The greatest contributions we, as a Corps, have made to the practice of medicine have been in the realm of prevention of disease. In the diagnostic and therapeutic aspects of military medicine the methods accepted in civil life are to a large extent equally applicable, and in the expanded Army Medical Service of wartime, practitioners and consultants from civil life become their main exponents. With the pathologists they show the nature of the problem rendered acute by war or newly brought to light by it. Their co-operative inquiries at the bedside and in the laboratory lead to administrative action for prevention of disease. The care of health under conditions of campaigning and service abroad has always presented problems fundamental to success in war and therefore calling for the utmost vigour and effort directed to their solution. In the resulting action the interest of physician, pathologist and hygienist tend to merge, and the records of war medicine show an increasing tendency to such fusion.

When we pause at this stage in our history to survey what we can claim to have given to the practice of medicine during the past fifty years we shall find that our main contributions have been in the improvement of health and the prevention of disease. This is well exemplified when we review the incidence during the first world war of those diseases which had been the scourges of previous campaigns—dysentery, malaria, enteric, smallpox and typhus. We find that the last two were practically non-existent and that enteric was much less prevalent than in any previous war. A large measure of control over dysentery and malaria was deferred until the second world war, during which it was achieved.

When we review the work of our Corps in the field of clinical medicine from the time of its inception fifty years ago to the present day we find that its main achievements have been won in war. The war in South Africa (1899-1902) with a sickness rate of 958 per 1,000 found the young Service with an organization and personnel quite inadequate to meet the situation. Had more been known of the methods of infection in the diseases with which our armies were beset, much more might have been done. The clinician at that time built on a foundation of morbid anatomy, and advances in clinical medicine awaited a widening of the scope of pathology. The age of chemotherapy had not yet come; not until ten years later did the work of Ehrlich usher it in. If we exclude the researches of Leishman into the pathogenesis of kala azar, those of Bruce and Nabbaro into trypanosomiasis and of Bruce and Zammit into melitensis infections we find no original contribution of fundamental importance to clinical medicine in the records of British military medicine between 1898 and 1914, although continuous clinical studies into the diagnostic and therapeutic aspect of tropical diseases were being placed on record.
Landmarks in Fifty Years of Medicine in the Army

... gained, however, pointed out the need for a more elaborate organization in war, and the scope of pathology, widened by the growth of bacteriology, haematology, biochemistry and other branches, opened up vistas of clinical research for which ample opportunities were to be at hand.

As the first world war began to drag on its course in the trenches of France and Flanders, problems of depletion of fighting strength by a high sick rate soon presented themselves. Four conditions, one new to the annals of military medicine, the others barely mentioned therein, attracted much attention in France. The first, to which the name "trench fever" was later given, was encountered from 1915 onwards. The infective nature of this condition was demonstrated in 1916 by the inoculation of volunteers, and in 1917 and 1918 the mode of infection and the part played by the body louse in the dissemination of the causal virus were shown in a combined research by members of the Army Medical Services and an American committee. Careful analysis of causes of sickness indicated that the condition accounted for the bulk of the large numbers of cases returned as "pyrexia of uncertain origin" and for many labelled myalgia and rheumatism. The important work centred round it merges with the wider triumph of control of disease due to personal uncleanliness and verminous infestation which forms an outstanding feature of what we achieved in France during the first world war. The other conditions referred to were trench foot, nephritis and gas gangrene, the last named essentially the concern of the surgeons. The condition called "trench foot" presented a problem unsolved up to that time, and was the subject of careful study to which investigations conducted by the Medical Research Committee were contributed. Its close relationship to true frost-bite was shown, and its incidence was reduced by the use of long, loose thigh boots, precautions taken to avoid interference with the circulation, and structural improvements in the trenches. The other subject which attracted much attention was nephritis, the association of which with conditions of campaigning had been previously noted in the American Civil War. Although nothing of outstanding importance was added to our knowledge of its prevention or cure, important observations on the presence of albumen in the urine in otherwise healthy soldiers formed a sound foundation for its assessment, and were a contribution of enduring value to medicine. It was shown that this so-called functional albuminuria did not operate as a predisposing factor in the causation of nephritis, and further that in the majority of cases of nephritis the attack was due neither to exacerbation of a chronic or latent lesion nor to the previous occurrence of a similar condition.

Conditions in the trenches with the inevitable rat infestation gave rise in 1915 to the prevalence of the sickness to be known later as leptospiral jaundice. Detailed clinical studies were made of the disease in man by collecting cases into a single hospital, and within a year it was shown that *Leptospira icterohaemorrhagiae* was the cause of the disease and could be found in a considerable proportion of rats in the areas where the cases were being contracted. The observations of the Japanese workers, Inada and Ida, the publication of which preceded that of the work in France by a few months, was thus early and
amply confirmed. Jaundice is a relatively common disorder in armies in the field, and in France it was shown that the condition might become a presenting feature of enteric group infections. The main problem in connexion with jaundice, however, centred round a very large group of cases encountered mainly in Gallipoli, Egypt and Mesopotamia, the so-called epidemic catarrhal jaundice, now known as infective hepatitis. Twenty-five per cent of certain units of British troops serving in Gallipoli and Alexandria contracted this disease. Valuable epidemiological studies were made and the mode of infection submitted to critical speculation. The investigations designed to show the possible relationship of bacterial infection to the condition were numerous and comprehensive, but negative, an important step in the development of the now widely held conception of its virus origin.

In April 1915 the Army Medical Services in France were confronted with a situation of grave urgency created by the casualties due to the effects of acute lung irritant gases introduced into modern warfare by the enemy. Knowledge of these effects was scanty and such information as there was had been derived from experience of casualties in mines, chemical works and sewers. The clinical and therapeutic aspects of the problem were subjected to close study and principles of treatment were drawn up. It was shown that in nearly every fatal case death occurred within forty-eight hours and often within twenty-four, and that the immediate aim was to tide the patient over this crucial period. Every effort had to be made to get the casualties as quickly as possible to a treatment centre staffed and equipped to deal with them. It was further appreciated that muscular exertion predisposed to the occurrence of pulmonary oedema, the cause of death, and all gas casualties, save the mildest, were treated as lying cases during removal. The technique of oxygen administration was greatly improved as a result of experience gained in their treatment. During the year 1916 the death-rate in lung irritant gas casualties treated was reduced from 24 per cent to 6 per cent. The introduction by the enemy of mustard gas shells in July 1917 was successfully met by the development of a high standard of anti-gas discipline and attention to the requirements of decontamination. In the successful organization of these the Army medical staffs played an active part in the provision of decontamination centres in Field medical units, the organization of the supply of fresh clothing and the provision of suitable preparations for counteracting the effects of mustard gas on the skin.

The segregation of particular groups of cases for special study with a view to achieving a rapid formulation of recommendations for dealing with them was widely used in the first world war, and much information of paramount value to civil medicine accrued thereby. The work of Lewis on Disordered Action of the Heart, submitted in a report to the Medical Research Committee, is a classic of medicine. It discriminates more clearly than had been done before the features and nature of the disease known as "soldier's heart," and shows that this differs in no essential way from disorders seen in civil life, being merely more conspicuous and inconvenient under conditions of military service. The introduction of centres for treatment and study of functional
neurological disorders produced by the shocks and strains of war yielded somewhat similar results of equal significance and value to medical science. This applied to the majority of these cases in which the causal factors appeared to be emotional. The smaller main group, to which commotion or contusion were ascribed as causal factors, was clearly defined, but the detailed objective assessment of the intellectual impairment arising in such cases awaited the investigations which were organized in the Army during the second world war.

Throughout the theatres of operation in the Middle East in 1915-18 the main medical problems besetting our Armies were those due to malaria and dysentery. With regard to the former it cannot be claimed that much advance was made as a result of our extensive contact with the disease during the war. Much of what we learned was of a negative character. Malaria could not be cured nor could its incidence be adequately controlled in an endemic area by the use of quinine. While no dramatic advance in the treatment of dysentery can be claimed the reverse can be said of its differential diagnosis. In addition to extensive protozoological studies, the diagnosis by cytological methods received more attention than had been given to it previously. This, in combination with cultural methods, enabled the relative proportions of case incidence due to amoebic and bacillary dysentery in theatres of war to be assessed with accuracy. In some areas, as in Gallipoli, prevailing conceptions of the preponderance of amoebic dysentery were shown to be false. A more notable result, however, was the establishment of early diagnosis and consequently the institution of adequate treatment at an early stage of the disease. This applied to both malaria and dysentery. Lines of communication were in many cases very long and were fraught with dangers to the lives of patients suffering from conditions of uncertain nature. Mobile laboratory facilities for diagnosis of malaria were brought into the forward areas and the work done on the differential diagnosis of amoebic and bacillary dysentery by cytological methods enabled larger numbers of cases to be diagnosed and treatment to be instituted in forward medical units prior to their being embarked upon a long journey of evacuation. Much alleviation of suffering and saving of lives were achieved by these means.

A noteworthy advance in medical knowledge during the first world war was the identification of the intermediate hosts of the two species of pathogenic schistosomes in Egypt. The danger of infection by these to large numbers of our Forces in Egypt dictated the necessity of investigation, and the Medical Research Committee in co-operation with the War Office and the London School of Tropical Medicine, sent out a special mission headed by Dr. Leiper. The main problem was successfully solved and fresh-water molluscs were shown to be the immediate hosts. The discovery was followed by the adoption of effective means for rendering the infected water safe for use in our military camps.

The advent of peace found the Medical Services, shrunk in conformity with the size of our small Army, unable to apply within its structure some of the valuable principles evolved in connexion with its organization during war.
The treatment of neuropsychiatric casualties and much of the emphasis on rehabilitation shown to be necessary during the war, were largely shelved. In the years between the world wars, however, opportunities presenting to Army medical officers for co-ordinated inquiries and the collection of records and data were not neglected. In this connexion the contributions from within the Army to the literature on cysticercosis spring readily to mind. In a brilliant research, now classical, MacArthur showed that somatic infestation of man by *Cysticercus cellulose*, the larval stage tapeworm *Taenia solium*, is a common cause of epilepsy developing in British soldiers after a period of service in India, and our knowledge of the pathogenesis of this disease is largely based on his work. Careful and painstaking follow-up studies by Dickson and Hargreaves have brought to light much of the natural history of the disease. In the field of therapeutics the collection of exact data by medical officers in the Army has contributed much to the work which followed the introduction of the synthetic anti-malarial drugs, atebrin and plasmoquine. To this the Fourth General Report of the Malaria Commission of the League of Nations published in 1937 bears witness. The value of plasmoquine as a drug with a definite effect on the relapse rate of *Plasmodium vivax* infections was amply confirmed by work done by medical officers of the Army in India, and the system they evolved still remains standard treatment for relapsing benign tertian malaria.

The advent of the second world war provided an opportunity for a renewed onslaught against dysentery and malaria. On this occasion, with additional therapeutic resources, measures taken were productive of much new knowledge and greater success. These problems, however, were attacked on fronts other than the therapeutic, and the success achieved by the insecticide dichlorodiphenyl-trichlorethane (DDT) and, in the case of malaria, the repellent dimethyl pthalate in personal protection, which we leave to be told elsewhere, must be ranged alongside the success achieved in the more direct action of drugs brought to bear against the causal infecting agents.

When the struggle to maintain the health of the troops in the Western Desert of Egypt began our resources for treatment of bacillary dysentery had not been rendered more efficient since the preceding world war, nor were we able to combat its prevalence any more successfully. After a period spent in the application of the saline and serum treatments, during which an unconvincing attempt was made to vindicate the use of phage, the appearance of a new sulphonamide, sulphaguanidine, prepared and tested in America by Marshall and his co-workers at the Johns Hopkins University, caused a dramatic change in the situation. The claims made for its efficacy were readily confirmed in our Armies in the Middle East, and so effective did the new preparation prove to be in the very early manifestations and in the established disease that the problem of bacillary dysentery practically ceased to cause further anxiety to the administration.

In the course of the Burma campaign serious difficulties arose in connexion with the treatment of amoebic dysentery. Relying on the efficacy of standard treatment in use before the war—injectons of emetine followed by E.B.I. with retention enemata of chiniofon, and later by oral administration of such drugs...
as stovarsol and carborsone—there was a tendency to retain cases in India in
the belief that relapses could be adequately controlled by the therapeutic
resources available. Unfortunately, shortage of E.B.I. led to many cases being
treated in Burma by methods in which specific therapy was represented by
etetine injections alone. Many cases showed a tendency to early and repeated
relapses, and despite almost continuous efforts to control the condition, they
became wasted and bedridden. It was suggested that the infecting parasites
were unusually virulent and that repeated courses of emetine injections had
produced emetine fastness in them, both views in conflict with the generally
accepted opinion based on the work of Walker in 1913 and that of Dale and
Dobell during the first world war. Confronted with the problem of treating
a cachectic patient with persistent abdominal pain and fever, and passing
twenty foul stools containing blood and numerous amebae daily, Hargreaves
found dramatic improvement followed the intramuscular administration of
penicillin, and he laid the foundation for a system of treatment which has
turned the scales in favour of satisfactory response in types of amebic dysen-
tery previously resistant and sometimes fatal. Penicillin has no directly lethal
action on the amebae but its function in the scheme of treatment elaborated
is to eradicate invading organisms and thereby cause the dispersion of the
exudate which seems to protect the amebae from measures adopted in treat-
ment. Provision for the combating of contingent penicillin-resistant organ-
isms is made by the oral administration of sulphasuxidine. After treatment
on these lines it is found that previously refractory cases become amenable to
the drugs which have a specific action on Entambeae histolytica.

The years between the two world wars had seen changes in the fields of
malarial therapeutics, and in 1939 we embarked on the war with our thera-
peutic resources enhanced by the addition of atebrin and plasmoquin, albeit
the large-scale manufacturing processes governing their supply were still
largely the sole property of the enemy. The anti-relapse value of plasmoquin
has been mentioned. Atebrin had been established as an anti-malarial product
similar in action to quinine and at least equally efficacious in treatment. In
Malaya it had been extensively studied, as a suppressive in a dosage of 0·2
gramme twice weekly and reports appeared to show that it was superior to
quinine in this respect. In some cases a daily dose of 0·1 gramme had been
used. Many of the suppressive trials reported had been in plantation coolie
communities, and their acceptance on equal terms for application to European
troops was regarded askance. Moreover, animal experiments indicated that
liver necrosis might result from large doses of the drug, and among the toxic
effects reported in men there were isolated reports of similar lesions, although
they were rare and usually occurred in subjects of severe anaemia. The loss of
Java to the enemy early in 1942 deprived us of further supplies of quinine, and
we had to face the continuing war lacking clear knowledge of how our pre-
paration of atebrin, mepacrine, could best be used as a suppressive drug. To
establish the value and safety and the optimum dosage of mepacrine as a drug
for the suppression of malaria in European troops and convince responsible
authorities that the results warranted its manufacture on a larger scale were
successful tasks, to some of the credit for which we may rightly lay claim. Results were achieved by the careful surveys of the health of soldiers after continuous administration of mepacrine in daily dosage of 0.1 grm. on six days each week for periods up to eighteen months in West Africa. These included liver puncture biopsies and other liver function tests carried out in cases found with slightly enlarged livers. It was shown that no adverse effects on their health could be demonstrated, and that histologically the liver showed no variation from normal. Although malignant tertian malaria had occurred in the group it was notable that there was no case of cerebral or grave forms of the disease and that neither serious sequelae nor blackwater fever had occurred. These results are noteworthy and tend to correspond to those obtained in the brilliant research conducted concurrently by Brigadier N. Hamilton Fairley at Cairns in Australia, which led more directly to the control of the clinical manifestations of malaria in troops operating in the jungles of South-East Asia.

During the second world war campaign in the Middle East the man-power of our Armies was again seriously undermined by a heavy incidence of jaundice, the same condition as has been mentioned in connexion with the 1914–1918 war, but with our conception of its pathology having undergone drastic alteration. It had come to be realized that the site of the inflammatory lesion was in the liver involving the parenchymal cells rather than in the bile-duct or its branches. Since 1939 the work aimed at clarifying its aetiology and the method of its spread has been very extensive and much of this has been carried out within the Army. The artificial communicability of the disease by intravenous injection of infected blood and the infectivity of faeces has been demonstrated, but the mode of infection of the disease during the severe epidemics in the Middle East cannot be said to have been solved. Extensive investigations failed to show that the icterogenic agent was spread more readily under conditions of bad hygiene and poor sanitation. The method of infection remains uncertain, and attempts to control the spread of the disease have failed.

More successful results attended investigations into the method of transmission of homologous serum jaundice, a similar disease which was frequently found to complicate the treatment of syphilis with arsenic, and which became a serious problem in clinics where large numbers of patients were having venipuncture and receiving therapeutic substances by subcutaneous, intramuscular or intravenous injection during the years of the second world war. It was shown conclusively in Venereal Disease Treatment Centres that if syringes used were carefully sterilized after each injection this condition did not occur. The incubation period of this jaundice was found to be seventy to one hundred and twenty days, and it was further shown that the blood is highly infectious from very early in the incubation period. Contamination of syringes occurred as a result of their use for venipuncture in groups of patients during this symptomless incubation period under conditions of supply which did not permit of a separate syringe for each patient. It was further shown that the arsenical preparations used did not play any significant part in the production of the hepatitis. The incidence of homologous serum jaundice in patients...
undergoing treatment in Venereal Disease Treatment Centres practically disappeared when the requirements of adequate sterilization were put into practice.

The rehabilitation of the sick and injured with its attendant contribution to the maintenance of morale in the Army and at home has been an achievement worthy of the highest tribute to the military Medical Services during the two world wars. The activation of latent psychoneurotic reacting tendencies by influences incidental to the military system and its function is a constant preoccupation to those responsible for the prevention of unnecessary loss of man-power through sickness and wounds. Much indeterminate disease and low morale was found to centre round the invalidism of gas casualties in the first world war, and a recognition of the part played by environmental factors during treatment contributed much to improvement in results. During rehabilitation it was found that firm control of patients, the avoidance of unnecessary evacuation, and the restriction of periods spent in hospital to a minimum, prevented the patients from falling into a morbid state and developing the functional symptoms which delayed recovery so often. Similar principles applied in cases of so-called "shell shock" resulted in considerable restoration of the impaired morale indicated by the initial heavy casualties from this cause. In the second world war these methods were extended, and convalescence was supervised where necessary in special hospitals and finally in convalescent depots under the supervision of specialists in the science of rehabilitation. In the atmosphere of these latter units with their emphasis on orderly controlled routine of remedial exercises and of military discipline, and with the patient removed from the emotional influences incidental to periods of sick leave spent at home, adverse reacting tendencies were successfully counteracted, and much was contributed to the success of the struggle to maintain man-power. Much valuable experience of rehabilitation was gained during the two world wars and the principles of treatment based on this, which were applied to prevent deterioration of morale in the Army during war, may well have a field of application in industrial and other groups in civil life, and merit wider recognition in the principles and practice of medicine.

In addition to services in connexion with rehabilitation, Army specialists in physical medicine have done other pioneering work which merits recognition as a contribution to the practice of medicine. The problem of the potential recruit who does not conform to the physical standards necessary for enlistment in the Army has seriously engaged their attention. During the second world war, special centres were organized in which systematic physical training, if necessary corrective of specific postural defects, was applied with a view to improvement of stamina and physique. Over 70 per cent of cases sent to these Physical Development Centres attained the standards which enabled them to serve in the Army after a period of graduated training averaging six weeks. The success of their work points to the advantages which might accrue to the nation by its wider application. One such centre is still maintained in the Army.

Skin diseases have always tended to be a serious cause of inefficiency in the Army. In the South African War the average annual incidence of skin disease
was 23 per 1,000. During the 1914–1918 war skin diseases caused a serious loss of man-power, and in 1915 in the U.K. 40 men in every 1,000 were admitted to hospital for diseases of the skin. In France and Flanders the rate of admission was 126 per 1,000. In the second world war the incidence was relatively high in all theatres, and the importance of skin conditions was reflected in the allocation of 10 per cent of total beds, excluding those required for battle casualties, found necessary for their treatment.

As in the first world war so in the second, scabies was statistically the most important disease. In the Army during the latter the advantages of treatment by benzyl benzoate, which had been used in Denmark by Kissmeyer for some years, were established, and important contributions were made to the researches carried out under the ægis of the Medical Research Council of the Ministry of Health at Sheffield. Following this it was established that a number of persons were silent carriers of the disease and that the incubation period in the average case was six to eight weeks or longer, a much greater period than had previously been considered. Further, great economy of man-power was achieved by the application of the principles established that the Sarcoptes is usually vulnerable, that, unless there is a severe epidemic, the disinfection of bedding and clothing is not necessary and that patients can be cured in their units without having to go off duty. Reference has been made to the control of disease due to verminous infestation during the first world war. The introduction of DDT during the second led up to much greater control of these conditions, and was a milestone in military history in that pediculosis with its subsequent pyogenic infections of the skin was reduced to a factor of little importance. From 1939 onwards impetigo attracted considerable attention and important observations were made on its transmission. Investigation of the desert sores, of which there was a heavy incidence in the Western Desert, pointed to the relationship of this condition to facial impetigo.

With regard to treatment, the dangers inherent in the local application of sulphonamides to the skin became apparent, and we owe to observations by Army medical officers the early appraisal of this two-edged weapon showing the risk of induction of sensitivity and of the light sensitivity which often follows. Much important information accrued from military sources on the subject of cutaneous diphtheria. The adaptation of old large buildings as skin wards was shown to be fraught with the danger of secondary infections of this nature. Virulent diphtheria bacilli were found in roof beams, and important principles were evolved governing the size of wards necessary for the treatment of skin cases. Tropical lichenoid dermatitis was described and its disputed ætiology assessed with particular reference to the part played by mepacrine. Many important observations on contact dermatitis under various conditions incidental to military life were also made in the Army during the second world war, and although the full ætiology of the conditions studied was not solved, these observations will prove to be a firm foundation for a fuller appreciation of the underlying causes. The psychosomatic aspects of a number of skin diseases were also investigated, and results of the work are of considerable importance to dermatological practice. While this should not be ques-
tioned, it has been stressed in the Army that somatic factors should be thoroughly investigated and the psychological assessment made with considered judgment.

A further contribution to dermatology during the more recent world war, and one of outstanding merit, was made in the important and wider field of rehabilitation. The work was carried out in an auxiliary hospital at Ragley Hall, Warwickshire, where patients who had spent on an average two-thirds of their Army service passing from hospital to hospital, were taught satisfactory personal adaptation to their disease compatible with the performance of useful work and the culture of physical fitness. This work was a valuable contribution to individual and national morale during a period of stress incidental to a serious man-power situation.

The foregoing cannot claim to give more than brief mention of the problems to which physicians in the Army have applied their genius and industry. The structure of the principles and practice of medicine to-day bears witness to the fruits of their work. Few communities lend themselves so well to the cultivation of team work in the field of the investigation, prevention and treatment of disease as the Medical Services of the fighting forces. The resulting integration of thought and action is apparent in the emphasis laid by Army physicians on preventive medicine in addition to their contributions to the study of established disease. Their breadth of vision is revealed in many impassioned and eloquent appeals they have made for more adequate representation of our best professional resources in the forward area of the battle zones. They have stressed the principle often repeated during the past fifty years that the Medical Services of the Army can only function efficiently on a foundation of regimental medical officers with energy and initiative, a sound knowledge of preventive medicine in all its aspects and of the men under their medical charge as well as of the diseases liable to beset them. Despite the distractions incidental to a post-war era of more elaborate and increasing specialization, the future of our Corps is bound up inextricably with this ideal.
Landmarks in Fifty Years of Medicine in the Army

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