacy from the Olympic Games etc.
- People are encouraged to eat more healthily: 5 a Day; 7 a Day etc.
- The contents of prepared foods have to be labelled clearly with the amounts of salt, saturated fats etc.
- A ‘traffic light’ system has been proposed for foods to provide even clearer warnings of health risks.
- Some restaurants now list the calorific values of meals.
- In extreme cases, the insertion of gastric bands can be very effective and the cheapest way of tacking obesity.
- Government initiatives to cut alcohol consumption have set limits of 21 units a week for an adult male and 14 for a woman.
- Proposals for a minimum price of a unit of alcohol have been announced.
- Campaigns to cut smoking have led to it being banned in all buildings.
- Packaging on tobacco products must include health warnings.
- It has been suggested that people who need hospital treatment as a result of excessive alcohol consumption should pay for the cost.
- Research has increased the understanding of genetic causes of disease, such as Down’s Syndrome and Sickle Cell anaemia.
- Doctors believe that at some point it will be possible to tackle such diseases genetically.

Improvements in diagnosis

- Blood tests can show damage to organs such as the liver or kidneys.
- Doctors can now use scanning equipment to investigate the human body and decide the extent of injuries.
- MRI scans can be used on muscle and ligament injuries; soft tissue cannot be investigated using x-rays.
- Monitors allow bodily functions to be checked and controlled. The ECG is now standard equipment in all hospitals.
- Much of this equipment is now available for use at home. Blood pressure can be checked easily using a wrist monitor.
- It may soon be possible to control high blood pressure (hypertension) by implants as opposed to daily pills.
- Dialysis for kidney failure can be carried out in the home by the patient.
- Radiotherapy and chemotherapy have meant that cancers can be checked, retarded and destroyed.
- In 2002, American surgeons implanted electrodes connected to a miniature computer into the visual cortex of a blind man.
- Using a video camera mounted on his glasses, he was able to 'see' well enough to drive a car.
- Some forms of high tech medicine have given rise to moral considerations. Stem cells are believed to be potential capable of repairing human organs and tackling conditions such as Parkinson’s Disease.
- However, some countries have banned the use of stem cells and the only procedure that is widely practised is the use of bone marrow.
- Modern doctors believe that stem cells and **genetic engineering** will allow doctors to cure or prevent most diseases in the 21st century.
- In 1999, however, a healthy young man who volunteered for gene therapy to cure a congenital liver complaint died of a toxic response.

Approaches to prevention and treatment

- In 1900, medical knowledge and treatment had changed out of recognition compared with 1800.
- However, average life expectancy in Britain was only 47 and medical care was out of the reach of the great majority of the population.

- Despite the work of Dr. John Snow in identifying the cause of cholera, the majority of water companies supplying London did not filter their product before pumping it into homes.

- When King Edward VII fell ill with peritonitis just before his coronation in 1901, the operation was carried out on a table in Windsor Castle.

- There had been, therefore, spectacular advances since 1750, but the effects of progress had only been felt by a small proportion of the population.

Improvements in the twentieth century

- In 1900, the only medical treatment available to most people was through the Poor Law.

- In 1911, the National Insurance Act provided limited free treatment to some working men, but not to their families.

World War Two 1939-1945

- In 1939, all hospitals in Britain were brought under central control for the first time.

- The health of the nation became very important and rationing was intended to ensure that all people received the right amount of nourishment.

- In 1942, the Beveridge Report recommended the setting up of the National Health Service.

- Beveridge wanted all medical treatment to be free from the ‘cradle to the grave’. The NHS came into existence in July 1948.

The impact of the NHS

- From the Appointed Day in July 1948, everyone in Britain was entitled to completely free medical care.

- This included visits to doctors, prescriptions, hospital treatment and operations, emergency services, dental treatment and false teeth, opticians and free spectacles and vaccinations and clinics.

- All the hospitals in the country (about 3,000) were taken over by the government and doctors were paid by the state.

- General Practitioners (GPs) were paid a fee for every patient that they had, no matter how many visits he or she made to the surgery.

- In October 1949, the Minister for Health, Aneurin Bevan announced what had happened since July 1948; 187,000,000 prescriptions had been provided, 5,250,000 pairs of glasses had been prescribed, 8,500,000 people had been treated at dentists

- The GP soon became the ‘Family Doctor’.

- The first charges to be introduced were for dental and optical treatment in 1951. These had proved to be the most costly items in the NHS budget. Nye Bevan resigned in protest.

- The most important change after July 1948 was that people no longer had to worry about whether they could afford treatment.

- In 1951, Seebohm Rowntree carried out a third survey into poverty. He wanted to find out just how difference the Welfare State had made.

- Despite the failure to put Beveridge's principle of a basic standard of living into practice, Rowntree found that only 1.5% of the people of Britain were living in poverty.

- However, this figure subsequently rose in the 1950s as benefits lagged behind the rise in the cost of living.

- By 1953, a quarter of widows and pensioners were applying for extra payments from the National Assistance Board.

- There were other criticisms of the NHS. One the one hand some said it encouraged people who wanted something for nothing and that taxpayers' money was being needlessly squandered.

- Some disliked the fact that there was still private practice. This would lead to twin standards – better care for those that could afford to pay.

Medicine and Treatment at the beginning of the twenty-first century

- Science has played a more important role in medical development during the twentieth century than in any previous period.

- There are now specialists in narrower and narrower areas of science. All of whom contribute to developments.

- Another reason for the increasing impact of science is the development of **research**.

- This is carried out by governments, but also by private companies, which produce drugs for profit.

- It is no longer possible for one man to make a breakthrough as it was in the nineteenth century.

- Major developments are made by **teams** of researchers who build upon the work of each other. Penicillin was one of the first examples of this process.

- Major developments in recent years have been the discovery by Watson and Crick of DNA (1953) and the human genome (2000).

- These may make it possible to treat so far incurable diseases such as cystic fibrosis and sickle cell anaemia.

- There are also concerns about the medical implications of scientific developments in other areas, such as the possibility of cloning and reproducing human organs and the development of genetically modified foods.

- Science has failed, however, to provide cures or vaccines for some common diseases, such as the cold. This is because the bacteria that cause these diseases evolve from year to year.

- Some bacteria are also becoming resistant to anti-biotics, partly because they have been used too often, but also because bacteria are living organisms which adapt to their environment.

Magic bullets

- Some early vaccines were ineffective because they were not strong enough to tackle bacteria.

- Magic bullets are targeted on one disease and have no side effects; the first was Salvarsan 606, which tackled syphilis.

Doctors and nursing

- Doctors and nurses have become more specialised. In hospitals, groups of doctors deal with special conditions, (e.g. cancer) or parts of the body (e.g. Ear, Nose and Throat) or types of patient (e.g. children or the elderly).

- Nursing too has had to become more specialised as new skills are needed, for example operating theatre nurses, children's nurses, intensive care unit (ICU) nursing.

- The training of doctors has remained much the same during the second half of the twentieth century.

- After medical school, doctors spend time in general hospitals before specialising or going into general practice.

- The training of nurses changed considerably in the later twentieth century; nurses used to work as student nurses in hospitals after initial training.

- Now, nurses are often graduates who have spent much longer studying and are more highly proficient.

- The role of nurses has also changed; Nurse Practitioners undertake some of the roles formerly reserved to doctors. They diagnose problems and can prescribe treatments.

- GP practices have also changed. In 1948, the GP was the family doctor who prescribed medicines and referred patients to hospital when necessary.

- Practices are now much larger; one in Kent has 17 doctors and carries out minor surgery, x-rays and can prescribe physiotherapy.

Case studies

Penicillin

- Penicillin was discovered by Fleming in 1928. He was motivated by his experiences in the trenches of World War One.
- He had seen many wounded soldiers suffering from infection after being wounded.
- Throughout the 1920s, he looked for ways of killing infection, with no success.
- On the morning of 3 September 1928, he returned from a month's holiday and began to clear up his cluttered laboratory.
- He was notoriously untidy and had not bothered to wash up before he had left.
- Fleming was sorting through a number of glass plates that had previously been coated with staphyloccus bacteria as part of research he was carrying out.
- He noticed that one of the plates had mould on it. The mould was in the shape of a ring and the area around the ring seemed to be free of the bacteria staphyloccus.
- The mould was penicillium notatum. Fleming concluded that the bacteria on the plate around the ring had been killed off by some substance that had come from the mould.
- Fleming published his discovery in 1929, in the British Journal of Experimental Pathology, but little attention was paid to his article.
- Fleming also became convinced that penicillin would not last long enough in the human body to kill bacteria effectively.
- In the 1930s, Fleming's trials occasionally showed more promise and he continued, until 1940, to try to interest a chemist skilled enough to further refine usable penicillin.
- In 1935, Ernst Chain, an Austrian Jew who had fled to Britain to escape the Nazis, came across Fleming's notes of his experiments. Chain was working with Howard Florey, an Australian, at Oxford.
- They began to work on penicillin and in 1940 carried out a series of experiments on mice.
- They gave it to four infected mice, all of which survived; another four all died. However, it had taken five months to produce enough penicillin to treat the mice.
- Florey and Chain wrote up their findings in the Lancet in 1940 and began to attract some support.
- They were able to build up a team, including, Norman Heatley, who developed a way of producing penicillin, and Margaret Jennings, who was responsible for bacteriology.
- Eventually, they also had five graduates and ten assistants working six days a week to try to produce penicillin

- In 1941, a doctor, Charles Fletcher, at a hospital in Oxford had heard of their work. He had a patient, a policeman called Albert Alexander, who was near to death as a result of bacteria getting into a wound.

- Fletcher used some of Chain's and Florey's penicillin on the patient and the wound made a spectacular recovery.

- Unfortunately, Fletcher did not have enough penicillin to fully rid the patient's body of bacteria and he died a few weeks later as the bacteria took a hold.

- Penicillin had shown what it could do on what had been a lost cause. The only reason the patient did not survive was because they did not have enough of the drug; it was not that it did not work.

- In 1941, Florey and Heatley travelled to the USA to try to persuade US companies to back penicillin. Their aim was to produce one kilogram so that clinical trials could begin.

- Florey got an American drugs company to mass produce it and by D-Day (June 6th 1944), enough was available to treat all the bacterial infections that broke out among the troops.

- Penicillin got nicknamed 'the wonder drug' and in 1945 Fleming, Chain and Florey were awarded the Nobel Prize for medicine.

- Penicillin was the first anti-biotic. These drugs kill infection inside the body. They marked an enormous revolution in the treatment of disease. Modern medicine would be unworkable without them.

The fight against lung cancer

- Lung cancer was a major killer in the early and mid-twentieth century; the main cause was smoking.

- Cigarettes became an acceptable social habit and in older films characters can be seen smoking almost continuously.

- Some tobacco companies advertised smoking as a healthy habit and claimed that it could help clear up minor complaints.

- Passive smoking, being in the presence of someone who was smoking, was almost unavoidable. Restaurants and hotels allowed smoking in all areas.

- In the late twentieth century, the British government began a major campaign to raise awareness of the dangers of lung cancer.

- Tobacco companies were banned from advertising on TV and in the press.

- This led to most tobacco companies stopping supporting sports events as a way of promoting their products.

- Eye-catching displays in all shops were banned April 2015.

The following information is taken from government publications.

- Smoking is responsible for one in every five deaths in adults aged over 35 in England, and half of all long-term smokers will die prematurely due to a smoking-related disease.
- Almost 24,000 people a year in England receive a lung cancer diagnosis when the disease is at a late stage.
- Only around 15% of cases are diagnosed at the earliest stage, when treatment is most likely to be successful.
- The next phase of the NHS Be Clear on Cancer campaign aims to create awareness of the signs and symptoms of lung cancer and to encourage people with a persistent cough to see their GP early.
- Lung cancer is currently England's biggest cancer killer, causing around 28,000 deaths each year and with around 33,800 people diagnosed.
- Those diagnosed at the earliest stage are 5 times more likely to survive lung cancer for at least 5 years than those diagnosed at a late stage.
- One of the reasons behind England's low early diagnosis rate is the public's lack of awareness about the disease and its symptoms.

New data shows:

- Almost three-quarters (73%) of people are unaware that lung cancer is England's biggest cancer killer
- Despite the fact that lung cancer is most common in people aged over 50, one in four people (26%) think that all age groups are equally at risk of lung cancer
- 40% of people are unaware that a cough that has lasted 3 weeks or more is a potential symptom of lung cancer
- Smoking and the harm it causes aren't evenly distributed. People in more deprived areas are more likely to smoke and are less likely to quit.
- Smoking is increasingly concentrated in more disadvantaged groups and is the main contributor to health inequalities in England.
- Men and women from the most deprived groups have more than double the death rate from lung cancer compared with those from the least deprived.
- Smoking is twice as common in people with longstanding mental health problems.
- There are relatively high smoking levels among certain demographic groups.
- Smoking in pregnancy increases the risks of miscarriage, stillbirth or having a sick baby, and is a major cause of child health inequalities.

- At the time of their babies' birth, over 1 in 4 pregnant women are recorded as smokers in Blackpool, but fewer than 2 in 100 in the London Borough of Westminster.

Government action

- It became illegal to smoke in work places in Britain in 2007.
- The legislation, introduced on the 1st July 2007, made it illegal to smoke in all public enclosed or substantially enclosed area and workplaces.
- The ban included smoking on vehicles which serve the public and / or are used for work purposes.
- Appropriate no smoking signs must be clearly placed in all smoke free premises and vehicles.
- Under the legislation in place work smoking rooms and areas are no longer permitted. All smokers must take their smoke breaks outside.
- The owners / managers of any premises have to take reasonable steps to ensure that all staff and/or visitors are aware of the ban and to uphold the ban.
- Smokers looking for an appropriate place to smoke may check the no-smoking signs in and around premises to easily see which areas are restricted or ask a staff member.

Help to stop smoking

- Help has been made available through the NHS and local authorities.
- Local stop smoking services offer the best chance of success. They are up to 4 times more effective than no help or over the counter nicotine replacement therapy.
- Health professionals, such as GPs, midwives, pharmacists, dental teams and mental health staff are often well placed to refer smokers to these services.

The British sector of the Western Front 1914-18

The context of the British sector of the Western Front

- In August 1914, Britain declared war on Germany. The British Expeditionary Force (BEF) was sent to Belgium.
- In October 1914, the BEF occupied the gap between the French and Belgian armies. This was the Ypres Salient.
- The salient was a bulge around the Belgian city of Ypres, which was surrounded by high ground occupied by the Germans.
- In 1915, British reinforcements occupied the front line in France north of the River Somme. This included the town of Arras.

The trench system

- Most generals had expected the war to be over quickly; they had anticipated a war of movement. Instead, there was deadlock. It was much easier to defend than to attack.
- Machine guns could fire 600 bullets a minute; heavy artillery could fire high explosive shells. Both sides began to dig trenches to provide cover.
- There were usually three lines of trenches; they were linked with communication trenches to allow for reinforcements and food to be brought to the front line.
- The trenches were built in zig-zag fashion to prevent blast from shells and enemy attackers killing large numbers of people.

Attempts to overcome the deadlock

- The deadlock in the West meant that both armies tried to find ways of breaking through the enemies defences.
- Gas was first used by the Germans at Ypres in April 1915 and proved a deadly weapon. 9,000 Allied soldiers were killed.
- Gas could be used in two ways. It could be released from tanks at the front line and allowed to drift over towards the enemy.
- Gas shells could also be used. These broke open when the hit the ground. Early respirators were clumsy and only fitted into the shirt collar.
- Gas was terrifying, but in the end did not prove to be a decisive weapon. It could blow the wrong way and attackers had to wear respirators, which hindered visibility and movement.
- Nevertheless, gas continued to be used until the very end of the war. Adolf Hitler was blinded by gas in October in 1918 and spent the last weeks of the war recovering in hospital.

- Another methods used to try to break through was mining. Special units were formed to dig under the enemies trenches and put huge mines in place.

- These were first used at Hill 60 near Ypres in early 1915. It was first attacked in February when a mine was exploded under the German positions on 17 February. This was the first British mine used in the war.

- In March, three more mines were dug and 9,400 lbs of gunpowder were dragged into position.

- The three mines were detonated at 19:05 on 17th April. The hill was then stormed and taken by the British forces. The three mines can be seen to the left of the entrance near the perimeter fence.

- The biggest mines were dug under the German frontlines at the Somme and then exploded just before the attack.

- The Lochnagar crater is about ninety metres in diameter and sixty metres deep, and is an impressive visual indication as to the scale of the horrific conflict.

- In June 1917, twenty mines were dug under the Messines Ridge near Ypres. The tunnels were nearly 300 metres long and contained more than 20,000 kilos of high explosive.

- Eighteen of the mines were detonated at the start of the battle, but two were forgotten. One blew up in 1956, but the other is still out there.

- Tunnels were also used in the successful attack at Vimy Ridge in April 1917.

- In the Arras sector in March 1916, New Zealand Tunnelling Companies dug a network of tunnels in the ground underneath Arras.

- They dug new tunnels and rooms and joined them up with the existing ancient tunnels and quarries or pits already under the city, quarried out hundreds of years before.

- The tunnels were fitted with running water and electricity supplies. Accommodation in the underground city was available for the soldiers to live and sleep.

- There was a large hospital for treating the wounded in a labyrinth of rooms with enough space to fit 700 beds and operating theatres.

Conditions requiring medical treatment

- Soldiers were usually in the front line for four days; they then went in to support trenches for another four days and then were withdrawn for eight days.

- Trenches soon became flooded in bad weather; this produced the disease known as ‘trench foot’.

- This was an infection caused by immersion in water for long time. Feet swelled and turned black. It was impossible to get boots on.

- Trenches were also full of rats, which crept over soldiers' bodies while they slept; they brought the risk of serious epidemics.

- Most soldiers would be infected by lice. When they were withdrawn from the front line, their uniforms were baked to kill the lice.

- It was usually impossible to wash in the trenches. Soldiers were given a ration of water everyday for all uses.

- Soldiers were given showers to get rid of lice and filth, when they were withdrawn from the front line.

Wounds

- There were large numbers of wounds to the head, because soldiers looked over the top of the parapet.

- Shrapnel, metal fragments, could spray around when a shell exploded tearing the skin

- High explosive shells could cause terrible injuries. They needed to be treated as quickly as possible

- The first thing to do was to get the wounded from the battlefield to medical aid.

- Medical officers treated as many casualties as possible at the front lines. Often they had to work in primitive conditions.

- The enormous numbers of injured meant many of them had to walk or be carried by stretcher to field ambulances.

- They were then taken to Field Dressing Stations and then on to Casualty Clearing Stations. Finally, they reached hospital. Each step was farther from the front lines.

- Doctors and medical orderlies were forced to select which patients would be operated on immediately, which could wait a few hours and which would be left to die.

- The movement of casualties from field dressing stations to hospital meant that records had to be kept; record cards were introduced to pass on information.

Blood transfusions

- Heavy bleeding and shock could be a death sentence, so doctors needed to find a way to replace lost blood quickly.

- Before the Great War, blood transfusions had been used sporadically, but they were risky, in part because compatible blood typing wasn't in widespread use.

- In 1917, it was shown that blood could be donated in advance and stored using sodium citrate as an anticoagulant.

- It was discovered that the plasma could be taken out of blood so that it could be stored longer.
- The use of stored blood was adopted by the British medical corps, saving the lives of untold numbers of soldiers.
- The Great War also saw the introduction of the portable X-ray machine. Marie Curie turned cars into X-ray vans to help scan wounds at the front.
- These radiology vehicles allowed doctors to save lives and prevent disability by detecting broken bones or shrapnel and bullets buried in flesh.
- Infection was a dire threat on the Western Front. Cholera, dysentery and lice-borne typhus could attack soldiers in crowded, rat-infested, mud-filled trenches.
- Doctors and nurses had to rely on iodine to clean wounds to stave off infection.

Gas

- Attacks began in April 1915 and continued throughout the war. There were three main gases used:
- **Chlorine** was deadly, but caused men to cough and so not much was inhaled.
- **Phosgene** was more effective because it was inhaled deeply and could have effects which were delayed for up to forty-eight hours.
- **Mustard Gas** caused severe blisters on the skin and therefore made protection very difficult.
- It tended to stay in the ground for long periods, so it could be dangerous long after an attack.
- There was no treatment for the effects of gas attacks; soldiers could go blind temporarily or even permanently.

Prosthetic surgery

- In previous wars, amputation of a limb often resulted in death. In the Great War, many soldiers survived amputations and needed further treatment.
- For the first time the provision of prosthetic limbs became a proper industry.
- Dr. Harold Gillies set up a unit at Sidcup in Kent and invented a number of procedures to repair faces.
- He grafted skin and tissue from other parts of the body to repair and rebuild cheeks, noses and chins.
- He also developed the tube graft to provide blood flow to the reconstructed area from another part of the body.

Shell-shock

- Wounds were not always physical. Thousands of men suffered emotional trauma from their war experience.
- ‘Shell-shock’, as it came to be known, was viewed with suspicion by the War Office and by many doctors.
- They believed that it was another form of weakness or malingering. Sufferers were treated at a range of institutions.
- Officers went to Craiglockhart where they were treated by psychiatrists and the men went to hospitals such as Netley, or were placed in asylums.
- Treatment was vastly different at each institution; the officers at Craiglockhart were given therapies such as talking cures.
- The men at Netley were treated with more physical forms of ‘cure’ such as physiotherapy.

The work of the RAMC

- At the outbreak of the Great War, there were 9,000 Warrant Officers and Men of the RAMC; this grew to 113,000 by 1918.
- It was soon realised that a man’s chances of survival depended on how quickly his wound was treated.
- There were vast numbers of casualties requiring treatment at the same time. It was impossible for surgeons to evaluate and practice successfully on the front lines.
- Efficient and rapid movement was the only way to achieve success. A system was set up and became known as the Chain of Evacuation.

The Chain of Evacuation

- Regimental Aid Posts were set up near the front line. The Battalion Medical Officer, his orderlies and stretcher-bearers, attended these.
- When not in action this was a Camp Reception Station [CRS] or Medical Inspection Room [MI Room] for infantry battalions.
- In action, the RAP was situated a few metres behind the front line, this could have been in a dugout, in a communication trench, a ruined house, or a deep shell hole.
- The facilities were only sufficient to carry out first aid. The Regimental Aid Post had no holding capacity.
- Wounded men were to either make their own way to it or be carried, usually by a member of his own Unit.

- They would be patched up and either returned to their duties in the line or passed back to an Advance Dressing station.

- The Advance Dressing Station would be sited about 400 meters behind the RAPs, in tents where necessary. The Main Dressing Stations were sited roughly one-mile further back.

- The Field Ambulance was the most forward of the RAMC units and the first line of documentation.

- The MDS did not at first have a surgical capacity, but did carry a surgeon's roll of instruments and sterilisers for life saving operations only.

- Soldiers would be transferred to a Casualty Clearing Station [CCS] for further treatment.

- The Casualty Clearing Stations moved casualties from the battlefield on to the hospitals. There was one CCS per Division.

- A Casualty Clearing Station was a very large unit, and could hold a minimum of 50 beds and 150 stretchers in order to treat a minimum of two hundred sick and wounded.

The essential parts of a CCS were:

- A large reception marquee.

- A resuscitation tent, where severely shocked or apparently dying cases were warmed up in heated beds, or transfused before operation.

- A pre-operation tent, where stretcher cases were prepared for operation.

- A large operating tent with complete equipment for six tables.

- An evacuation tent, where the cases were sent after operation, to await the hospital train for the Base.

- Award tent for cases requiring watching for twenty-four hours, or too bad for evacuation.

- They were usually situated about 20 kilometres behind the front lines; roughly mid-way between the front line and the Base Area.

- They were the first line of surgery and the furthest forward of nursing staff but treatment could still only be limited.

- There were six mobile X-Ray units serving in the British Expeditionary Force during the Great War and these were sent to assist the CCS's during the great battles.

Hospitals

- There were two Stationary Hospitals to every Division and each one was designed to hold up to 400 casualties.

- A General Hospital was located on or near railway lines to help movement of casualties from the Casualty Clearing Stations on to the Ports.
- Many of the general hospitals were Voluntarily Hospitals supplied by the British Red Cross and St. John Combined Organisation.
- The general hospitals in the Base Areas had complete X-Ray departments and operated as separate sections within the hospital's complex.
- Once admitted there was a good chance of survival, the Official History states that whilst 36,879 men died on hospital, 169,842 returned to duty after treatment.
- Although condition of medical treatment could be very basic, the number of soldiers who survived wounds was very large.
- On the Western Front, 1,600,000 wounded returned to the front line. This was an enormous improvement on any previous war.

The FANY (First Aid Nursing Yeomanry)

- The FANY was set up in 1907, but at the outbreak of war, no one in the army showed any interest.
- In October 1914, six members went to France and treated wounded British soldiers in Calais who were receiving only the minimum of care.
- They set up a hospital in a convent school and British wounded soldiers were arriving at it before they had had time to unpack their equipment.
- The hospital soon had 100 beds and between 1914 and 1916, the hospital treated over 4000 patients.
- As well as treating wounded soldiers, FANY's drove ambulances and set up soup kitchens and general canteens.
- The FANY also took food and spare clothes up to the front line and brought a mobile bath unit.
- In 1915, they were given what could be seen as a formal base in Calais from which to work.
- By 1916, the FANY were working with mechanics to repair broken down motor vehicles.

The underground hospital at Arras

- This was built when the quarries at Arras were extended to dig tunnels for the Battle of Vimy Ridge, which began on 9 April 1917.
- A hospital with 700 beds was created with operating theatres for the men who were going to be wounded in the battle.

- The hospital only survived for three days before it was destroyed by German shellfire.

Experiments in surgery

- On the Western Front, surgeons had to operate very quickly. They often worked in very primitive conditions.
- Innovations developed in the First World War had a massive impact on survival rates, such as the Thomas splint.
- This was named after the Welsh surgeon Hugh Owen Thomas. It secured a broken leg.
- At the beginning of the war 80% of all soldiers with a broken femur died. By 1916, 80 % of soldiers with this injury survived.

Blood banks

- In 1916, Francis Rous and James Turner found that adding a citrate glucose solution allowed blood to be stored for longer.
- This meant that, when an attack was planned, the army could ask for donations of blood from the public, so that they were available for transfusion to treat the wounded.
- Geoffrey Keynes, a British surgeon, developed a portable machine that could store blood.
- This meant that transfusions could happen closer to the battlefield.
- The first blood depot was established in 1917 for the Battle of Cambrai, using blood group O, which can be safely given to all patients, whatever their blood type.

The historical context of medicine in the early twentieth century

- Pasteur discovered the germ theory of disease in 1862; this revolutionised medical treatment and led to the first vaccines.
- By the beginning of the twentieth century, there had been major changes in surgery.
- Anaesthetics and antiseptics had been developed in the 1850s and 1860s.
- Aseptic surgery had been developed by Robert Koch in the 1870s and 1880s.
- Blood groups were identified by Karl Landsteiner in 1901.
- That meant that the three major risks in surgery had been overcome.
- X-rays had been discovered by Wilhelm Rontgen in 1895, enabling much more effective surgery.
- Radium had been identified by the Curies in 1908.

- Hospitals in Britain had been changed completely by the work of Florence Nightingale.
- Despite all of these improvements, doctors and surgeons found themselves thrown back hundreds of years when faced by the huge numbers of casualties in the war.

This account, written by a surgeon in 1916, suggests that surgery had been put back by about one hundred years.

> It was mainly amputations for septic compound fractures, and ligaturing arteries for haemorrhage. I never thought when I was doing operative surgery before the war that I should have to use any of the set operations except on the rarest occasions. For the surgery we were doing was the surgery of the Napoleonic Wars. We were ligaturing arteries, or doing the classical amputations we had learnt out of books.

- The war speeded up progress in medical treatment and surgery. Doctors and surgeons were forced to find solutions to problems as quickly as possible.
- Some ideas worked and others did not, however, the proportion of British soldiers who survived wounds was far greater than in any previous war.