It is a great privilege to be invited to deliver this address on "Medicine’s debt to the Army" and it is especially gratifying for me, Dr. Royle, to be doing so during your term of office as President. Considering the list of my distinguished predecessors I am the more deeply appreciative of the honour you have done me. My aim, this afternoon, is to discuss the debt that Medicine owes to the Army. Army commanders have always realized the importance of maintaining the fitness of soldiers to fight and fight again. No plans, however well laid, are considered complete without estimates of potential casualties. Over the centuries, thanks to military medicine, such estimates have become progressively smaller. Had I chosen to consider the Army’s debt to Medicine my task would have been simpler, for obviously the British Army without an efficient and effective medical service would be unable to fulfil its role. Although I shall speak of Medicine’s debt to the Army, it is well to remember that the obverse is even more important and well recognized.

Before proceeding to consider the contributions made by the Army to the art and science of Medicine, it is worth considering the responsibilities of military medical practice. In peace the Army medical officer selects only healthy recruits, endeavours to maintain them in a state of fitness, and cares for their dependant wives and children. In war his main responsibilities are to collect, treat and evacuate casualties; to repair expeditiously the effects of injury and disease and if possible return men to the battle front. With these obligations in mind it is well to remember that the Army Medical Services have evolved fitfully over a period of more than 300 years. Ever since 1664 when John Knight was made Chirurgeon-General of all the Forces in England and Wales and 14 years later when the first Physician-General was appointed, our affairs have been conducted by medical men. Just as efficient medical administration is indispensable to the Army, the preservation of health, or Army Health as it is now called, has always been its primary care. As Singer (1928) has written, "many of the most important medical movements during the 18th century were initiated by Army and Navy surgeons." The same writer considers that the use of statistics to assess the results of preventive measures accounted for this, but Dudley (1953) believes that their superiority was due to the enforcement of these same measures by Service discipline. Today no one doubts that Army Health is a vital and integral part of medical administration.

I now propose to consider in turn, beginning with the great pioneers, those who have exercised a major influence on progress in military medicine. War has often
acted as a spur for betterment of medical conditions in the Service but when peace came the medical lessons of war were frequently forgotten. Nevertheless, there is evidence that what lessons the Army learnt in war were often adapted for civilian use at a later date.

Although necessarily there will be gaps in this story, I shall speak of those who, in my opinion, have influenced the main advances, not forgetting the doctors who served temporarily in the Army in time of war. It is not improbable that the latter were the means of ensuring that useful military ideas were introduced into the civilian medical practice of the time.

Medical Administration and Army Health

Sir John Pringle heads my list. This remarkable Scot, born in 1707, fought single-handed to have his precepts and standards accepted by the Army. Trained at St. Andrews, Edinburgh and Leyden Universities he settled in Edinburgh but was soon serving with the Army. In 1744 he was appointed Physician-General to H.M. Forces in the Low Countries and later took part in the Jacobite rebellion. His famous book “Observations on Diseases of the Army,” published in 1752, remained the standard work on military medicine for the rest of the century. Written in simple language his book was intended for all officers in the Service. Trevelyan (1946) considers that he “reformed military hygiene on scientific principles which also had a great influence on the habits and treatment of the civilian population.” A close friend of James Boswell and Captain James Cook, R.N., his worth was generally appreciated during his lifetime and he became President of the Royal Society. He proved that hospital and jail fevers were identical, defined influenza as a clinical entity and first applied the term “return” to medical statistics in the Army. He recognized putrefaction as a cause of disease and was the originator of the word antiseptic. He was distinguished also as a hygienist.

Another notable administrator was Sir James McGrigor, an Aberdonian, who joined the Army as a medical officer in 1793. Typhus was the main problem with which the Army had to contend in the ill-fated Walcheren expedition in 1809, from which more than 30,000 men died. McGrigor himself fell ill with the disease while returning from Holland, but once back in England he set about preventing its spread and was said to have given his hospital “so clean and cheery an appearance that it attracted the attention of the officers.” We also find him serving in York where he pointed out that “a military hospital was the best for trying the effects of all new remedies or modes of treatment because there the patient was more under control than in any other hospital.” He encouraged his young doctors to engage in postgraduate study and insisted that all medical administrators must first be good doctors able and willing to teach their juniors. In 1812 he joined the Duke of Wellington in Portugal where his convalescent depots were the means of keeping many thousand soldiers in the field. It was at his request that prefabricated hospital huts were sent out from England. The method he instituted of registering battle casualties is still the basis of our field medical returns. It may have been because the Duke of Wellington wrote that “the Medical Department is the only one that will obey orders, on them I can rely for doing their duty,” that McGrigor, in 1814, was able to obtain priority for the transport of wounded and medical supplies at the Battle of Toulouse—the
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last battle of the Peninsular War. Also in 1814 he was appointed Director-General, a post which he held for 36 years. Possibly his greatest reform was to improve the type of doctor recruited into the Army, and to ensure for such men a more attractive career. In hospitals he organized separate wards for certain diseases, improved ventilation in many military buildings, and insisted that men were not discharged from hospital until fully recovered. It is likely that it was as a result of McGrigor’s influence that the soldier obtained a bunk to himself. He also insisted that his doctors were made familiar with the Army in which they served. When he retired in 1851 there had been an overall improvement in hospitals and equipment; the type of medical officer had improved and he was reasonably well trained in his duties.

Nevertheless when hostilities broke out in the Crimea two years later, it was surprising that the campaign proved for the Army Medical Department so notably disastrous—probably the consequences on the administration of 40 years’ freedom from hostilities which found the Department unprepared for war. In the Crimea the shortage of medical and other resources, lack of transport for essential material and for the casualties, a deficiency of trained medical staff officers and a poor standard of hospitals all contributed to a state of affairs which was deplorable. A quarter of the force of 94,000 men died from wounds, disease or starvation. Taking into account these circumstances and conditions Sir John Hall, the Principal Medical Officer, and his staff performed splendid service as a series of recently discovered documents strongly supports. It has already been pointed out that in proportion to their numbers more medical than other officers died in the campaign. These comments must not detract from the outstanding work done by Miss Florence Nightingale. From the Army in the Crimea she gained valuable experience which, combined with her organizing ability and stern discipline, she applied to the improvement of hospitals and the welfare of the soldier and his family. She transformed the successors of Betsy Prigg and Sairey Gamp into members of a skilled and organized profession, and anticipated the need for district nurse and health visitor. This resourceful woman also realized the value of statistics to hospitals and the medical profession generally and thus she took especial interest in the health and mortality of her nursing staff. She first observed, then studied a problem; her resulting judgment was calculating and thoughtful. More especially, her writings influenced public opinion to a remarkable extent. Even without visiting the sub-continent she exercised a profound effect on public health in India, proving by means of statistics that many diseases were definitely preventable; pointing out at the time that the great epidemic diseases are limited not by geography but by sanitation.

The next notable person to exercise a profound influence on Army medical practice was one of her protégés, Edmund Alexander Parkes, a man of strong personality, untiring energy and a first-class teacher. He was given charge of a hospital at Renkoi near the Dardanelles during the Crimean War in order to lighten the burden on the Scutari hospitals. Following ten years as Professor of Clinical Medicine at University College Hospital, London, he was appointed in 1860 to the Chair of Military Hygiene at the newly formed Army Medical School at Fort Pitt, Chatham. In this post “he had almost to create the science he had to teach,” nevertheless his influence “on the public services themselves was beneficial to an extent that can hardly be overestimated”
Medicine's Debt to the Army

(Longmore). During his term of office the design of barracks, hospitals and married quarters greatly improved and the load of the soldier on the march was lightened significantly. Parkes's Manual of Practical Hygiene, first published in 1864, remained the standard work of military and civil practice for more than 20 years after. On his death he was described by Baron Mundy, then Professor of Military Hygiene in Vienna, as "the founder and best teacher of military hygiene of our day, the friend and benefactor of every soldier" (Osborn), a fitting epitaph for an outstanding personality. His successors at the Army Medical School were de Chaumont, Notter and Firth, who carried on his work.

With the opening of the South African War, medical officers, though well trained in the principles of hygiene, had neither the means nor the authority to apply them; consequently, the incidence of preventable disease was unduly high. Rations, which were unsuitable, could not be improved by cooking, water purification was defective and sanitation was deplorable. In summer, flies and insects swarmed around the camps in countless numbers. It is not surprising that soon after the war a Manual of Sanitation for the use of all Army officers was issued. This was just 250 years after Pringle's book had been written with the identical object in view.

In 1880 Alfred Henry Keogh entered the Army and it is to his administrative genius that we are indebted to this day. After distinguished service in South Africa he was made Director-General in 1904, and six years later on retirement he was appointed Rector of the Imperial College of Science. When World War I broke out, the medical services were again unprepared for the emergency and Keogh was recalled as Director-General for a further term. Again his genius for making quick decisions and delegating authority proved invaluable and the Medical Corps expanded smoothly and rapidly to meet its huge commitments at home and overseas. To Keogh we owe encouragement of medical research, the appointment of civilian consultants to the Army, the recognition of Millbank as an Army postgraduate centre, and the establishment of the School of Army Health. That the medical and nursing branches of the Territorial Army were developed on a sound basis was due to his efforts. It was also at his instigation that field medical units in the present form of field ambulances and casualty clearing stations were instituted.

During and following World War I, further conspicuous efforts were made to improve the health and welfare of the soldiers. First, the system of selecting recruits and medical board procedures were overhauled. Later, barracks, messing, training and recreational facilities were generally improved. The soldier's energy requirements were studied and centres for physical development and rehabilitation were opened. Lastly, and probably most important of all, supplies of safe drinking water were made possible on the initiative of William Horrocks. By all these improvements and innovations the wastage from preventable disease was reduced to a minimum.

By the beginning of World War II the standard of accommodation, both in barracks and in the field, had been brought up to date; and the soldier's rations and their preparation had been so markedly improved that there was little risk of the occurrence of nutritional deficiency. The uniform, head-dress and equipment had been modernized and special clothing had been devised to protect men from extremes of heat and cold. The Army was by now well trained in sanitation, and new methods
of disposal of excreta and refuse were being strictly applied. During this war the PULHEEMS System, a method of recording an assessment of the soldier's fitness, was adopted and this, together with personnel selection procedure, ensured that he was employed at work most suited to his talents. The provision of extra bathing and washing facilities reduced further the incidence of dirt diseases, the insect vectors of which were finally banished by the use of DDT and impregnated clothing.

So much has been accomplished today by Army Health that we are liable to take it all for granted and forget that this is the heritage of military hygiene from the past.

**Army Pathology**

Perhaps because of its orderly and challenging nature, pathology is the discipline in which the Army has bestowed great benefits. It is worth noting that even in the 18th century it was customary in military hospitals to perform regular post-mortem examinations—before this became a routine in civilian institutions.

Army Pathology was born in 1860, again as a result of experience in the Crimea, when Doctor William Aitken was appointed to the Chair of Pathology at the Army Medical School. As a teacher and practical morbid anatomist, it was he who paved the way for the great advances the School and its staff were destined to make. Specimens from the Army museum instituted in 1810 by McGrigor were transferred to his Department, so that it was soon enabled to train young medical officers in this subject. Aitken was equally versed in general medicine; his book on its science and practice, first published in 1857, had a wide popular appeal. His many contributions to pathology gained him the F.R.S. in 1873 and a Knighthood from Queen Victoria in 1887.

On his death in 1892 Dr. Almroth E. Wright was appointed Professor. At heart a keen clinician and protagonist of vaccine therapy, Wright has been well portrayed by Bernard Shaw in “The Doctor's Dilemma.” A passionate investigator he did much early research work with a view to producing a vaccine capable of protecting against typhoid fever. But two of his most valuable “discoveries” turned out to be William Leishman and Alexander Fleming.

Leishman, who succeeded him in 1903 as Professor, was an equally gifted research worker. He first improved one of the new Romanowsky stains, employing it to discover the protozoal organism which causes kala azar and which now bears his name. Possibly his greatest contribution to Medicine was his introduction of safe typhoid vaccine for general use.

Early in the century the Army Pathology department at Netley had already trained men like Ronald Ross, David Bruce and David Semple. It was therefore not surprising that, when World War I came, some of the best brains working with the Royal Army Medical Corps were attracted to the speciality, among them Fleming, Leiper, Wenyon and Warrington Yorke. During the period 1914-18 investigations were carried out into many problems, including cerebrospinal fever, typhus and trench fevers and the dysenteries. Mobile laboratories were employed for the first time and wound sepsis, especially that caused by tetanus and gas gangrene organisms, was investigated fully.

The period between the wars was devoted to consolidation, and J. S. K. Boyd began his investigations on the dysentery bacilli and their classification. The institution
of a diagnostic reference laboratory was a new and welcome innovation. In World War II the need for increased diagnostic work induced the pathological services to expand on an unprecedented scale, and, in collaboration with the Medical Research Council, original research was undertaken on infective hepatitis, influenza, scrub typhus, sprue, malaria and schistosomiasis. The work of Boyd in dealing with tetanus and that of J. D. MacLennan in elucidating anaerobic wound infection typify especially notable advances. Equally remarkable was the unique opportunity which arose to evaluate penicillin therapy on an ambitious scale, and to pursue original investigations too numerous to indicate. As Sachs (1955) has pointed out there was no doubt as to the success and efficiency of the pathology service in World War II. There is no doubt also that pathology in all its new branches benefited as a result.

**Military Surgery**

"How large and various is the experience of the battlefield and how fertile the blood of warriors in rearing good surgeons."

Of all medical sciences, surgery probably owes the most to experience in war since its development is largely influenced by the treatment of wounded soldiers. Until the 19th century surgery was crude, septic, rough-and-ready but nevertheless often strikingly successful. Among the early pioneers were William Clowes and John Woodall, who served with the Army of Queen Elizabeth I, both of whom wrote on the treatment of "wounds made with gunshot." Woodall's maxim that no wound of this kind "can be said to be a simple wound" shows that methods were already being devised to deal with these injuries. The first to practise ligation of large vessels to control bleeding, he is credited with the invention of the trephine with a movable centre pin. A little later, Richard Wiseman attracted attention, for it was he who first recommended primary amputation.

In some respects it is surprising that early in the 18th century interest in war surgery began to lapse. Nevertheless Francis Home, who was at the Battle of Dettingen in 1743 wrote that he "cut all the wounds that he dressed there." This is the first mention of wound excision in British military surgery.

John Hunter, Surgeon-General from 1784, was a man with an original mind; his theories and discoveries advanced surgery to a great extent. His was a conservative approach to war surgery, and he did not endorse early amputation as practised at the time. His book on the treatment of gunshot wounds, based on his experience gained as a staff surgeon, was published in 1794.

Two surgeons of the early 19th century deserve special mention. To George James Guthrie, who served in the Peninsular War and treated many of the wounded in Brussels after Waterloo, we are indebted for planning amputations on a sound basis, for proper alignment of fractures and for improving the treatment of nerve injuries. He was also a strong advocate of early surgery. Charles Bell's name is synonymous with progress, and especially for having advanced our knowledge of the nervous system. He availed himself of two opportunities of gaining first-hand war experience; first, in 1809 at Haslar Hospital he treated casualties evacuated from Corunna and also in Brussels after Waterloo, when he worked continuously for 72 hours perform-
ing more than 300 operations. From this date onwards it is not easy to knit together a really homogeneous story of surgical progress.

In 1860, following Crimean experience, Thomas Longmore became Professor of Military Surgery at the Army Medical School, and during his 31 years' tenure was able to exercise an important influence on the treatment of wounds. Some regard him as a father of modern war surgery; certainly he improved the transportation of casualties and devised the First Field Dressing.

The South African War did not lead to the advances in surgery that had been anticipated except for improvements in vascular surgery and the use of X-rays for localizing foreign bodies. World War I, on the other hand, was especially notable for the work of the surgeon; his attainments are hard to parallel in any other period of medical progress. During this war septic surgery gave way, first, to anti-septic and finally, to aseptic techniques. Time permits me to mention only major advances and some of the famous names with which they are now associated.

Inspired by Anthony Bowlby many young surgeons gained unrivalled experience of traumatic and burns surgery; the definite value of early wound excision was appreciated; George Gask and Grey Turner, with their work on chest injuries, paved the way for the striking advances of Tudor Edwards; Cuthbert Wallace and William MacCormac guided the treatment of abdominal wounds, enabling Owen Richards to report success with early laparotomy. The team led by Sinclair and Pearson developed the Thomas splint; Harold Gillies and others initiated plastic surgery; George Makins began to mend wounds of the heart and arteries from which cardiac and vascular surgery was ultimately to develop; Godlee and Horsley made possible operations on the brain; Gordon Taylor encouraged the more general use of blood transfusion; John Fraser began to study surgical shock; Haldane invented his oxygen apparatus for the treatment of gas casualties; and the conquest of tetanus and gas gangrene in wounds began.

Many civilian surgeons, grateful for the experience they had gained in 1914-18, applied that experience in the breathing-space afforded by the post-war period. As Zinsser (1935) wrote: "Nobody won the last war but the medical services. The increase in knowledge was the sole determinable gain for mankind in a devastating catastrophe." Benefiting largely from knowledge gained during the Spanish Civil War, the services of many well-trained surgeons were available when World War II began. Medical Field units had become more mobile than in former wars and the occurrence of large numbers of casualties was anticipated and provided for. A new mobility was made possible by the use of field surgical teams, and the formation of advanced surgical centres enabled operations to be performed sooner and nearer the front line.

World War II created many opportunities, though it is still relatively too recent to mention by name those who seized them. From the outset two basic principles were appreciated; that good surgery can result only from team work and that the time factor after wounding is important, the optimum being not more than 12 hours. New priorities for sorting casualties, improved methods of transportation and the general availability of blood for transfusion all combined to give the wounded soldier a better chance of recovery. A number of specialized surgical centres were established for neurosurgical, thoracic and orthopaedic teams and valuable experience of accident
surgery resulted. Again with the help of the Medical Research Council, peripheral nerves injuries, shock, burns and many problems were investigated. Controlled trials of penicillin have already been mentioned, but it was soon apparent that, in spite of chemotherapy, there could be no relaxation of the basic principles of surgery. Again there were advances in anaesthesia which greatly assisted in the saving of lives and limbs. Since then, minor wars such as that in Korea have afforded fresh opportunities for progress, and the Army is actively pursuing new methods of dealing with war wounds even today.

Army Psychiatry

No account would be complete without some mention of psychiatry, which was introduced into the Army in Ireland in 1711, when special arrangements for soldiers were made at the Royal Hospital, Kilmainham, Dublin. As far back as 1820 the military authorities were aware of the need for a more humane approach to the treatment of the mentally-ill soldier, such as the need for occupational therapy in the form of exercises, gardening and games provided at Chatham (Rosie 1948). The famous "D" block at the Royal Victoria Hospital, Netley, was opened 40 years later in 1866.

In World War I sick wastage due to war neurosis and shell shock was carefully studied. Among the special centres established for treating such patients, probably that directed by Arthur Hurst was the best known of all. In any event much new thinking on the early diagnosis of anxiety and cardiac neurosis resulted. Military service in World War II encouraged psychiatrists to break new ground in both prevention and therapy, and many problems were solved, including a number with peace-time applications. One other important aspect of service psychiatry was the elaboration of selection procedure which is now in use in many spheres of employment.

Summary

This completes a brief review of the advances in medical science which the Army can be held to have inspired or initiated. That there are unavoidable omissions is conceded and you may wonder that references to the work of Ross, Bruce and Shortt have not been included. However, tropical medicine, in which the Army has so frequently taken the lead, remains to be dealt with on another occasion. I hope that sufficient evidence has been adduced to show that over a considerable period the Army has enjoyed a medical service administered by doctors for doctors and their patients, and that the resulting benefits have by no means been confined to military practice alone.

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Medicine’s Debt to the Army: A Review of the Army’s Contribution to Medical Science

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