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MANUAL
FOR
MEDICAL OFFICERS OF THE
ROYAL AIR FORCE.

Issued for the information and guidance of all concerned.

By Command of the Air Council.

C. G. Bullock

AIR MINISTRY,

Published 1931.

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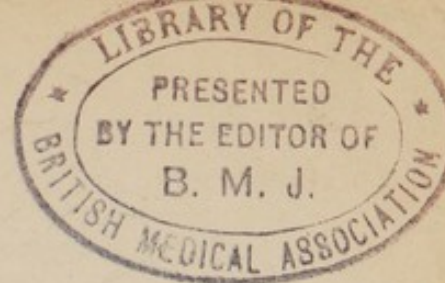


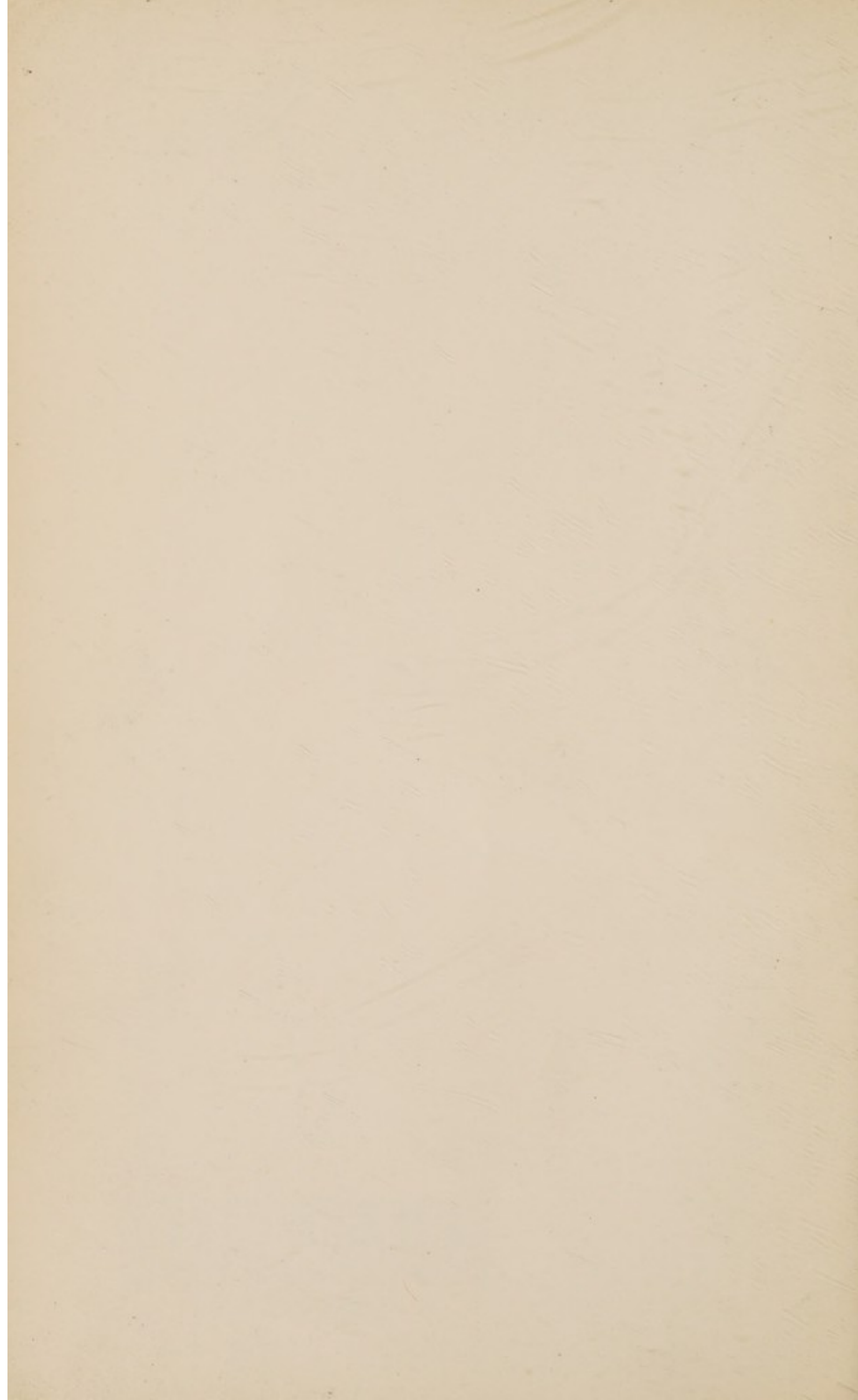
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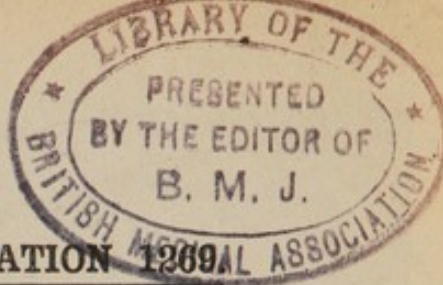
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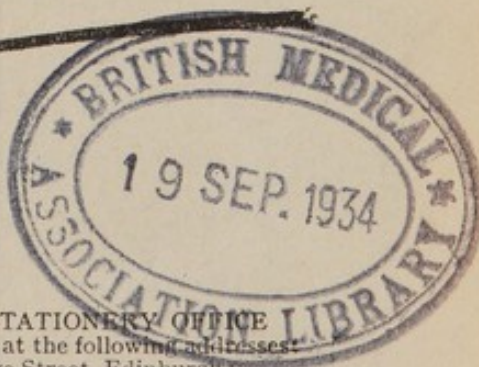
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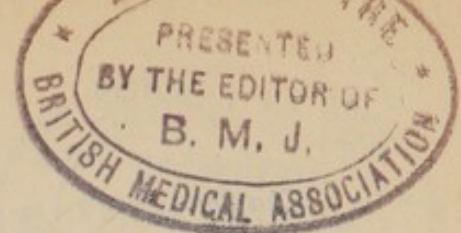
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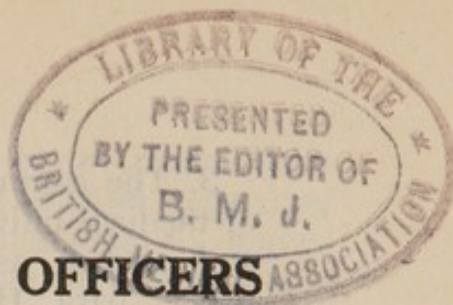
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ABBREVIATIONS.

A.A.F.	Auxiliary Air Force.
A.D.C.	Army Dental Corps.
A.F.	Army Form.
A.M.W.O.	Air Ministry Weekly Order.
A.M.Os.	Air Ministry Orders.
A.O.C.	Air Officer Commanding.
A.P.	Air Publication.
C.D.	Confidential Document.
C.M.P.	Civil Medical Practitioner.
C.O.	Commanding Officer.
D.M.S.	Director of Medical Services.
D.P.M.O.	Deputy Principal Medical Officer.
D.P.M.O. (Hy.)	Deputy Principal Medical Officer (Hygiene).
E.M.O.	Embarkation Medical Officer.
i/c	in charge of.
K.R. and A.C.I.	King's Regulations and Air Council Instructions for the Royal Air Force.
M.O.H.	Medical Officer of Health.
M.T.	Mechanical Transport.
N.C.O.	Non-commissioned Officer.
P.M.O.	Principal Medical Officer.
R.A.F.	Royal Air Force.
S.D.O.	Senior Dental Officer.
S.M.O.	Senior Medical Officer.
U.K.	United Kingdom.
W. & B.	Works and Buildings.



MANUAL FOR MEDICAL OFFICERS

OF THE ROYAL AIR FORCE.

PART I.

(The instructions contained in Part I are supplementary to, and explanatory of, K.R. and A.C.I., which remains the standing authority on the matters with which it deals.)

CHAPTER I.

ORGANISATION AND DUTIES.

SECTION I.—GENERAL ORGANISATION AND ADMINISTRATION.

1. The medical services of the Royal Air Force are organised first for the prevention of disease, and secondly for the care and treatment of the sick and injured. The officers are charged with :—

1. The duty of recommending to air and other officers commanding, verbally or in writing, any precautionary or remedial measures relating to flying, stations, camps, hospitals, personnel, transportation, food, billets, dress, physical training, drills, duties, recreation and all other matters which may, in their opinion, conduce to the preservation of the health of the personnel, and to the mitigation or prevention of disease in the Royal Air Force. (K.R. and A.C.I., paras. 1457, 1473 and 1477.)

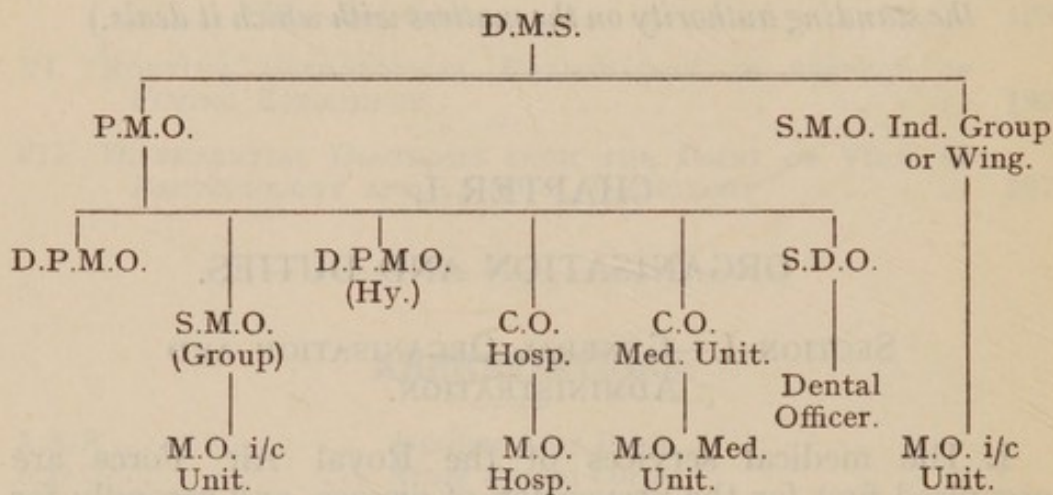
2. The professional treatment and care of the sick and injured (except when in hospitals other than air force), the administration of air force hospitals and sick quarters, the provision and replenishment of medical, surgical and dental stores and the preparation of medical, records and statistics. (K.R. and A.C.I., paras. 1479, 1585, 1586, 1587 and 1637.)

3. The command of all patients in air force hospitals, of medical units and establishments, and of such officers and airmen as may be attached thereto. (K.R. and A.C.I., para. 1587.)

4. Training of medical personnel. (K.R. and A.C.I., paras. 492, 503, 1460, 1490, 1500, 1618 and Chapter X, Section III (paras. 570 *et seq.*.)

5. The determination of the physical fitness of candidates for commissions, of recruits and of others before entering air force service, and the examination and reporting upon the health of officers, airmen and others when required.

2. Channel of Administration.—The following table shows the normal channel of administration of the medical services of the Royal Air Force :—



3. Duties of Administrative Medical Officers.—Instructions as to the duties of P.M.Os. and other medical officers appointed to the staff of air or other officers commanding areas, commands and formations are contained in K.R. and A.C.I., Chapter XIX, Section III.

4. Dental Personnel will be controlled and administered by the P.M.O. of the area, or the S.M.O. of the independent group or wing, as in the case of medical personnel.

5. Princess Mary's R.A.F. Nursing Service.—Instructions regarding the status and duties of members of Princess Mary's R.A.F. Nursing Service are contained in A.P. 1075.

6. The C.O. of a Hospital or Medical Unit has the responsibilities of a C.O. of a unit as laid down in K.R. and A.C.I., paras. 52 to 73. (See also K.R. and A.C.I., para 1587.)

7. Medical Inspector of Recruits.—The duties of the Medical Inspector of Recruits are laid down in K.R. and A.C.I., para. 1501 and A.P. 948.

8. Correspondence.—Attention is drawn to the instructions laid down in K.R. and A.C.I., paras. 2190 to 2196, regarding correspondence and the reference of questions to higher authority. In order to avoid delay, instructions from a competent medical authority to medical officers, or instructions regarding movements of medical personnel, may be sent direct when no action is required to be taken by the S.M.O. concerned, but a copy will invariably be sent to the S.M.O. for his information.

SECTION II.—GENERAL DUTIES.

9. The Principal Duties of Medical Officers are laid down in K.R. and A.C.I., Chapter XIX, Section III. The attention of medical officers is in addition directed to the following :—

1. Exercise of command. (K.R. and A.C.I., paras. 111, 1077 and 1683.)

2. Acquaintance with regulations. (K.R. and A.C.I., Chapter XV, Section I.)

3. Supply of Air Ministry Orders. (K.R. and A.C.I., para. 60.)

4. Books to be kept. (K.R. and A.C.I., paras. 2287 and 2352.)

5. Publication of Articles. (K.R. and A.C.I., para. 1072.)

6. Patents and Designs. (K.R. and A.C.I., para. 862, and A.M.W.Os. 667/29 and 166/30.)

7. Leave of absence. (K.R. and A.C.I., Chapter XVIII, Section I, and para. 1499.)

8. Treatment of subordinates. (K.R. and A.C.I., para. 1087.)

9. Grant of private health certificates. (K.R. and A.C.I., para. 1420.)

10. Treatment of airmen suspected of drunkenness. (K.R. and A.C.I., paras. 1115, 1116 and A.M.W.O. 224/27.)

11. Responsibility for material. (K.R. and A.C.I., paras. 85 and 2445.)

12. Responsibility for ambulances. (K.R. and A.C.I., para. 1484.)

13. Use of service transport for medical attendance, out-patient and hospital treatment. (Paras. 65 and 84 below.)

14. Notification of serious and dangerous illness. (K.R. and A.C.I., paras. 1611, 2315 and 2316.)

10. First-Aid.—1. *Precautions during flying.*—The regulations with regard to the precautions to be taken for the conveyance of injured persons are contained in K.R. and A.C.I., para. 714, those governing the responsibility for the removal of such injured persons being contained in K.R. and A.C.I., para. 1879, cl. 5. When flying is in progress at a flying training school and the R.A.F. medical officer is prevented from being in attendance owing to an emergency, the C.O. should make arrangements under which the attendance of a C.M.P. can be obtained if necessary. (K.R. and A.C.I., paras, 1499 and 1546.)

2. *Civil aircraft—forced landings.*—The medical officer will render first aid as laid down in K.R. and A.C.I., para. 2044, in cases of injury to the personnel.

3. *Civilian employees.*—If an Air Ministry employee sustains injury or is suddenly ill while on duty, first-aid treatment may be given as indicated in A.P. 826, and he may be conveyed by service transport without charge to hospital or to his home, provided he is unable to proceed by other means and the necessity is certified by a medical officer, civil medical practitioner, or the C.O.

4. *Civilians.*—Civilians not connected with the R.A.F. may be admitted to an air force hospital only on account of injuries sustained in the vicinity of an air force station and when civil facilities are not available. Conveyance of civilians by service transport either to an air force or civil hospital will be on re-payment. The Air Ministry will be informed at once of all such admissions with full particulars of each case. (K.R. and A.C.I., para. 1512.)

Note.—Flying accidents will normally be reported to the medical officer by the duty pilot, on whom also devolves the responsibility of despatching the ambulance, etc., to the scene of the accident. (K.R. and A.C.I., para. 823, cl. 5.)

11. Cases to be accompanied by M.O. to Hospital.—All serious cases should be accompanied by a medical officer to hospital when practicable. When one medical officer only is borne for duty at the station and flying is in progress he will not accompany a case to hospital without the sanction of the C.O. of the station. Where a patient's life is in danger the medical officer will take care to represent the gravity of the case to the C.O. (See para. 10 and K.R. and A.C.I., paras. 1482 and 1483.)

12. Airmen sent to Hospital—Effects to be taken.—Instructions as to the effects to be sent with an airman proceeding to hospital are given in K.R. and A.C.I., para. 2600, cl. 1.

13. Airmen sent to Hospital—Rations not to be sent.—Rations will not be sent with an airman proceeding to hospital. (See K.R. and A.C.I., para. 2673, cl. 2.)

14. Sales of Poisons and Medicines in Service Institutes.—The medical officer may approve the sale of harmless drugs and simple medicines. (See K.R. and A.C.I., para. 1771.)

15. Special Lenses for Goggles for Pilots.—The regulations for the supply of lenses for pilots suffering from defective vision are laid down in K.R. and A.C.I., para. 2571.

16. Books and Publications.—Care will be exercised in the custody of the books and publications provided for use in hospitals and station sick quarters as scheduled in K.R. and A.C.I., para. 1619.

CHAPTER II.

MEDICAL EXAMINATIONS, BOARDS AND
ATTENDANCE. HOSPITAL TREATMENT
AND HOSPITAL ADMINISTRATION.

These subjects as they affect officers and airmen of the R.A.F. Reserve, Special Reserve and Auxiliary Air Force are dealt with in A.P. 938, A.P. 1108, and A.P. 968 respectively.

SECTION I.—MEDICAL EXAMINATIONS.

17. General.—Care should be taken that the results, both positive and negative, of medical examinations are recorded on the appropriate forms. In addition, when a disability of a temporary nature is found, the cause and probable duration of unfitness should be indicated.

18. Disclosure of Information.—Where the forms appointed to be used by the regulations are marked "Confidential" no indication of their contents is to be divulged to unauthorised persons.

19. Officers.—A serving officer will be medically examined when necessary under the terms of K.R. and A.C.I., para. 1443 ; in the event of an officer being considered to be below the standard required of him under K.R. and A.C.I., para. 1430, action will be taken as indicated in K.R. and A.C.I., para. 1445. The state of health of all pilots newly posted to commands overseas should be inquired into by the unit medical officer as soon after arrival as possible, and before their being required to undertake flying duties, with a view to ascertaining whether any deterioration in health has taken place during the period that has elapsed between their last medical examination and their arrival at their new stations. Unless indicated as the result of enquiry, the special flying physical efficiency tests should not be carried out, but investigation should be made into the medical history on the voyage and the occurrence of gastro-intestinal disturbance, loss of weight, etc., supplemented by such medical examination as may be considered necessary.

20. Princess Mary's R.A.F. Nursing Service.—Members of Princess Mary's R.A.F. Nursing Service will be medically examined in the same circumstances, where applicable, and under similar procedure as laid down for officers.

21. Cadets.—Cadets will be medically examined in the same circumstances, where applicable, and under similar procedure as laid down for officers.

22. Airmen.—The conditions and procedure governing the medical examination of airmen generally are laid down in K.R. and A.C.I., paras. 1446 and 1481. In addition, special medical examinations are required as follows:—

1. Selection for courses. (K.R. and A.C.I., para. 391.)
2. Air gunners. (K.R. and A.C.I., para. 507.)
3. Motor boat crew. (K.R. and A.C.I., para. 552.)
4. Transfer to the reserve. (K.R. and A.C.I., para. 653.)
5. M.T. drivers ophthalmic examination. (K.R. and A.C.I., para. 1450.)
6. Prevention and detection of tuberculosis. (K.R. and A.C.I., para. 1452.)

Note.—Care should be taken that airmen selected for training as pilots are not sent forward for examination by the Central Medical Board unless there is a reasonable probability of their acceptance.

23. Candidates for Commissions.—The medical examination of candidates for commissions in the Royal Air Force will be conducted in accordance with the procedure referred to in para. 27 below.

24. Recruits.—The regulations applicable to the entry of candidates for recruitment are as follows:—

1. Recruits.—A.P. 948. The standards of medical fitness and the detailed instructions for the conducting of such medical examinations are contained in A.P. 1129.
2. Aircraft Apprentices.—A.M. Pamphlet 15, which also contains the standards of medical fitness.
3. Apprentice Clerks.—A.M. Pamphlet 9, which also contains the standards of medical fitness.

25. Civilian Employees.—The medical examination of civilian employees will be undertaken as necessary in accordance with the terms of K.R. and A.C.I., para 1449; matters affecting the conduct of the examinations are dealt with in A.P. 826. The medical examination of salaried civilian staff on entry will, when arranged for by the Air Ministry, involve the completion of Form 857, on which will be recorded the candidate's declaration as to his family and personal medical history, together with the results of his physical examination

by the medical officer. This form will as a rule be also utilised to record the results of the examination of salaried staff before posting overseas, and before being certified as fit to be sent into the air. In the case of employees engaged on a weekly wages basis, only a certificate in accordance with A.P. 826, need be rendered, care being taken to note thereon any physical disability (*e.g.*, hernia) which, although not sufficient to render the applicant unfit for employment, might subsequently prove of importance in connexion with claims for compensation for injury. Form 1664 (accident report) will be completed in the circumstances detailed in K.R. and A.C.I., para. 1449, cl. 3. The medical officer who examines the case will describe thereon the injury sustained and will show as far as possible whether it appears to have resulted from the accident as stated. In certain circumstances connected with the Workmen's Compensation Act further reports than those referred to in K.R. and A.C.I., para. 1449, cl. 3, are required to be rendered by medical officers on A.M. Form 744; in such a report a considered opinion is required as to return of working capacity in the future and the degree of disablement existing, together with recommendations as to means of reducing such disablement.

26. Families.—Normally medical examination from a service standpoint is not required, except in respect of the attendance of children at service schools or for the purpose of determining the fitness of the family to embark, in accordance with K.R. and A.C.I., para. 937; in the latter connexion medical officers should also be conversant with A.P. 945.

SECTION II.—MEDICAL BOARDS.

27. General Organisation.—A medical board is, as a rule, held when an authoritative opinion is required concerning the medical position of an individual. K.R. and A.C.I., para. 1432, enumerates the authorities who are empowered to authorise the convening of medical boards and the circumstances in which they are normally called for. The medical fitness of candidates for commissions from civil life, or officers selected for permanent commissions will be determined in accordance with the instructions contained in K.R. and A.C.I., paras. 1430, 1431 and 1440 to 1442. The medical standards are fully set forth in A.M.Ps. 17, 18, A.Ps. 121, 130, 904, 938, 968 and 1108.

28. Composition of the Medical Board.—The composition of the medical board is laid down in K.R. and A.C.I., para. 1429.

29. Necessity for full and accurate Completion of Forms.—

When answering the questions on the various forms used to record the board proceedings, members of boards must bear in mind that the disposal of the officer or airman and the determination of his eligibility for a disability award are mainly based on the facts recorded and the opinions expressed by the board. Hence it is of paramount importance that the proceedings should record the facts on which the board have based their opinions, and the reasons for the conclusions arrived at. In addition to a description of the disabilities which have necessitated the board, the general condition of the officer or airman should be systematically investigated both by the medical officer in charge of the case and by the board, and the results (even though negative) recorded under appropriate classifications. The fact that no other disability is claimed or discovered will be recorded on the board proceedings. This will minimise claims made subsequent to discharge on account of disabilities which might otherwise have been overlooked at the time of invaliding. For the action to be taken by a board when it is considered that there is presumptive evidence of misstatement by an airman on enlistment with regard to previous receipt of disability award. *See K.R. and A.C.I., para. 660, cl. 8.*

30. Proceedings confidential.—As any preparatory statement by a medical officer in charge of a case and the proceedings of medical boards on officers and airmen are strictly confidential, care should be taken to ensure that no information is disclosed to the person boarded other than that provided for in the giving of the medical board summary (Form 657) to an officer on conclusion of the board proceedings. (*K.R. and A.C.I., para. 1451.*)

31. Definition of “Directly attributable to Conditions of Service.”—1. A wound or injury will normally be regarded as directly attributable to the conditions of air force service only when it is incurred during the actual performance of air force duty, and arises directly out of such performance.

2. An injury sustained whilst taking part in a game or physical recreation organised by or with the approval of the appropriate air force authority may be regarded as directly attributable to the conditions of service, subject to the provisions laid down in *K.R. and A.C.I., para. 3612.*

3. A disability, other than a wound or injury, will not be regarded as directly attributable to the conditions of service unless it arises directly out of the special conditions or circumstances incidental to air force service. Diseases, *e.g.*, enteric fever, dysentery, malaria, etc., to which persons are specially

liable during service at stations abroad, may, if contracted during such service, be regarded as directly attributable to the conditions of service.

4. Subject to cl. 2 above a disability will not be regarded as directly attributable to the conditions of service if, although contracted during the period of such service, it is due to the ordinary risks of indoor or outdoor life to which R.A.F. duty carries no special liability.

5. The foregoing definition of direct attributability to the conditions of service will be strictly observed by medical boards; but should it appear that there is clear justification for exceptional treatment in a particular case a separate report to this effect may be submitted, the circumstances being fully stated.

32. Basis of Assessment.—The basis of assessment is to be the degree of disablement estimated to be suffered by the individual as determined by comparison with the condition of a normal healthy man of the same age, without reference to the earning capacity of the individual in his own or any other specific profession, trade, or occupation, and without regard to any particular conditions or circumstances.

33. Method of Assessment of Disabilities.—Ordinarily assessment is made on a percentage basis and is to be stated in multiples of ten where the degree of disablement is 20 per cent. or over; where the disability, however, is estimated to be less than 20 per cent. it will be exactly stated, *e.g.*, as 1 per cent. as 6 per cent. or as 13 per cent., etc. Where there are two or more separate and distinct disabilities, these are to be assessed both separately and collectively, the collective assessment not necessarily being the sum of the rates at which each separate disability is assessed.

34. Assessment of surgical Disabilities.—Where possible assessment will be made in accordance with the "Table of Disability Assessments of specified Injuries" (C.D. 24). In cases of disablement, other than those exactly provided for in the table, the assessment will be made at the percentage which is held to correspond most closely to the degree of disablement represented by the disability.

35. Duration of Assessments.—The assessments of medical boards for purposes of disability retired pay, disability pension, etc., are to represent the average degree of disablement during the period covered by the assessment.

36. Disability arising in connexion with Great War Service.—In the case of disability arising in connexion with the Great

War (see K.R. and A.C.I., "Explanation of Terms") the board will state whether such is attributable to or whether aggravated by service during that period.

37. Cases of Aggravation of non-attributable Disability by Conditions of Service subsequent to the Great War.—Besides the cases of direct attributability referred to in para. 31 above, there may be cases in which the disability though not directly attributable to post-war air force service would not, but for specific conditions of such service, have produced the same disabled condition. When the opinion of the board is to this effect the board will be governed by the following working rules :—

1. the original disease or injury must have either arisen in the service or be of such a nature as might easily have escaped observation on entry, even by most careful examination ; and

2. the condition from which the man is suffering must be definitely due to conditions of his service and not such as might arise from the original disease or injury by the mere passage of time.

Although the words "aggravation" and "aggravated" do not appear in the post-war pension regulations, cases where both of the above conditions are fulfilled may be regarded for purposes of disability awards and in deciding the entitlement of officers and members of P.M. R.A.F. N.S. to sanatorium treatment at public expense, as directly attributable to conditions of service, subject to Air Ministry confirmation. If, however, it is found subsequently that the effects of aggravation by conditions of service have passed away, the disability, though it may still exist and even be considerable, will no longer be regarded as attributable.

38. Opinion of Medical Board.—Medical boards when recording their opinions as to causation of a disability, degree of disablement, or fitness for service will be careful not to allow their decisions to be influenced unduly by the proceedings of previous medical boards. In the event of their disagreeing with the opinions expressed by previous boards they will state the grounds on which they base their disagreement. Care also will be exercised by boards in recording accurately any specific conditions of service to which in their opinion a disability is due.

Officers.

39. Procedure.—The detailed procedure governing the conduct of boards on officers is laid down in K.R. and A.C.I., paras. 1428–1445.

40. Statement of Case.—Form 42 will be completed as required by K.R. and A.C.I., para. 1433, and should embody a report of the progress of the case on the reverse of the form, when necessary, for the information of the board.

41. Standards of visual Fitness for Pilots.—Medical boards will pay particular attention to the maintenance of the standards of visual fitness laid down for flying personnel (*see* A.P. 130). An officer, however, who was passed medically fit under the lower standards in force during the Great War and who has in course of time acquired considerable flying experience, should be permitted to continue his flying duties provided that :—

1. his flying abilities show no evidence of deterioration as certified by his C.O., and that
2. since the previous medical examination no marked deterioration in vision has occurred.

42. Medical Classification.—1. The medical standard of fitness for officers is contained in K.R. and A.C.I., paras. 1430 and 1431. The classifications and findings of boards are contained in K.R. and A.C.I., para. 1434.

2. When the classification "fit for limited flying" is used, the medical board will record their opinion as to the fitness of the individual in question to undertake aerobatics, high-altitude flying and duration of the flight (*see also* para. 330).

3. In the case of an officer or airman under preliminary flying training who is suffering from a disability not the result of a flying accident, the medical board will record on the board proceedings their opinion as to whether he will be fit to resume such training within a period of three months.

43. Sick Leave.—1. Sick leave will be recommended in accordance with K.R. and A.C.I., paras. 1377–1384 and 1436, but only when there is a reasonable prospect that the officer will ultimately be fit to return to duty.

2. Officers of the R.A.F. Reserve, Special Reserve and Auxiliary Air Force will not be recommended sick leave by a medical board, but will be given orders to proceed to their homes and await instructions from the Air Ministry.

44. Re-examination.—It is to be appreciated that so long as an officer is unfit for the standards required of him and provided his disability has not reached a permanent and stationary condition, arrangements for re-examination must be indicated by each medical board. (*See* K.R. and A.C.I., para. 1437.)

Princess Mary's Royal Air Force Nursing Service.

45. The instructions governing the procedure for boards on officers will apply also to Members of Princess Mary's R.A.F. Nursing Service.

Cadets.

46.—1. The regulations under which medical boards are held on officers of the Royal Air Force will apply to cadets, with certain modifications as detailed below.

2. Form 47 will be used in recording the proceedings of the medical board and all questions on the form will be answered in accordance with the present procedure for officers, except as stated otherwise below. When completing the paragraph "Findings of the Board," the present procedure for the medical classification of officers will be adhered to, with the exception that the letter "A" will represent "Fitness to receive instruction in flying" instead of "Fitness for air duties."

3. If a cadet is found by a medical board to be permanently unfit owing to physical unfitness caused by injury sustained (a) while on flying duty or while being carried in aircraft under proper authority or (b) while otherwise undergoing authorised instruction in flying duties, the board will record its opinion in answer to the following additional questions:—

(i) To what degree is the cadet disabled at the present time? (See paras. **32** and **33**.)

(ii) Will such degree be permanent?

(iii) If not permanent, how long will the present degree of disability persist?

4. On completion of the board the cadet will be instructed to return to his unit or remain in hospital, as the case may be, to await the decision of the Air Ministry as to his disposal.

5. Forms 657, 46, 47 and 48 will be completed and dealt with under existing regulations.

Airmen.

47. When to be brought before a Medical Board.—An airman will be brought before a medical board on the occasions laid down in K.R. and A.C.I., para. 1446, and as otherwise deemed necessary in special circumstances.

48. Procedure.—The detailed procedure governing the conduct of medical boards on airmen is laid down in K.R. and A.C.I., Chapter X, Section VIII; matters affecting extension of service, re-engagement and continuance in the service are dealt with in K.R. and A.C.I., Chapter X, Section V, and

instructions regarding airman pilots are contained in K.R. and A.C.I., paras. 506 and 1440. Recommendations for the issue of a civilian greatcoat to invalided airmen will be made when necessary in accordance with K.R. and A.C.I., para. 2581, cl. 6.

49. When to be Invalided.—An airman will be invalided (see K.R. and A.C.I., para. 660, cl. 2) if, on the recommendation of a medical board approved by a competent medical authority, he is found to be either

1. Physically unfit under present standards.

Note.—An airman is considered unfit under this heading when upon medical examination his condition is found to have fallen sufficiently below the required physical standard as to prevent him from efficiently carrying out the duties of his trade classification at home or abroad ; or when he is found to be suffering from a disability which, although not affecting his trade efficiency at present, is likely to become so aggravated by further service employment as to necessitate his discharge under 2 below ; or,

2. Physically unfit for any form of air force service.

50. Procedure for Invaliding.—1. *General.*—An airman who is brought forward for invaliding under para. 49 above will be dealt with under the terms of K.R. and A.C.I., para 660. (See K.R. and A.C.I., para. 652, cl. 19, as to an airman with less than six months service.)

2. *Special cases.* (a) *Amputation cases.*—An airman who has lost a limb will, when fit to be moved, be transferred to P.M.R.A.F. hospital, Halton, in order that limb-fitting may be arranged. For cases in naval and military hospitals, see A.M.W.O. 566/29. In effecting the transfer to Halton, if the condition of the airman will not permit of his travelling by the normal methods of conveyance, R.A.F. service transport may be used. When, at Halton, the stump is healed and ready for fitting an artificial limb, the airman will be brought before a medical board for invaliding. As a working rule, the stump will be considered healed and ready for fitting when the condition is such that the airman is ready for the first fitting of his artificial limb.

(b) *Pulmonary Tuberculosis Cases.*—An airman suffering from pulmonary tuberculosis will be dealt with under the general procedure in 1 above, and will be invalided as soon as the diagnosis has been definitely made, in order that he may be afforded the earliest possible opportunity of obtaining

suitable treatment. The special medical forms required by K.R. and A.C.I., para. 1452, will be completed. (See also paras. 51 and 52 below.)

(c) *Certain Surgical Cases other than Amputation Cases.*—When it is considered that an airman requires further surgical attention in hospital to complete the treatment of his invaliding disability, an application, accompanied by a full medical report, will be submitted to the Air Ministry through the usual channels for authority to postpone the invaliding board until the treatment has been carried out.

51. Notification to National Health Insurance Department.—When an airman is discharged from the Royal Air Force on account of a disability which is assessed at 70 per cent. or over or on account of tuberculosis, valvular disease of the heart, kidney disease, epilepsy, insanity, diabetes, or cancer, irrespective of the degree of disablement, the C.O. hospital or president of the invaliding medical board will complete Form 152 in duplicate, forwarding the original to the Controller, Ministry of Health, Insurance Department, Ruskin Avenue, Kew, Surrey, and the duplicate to Officer i/c R.A.F. Records, with the ex-airman's documents.

52. Notification to Civil Authorities.—1. *Tuberculosis.*—When an airman is discharged from the Royal Air Force on account of tuberculosis, Form 460 will be prepared in triplicate, one copy being forwarded to the Officer i/c R.A.F. Records with the ex-airman's documents, and the remaining copies being despatched as follows for transmission to the Medical Officer of Health concerned :—

(a) England, Channel Islands and Isle of Man—to the Principal Medical Officer, Ministry of Health, Whitehall, London, S.W.1.

(b) Scotland—to the Scottish Board of Health, Edinburgh.

(c) Wales or Monmouthshire—to the Welsh Board of Health, City Hall, Cardiff.

(d) Ireland—Free State—to the Local Government Board, Dublin. Northern Ireland—to the Secretary, Ministry of Home Affairs, Local Government Department, Ocean Buildings, Belfast.

2. *Chronic carriers of disease.*—In such cases the following particulars will be furnished to the public health authorities mentioned above :—Name, age, full address where airmen will reside on discharge ; dates and place of the original attack of typhoid fever, paratyphoid fever or dysentery ; summary

of bacteriological or protozoological findings with dates ; notes as to specific treatment received and the present state of health, together with the date of discharge.

53. Discharged Airmen retained in Hospital.—1. When the condition of an airman whose discharge as an invalid has been approved is such that he is unfit to travel, he may at the discretion of the C.O. of the hospital be retained as a free patient for further treatment under the terms of K.R. and A.C.I., para. 648, cl. 5.

2. Immediately before the removal of such a patient from the hospital he will be examined by a board of medical officers for the information of whom the proceedings of the invaliding board should, where possible, be obtained, and a report on Form 686 (modified as necessary) reviewing the degree of disablement then existing will be rendered to the Air Ministry. Discretion should, however, be exercised in these cases to avoid unnecessary duplication of boards, which need not be held where it is considered that the period of retention has been so short, and the result of treatment accorded is such as to render unlikely any alteration of the patient's degree of disablement as assessed by the invaliding board.

54. Effective Date of Discharge (invalided), *see K.R. and A.C.I., paras. 660 and 661.*—The effective date of discharge of :—

1. An airman invalided while serving in home units will be the date of leaving the R.A.F. Depot.

2. An airman who is a patient in a hospital will be the date of leaving the hospital, or if retained for further treatment the date of the receipt in hospital of the authority for his discharge.

These instructions do not apply to an airman serving at home who, not being a prospective invalid, becomes due for discharge or transfer to the reserve under the terms of his service whilst a patient in hospital. The transfer to the reserve or discharge from the service in such cases will be effected on the termination of the regular air force portion of the engagement. (*See also K.R. and A.C.I., para. 648, cl. 2.*)

55. Venereal Disease.—When an airman is invalided on account of venereal disease or has recently undergone treatment for such before discharge or transfer to the reserve, action will be taken in accordance with K.R. and A.C.I., para 648, cl. 8.

56. Epilepsy.—When it has been decided that an airman is suffering from true epilepsy arrangements will be made for him to be brought before a medical board with a view to his

being invalided. A certificate from a medical officer stating that he has seen the airman in a true epileptic fit will be attached to the Form 496 before submission of the case to the P.M.O.

57. Mental Disease.—1. An airman, who, during his R.A.F. service becomes the subject of mental disease, will be invalided for such in accordance with the procedure laid down in K.R. and A.C.I., paras. 662 and 1539.

2. When a diagnosis of mental disease has been clearly established, the C.O. of the hospital will submit Forms 833, 48, and 496 to the P.M.O. area or command, who will decide whether or not the airman is to be brought before a medical board, and will return the documents to the C.O. of the hospital.

3. A medical board on a case of mental disease will state in the proceedings whether they recommend the patient's discharge as a dangerous or harmless lunatic and whether he should be placed in a civil lunatic asylum or handed over to his relatives or friends ; if the latter recommendation is made a certificate accepting full responsibility for the care of the patient will be obtained from the relatives or friends before forwarding the proceedings to the P.M.O. area or command for approval.

58. Conducting Party for Invalids.—A helpless discharged airman will be conducted to his destination by an unarmed conducting party provided under local arrangements. (K.R. and A.C.I., para. 660, cl. 7.)

59. Medical Board Procedure in other special Cases.—

1. *Medical boards held in connexion with invaliding of airmen from the Reserve, Special Reserve, or Auxiliary Air Force.*—In addition to determining whether the invaliding disability is directly attributable to the conditions of service, and, if so, the degree of disablement and its probable duration at that degree, these boards will record their opinion as to whether, if not so attributable, the disability was contracted during or aggravated by :—

- (a) regular service ;
- (b) training in the reserve, special reserve or auxiliary air force ;
- (c) mobilized or embodied service in the reserve, special reserve or auxiliary air force.

If the answer to (a), (b) or (c) is in the affirmative, the board will assess the degree of disability on invaliding. Such examinations will be recorded on Form 496 suitably amended, and the statement by the airman as to his own case will be completed.

2. *Medical boards in connexion with claims by airmen to disability pension after discharge.*—In these cases before an award can be made and apart from any degree of disablement found to exist as usually assessed, it is also necessary to show the degree of incapacity to earn a livelihood at the airman's normal trade or calling (*see* K.R. and A.C.I., para. 3722). Such examinations will be recorded on Form 496, suitably amended, and the statement by the claimant as to his own case will be completed.

3. In cases under 1 and 2 above, where it is considered by the medical board that the airman should be admitted to a R.A.F. hospital in order that his condition may be accurately diagnosed, admission for a period up to seven days may be authorised by the competent medical authority. Admission to hospital is for the purpose of observation only and treatment may not be given.

4. *Officers and airman who are already in receipt of temporary disability awards* will be re-examined and the results recorded on Forms 847A and 686, respectively.

5. *Medical examinations and boards required on persons other than R.A.F.*—(a) British Army personnel will be dealt with under the "Regulations for the Medical Services of the Army."

(b) Indian Army personnel will be dealt with under the "Regulations for the Medical Services of the Army in India."

(c) Naval personnel will be dealt with under "Instructions for Royal Naval Hospitals and other Medical Establishments."

(d) Civilians employed with the R.A.F. will be examined as directed by the Air Ministry on A.M. Form 857 as to fitness for employment. Cases of compensation on account of injury will be examined on A.M. Form 744. When a medical board is required, Form 2 will be used.

Note.—The above A.M. forms will be supplied by the Air Ministry when the instructions regarding the examination are issued.

Families of Officers and Airmen.

60. Procedure.—Normally a medical board will only be held on the wife or child of an officer or airman when it is considered necessary to transfer the person concerned from a station abroad on medical grounds. In such circumstances the same procedure as for airmen will be followed, so far as it is applicable, except that the case will be reported upon by a medical board on Form 2. (*See also* K.R. and A.C.I., para. 968.).

SECTION III.—MEDICAL ATTENDANCE AND HOSPITAL TREATMENT.

A.—*Medical Attendance.*

61. Definition.—The term “medical attendance” defined in K.R. and A.C.I. “Explanation of Terms” means the professional advice and treatment afforded to persons eligible under air force regulations for such during sickness or injury (a) as out-patients at a service medical establishment or (b) in quarters or at their residence, by a medical officer nominated for duty at the station or by a civilian medical practitioner engaged for attendance on air force personnel. Medicines, etc., will be provided under the terms of K.R. and A.C.I., para. 1510. Medical attendance does not include in-patient hospital treatment.

62. Persons eligible for medical attendance.—Officers suffering from disabilities attributable to conditions of service, and airmen, are entitled to medical attendance at public expense. As a privilege, medical attendance may also be granted to the undermentioned persons wherever there is a medical officer nominated for duty at the station or where a civilian medical practitioner is engaged for attendance on air force personnel. The M.O. or C.M.P. will not be called upon to visit persons allowed medical attendance as a privilege when they reside beyond the radius fixed by K.R. and A.C.I., para. 1509.

1. Officers on full pay (and when not excluded therefrom by the terms of their contracts re-employed retired officers employed elsewhere than at the Air Ministry) under the terms of K.R. and A.C.I., para. 1513, cl. 1.

2. Officers on half-pay under the terms of K.R. and A.C.I., para. 1513, cl. 2.

3. Officers in receipt of disability retired pay under the terms of K.R. and A.C.I., para. 1526.

4. Naval and marine officers attached to the R.A.F. for service with the Fleet Air Arm under the terms of A.M.W.O. 550/25.

5. Members of Princess Mary's R.A.F. Nursing Service under the terms of K.R. and A.C.I., para. 1525.

6. Civilian employees at home and abroad under the terms of K.R. and A.C.I., paras. 1542 and 1541, respectively, and A.P. 826.

7. Civilian servants of officers under the terms of K.R. and A.C.I., para. 1520.

8. Airmen in receipt of disability pension if specially sanctioned by the Air Ministry under the terms of K.R. and A.C.I., para. 1540.

9. Dominion personnel attached to the R.A.F. under the terms of K.R. and A.C.I., Para. 1519, cl. 1.

10. Families. (a) The families of officers (as defined in K.R. and A.C.I., para. 1524) under the terms of K.R. and A.C.I., para. 1521.

(b) The families of airmen on the married establishment (as defined in K.R. and A.C.I., para 1538) under the terms of K.R. and A.C.I., para. 1532.

(c) The families of airmen not on the married establishment (as defined in K.R. and A.C.I., para. 1538) under the terms of K.R. and A.C.I., para. 1537, cl. 1.

63. Persons Eligible for Out-Patient Treatment.—1. *At service medical establishments.*—All persons as in para. 62 above may be permitted to attend for out-patient treatment free of charge at the nearest service medical establishment where facilities for such exist under the provisions of the regulation allowing them medical attendance providing no expense for transport is incurred by public funds except as provided in paras. 64 and 65 below. Such treatment will be arranged in the first instance by the M.O. or C.M.P. concerned. Medical comforts may be issued to the wives and families of airmen on the married establishment when necessary as laid down in A.P. 112, Chapter II, para. 11, cl. (ii).

Note.—For out-patient treatment afforded to R.A.F. personnel at service medical establishments other than R.A.F., see A.M.W.Os. 344/25, 573/26 and 799/27 for the scale of charges levied against air force funds. A nominal roll of all R.A.F. personnel so treated will be prepared monthly, stating the nature of the treatment afforded to each person and how conveyed for such, and forwarded to the competent medical authority for transmission to the Air Ministry.

2. *At civil institutions.*—Where out-patient treatment is not available from service sources, arrangements may be made by the M.O. or C.M.P. concerned for the following personnel to attend civil institutions for out-patient treatment at public expense :—

(a) Officers suffering from disabilities attributable to conditions of service under the terms of K.R. and A.C.I., para. 1516, with the approval of the competent medical authority concerned.

(b) Officers in receipt of disability retired pay under the terms of K.R. and A.C.I., para. 1526, with the approval of the Air Ministry.

(c) Members of P.M. R.A.F. N.S. under the terms of K.R. and A.C.I., para. 1525, with the approval of the competent medical authority concerned.

(d) Serving airmen under the terms of K.R. and A.C.I., para. 1528, with the approval of the competent medical authority concerned.

(e) Airmen in receipt of disability pension, with the authority of the Air Ministry under the terms of K.R. and A.C.I., para. 1540.

Note.—Where arrangements for out-patient treatment for the above personnel are not made by the M.O. or C.M.P. concerned, a refund of such expenses, as are considered reasonable by the competent medical authority, may be recommended for approval by the Air Ministry. All claims by civil institutions will be prepared on Form 666 and forwarded to the competent medical authority for transmission to the Air Ministry for payment. Except as provided above, claims for reimbursement at public expense on account of out-patient treatment will not be entertained. (See K.R. and A.C.I., para. 1511.)

64. Entitlement to Travelling Expenses in connexion with Out-Patient Treatment.—1. Serving officers will be allowed travelling expenses under the terms of K.R. and A.C.I., para. 3018, *i.e.*, only when proceeding under orders to a hospital for special treatment or specialist advice which cannot be given from local service sources. For this purpose, an x-ray examination as an aid to diagnosis is not included under the terms "special treatment" or "specialist advice" unless the disability is attributable to conditions of service.

2. Officers in receipt of disability retired pay will be allowed travelling expenses under the terms of K.R. and A.C.I., para. 1526. (See also K.R. and A.C.I., para. 3019.)

3. Members of P.M. R.A.F. N.S. will be allowed travelling expenses as for officers above.

4. Serving airmen will be allowed travelling expenses in all cases, subject to the limitation as to cost in K.R. and A.C.I., para. 3018.

5. Airmen in receipt of disability pension will be allowed travelling expenses under the terms of K.R. and A.C.I., para. 1540. (See also K.R. and A.C.I., paras. 3019 and 3025.)

Note.—Except as provided above, travelling expenses in connection with non-entitled medical treatment will not be allowed. (See K.R. and A.C.I., para. 3041.)

65. Conveyance by Service Transport in connexion with Medical Attendance and Out-Patient Treatment.—1. *Medical attendance.*—Service transport may be used by medical officers nominated for duty at the station and by civilian medical practitioners engaged for attendance on air force personnel in affording medical attendance to persons as in para. 62 above only when such persons reside within the radius fixed by K.R. and A.C.I., para. 1509.

2. *Out-patient treatment.*—Persons who are allowed travelling expenses under para. 64 above, and who, by reason of their disability, are unable to travel by the normal methods of conveyance, may be conveyed for out-patient treatment by service transport at public expense.

Note.—The use of service transport in connexion with medical treatment other than as above will be on repayment under the terms of K.R. and A.C.I., para. 1956, cl. 1 (*h*).

66. Employment of Local Civilian Medical Practitioners and Civilian Specialists.—1. At a station where the services of a medical officer are not available, in cases of extreme urgency and when a second opinion or assistance is required, a local civilian medical practitioner may be engaged under the terms of K.R. and A.C.I., para. 1546.

2. Officers, on leave or on duty where service medical attendance is not available, and who are suffering from a disability attributable to conditions of service, may employ a local civilian medical practitioner under the terms of K.R. and A.C.I., para. 1516. A civilian specialist may also be employed under the same regulations. Claims for refund of expenses will be made through the usual channels to the Air Ministry.

3. Members of P.M. R.A.F. N.S. may employ civilian medical practitioners and specialists as for officers above.

4. Airmen on leave or pass may employ civilian medical practitioners under the terms of K.R. and A.C.I., para. 1400, and A.M.W.O. 115/30.

5. Civilian specialists may be employed under the terms of K.R. and A.C.I., para. 1552.

Note.—Except as provided above, claims for the employment of civilian medical practitioners and specialists will not be allowed at the expense of air force funds. (*See* K.R. and A.C.I., para. 1511.)

67. Special Instructions regarding Officers and Airmen receiving Medical Attendance privately and the Payment of Claims.—1. *Officers.* (1) Sick at home.—On receipt of information or medical certificate that an officer, not on leave

and living outside the radius fixed by K.R. and A.C.I., para. 1509, is sick at home, the unit medical officer should arrange, if necessary and practicable, for his admission to the nearest service hospital. If the officer desires to make his own arrangements for medical treatment, a certificate to this effect should be obtained as required by K.R. and A.C.I., para. 1516, cl. 2. The headquarters of the area or command concerned should be notified through the officer commanding the unit of the arrangements made.

(2) Sick on leave.—(a) When an officer, returning to duty on completion of ordinary leave, reports that he has been receiving medical treatment during leave, the unit medical officer will endeavour to obtain confirmation of the illness through the officer himself without involving air force funds, when in his opinion the future fitness of the officer is likely to be affected. Action should be taken in any case to ensure that the officer is fit for the duties of his branch. (See also K.R. and A.C.I., para. 713.)

(b) When an officer is unable, through illness, to return to duty on completion of ordinary leave, he is required to forward a medical certificate under the provisions of K.R. and A.C.I., para. 1384. Action should then be taken to regularise the medical position of the officer as required by K.R. and A.C.I., para. 1382, cl. 1 (d), headquarters of the area or command concerned being notified through the officer commanding the unit. The unit medical officer should arrange, if necessary and practicable, for the officer to be admitted to the nearest service hospital.

Claims for the recovery of expenses will only be submitted under the provisions of K.R. and A.C.I., para. 1516.

2. *Airmen.* (1) Sick at home.—On receipt of information or medical certificate that an airman, not on leave or pass, is sick at home, the unit medical officer will arrange for the transfer of the case, when fit to be moved, to station sick quarters or to the nearest service hospital or, if impracticable, to a civil hospital. If it is ascertained that a civilian medical practitioner is already in charge of the case, he will be consulted prior to the transfer.

(2) Sick on leave or pass.—When an airman is sick on leave or pass and has employed a civilian medical practitioner, he is required to forward a medical certificate to this effect under the terms of K.R. and A.C.I., para. 1400, cl. 2. The unit medical officer will, after scrutiny of the certificate, ascertain when the airman will be fit to be moved to the nearest service hospital or fit to return to duty and will take action accordingly. The competent medical authority concerned will be informed when action is required under K.R.

and A.C.I., para. 1400, cls. 2 and 4. Any action required under A.M.W.O. 115/30 will be arranged through the O.C. of the unit.

Claims for payment of civilian medical practitioners are dealt with on Form 1667. This form will be forwarded as directed by K.R. and A.C.I., para. 1400, cl. 3, for completion by the civilian medical practitioner concerned. Unit medical officers should assist their commanding officers in checking the amounts claimed with the mileage fees allowable under the terms of K.R. and A.C.I., para. 1550. Charges in excess of the scale allowed should be referred to the headquarters of the command or area concerned for decision as to payment when the form is forwarded as directed by K.R. and A.C.I., para. 1551.

B.—Hospital Treatment.

Admission to Service Hospitals and Hospital Charges.—The following personnel may be admitted to service hospitals in the undermentioned circumstances.

68. Officers.—1. Officers on full pay, half-pay and retired officers re-employed, under the terms of K.R. and A.C.I., para. 1514.

2. Officers, retired, under the terms of K.R. and A.C.I., para. 1526.

3. Officers, naval and marine attached to the R.A.F. for service with the fleet air arm, under the terms of A.M.W.O. 550/25. Hospital charges are not levied.

4. Officers of the Dominion permanent forces, under the terms of K.R. and A.C.I., para. 1519.

69. Members of Princess Mary's R.A.F. Nursing Service—as in the case of officers on full pay, but hospital charges will not be levied. (*See* K.R. and A.C.I., para. 1525.)

70. Cadets while at the College may be admitted to the R.A.F. hospital at Cranwell; charges being levied as laid down in A.P. 121, appendix 1, cl. 5.

71. Airmen.—as necessary; hospital charges will only be levied in cases due to the airman's own fault and offences under the Air Force Act, in accordance with K.R. and A.C.I., para. 1545. "Relapses" of venereal disease will (in contradistinction to "sequelæ") be regarded as coming under the term "own fault disease," and hospital charges will be levied accordingly. Cases who, there is reason to believe, have not remained clinically free from the direct and usual result of the original infection will be so regarded, whereas those in whom the condition necessitating treatment has

but a constitutionally remote connexion with the original infection will be regarded as "sequelæ" and will not be liable for charges under K.R. and A.C.I., para. 1545.

72. Civilian Employees at home. (See A.P. 826, and K.R. and A.C.I., paras. 1542 and 1543.)—1. Those who have been offered and have accepted the government scheme of compensation may be admitted where necessary to a service hospital in cases of disability resulting from an injury arising out of and during the course of their employment, or of an industrial disease scheduled under the Workmen's Compensation Act or due to the nature of their employment; hospital charges being applied as directed in A.P. 826.

2. Civilian employees and their families who are resident (in official quarters) on R.A.F. stations may be admitted to a service hospital when no civil facilities exist only when suffering from infectious disease or lunacy, for the safety of R.A.F. personnel, or on urgent medical grounds; if admitted on urgent medical grounds, hospital charges will be applied as directed in A.P. 826.

73. Civilians abroad.—Under the terms of K.R. and A.C.I., para. 1541, civilian officials of the officer grade, civilian employees, and the families of civilian employees may under certain circumstances be admitted to hospital abroad, in which case the charges detailed in K.R. and A.C.I., para. 1541, will be levied where applicable.

74. Airmen's Families.—1. *On married Establishment* may be admitted to a service families' hospital, except in cases of chronic illness and infectious disease (other than as referred to below) on the authority of the competent medical authority under the terms of K.R. and A.C.I., para. 1533, cls. 2 and 3. Where, however, an infectious disease scheduled in K.R. and A.C.I., para. 1533, cl. 1, arises in a family resident within the precincts of a R.A.F. station, the patient will invariably be admitted to hospital. Cases of infectious disease occurring amongst families not so resident and under the control, therefore, of the local sanitary authority, will be considered by that authority in the first instance, and if admitted to hospital for the safety of the general community no liability to R.A.F. funds will be accepted. Where, however, admission to hospital is not considered necessary in the interest of public health, the case will be considered by the P.M.O. of the R.A.F. area or command from the point of view of the safety of R.A.F. personnel generally, and the case admitted to hospital, if necessary, on the authority of the air or other officer commanding. Where admissions to hospital are

authorised in accordance with regulations, hospital charges will only be levied in confinement cases. (*See* K.R. and A.C.I., para. 1545.)

2. *Not on married Establishment.*—(a) May be admitted to a service families' hospital where such a course is considered necessary by the competent medical authority to prevent spread of infectious disease amongst R.A.F. personnel under the terms of K.R. and A.C.I., para. 1537, cl. 2. In such circumstances no hospital charges will be made.

(b) On the authority of the air or other officer commanding in other cases under the terms of K.R. and A.C.I., para. 1537, cl. 3. Cases of confinement will not be admitted unless the medical aspect of the case justifies exceptional treatment. Hospital charges will be levied as in K.R. and A.C.I., para. 1545.

Note.—Forms 1511 will be prepared to cover the admission of all families to service hospitals.

75. Officers' Civilian Servants and Civilians not employed by the Air Ministry contracting infectious disease may be granted hospital treatment in the circumstances and on the conditions laid down in K.R. and A.C.I., para. 1543. Non-infectious cases may be admitted under the terms of K.R. and A.C.I., para. 1542, cl. 2, the Air Ministry being informed through the usual channels of such admissions immediately.

76. Disability Pensioners.—Subject to certain approved conditions, and to the necessary accommodation being available, airmen granted pensions in consequence of disabilities directly attributable to post-war service may be afforded hospital treatment for the disability on account of which they were discharged. Application by or on behalf of pensioners for treatment will be addressed to the Secretary, Air Ministry. (*See* K.R. and A.C.I., para. 1540.)

Admission to Civil Hospitals and Hospital Charges.—If the facilities of a service hospital are not available, admission to a civil hospital of the following personnel may be allowed, and hospital charges will be levied where applicable as in service hospitals. (*See* also para. 82.)

77. Officers.—1. Officers on full pay, half-pay, and retired officers re-employed, under the terms of K.R. and A.C.I., para. 1515.

2. Officers, retired, under the terms of K.R. and A.C.I., para. 1526.

3. Officers, naval and marine attached to the R.A.F. for service with the fleet air arm, under the terms of A.M.W.O. 550/25.

78. Members of Princess Mary's R.A.F. Nursing Service.—As for officers under the terms of K.R. and A.C.I., para. 1525.

79. Airmen.—When necessary under the terms of K.R. and A.C.I., para. 1531.

80. Civilian Employees and their Families abroad.—The conditions under which such personnel may be admitted to a civil hospital are laid down in K.R. and A.C.I., para. 1541.

81. Airmen's Families.—1. If resident within the precincts of a R.A.F. station and suffering from infectious disease—as scheduled at K.R. and A.C.I., para. 1533, cl. 1.

2. If not so resident, and admission to hospital is not considered necessary by the local sanitary authority in the interests of the general community, cases of infectious disease may be admitted to hospital when it is considered by the competent medical authority that this course is necessary to prevent the spread of infectious disease amongst air force personnel.

3. In certain circumstances, where the urgency or other special features of the case demand it, families on the married establishment may be admitted to a civil hospital under the terms of K.R. and A.C.I., para. 1534.

82. Special Instructions regarding the admission of R.A.F. Personnel to Civil Hospitals and the Payment of Claims.—

1. The entitlement to admission to a civil hospital is laid down in paras. 77 to 81 above and in K.R. and A.C.I., Chapter XIX, Section IV. Unit medical officers should ensure that cases admitted under their directions are eligible for treatment at public expense, otherwise financial hardship may be caused. Attention is directed to the fact that chronic cases are not to be considered as eligible for admission to a civil hospital under this paragraph, and that no liability for the cost of hospital treatment in such cases will be accepted by the Air Ministry.

2. On admission of a case to a civil hospital, the unit medical officer will immediately confirm the daily charge for maintenance and treatment with the civil hospital authorities where a standing agreement exists and also ascertain if any additional charges will be preferred. If no agreement exists, he will obtain the best terms possible. Full details of the admission will then be forwarded on Form 3467 to the competent medical authority of the area or command on whose strength the individual is borne requesting approval for the action taken.

3. The competent medical authority will advise the air or other officer commanding as to the necessity for the admission. The air or other officer commanding may approve the admission of officers and members of P.M. R.A.F. N.S. whose disabilities are regarded as directly attributable to conditions of service and will inform the Air Ministry immediately giving full details of each case. Approval will also be given for the admission of airmen but Air Ministry will not require to be informed. In the case of wives and families of airmen, the air or other officer commanding will obtain Air Ministry sanction for all such admissions prior to approving the admission, but may provisionally give approval in urgent circumstances.

4. The unit medical officer will keep in close touch with the civil hospital authorities and should arrange for the transfer of the case to the nearest service hospital as early as practicable. Normally, the transfer should be carried out by rail, but service transport may be utilised when there are special medical grounds or when the distance is not considered excessive and transfer by such method will result in a saving to air force funds.

5. Where the retention of a case in a civil hospital exceeds three months, the unit medical officer will forward a full report to the competent medical authority concerned for transmission to the Air Ministry in accordance with K.R. and A.C.I., para. 1512, cl. 2.

6. When the case is discharged or transferred, the unit medical officer will obtain from the civil hospital authorities the full amount of the claim for all services rendered. Form 3467 will then be completed, the hospital account attached, and forwarded to the competent medical authority for counter-signature and transmission to the Air Ministry for payment in accordance with K.R. and A.C.I., para. 1515, cl. 4.

83. Entitlement to Travelling Expenses in Connexion with In-patient Hospital Treatment.—The following will be allowed travelling expenses.

1. Officers, airmen and members of Princess Mary's R.A.F. Nursing Service, serving in the regular R.A.F., under the terms of K.R. and A.C.I., paras. 3018 and 3019.

2. Officers in receipt of Disability Retired Pay, under the terms of K.R. and A.C.I., paras. 1526 and 3019.

3. Airmen in receipt of Disability Pension, under the terms of K.R. and A.C.I., paras. 1540, 3019 and 3025.

Note.—Other persons, including families, who may be admitted to hospital will not be allowed travelling expenses except when such are specially authorised by the Air Ministry.

84. Conveyance by Service Transport in connexion with In-patient Hospital Treatment.—The following may be allowed conveyance by service transport.

1. Persons who are allowed travelling expenses under para. 83 above, and who, by reason of their disability, are unable to travel by the normal methods of conveyance, may be conveyed to hospital (but not from hospital on discharge) or when transferred to another hospital, by service transport at public expense.

2. The families of airmen (as defined in K.R. and A.C.I., para. 1538) may be conveyed to hospital (but not from) by service transport at public expense under the terms of K.R. and A.C.I., para 1484, cls. 4 and 5.

Note.—The use of service transport in connexion with non-entitled medical treatment other than as stated above will be on re-payment under the terms of K.R. and A.C.I., para. 1956 cl. 1 (h), unless otherwise specially directed by the Air Ministry.

85. Admission to King Edward VII Hospital and Osborne.—Applications for the admission of an officer to King Edward VII Hospital, London and for admission to the Convalescent Home, Osborne, will be submitted by the C.O. of the R.A.F. Hospital to the Director of Medical Services, Air Ministry, through the usual channels, a special form for this purpose being used for Osborne.

Sanatorium Treatment.

86. Officers and Members of Princess Mary's R.A.F. Nursing Service.—The terms under which sanatorium treatment is provided for officers and members of Princess Mary's R.A.F. Nursing Service are laid down in K.R. and A.C.I., para. 1527.

Note.—Attention is directed to the differentiation observed in the regulations between treatment in a hospital and in a sanatorium, there being no authority to provide treatment in the latter for personnel other than officers and members of Princess Mary's R.A.F. Nursing Service as referred to above.

SECTION IV.—HOSPITAL ADMINISTRATION.

87. Allocation of Duties.—The management and control of hospitals are dealt with generally in K.R. and A.C.I., Chapter XIX, Section VII. Specific duties concerning certain of the hospital staff are alluded to therein, but apart from these the C.O. (in his capacity as unit commander) is responsible that all officers and airmen under his command are made aware through the medium of standing orders, or otherwise, of their individual responsibilities and duties.

88. Personal Responsibility.—Medical officers will be personally responsible for the proper treatment and care of patients in, and for the discipline and cleanliness of the wards under their charge. They will at once report to the C.O. all cases of serious illness and changes of diagnosis, and will cause patients whom they consider fit for discharge to be brought before the C.O. for his covering approval by countersignature of the diet sheets.

89. Hospital Diets.—Rules governing the dieting of patients in hospitals and station sick quarters are to be found in A.P.112.

SECTION V.—DENTAL SERVICES.

90. Duties of Dental Officers.—Instructions relating to the duties of dental officers are contained in K.R. and A.C.I., paras. 1561 and 1562. (*See also paras. 4 and 9 above.*)

Treatment should as a rule be carried out for not less than five and a half hours daily divided into morning and afternoon sessions, the times of which will be arranged after consultation with the C.O. of the unit concerned.

Dental officers are strictly to observe punctuality in regard to the hours of attendance for duty, and except for leave, will not be absent from duty during normal hours without prior authority of the C.O. of the station and with the permission of the senior dental officer if one is available.

91. Oral Hygiene.—Dental officers should impress upon all ranks the importance of keeping the teeth and gums in a sound and healthy condition and should take every opportunity to see that the principles of oral hygiene are understood and carried out.

When a dental officer considers that an airman is not giving sufficient care to the cleanliness of his teeth, he should bring the matter to the notice of the C.O. of the unit.

92. Standards of Dental Fitness.—1. Officers. (*See A.P.130.*)

2. Cadets. (*See A.P.121.*)

3. Aircraft apprentices
Apprentice clerks
Recruits } (*See A.P.1129.*)

93. Persons eligible for Dental Treatment.—1. Officers. (*See K.R. and A.C.I., paras. 1563 and 1564, and A.M.W.O. 550/25.*)

2. P.M.R.A.F.N.S. (*See K.R. and A.C.I., para. 1565.*)

3. Airmen. (*See K.R. and A.C.I., para. 1566.*)

4. Families. (*See K.R. and A.C.I., paras. 1574 and 1575.*)

94. Employment of Civilian Dental Surgeons.—The regulations relating to and the fees allowed for dental treatment carried out by civilian dental surgeons are contained in K.R. and A.C.I. paras. 1571, 1572 and 1573.

95. Daily record of Dental Treatment.—The instruction for keeping the daily record is laid down in K.R. and A.C.I., para. 1578.

96. Refusal of Treatment.—See K.R. and A.C.I., para. 1578, cl. 3.

97. Provision of Porcelain Crowns.—See K.R. and A.C.I., para. 1569.

98. Provision of Dentures.—1. The instructions relating to the provision of dentures at public expense are laid down in K.R. and A.C.I., para. 1568. The dental officer will be responsible for the careful packing of plaster models and dentures and the marking of models and impressions when forwarding them to the dental mechanical laboratory.

2. The instructions relating to the provision of dentures on re-payment are laid down in K.R. and A.C.I., para. 1570.

99. Dental Treatment of other services and by other services.—(See K.R. and A.C.I., para. 1576.)

100. Forms.—The following forms are used in connexion with dental treatment.

Form 632	..	Dental report.
Form 676	..	Monthly dental return.
Form 3499	..	Appointment form.
Form 664B	..	Voucher for the supply of dentures on re-payment.
Form 48	..	Medical history envelope, dental chart and table with record of treatment.

101. Form 632.—1. The front page of this form will be used by service dental officers when recommending the supply or repair of dentures, and will be disposed of in accordance with K.R. and A.C.I., para. 1568.

2. The reverse page will be used by civilian dental surgeons when recommending any kind of dental treatment, and will be disposed of in accordance with K.R. and A.C.I., para. 1572.

102. Form 676.—This form will be compiled and disposed of in accordance with K.R. and A.C.I., para. 1578, cl. 1. A separate return showing all dental treatment afforded to R.A.F. families will accompany this form.

103. Form 3499.—This form will be used for entering all appointments made for the attendance of personnel for dental treatment and will be disposed of in accordance with K.R. and A.C.I., para. 1561, cl. 2A.

104. Form 664B.—This form will be used in accordance with K.R. and A.C.I., para. 1570.

105. Form 48.—The table relating to dental treatment on this form should be examined, where possible, by the dental officer once a month. The dental chart will be completed and treatment entered in accordance with K.R. and A.C.I., paras. 1577 and 1578.

When completing the chart, the dental officer should make use of the following symbols :—

Decayed teeth (saveable)	O
Decayed teeth (unsaveable)	X
Fillings present	●
Missing teeth	—
Dentures (service or private) ..	D $\frac{10}{7}$

Oral hygiene (to be noted in top left corner above chart) Good, fair or neglected.

The following symbols should be used where entering details of treatment completed :—

Extractions	Ext. $\overline{54}$
Extractions (local anaesthetic) ..	Ext. L.A. $\underline{6}$
Extractions (general anaesthetic) ..	Ext. Gen. $\frac{42}{65} \mid \frac{78}{12}$
Amalgam and cement linings ..	Amal. C. $\mid \underline{45}$
Amalgam, copper	Amal. Cu. $\mid \underline{68}$
Amalgam	Amal. $\mid \overline{6}$
Synthetic	Syn. $\underline{21}$
Cement	Cem. $\underline{4}$
Root filling	R.F. $\mid \underline{6}$
Root dressing	R.D. $\mid \overline{7}$
Arsenic dressing	AS ₂ O ₃ . $\mid \underline{4}$
Scaling	Scl.
Dentures fitted	D. $\frac{654}{653} \mid \frac{35}{67}$
Dentures remodelled	D. remod. $\frac{U}{L}$

Dentures repaired	..	..	..	D. rep.	$\frac{U}{L}$
Additions to dentures	..	..	..	D. add.	$\frac{14}{}$
Pyorrhoea	..	..	..	Py.	$\frac{1}{21} \frac{67}{34}$

106. Special Instructions.—All entries will be made legibly in the appropriate columns of Form 48 and with due regard to economy of space.

A record will not be made regarding an ordinary dressing unless such dressing is a final one, *i.e.*, previous to posting of the person concerned.

At any inspection and charting by a dental officer if no treatment is required, the word "fit" will be entered in the treatment column. Where treatment is necessary, the word "incomplete" will be entered. When treatment is completed the word "fit" will be entered. All entries will be dated stating the station concerned and initialled by the dental officer making the entries.

When any treatment is interrupted owing to the officer or airman being posted to another unit, the dental officer will notify the dental officer of the new unit (or medical officer if no dental officer is available) through the C.O. of the unit.

107. Full details of all treatment required resulting from dental inspections will be kept by dental officers in a separate book. This will also enable statistics to be supplied for Form 676.

108. Dental Stores.—1. The procedure of obtaining and accounting for dental stores is laid down in K.R. and A.C.I., Chapter XIX, Section VIII, and in Chapter IV of this manual so far as may be applicable.

2. The following forms relating to dental stores are used in the R.A.F.

Form 1209	..	..	Demand for stores, etc.
Form 636	..	..	For taking stores on charge.
Form 600	..	..	Issue and receipt voucher between units.
Forms 712 and 712A			Receipt vouchers for stores from Kidbrooke or Contractor,
Form 1230	..	..	Accounting for losses and unserviceable stores.
Form 594	..	..	Discrepancy report.

CHAPTER III.

INSTRUCTIONS FOR THE PREPARATION AND DISPOSAL OF MEDICAL RECORDS AND RETURNS.

109. Forms.—1.

Form 48	..	..	Medical History Envelope.
Form 994	..	..	Weekly return of medical examination of recruits.
Form 241	..	..	Weekly summary of sickness from areas or commands.
Form 38	..	..	Weekly sick report.
Forms 39 and 41	..	..	Record of individual sickness.
Form 39A	..	..	Record on case of Pulmonary Tuberculosis.
Form 522	..	..	Weight card.
Forms 35 and 36	..	..	Record of medical examination of a recruit on entry, or of an airman on transfer to reserve.
Forms 826 and 827	..	..	Record of medical examination on entry of an officer, member of P.M.R.A.F.N.S., cadet or airman-pilot.
Forms 42 and 43	..	..	Record of special medical examination.
Forms 44 and 45	..	..	Record of medical examination of a person involved in a flying accident.
Forms 46 and 47	..	..	Record of a medical board on an officer, member of P.M.R.A.F.N.S., cadet or airman-pilot.

2. With the exception of Forms 38, 39A, 48, 241, 522 and 994, the above forms are divided into groups, each group consisting of a card with flimsy attached and a paper form. The paper form is first completed and retained as a permanent record at the establishment where it is compiled (*see* K.R. and A.C.I., para. 1495). The contents of the paper form are then transferred to the corresponding card and flimsy. Each card and flimsy is spaced for typing and should be typewritten in the administrative office of the unit when no typewriter is available in the station sick quarters. All signatures will be in manuscript.

110. Form 48.—This form is of two types, one for officers, cadets and members of P.M.R.A.F.N.S., and the other for airmen. It consists of a stout envelope with certain tables on it for recording its contents, various examinations such as dental, medical classification, inoculations and vaccinations, and the issue of surgical appliances.

Forms 48 will be kept by medical officers as laid down in K.R. and A.C.I., para. 1493.

Instructions for the safe custody and renewal are contained in K.R. and A.C.I., Chapter XXIX, Section IV.

Forms 48 will be compiled and disposed of as follows :—

1. Officers and members of P.M.R.A.F.N.S. as laid down in K.R. and A.C.I., para. 2336.

2. Airmen as laid down in K.R. and A.C.I., para. 2168.

111. Form 994.—This form will be completed on the Saturday of each week by recruiting medical officers and forwarded to the Medical Inspector of Recruits for the R.A.F. in accordance with K.R. and A.C.I., para. 1447, cl. 3.

112. Form 241.—This form will be completed weekly by Principal Medical Officers of areas or commands as directed by K.R. and A.C.I., para. 1464, cl. 1, and forwarded to the Air Ministry. The form is prepared from Forms 38 (weekly sick reports) and is divided into three tables.

Table 1 gives the total number of “non-effective, sick” remaining at the end of the week. A note should be made of deaths and flying casualties occurring during the period.

Table 2 shows the average strength by units of the area or command for the period, and gives the detail under certain specified headings of the total number of non-effective sick shown in Table 1.

Table 3 records the numbers of notifiable diseases by stations.

113. Form 38.—1. *General Instructions.*—The form consists of thick sheets, each having a detachable flimsy sheet, bound into book form. All personnel (except families) who have been non-effective during the week ending midnight on Friday will be entered on the form. A separate book of Forms 38 should be kept for each class of patient enumerated below. The form will be prepared as a weekly sick report by unit medical officers as directed by K.R. and A.C.I., para. 1496, and by C.Os. of R.A.F. hospitals as directed by K.R. and A.C.I., para. 1613, and the flimsy sheet forwarded to the competent medical authority concerned not later than noon on the Saturday of each week. When the flimsy sheet has been detached, the thick sheets serve as a permanent record for the establishment concerned. Nil returns are required.

The competent medical authority concerned will, for personnel serving in the regular air force who are admitted to civil institutions, be responsible for the preparation of separate Forms 38 for each institution.

The competent medical authority of the Air Defences of Great Britain command will be responsible for the collection of Forms 38 (flimsy) for all air force serving personnel admitted to naval and military medical establishments in the United Kingdom.

The competent medical authority of each area or command will retain all Forms 38 (flimsy) received until the end of each quarter and will then complete and forward them as directed by K.R. and A.C.I., para. 1464, cl. 2. (See K.R. and A.C.I., para. 1476, for the action to be taken by a senior medical officer of a group.)

2. *Compilation—general.*—(i) Separate forms will be completed weekly by each air force establishment at home and abroad as follows :—

(a) Personnel serving in the regular air force who are admitted to sick quarters or hospital.

(b) All other persons who are admitted to sick quarters or hospital.

(c) Any particular category of patient as may be specifically directed by the Air Ministry.

(ii) Separate forms will in addition be completed by each air force establishment at home only when applicable as follows :—

(a) For a unit belonging to a different area or command, or a formation of not less than one flight attached for a period of one week or more.

(b) For a unit belonging to a different group of the same area or command, or a formation of not less than one flight attached for a period of one week or more.

Note.—Personnel, numerically less than one flight, detached from one unit and attached to another, will be shown on the Form 38 of the unit and command, respectively, which affords the medical treatment.

A party or flight detached from its parent unit and not attached to another will be treated as an independent unit and will require a separate Form 38.

An officer sick on ordinary leave, but returning to duty on completion of such, will not be shown on a Form 38, although a Form 39 should be completed whenever possible. (See para. 114, 3 (c)).

An officer unable, through illness, to return to duty on completion of ordinary leave will be shown on the station Form 38 with effect from the date of the expiration of the ordinary leave, and will continue to be shown until he is transferred to a service hospital or is discharged to duty or to

a medical board. If, however, during this period he is admitted to a civil institution at his own expense, no record will be made on a Form 38 of such admission. (See para. 114, 3 (c) as to Form 39).

An airman sick at home or sick on leave will be shown on the station Form 38 with effect from the date of his becoming non-effective and will continue to be so shown until he is returned to duty, or transferred to a service hospital or to a civil institution.

An officer or an airman, sick at his home while on ordinary leave in the United Kingdom from a command abroad, will be shown on a separate Form 38 headed "Sick on leave from abroad" by the S.M.O. of the R.A.F. Depot, Uxbridge, and will continue to be so shown until he is discharged to complete his leave or is transferred by higher authority to a service hospital or to a civil institution.

An officer or an airman, retained in hospital for treatment after the termination of his regular service, will be discharged from the Form 38 for regular air force personnel and admitted to the Form 38 for "all others."

An officer or an airman who is treated in a sick quarters other than his own while on duty or on leave will be reported immediately by the medical officer affording treatment to the medical officer of the individual's parent unit for inclusion in the relevant current Form 38.

3. *Compilation—detail.*—(i) *Section I.*—Full details of all personnel who are sick for a period of more than 48 hours will be recorded in this section. Each case will be allotted a serial number, the first new case in the year commencing 1st January being given the No. 1, and the series continued to the end of the year. Cases of 48 hours' duration or less, which are discharged to any form of duty within that time, will not be entered in this section, nor will cases under treatment which are still performing any kind of duty. Cases transferred from sick quarters or hospital to another hospital will be entered in Section I, irrespective of the duration of their stay. The "How disposed of" column of the flimsy sheet will be completed at the end of the week as follows:—

(a) For cases admitted and discharged to duty during the week, the words "Duty" or "Light duty" will be entered.

(b) For cases admitted during the week and still remaining at the establishment, the word "Remaining" will be inserted.

(c) For cases admitted during the week and transferred elsewhere for treatment, the name of the establishment to which transferred and date of transfer will be recorded.

(d) In case of death, the word "Died" and the date of death will be entered.

The "How disposed of," "Date of discharge" and "Number of days sick" columns of the thick sheet will be completed as and when the patient leaves the establishment compiling the form, thus forming a complete admission and discharge record for every patient.

(ii) *Section II* will be completed in accordance with K.R. and A.C.I., para. 1496, cl. 3. Personnel excused duty for 48 hours or less on account of prophylactic inoculation will not be included in this section. If, however, the duration of such cases exceeds 48 hours, they will be recorded in Section I.

(iii) *Section III*.—The numerical strength, on the day of compiling the form, of each unit to which the form refers will be entered separately in this Section. (K.R. and A.C.I., para. 1496, cl. 4.)

(iv) *Section IV, Bed-state*, will refer to the particular category for which the form is rendered.

(v) *Section V*.—Similarly will refer to the number of beds equipped for the particular category for which the form is rendered.

(vi) *Procedure at the end of each year*.—(a) All cases remaining in sick quarters or hospitals on 31st December will be regarded as nominally discharged on that date and re-admitted on 1st January. These nominal discharges will not, however, be shown in Section IV of Form 38; only actual discharges will be recorded in this section.

(b) When the 31st December does not fall on a Friday, the Form 38 due to be compiled on the last Friday of the year will be extended to include all cases admitted up to midnight of 31st December. Similarly, the first Form 38 rendered in the new year will include the period, if any, subsequent to 31st December and additional to the first complete week of the new year. Section I of the latter form will be divided into two distinct parts:—

(i) Cases remaining from 31st December and re-admitted in accordance with clause 6 (a) above. The original serial number prefaced by the letter "R" will be entered, but the date of admission will be recorded as 1st January; and

(ii) Entirely new admissions since the 1st January.

A nominal roll of all patients remaining in sick quarters or hospitals on the last Friday of each quarter, *i.e.*, thirteen weekly period, will be compiled in duplicate by medical officers in charge of such establishments and will be forwarded with the last Form 38 for the quarter to the competent medical authority, who will cause the consolidated statements detailed in K.R. and A.C.I., para. 1464, cl. 2, to be forwarded to the Air Ministry.

114. Forms 39 and 41.—1. These forms will be compiled and disposed of in accordance with the procedure laid down in K.R. and A.C.I., paras. 1498 and 1604, cls. 5 and 8.

2. Form 41 is prepared as a case sheet showing the treatment received by the person while a patient, and is retained at the establishment concerned as a permanent record.

3. Form 39 consists of a card and flimsy and is completed from the relevant Form 41 when the patient (with the exception of families) is discharged from the medical establishment affording the treatment. The flimsy is placed in the Form 48. The card is retained until the end of the week and then forwarded, together with all similar cards for patients discharged, to the competent medical authority concerned through the usual channels.

(a) Personnel who are sick at home while on leave in the United Kingdom from commands abroad will be accounted for by the S.M.O. of the R.A.F. Depot, Uxbridge, and Forms 39, card and flimsy, will be headed "Sick on leave from abroad" and both forwarded to the competent medical authority of Inland Area command for transmission to the Air Ministry.

(b) The competent medical authority of the Air Defence of Great Britain command will collect all Forms 39 (cards) from naval and military hospitals and will forward them weekly to the competent medical authorities of the command to which the personnel belong.

(c) Form 39 for officers and airmen sick on leave and/or treated for more than 48 hours in a sick quarters other than their own will be rendered by the medical officer of the parent unit as soon as particulars are available. One form is required to cover the period of treatment at home or/and if the case is transferred to a hospital (service or civil) to effect the nominal transfer, a second form will be prepared to cover the period in hospital, and a third form, when applicable, for any period of treatment at the station subsequent to discharge from hospital providing that the officer or airman is unfit for any form of duty. In the case of personnel treated in a sick quarters other than their own,

Form 39 will be rendered by the medical officer of the parent unit on receipt of the relevant Form 41 from the sick quarters where the patient was treated.

(d) Abroad, in cases of invaliding, a Form 39 will be prepared to cover any period which may elapse between the date of the invaliding board and the date of embarkation when such cases are discharged to their unit on light duty or excused duty awaiting embarkation.

(e) When officers and airmen who are patients in hospital are transferred to the reserve prior to their discharge from the hospital, Form 39 will be prepared up to and including the date of such transfer. A further Form 39 will be prepared for the period for which further treatment is afforded, and will be headed accordingly.

(f) Form 39 will not be prepared by medical establishments for persons admitted to hospital under the category of "all others" except as in sub-para. (e) above. In cases of outstanding professional interest, and in cases of death or injury, Form 39, card only, will be prepared and forwarded through the usual channels to Air Ministry. Form 41, however, will be prepared in all cases and retained for record purposes.

(g) Forms 41 and 39 will be used for recording the opinions of consultants. (See sub-para. 4 (i).)

4. *Compilation.*—(a) Diagnosis will be in accordance with the Nomenclature of Diseases, and in the event of an alteration in this, the disease or injury previously entered will be ruled through in such a way as to remain legible and the new diagnosis entered above. Any new disease supervening will be entered under the appropriate heading with the date of diagnosis.

(b) Rank, trade, age, etc., and full christian names, will always be entered in the spaces provided.

(c) The method of recording the number of days under treatment is laid down in K.R. and A.C.I., para. 1589.

(d) In operation cases (major or minor), where applicable, the anaesthetic and the method of administration will be entered in the space provided.

(e) In cases of injury, the date together with a short statement of the cause and whether sustained on duty, off duty, or on leave, will be recorded under "Previous history of the case." In cases of disease, any relevant factors such as the nature of any special duty on which employed should be entered under this heading as this information may be useful later in deciding any claims to disability pension in the event of invaliding.

(f) In cases of disease for which prophylactic inoculation or vaccination is practised, *e.g.*, the enteric group, smallpox, cholera, plague, etc., the dosage and dates of the relevant inoculation or vaccination should be recorded. Where no inoculation or vaccination has been carried out, a note to this effect should be made.

(g) In cases of death, the findings of the autopsy, if held, will be recorded, and the competent medical authority concerned will state his opinion of Form 39 (card) as to whether death was the result of wound, injury or disease caused by service or aggravated thereby, and if so, by what special conditions of service.

(h) Cases remaining in medical establishments on the 31st of December, will be nominally discharged in accordance with K.R. and A.C.I., para. 1498, cl. 3, and re-admitted on the 1st of January. The Form 39 dealing with the period of sickness up to 31st December will show the words "Remaining 31-12-..." under the heading "Date of discharge to duty," and the "Number of days under treatment" line will show the number of days to the 31st December only. A second form will be compiled for the remaining period of the disability in the next year. The original serial number will be retained but will be prefaced by the letter "R." The "Date of admission" line will read "Re-admitted 1-1-..." and only the actual number of days from the 1st January will be recorded in the "Number of days under treatment" line. Both Forms 39 (card and flimsy) will be prominently marked at the top "Remaining 31-12-..." Only one Form 41 need be prepared.

(i) In recording the opinions of consultants, the following procedure will be adopted:—

In-patients in hospitals and sick quarters seen by a consultant (a) at the medical unit where they are undergoing treatment: The consultant will record and sign his opinion on the relevant Form 41. (b) at a medical unit other than that at which they are undergoing treatment: The medical officer will forward the original Form 41, together with a blank Form 41 completed in respect of particulars of the patient, attached to Form 48, to reach the appropriate medical unit at least 24 hours before the time appointed for the consultation. The consultant will record and sign his opinion on the original Form 41 and return it to the unit concerned, retaining the duplicate Form 41 for record purposes.

Out-patients: The medical officer who has applied for the opinion of the consultant will complete Form 41 up to and including the "present condition of the case,"

attach it to Form 48 and forward it to reach the appropriate medical unit at least 24 hours before the patient is due for consultation. The Commanding Officer of the unit where the consultation is held will be responsible for transferring the consultant's opinion from Form 41 to a Form 39, card and flimsy, headed "Consultant's Report." Form 41 will be retained as an office record, the flimsy Form 39 inserted in Form 48, which will be returned to the unit concerned, and the card Form 39 forwarded to the Air Ministry.

115. Form 39A.—This form consists of a card only and is completed as a questionnaire in all cases where pulmonary tuberculosis has been diagnosed in personnel of the regular R.A.F. The form will be prepared in accordance with K.R. and A.C.I., para. 1452, cl. 6, and will be placed temporarily in Form 48 to assist in assessing attributability, and ultimately included in the individual's permanent medical records.

116. Form 522.—This form is employed as a weight record card and is prepared for all personnel of the R.A.F. as laid down in K.R. and A.C.I., para. 1452, cl. 2.

117. Forms 35 and 36.—These forms will be completed for the following medical examinations:—

1. Recruits on entry, in accordance with K.R. and A.C.I., paras. 1447 and 2168, and on second examination in accordance with K.R. and A.C.I., para. 1452, cl. 4.

2. Airmen on transfer to the reserve, in accordance with K.R. and A.C.I., para. 653, cl. 1.

118. Forms 826 and 827.—These forms will be compiled and disposed of in accordance with K.R. and A.C.I., paras. 1441 and 1442. In completing Form 826 the standard abbreviations to be used in respect of eyes, ears, and general medical and surgical examinations are those laid down in A.P. 130.

119. Forms 42 and 43.—These forms will be compiled and disposed of in accordance with K.R. and A.C.I., paras. 1443 and 1446. If the medical classification of the person examined is considered by the examining medical officer to require revision, arrangements should be made by him to regularise the position by referring the case to the competent medical authority for a medical board at the earliest opportunity. In the meantime, the duties for which the person is eligible will be those appertaining to the lower classification. Forms 42 and 43 will not be rendered for personnel who are patients in hospital. In completing Form 42 the standard abbreviations to be used in respect of eyes, ears and general medical and surgical examinations are those laid down in A.P. 130.

120. Forms 44 and 45.—These forms will be compiled and disposed of in accordance with K.R. and A.C.I., para. 1444. They will not be prepared for parachute accidents resulting from practice descents but should be completed for each person who makes a forced descent. Where an aeroplane accident occurs away from the parent unit, Forms 44 and 45 will be prepared by the attending R.A.F. medical officer and forwarded direct to the medical officer of the unit concerned. The responsibility, however, of obtaining and forwarding such cards rests with the medical officer of the parent unit.

121. Forms 46 and 47.—These forms will be compiled and disposed of in accordance with K.R. and A.C.I., para. 1435, which also contains instructions for the completion of the medical board summary, Form 657.

122. Medical Returns and Records from R.A.F. Transports.—1. *Form 38.* Separate books of Form 38 will be used for the following :—

(a) R.A.F. personnel.

(i) Admitted during the period of the voyage.

(ii) Invalids from abroad, whether admitted to sick quarters or not. "Nil" returns are required.

(b) Army personnel.

(c) Navy personnel.

(d) All others.

The forms on completion will be disposed of in accordance with the procedure laid down in K.R. and A.C.I., para. 1004, cl. 3.

2. *Forms 39 and 41* will be compiled for R.A.F. personnel as laid down in K.R. and A.C.I., para. 1498 and Forms 39 will be disposed of as laid down in K.R. and A.C.I., para. 1004, cl. 3. Form 41 only will be compiled for Navy personnel and all others.

At the conclusion of the trooping season all Forms 41 will be forwarded to the Secretary, Air Ministry.

3. *Army Form I. 1220* will be compiled and disposed of in accordance with para. 123.

4. *Nominal Rolls required by Embarkation Medical Officer for R.A.F. Personnel from R.A.F. Transports.*—1. At the Port of Disembarkation in the United Kingdom, the following nominal rolls will be prepared and handed to the Embarkation Medical Officer. These rolls are in addition to the disembarkation return required by K.R. and A.C.I., para. 1054.

(1) Nominal roll of sick.—Separate rolls, for officers, mental cases, women and children, invalids to the United Kingdom, sick among the drafts on board, cases of infectious disease and cases of venereal disease, showing the disposal of each case.

(2) Nominal roll of women and children not sick but accompanying sick husbands.—To include all women and children who may be required by the embarkation medical officer to accompany husbands to hospital.

(3) Nominal roll of husbands accompanying sick wives and children.—To include all airmen who may be required by the embarkation medical officer to accompany wives and children to hospital.

2. At the Port of Disembarkation abroad, a nominal roll of sick, including the disposal of each case will be prepared and handed to the Embarkation Medical Officer for transmission to the competent medical authority of the command concerned.

3. With regard to special nominal rolls required for infectious cases by the Embarkation Medical Officer and the Port Sanitary Authority, *see* para. 311.

123. Returns for Personnel of the British Army on Board R.A.F. Transports.—When personnel of the British Army are embarked in a R.A.F. transport, the following additional records and returns will be rendered.

1. A.F.B. 182 will be compiled to cover the periods from the day of embarkation to the day preceding disembarkation. The statistics of the following classes will be kept separate :—

(a) Troops proceeding on service abroad.

(b) Troops returning home from abroad.

(c) Troops proceeding from one station abroad to another.

(d) Invalids embarked as such, returning to home stations.

(e) Sick and wounded transferred from active service in the field.

2. Nominal roll in triplicate, A.F.A. 36, showing—

(a) Invalid officers and nursing sisters.

(b) Officers or nursing sisters proceeding on sick leave.

(c) Invalid other ranks.

(d) Sick transfers other than invalids.

(e) Invalid families.

(f) Husbands accompanying sick families.

(g) Families accompanying sick husbands.

(h) Mental cases (on a separate roll).

3. R.A.M.C. casualties, A.F. O.1810, for personnel of R.A.M.C. or A.D.C.

4. Nominal roll of R.A.M.C. officers and nursing sisters with home addresses.

5. Medical documents of deceased soldiers.

6. Nominal roll of infectious diseases on A.F. A.36.

7. Report of cases of typhoid fever on A.F. I.3056.

8. Hospital case cards, A.F. I.1220.

9. Death certificates.

10. Disembarkation state on Form L.

These returns are in addition to the disembarkation returns required under K.R. and A.C.I., para. 1054, and para. 122 above, and are to be handed to the embarkation medical officer.

124. Records and Returns for Personnel of the British Army admitted to Royal Air Force Medical Establishments.—

1. *Form 38.* Separate Forms 38, when called for by the Air Ministry, will be compiled weekly for personnel of the British Army admitted during the week. These forms will be prominently marked "British Army Personnel," and on completion will be disposed of in the same manner as those for R.A.F. personnel, unless other instructions are issued by the Air Ministry.

2. *A.F.I. 1220* will be compiled for each case admitted to R.A.F. hospitals or transferred to another hospital. In commands where the medical charge is a R.A.F. responsibility, a card will also be compiled for each officer or soldier dying out of hospital. Form I. 1220 will not be completed for cases treated in barracks or in R.A.F. sick quarters except in cases of death or cases of outstanding professional interest. The cards of all patients who have been disposed of by :—

- (a) discharge to duty, or
- (b) discharge as an invalid, or
- (c) death, or
- (d) transfer to another hospital,

will be forwarded weekly to the competent medical authority who will dispose of them as instructed by the Air Ministry.

On the first of January in each year, a new card with a fresh serial number will be made out for each patient who remained in hospital on the previous day, the word "Remained" being written on the top of the new card. The old cards will be disposed of as detailed above, the word "Remaining" being written on the top of each card.

3. *Form 241.* In commands where the medical charge of troops is the responsibility of the R.A.F., the competent medical authority will cause Form 241 to be compiled monthly in duplicate in respect of all Army personnel admitted to Royal Air Force medical establishments during the month. One copy will be forwarded by the competent medical authority to:—

The Under Secretary of State,
The War Office,
Whitehall,
S.W.1,

the second copy will be forwarded to:—

The Secretary,
Air Ministry,
Kingsway,
W.C.2.

CHAPTER IV.

MEDICAL, SURGICAL AND DENTAL STORES.

SECTION I.—GENERAL INSTRUCTIONS.

125. R.A.F. Medical Store Depots.—1. Kidbrooke.—The officer in charge will be responsible to, and will communicate direct with, the Director of Medical Services, Air Ministry, on all matters affecting his duties, in the performance of which he will be guided by special instructions issued to him as necessity arises.

2. Other Depots.—Officers in charge will be responsible to the Principal Medical Officer of the area or command in which the depot is situated, for the custody, maintenance, expenditure, etc., of all stores in their charge, and will communicate direct with the P.M.O. concerned on all matters connected therewith.

126. Custody of Poisons.—Items of medical stores deemed to be poisons within the meaning of the Poisons and Pharmacy Act of 1908, and detailed below, will be kept under lock and key in accordance with the procedure laid down in K.R. and A.C.I., para. 1651.

Part I.

Arsenic, and all its medicinal preparations.

Aconite, aconitine, and their preparations.

Alkaloids—all poisonous vegetable alkaloids not specifically named in this schedule and their salts, and all poisonous derivatives of vegetable alkaloids.

Atropine, and its salts and their preparations.

Belladonna, and all preparations or admixtures (except belladonna plasters) containing 0·1 or more per cent. of belladonna alkaloids.

Cantharides, and all its poisonous preparations.

Coca, any preparation or admixture of, containing 1 or more per cent. of coca alkaloids.

Corrosive sublimate.

Cyanide of potassium, and all its poisonous cyanides and their preparations.

Emetic tartar, and all preparations or admixtures containing 1 or more per cent. of emetic tartar.

Ergot of rye, and all preparations of ergots.

Nux vomica, all preparations or admixtures containing 0.2 or more per cent. of strychnine.

Opium, and all its preparations or admixtures containing 1 or more per cent. of morphine.

Picrotoxin.

Prussic acid, and all its preparations or admixtures containing 0.1 or more per cent. of prussic acid.

Savin, and its oil, and all preparations or admixtures containing savin or its oil.

Part II.

Almonds, essential oil of (unless deprived of prussic acid).

Antimonial wine.

Cantharides tincture and all vesicating liquid preparations or admixtures of.

Carbolic acid, and liquid preparations of carbolic, and its homologues containing more than 3 per cent. of those substances.

Chloral hydrate.

Chloroform, and all its preparations or admixtures containing more than 20 per cent. of chloroform.

Coca, any preparation or admixture of, containing more than 0.1 but less than 1 per cent. of coca alkaloids.

Digitalis.

Mercuric iodide, mercuric sulphocyanide.

Oxalic acid, and its salts.

Acids, sulphuric, nitric and hydrochloric.

Poppies, all preparations of, excepting red poppy petals and syrup of red poppies (*papaver rhœas*).

Precipitate, red and all oxides of mercury.

Precipitate, white.

Strophanthus.

Sulphonal.

Creosote, croton oil, elaterium, amyl nitrite.

All other preparations or admixtures which are not included in Part I of this schedule and which contain a poison within the meaning of the Pharmacy Act, and also such other drugs as the medical officer in charge may order to be kept.

127. Dangerous Drugs Act, 1920.—Officers commanding R.A.F. hospitals and medical officers at stations will keep a special book as ordered by K.R. and A.C.I., para. 1651, cl. 3, for all issues of the following drugs:—morphine, cocaine, ecgonine, diamorphine (heroin), dihydro-oxycodine ("Eucodal"), dihydrocodeine ("Dicodide"), dihydromorphine ("Dilaudide") and their respective salts, medicinal opium, extracts and tinctures of Indian hemp, and any preparation, admixture, extract or other substance containing diamorphine, dihydro-oxycodine, dihydrocodeine, dihydromorphine or not less than one-fifth per cent. of morphine, or one-tenth per cent. of cocaine or ecgonine. The expression "ecgonine" means laevo-ecgonine, and includes any derivatives of ecgonine from which it may be recovered industrially. The percentage in the case of morphine will be calculated as in respect of anhydrous morphine.

The regulations do not apply to the following:—

Cereoli Iodoformi et Morphinae	..	..	B.P.C.
Elixir Diamorphinae et			
Terpini c. Apomorphina	..	..	B.P.C.
Emp. Opii	..	..	B.P. 1898.
Linctus Diamorphinae Camphoratus	..	..	B.P.C.
Linctus Diamorphinae c. Ipecacuanha	..	..	B.P.C.
Linctus Diamorphinae et Scillae	..	..	B.P.C.
Linctus Diamorphinae et Thymi	..	..	B.P.C.
Lin. Opii	..	..	B.P.
Lin. Opii Ammon	..	..	B.P.C.
Pasta Arsenicalis	..	..	B.P.C.
Pil. Hydrarg. c. Opio	..	..	B.P.C.
Pil. Ipecac. c. Scilla	..	..	B.P.
Pil. Plumbi c. Opio	..	..	B.P.
Pil. Digitalis et Opii Co.	..	..	B.P.C.
Pil. Hydrarg. c. Cret. et Opii	..	..	B.P.C.
Pulv. Cretae Aromat. c. Opio	..	..	B.P.
Pulv. Ipecac. Co. (Dover's Powder)	..	..	B.P.
Pulv. Kino Co.	..	..	B.P.
Suppos. Plumbi Co.	..	..	B.P.
Tabellae Plumbi c. Opio	..	..	B.P.C.
Ung. Gallae c. Opio	..	..	B.P.
Ung. Gallae Co.	..	..	B.P.C.

SECTION II.—SUPPLY OF MEDICAL, SURGICAL AND DENTAL STORES.

128. Authorised Scale.—1. The authorised scale of medical equipment for R.A.F. medical establishments is laid down in A.P. 132.

2. Demands for unauthorised articles will always be accompanied by an explanation of the circumstances which render them necessary.

129. Medical Equipment, how demanded and accounted for.—1. The procedure for obtaining and accounting for medical, surgical and dental stores is laid down in K.R. and A.C.I., Chapter XIX, Section VIII.

2. Hypodermic and ophthalmic tablets issued in tubes from the R.A.F. medical store depot at Kidbrooke, whether as separate items or as components of special forms of equipment (*e.g.*, hypodermic cases, 1925 pattern), will be invoiced in such a manner as to show the number of tubes and the total number of tablets contained in each. Medical and Dental Officers will take all such tablets on charge by number in the body of their account.

3. Sera and vaccines will not be stocked in large quantities, but should be demanded, as far as possible, as required.

130. Economy in use of Medical, Surgical and Dental Stores.—The strictest economy will be exercised in the use of stores and in demanding them. All officers concerned will satisfy themselves that only such articles and quantities as are actually needed are demanded and, in the case of expensive items, that the expense is justified and that no less expensive articles will suffice.

131. Complaints.—Objections as to age, adulteration, etc., of drugs and inferior quality or defective workmanship of surgical instruments, etc., will be referred to the Air Ministry through the usual channels.

132. Drugs supplied by different Firms.—Drugs supplied by different firms should be kept in separate containers, so that, should complaint be made as to quality or quantity, no difficulty will arise in ascertaining the source of supply.

133. Unpacking Medical Stores.—Medical stores received by units will be unpacked in the presence of a medical officer, or medical quartermaster, who will note at the time of unpacking :—

1. discrepancies ;
2. breakages or damage.

1.—(a) Where a discrepancy is found to exist between the quantities of stores received and the quantities shown on the voucher relating thereto, the consignee will prepare forthwith a discrepancy report on Form 594, in triplicate, except where the discrepancy is obviously due to breakage in transit. In the latter case, the question of the liability of the carrier is to be investigated, and, if necessary, a claim raised. Form 1230 will be rendered, showing whether a charge has been made, or whether the loss is a write-off at the expense of Air Force funds.

(b) The original and duplicate copies of the discrepancy report will be forwarded through the usual channels to the consignor, attached to the issue voucher (Form 712A or 600). The triplicate copy will be retained in the book.

(c) A note will be made on both copies of the issue voucher against the item or items concerned, stating the actual quantity received and brought on charge. A reference to the discrepancy report will be inserted on the issue voucher, but the consignor's original figures must not be altered.

(d) On receipt of the discrepancy report the consignor will cause immediate enquiry to be made regarding the discrepancy and will take such other action as he may consider advisable ; if necessary, the stock will be verified. A reply will be sent to the consignee within seven days.

(e) If the discrepancy is admitted, the consignor will, if necessary, adjust the discrepancy in his accounts by certificate voucher, attaching the duplicate copy of the discrepancy report in support of the adjustment. The certificate voucher and issue voucher will be cross-referred. The certificate voucher number will be shown on both copies of the discrepancy report, and the original copy of the report will be endorsed "Discrepancy admitted" and returned to the consignee. The consignee will attach the report to the relative receipt voucher.

(f) When the discrepancy reported is a deficiency, the consignee will always state on Form 594 the conditions of the package on receipt, the time which elapsed between receipt and unpacking of the consignment and any other particulars bearing on the matter.

(g) If the consignor does not admit responsibility for the deficiency, after investigation has been made by both parties, a report of the matter, with copies of all correspondence relating thereto, will be referred by the consignor to the Air Ministry or P.M.O. for establishments at home and abroad respectively.

(h) In such circumstances the number of the certificate receipt voucher bringing the disputed stores on charge is to be quoted on the original copy of the discrepancy report returned to the consignee. On receipt by the consignee, the copy of the discrepancy report will be filed with the relative receipt voucher.

(k) As a general rule the duty of investigating losses, and, where necessary, obtaining authority for writing off the lost stores, rests with the consignor, but the consignee is responsible for furnishing him with all information available, and for informing, if necessary, the railway company or carrier delivering the goods of the loss or damage immediately this is ascertained. Only when the loss has obviously occurred at the consignee's end is it incumbent upon the latter to take the necessary action.

2. In cases of breakage or damage in transit, where it is apparent that no actual deficiency exists, the consignee will complete Form 1230 in triplicate giving as full details as possible, and will forward the completed forms to the competent medical authority for any further action necessary.

134. Empties.—1. At home.—Bottles, cases and other containers received with consignments of medical stores are to be sent, when empty, to the R.A.F. Medical Stores Depot, Kidbrooke. Distinguishing marks on cases and price labels on bottles are not to be erased. Care is to be taken that all cases specially made for the transport of medical stores are returned to Kidbrooke. These cases are marked with the letters "M.S.D." and have serial numbers. These numbers are to be quoted on the Forms 600 (issue voucher) returning the cases to Kidbrooke. Where packing cases are received direct from contractors, and where a charge has been made for such, instructions will be given separately for their disposal. Consignments of empties for Kidbrooke will be sent through the unit stores officer from whom a temporary receipt will be obtained pending the receipt of Form 600 duly completed by the Officer Commanding, Medical Stores Depot, Kidbrooke.

2. Abroad.—Sales of empty bottles, packages and other articles will be made under the orders of the air or other officers commanding areas or commands abroad as and when necessary.

135. Supply of artificial Limbs, Eyes and surgical Appliances.—Instructions as to the supply, repair and replacement of artificial and surgical appliances are contained in K.R. and A.C.I., paras. 1659 to 1667.

136. Demand for artificial Eyes and surgical Appliances.—

1. The name and rank of an officer, and the name, rank, trade and official number of an airman for whom an appliance is required, will always be stated in the remarks column of Form 1209. If the supply is a first issue, the fact should be stated; if otherwise, the date of the last issue should be recorded. When appliances are demanded for an officer, a statement that the disease or injury necessitating the supply was sustained in and by the service (if such a certificate is appropriate) will be entered in the remarks column of Form 1209.

2. When surgical appliances are required for officers from the Navy or Army holding temporary commissions in the R.A.F. in respect of service injuries received prior to joining the R.A.F., full particulars of the injury, date, etc., will be given.

137. Issues on Loan.—Medical, surgical or dental equipment issued on loan will not be struck off charge in the account. Issue vouchers, numbered in the ordinary series but endorsed "Loan record only" will be raised on Form 603 in triplicate, and the issue will be recorded from that voucher in a manuscript Loan Book. Two copies of the voucher will be despatched with the loan, with a request that one copy may be receipted and returned.

2. On return of the item from loan, a certificate receipt voucher numbered in the ordinary series but endorsed "Loan Record only," will be raised to clear the entry in the Loan Book.

3. The Loan Book, which should be ruled to show voucher number and date, description of loan, person to whom lent, period of loan, and return voucher number and date, should be examined periodically and the necessity for the continuance of any of the articles loaned reviewed.

138. Articles requiring Repair.—1. When articles require repair a demand will be prepared on Form 1209, stating the nature of the repairs considered necessary. The demand will be forwarded through the usual channels to the Air Ministry. In commands abroad the P.M.O. will make the most economical arrangements for the repair of damaged articles.

2. When articles are sent for repair, the same procedure as for loans is to be followed, except that, when repaired articles are returned, Form 603 will be replaced by Form 712. Forms 712 and 712A in respect of repairs should not be included in the sequence of Receipt Vouchers but in a special sequence of Repair Vouchers.

139. Articles scheduled as dangerous.—When it is necessary to despatch articles scheduled as dangerous, they will not be packed with other goods, but will form a separate consignment. Application for transport will be made on Form 922 marked in red ink "Dangerous" or "Inflammable," as the case may be. Cocaine will invariably be forwarded in a separate package by registered post. (See K.R. and A.C.I., paras. 2455 and 2457.)

140. Expendable Stores.—1. Apart from medicines, tablets, and dressings, certain articles which are liable to become unserviceable through constant use may be regarded as expendable. In such cases the procedure detailed in K.R. and A.C.I., para. 1641, will be followed; examples of such articles are :—

Medical, &c.—

Cloth, india-rubber.	Pillows, india-rubber.
Tubing, drainage.	Brushes, camel hair.
Catheters, other than metal.	Gloves, india-rubber.
Rods, glass, stirring.	Needles, hypodermic and surgical.
Sponges.	Types, test.
Syringes, urethral.	Tubes, test.
Bottles (under 8 ozs.).	

2. *Dental Stores regarded as expendable.*—(a) With the exception of a few items mentioned in (b) below, all items shown in the section of Form 636 headed "Medicaments" may be regarded as expendable.

(b) All expenditure of the following will be supported by a signed manuscript list headed "Expended, or rendered unserviceable through fair wear and tear" :—

Amalgams.	Mercury.
Brushes, bristle.	Murocaine (or other local anæsthetics).
Burs.	Novocaine.
Bottles (under 8 ozs.).	Napkins.
Cones, felt, assorted.	Polishers, buff.
Carborundum discs, wheels, etc.	Points, wood, assorted.
Discs, Moore's.	Saw frames, blades for.
Discs, paper, polishing.	Syringes, needles for.
Discs, rubber.	Syringes, washers for.
Drills.	Solder, silver.
Gutta-percha, Gilbert's.	Tape, white.
Matrices, celluloid and metal.	All precious metals and teeth.
All wires.	

(c) Breakage or expenditure of all other items will be shown on Form 1230.

141. Composite Articles.—Each composite article of equipment, when returned to store, will be accompanied by a list of its contents in triplicate in which deficiencies, damage and expenditure will be recorded, showing the extent and amount against each item. The three copies will be signed and dated by the officer returning the articles. One copy will be placed inside each of the articles and the two remaining copies will be attached to the vouchers forwarded to the consignee. The consignee will return one copy and retain the other two, filing one with the issue voucher and placing one inside the article until conversion or completion is effected in store.

142. Provision of Spectacles.—1. Instructions governing the provision of spectacles and lenses are laid down in K.R. and A.C.I., para. 1653. Spectacles are demanded on Form 1209 accompanied by the prescription form (Army Form I. 1240) which is prepared in duplicate, one copy being forwarded through the usual channels to the Air Ministry where arrangements are made for supply, and the other inserted in F. 48. An entry is to be made in Table 6 of an airman's medical history envelope (Form 48) when spectacles have been supplied.

2. Instructions for obtaining lenses for special goggles are laid down in K.R. and A.C.I., para. 2571.

143. Lens Limits.—No spectacles outside the following limits will normally be supplied (*see* K.R. and A.C.I., para. 1653, cl. 4):—

1. No simple spherical lens will be supplied of less strength than 0·50 dioptré nor of a greater strength than 10·00 dioptrés.

2. No simple cylindrical lens will be supplied of a less strength than 0·50 dioptré, nor of a greater strength than 6·00 dioptrés.

3. No sphero-cylindrical lens will be supplied having before or after transposition—

(a) One of its component parts less than 0·50 dioptré and the other component part less than 1·00 dioptré.

(b) A combined strength greater than 12·00 dioptrés, or

(c) A cylindrical strength greater than 6·00 dioptrés.

4. No sphero-cylindrical lens will be supplied having a concave-spherical surface combined with a convex-cylindrical surface. All such combinations are capable of being transposed into a lens having a convex-spherical surface combined with a concave-cylindrical surface.

5. No quarter-dioptre lenses will be supplied above 3.00 dioptries and no half-dioptre lenses above 6.00 dioptries. No lenses with intervals of less than quarter dioptries will be supplied.

144. Considerations when ordering Spectacles.—The following general considerations should be kept in mind when ordering spectacles :—

1. Though many men have become so accustomed to the use of spectacles in civil life, especially when engaged in clerical work, that they may be at a serious disadvantage without them, yet there are many who have never worn spectacles although they have a definite error of refraction, and they will not wear them unless they find obvious benefit from their use. This is especially so in wet weather when the difficulty in keeping glasses clean makes many men prefer to do without them.

2. As a matter of experience it is found that men in the following classes do not as a rule require spectacles, and that their supply to such men is not justified :—

- (a) Men with myopia of 1D and under.
- (b) Men with hypermetropia of 2D and under, who are below the age of 30 years.
- (c) Men with a slight degree of astigmatism, even though they complain of occasional headaches.
- (d) Men with one amblyopic eye and the other with normal vision.

SECTION III.—DAMAGES, LOSSES AND DEFICIENCIES.

145. Losses and Deficiencies.—Medical, surgical and dental stores, broken, deficient, lost or damaged, unserviceable through fair wear and tear, or of obsolete pattern, will be dealt with in accordance with the procedure laid down in K.R. and A.C.I., Chapter XIX, section VIII. The authority for writing any article off charge will be quoted in, and will accompany, the ledgers.

146. Assessment of Charges.—When charges are made for articles so damaged as to be rendered unfit for further use every reasonable and just allowance will be made for fair wear and tear on the same scale as for R.A.F. general stores which is laid down in A.P. 830, Vol. 1, paras. 1580 to 1582. The charges to be made will be taken from the current Priced

List of Medical Equipment for the Army. If the article is not quoted therein, the charge will be ascertained from the Air Ministry.

Charges for articles lost or damaged (culpably or through contributory neglect) will be assessed as follows :—

1. *Repairable Damage*.—Actual cost of repair, obtained when necessary from the Air Ministry, both wages and material or components, together with the appropriate increases in respect of overhead services and departmental expenses, provided that this does not exceed the actual value of the whole article, in which case the air or other officer commanding may authorise the lesser amount to be charged.

2. *Loss or Damage beyond Repair*.—The full value of the article when new, together with departmental expenses, unless it is established by evidence that the actual value is less, in which case a depreciated rate of not less than three-fifths (one quarter in the case of textile articles) will be charged.

147. Boards of Survey.—1. Survey boards on medical, surgical and dental stores will be assembled on the authority of the competent medical authority of an area or independent command.

2. The board will be composed of officers of the medical service and will consist of a president and, if available, two members. The president should be an officer not below the rank of Squadron Leader. Where dental stores are being conditioned a dental officer should be detailed as one of the members.

3. The articles to be surveyed will be detailed on Form 681, compiled in duplicate, and both copies signed in the appropriate space by the officer in whose charge the stores are held.

4. Both copies of Form 681 will be forwarded to the competent medical authority, who will sign in the space provided to authorise the convening of the board.

5. The board will condition the articles to be surveyed under the appropriate headings shown on the form.

6. On completion of the survey, both copies of Form 681 will be forwarded to the competent medical authority for his approval and signature.

7. Articles recommended to be destroyed will not be written off charge until authority has been obtained from the competent medical authority, and until destruction has been carried out in the presence of an officer, who will sign the necessary certificate of destruction on the Form 681.

8. In dealing with unserviceable stores, the competent medical authority will satisfy himself, before he issues instructions for reduction to produce, that the articles are no longer of use for their purpose. Care should be taken to save all materials of value such as metal parts of X-ray tubes, platinum, silver, etc.

9. The produce will be brought to account by conversion voucher (Form 21) prepared from the proceedings of the board of survey, and will be disposed of under the instructions of the air or other officer commanding. A list of repairable articles, other than those requiring minor repairs, will be forwarded to the Air Ministry through the usual channels, and instructions requested as to their disposal.

SECTION IV.—SCALE, STORAGE, CARE AND INSPECTION OF MEDICAL MOBILIZATION STORES.

148. Scale.—The scale of medical mobilization equipment is laid down in the Unit Equipment Tables, A.P.1805, and is standard for all types of unit when mobilized for any purpose. These stores are held at the Medical Stores Dépôt, Kidbrooke, and will be despatched, when necessary, as part of the unit mobilization equipment to the station or port of embarkation where they are required. In commands abroad, medical emergency stores do not conform to this scale but will consist of a reserve supply for three months, which is to be turned over at regular intervals. These stores will be held at the medical stores dépôt of the command abroad, or, where no dépôt exists, at each station.

149. Care of articles liable to Rust.—Steel and plated articles are best preserved by occasionally wiping them over with a clean soft, but not fluffy, cloth made slightly greasy with soft paraffin, care being taken not to dull the edges of cutting instruments.

150. Turnover.—1. At medical stores dépôts, articles of mobilization or emergency equipment liable to deterioration will be turned over, as far as possible, by issue to stations or hospitals at least every two years. Abroad, demands to replace such articles will immediately be forwarded through the usual channels.

2. Medical mobilization or emergency equipment will be kept at all times ready for immediate issue and will be reserved exclusively for the unit to which it is allotted. No portion of this equipment (except as allowed by sub-para. 1 above) will be taken into use in peace time without prior sanction from the Air Ministry.

3. Articles will not be removed from medical mobilization or emergency equipment until a new supply has been obtained to replace them.

151. Half-yearly Inspection of Emergency Equipment Abroad.—On 1st January and 1st July, P.M.Os. will arrange for the assembly of a board of medical officers to examine thoroughly the emergency equipment held on charge. The board will report on Form 681, for the information of the Air Ministry, the number of composite articles of medical equipment examined, their condition, and the steps recommended to be taken for the replacement or exchange of any item. The board should also state what items can be utilized, with a view to facilitating an adequate turnover.

SECTION V.—FIRST-AID AEROPLANE SATCHELS.

152. First-aid aeroplane satchels will be held on charge in the medical account (Form 1214) of a unit by the unit medical officer.

153. Satchels, on the scale of one for each single or two-seated, and three for all other types of aeroplane abroad, and in units at home as detailed from time to time in Air Ministry Orders, will be demanded by flight commanders from the unit medical officer. These satchels will not be struck off charge in the medical store account (Form 1214), but a temporary receipt on Form 1209 will be obtained by the medical officer to support the account.

154. The proper condition of the satchel and contents will be the responsibility of the medical officer, who will periodically inspect them to ensure that both satchels and contents are serviceable and in accordance with the authorised scale.

155. Flight commanders will be responsible for the presence of a satchel on each aeroplane, and for loss or damage to the satchel or its contents whilst in their charge.

156. Details of loss of or damage to the satchel, or expenditure requiring replacement, will be notified by the flight commander to the unit medical officer.

157. In the event of loss of or damage to the satchel or its contents, the procedure laid down in K.R. and A.C.I., paras. 1644 to 1647, will be followed.

158. Replacements of the satchel or its contents will be demanded by the medical officer as laid down in K.R. and A.C.I., paras. 1637 and 1638.

SECTION VI.—MEDICAL STORES ON BOARD R.A.F. TRANSPORTS.

159. Medical Stores—how demanded.—Medical stores as scheduled in the "Unit equipment tables for R.A.F. Transport Vessels" (A.P. 1373) will be issued to R.A.F. transports at the beginning of each trooping season under arrangements made by the Air Ministry, and placed on board under the direction of the embarkation officer (K.R. and A.C.I., para. 932). Demands for subsequent voyages will be made out as detailed in K.R. and A.C.I., para. 1637, and will be forwarded by the S.M.O. of the transport direct to the Air Ministry in sufficient time to allow for packing and issue of stores.

160. Issues other than to Troops.—In the event of medical stores being issued other than for the treatment of troops on board transports or freight ships, a receipt will be obtained as a voucher to support the ledger.

161. Accounting.—Medical stores will be accounted for in accordance with the instructions laid down in K.R. and A.C.I., para. 1639, cl. 7. At the beginning of each voyage the S.M.O. of the transport will arrange for a complete check of all stores as soon as possible, and on arrival at the port of destination a fresh stock-taking will be carried out and the account completed to show the balance in hand.

162. On Termination of Voyage.—On completion of the voyage, whether at home or abroad, the medical stores will be dealt with as follows :—

1. Where troops are about to be embarked in the transport at the same port within a few days, if the officer in medical charge of the transport is to remain on board for another voyage, the medical equipment will remain in his charge, satisfactory arrangements being made by him for its safe custody. Otherwise the medical N.C.O. on permanent duty in the ship will be responsible for the stores during the time that no medical officer is available. He will hand over the stores to the S.M.O. at the beginning of a voyage and will take them over again at the end.

2. Where the transport is proceeding without medical personnel to another port to embark troops, the medical stores will be vouchered, checked and packed and handed over to the master of the ship, who will be responsible for their safe custody until delivered by him to the officer assuming medical charge where troops are to embark.

3. Where the transport is not being further used for the transport of troops, the medical stores will be returned to the R.A.F. Medical Stores Depôt, Kidbrooke, accompanied by the ledger.

163. Expendable Stores.—Expendable stores will be written off ledger charge when issued to the dispensary, a receipt being obtained from the orderly in charge to support the ledger account.

164. Vaccines, Sera and Calf Lymph will invariably be kept in the ship's cold-storage room.

SECTION VII.—PRECAUTIONS TO BE OBSERVED IN CONNEXION WITH X-RAY INSTALLATIONS.

165. General.—The dangers of over-exposure to X-rays and radium can be avoided by the provision of adequate protection and suitable working conditions. It is the duty of those in charge of X-ray and radium departments to ensure such conditions for their personnel. The known effects to be guarded against are :—

1. Injuries to the superficial tissues.
2. Derangements of internal organs and changes in the blood.

166. Working Hours.—The following hours which are recommended for whole-time X-ray and radium workers in civilian institutes are added for guidance only, as it is realised that the exigencies of the service do not permit of their complete adoption in service medical establishments.

1. Not more than seven working hours a day.
2. Not more than five working days a week. The off-days to be spent out of doors as much as possible.
3. Not less than one month's holiday a year.
4. Whole-time workers in hospital X-ray and radium departments should not be called upon for other duty.

167. General X-ray Recommendations.—1. X-ray departments should not be situated below the ground floor level.

2. All rooms, including dark rooms, should be provided with windows affording good natural lighting and ready facilities for admitting sunshine and fresh air whenever possible.

3. All rooms should be provided with adequate exhaust ventilation capable of renewing the air of the room not less than ten times an hour. Air inlets and outlets should be arranged to afford cross-wise ventilation of the room.

4. All rooms should preferably be decorated in light colours.

5. X-ray rooms should be large enough to permit a convenient lay-out of the equipment. A minimum floor area of 250 square feet (25 square metres) is recommended for X-ray rooms and 100 square feet (10 square metres) for dark rooms. Ceilings should not be less than 11 feet (3.5 metres) high.

6. A working temperature of about 18° C. (65° F.) is desirable in X-ray rooms.

7. Whenever practicable, the X-ray generating apparatus should be placed in a separate room from the X-ray tube.

168. X-ray Protective Recommendations.—1. An X-ray operator should on no account expose himself unnecessarily to a direct beam of X-rays.

2. An operator should place himself as remote as practicable from the X-ray tube. It should not be possible for a well-rested eye of normal acuity to detect in the dark appreciable fluorescence of a screen placed in the permanent position of the operator.

3. The X-ray tube should be surrounded as completely as possible with protective material of adequate lead equivalent.

4. The following lead equivalents are recommended as adequate :—

<i>X-rays generated by Peak Voltages not exceeding</i>			<i>Minimum Equivalent Thickness of Lead.</i>		
75 K.V.	1	mm.
100 „	1.5	
125 „	2	
150 „	2.5	
175 „	3	
200 „	4	
225 „	5	

5. In the case of diagnostic work, the operator should be afforded protection from scattered rays by a screen of a minimum lead equivalent of 1 mm.

6. In the case of X-ray treatment, the operator is best stationed completely outside the X-ray room behind a protective wall of a minimum lead equivalent of 2 mm. This figure should be correspondingly increased if the protective value of the X-ray tube enclosure falls short of the values given in 4, above. In such event, the remaining walls, floor and ceiling may also be required to provide supplementary protection for adjacent occupants to an extent depending on the circumstances.

7. Screening examinations should be conducted as rapidly as possible with minimum intensities and apertures.

8. The lead glass of fluorescent screens should have the protective values as recommended in 4, above.

9. Screening stands and couches should provide adequate arrangements for protecting the operator against scattered radiation from the patient.

10. A fluorescent screen should, if necessary, be provided with a protective "surround" so that adequate protection against direct radiation is afforded for all positions of the screen and diaphragm.

11. Inspection windows in screens and walls should have protective lead values equivalent to that of the surrounding screen or wall.

12. Efficient safeguards should be adopted to avoid the omission of a metal filter in X-ray treatment.

13. Protective gloves, suitably lined with fabric or other material, should have a protective value not less than $\frac{1}{2}$ mm. lead throughout both back and front (including fingers and wrist). Protective aprons should have a minimum lead value of $\frac{1}{2}$ mm.

169. Electrical Precautions in X-ray Rooms.—1. The floor-covering of the X-ray room should be of insulating material such as wood, rubber or linoleum.

2. Overhead conductors should be not less than 9 ft. from the floor. They should consist of stout metal tubing or other coronaless type of conductor. The associated leads should be of coronaless wire kept taut by suitable rheophores.

3. Wherever possible, earthed guards should be provided to shield the more adjacent parts of the high tension system. Unless there are reasons to the contrary, metal parts of the apparatus and room should be efficiently earthed.

4. The use of quick acting double-pole circuit breakers is recommended. Over-powered fuses should not be used. If more than one apparatus is operated from a common generator, suitable overhead multi-way switches should be provided.

5. Some suitable form of kilo-voltmeter should be provided to afford a measure of the voltage operating the X-ray tube.

170. Radium Protective Recommendations.—A. *Radium Salts.*—1. Protection for radium workers is required from the effects of :—

- (1) Beta rays upon the hands.
- (2) Gamma rays upon the internal organs, and the vascular and reproductive systems.

2. In order to protect the hands from Beta rays, reliance should be placed, in the first instance, on distance. The radium should be manipulated with long-handled forceps, preferably made of wood, and should be carried from place to place in long-handled boxes lined on all sides with about 1 cm. of lead. All manipulations should be carried out as rapidly as possible.

3. In order to protect the body from the penetrating Gamma rays during the handling of radium, a screen of not less than 1 in. thickness of lead should be used. Proximity to the radium should only occur during actual use and for as short a time as possible.

4. Radium, when not in use, should be stored in a safe as distant as possible from all personnel. It is recommended that radium tubes or applicators be inserted into separate lead blocks in the safe, giving a thickness of protective wall amounting to 5 cms. of lead per 100 milligrammes of radium element.

5. A separate room should be provided for the "make-up" of screened tubes and applicators, and this room should only be occupied during such work.

6. The measurement room should be a separate room and it should contain the radium only during its actual measurement.

7. Nurses and attendants should not remain in the same room as patients who are undergoing radium treatment.

8. All unskilled work, or work which can be learnt in a short period of time, should preferably be carried out by temporary workers who should not be engaged on such work for periods exceeding six months. This also applies to nurses and those engaged in "making-up" applicators.

9. Discretion should be exercised in transmitting radium salts by post. In the case of small quantities, it is recommended that the container should be lined throughout with lead not less than 3 mms. thick. It is more satisfactory to transport large quantities by hand in a suitably designed carrying case.

B. *Emanation*.—1. In the manipulation of emanation, protection against the Beta and Gamma rays has likewise to be provided.

2. The handling of emanation should be carried out, as far as possible, during its relatively inactive state.

3. The escape of emanation should be very carefully guarded against, and the room in which it is prepared should be provided with an exhaust fan.

4. Where emanation is likely to come in direct contact with the fingers, thin rubber gloves should be worn to avoid contamination of the hands with active deposit. Otherwise, the protective measures recommended for radium salts should be carried out.

5. A separate pumping room should be provided with a connecting tube from the special room in which the radium is stored in solution. The radium in solution should be heavily screened to protect people working in adjacent rooms. This is done preferably by placing the radium in solution in a lead-lined box, the thickness of lead recommended being according to the table below :—

<i>Quantity of Radium Element.</i>				<i>Thickness of Lead.</i>	
0.5 gram	..	..	..	6 in.	(15 cms.)
1.0	„	..	..	6.6 „	(16.5 „)
1.5	„	..	..	6.8 „	(17 „)
2.0	„	..	..	7.2 „	(18 „)

Note.—The above are the International Recommendations for X-ray and Radium Protection.

CHAPTER V.

HYGIENE AND PATHOLOGY.

SECTION I.

The Principal Medical Officer.

171. The Duties of the Principal Medical Officer are laid down in K.R. and A.C.I., Chapter XIX, Section III, paras. 1457 to 1464.

The Deputy Principal Medical Officer (Hygiene).

172. Duties.—Under the P.M.O., the D.P.M.O. (Hy.) is the advisory authority on all questions relating to hygiene, as laid down in K.R. and A.C.I., Chapter XIX, Section III, paras. 1466 to 1472.

173. Vaccination and Inoculation.—He will ensure that the provisions of K.R. and A.C.I., para. 1416, are observed.

174. Annual Report.—The annual report referred to in K.R. and A.C.I., para. 1472, will be prepared on the lines laid down in A.M.W.O. 445/29.

The Officer Commanding, R.A.F. Pathological Laboratory.

175. Duties.—1. *Advisor to the Director of Medical Services.*—The Officer Commanding R.A.F. Pathological Laboratory is the advisor to the Director of Medical Services on all technical questions relating to pathology, bacteriology, bio-chemistry and tropical medicine, and in this connexion may correspond direct with the Directorate of Medical Services, Air Ministry.

2. *Training.*—He will make recommendations to the Director of Medical Services as to the selection of officers and airmen for training in pathological duties. He will be responsible to the Director of Medical Services for the organisation of this training, and may be required to carry it out.

3. *Medical Services Examination Committee.*—He will be available as a member of the Medical Services Examination Committee.

4. *Research.*—He will be responsible to the Director of Medical Services for the initiation, organisation and conduct of all research in connexion with the subjects mentioned in clause 1 above, and in such other subjects as the Director of Medical Services may from time to time add thereto.

5. *Supervision.*—He will supervise the technical conduct of all clinical laboratories, and will ensure that the pathological and bacteriological facilities for prophylaxis, diagnosis and treatment are adequate, accessible, prompt and economical, For this purpose he will, by previous arrangement with the officer commanding the hospital concerned, visit each air force clinical laboratory in the home commands at least once in every year and will on these occasions have access to such personnel, material and documents as may be necessary for the prosecution of his duties. In order to make the necessary arrangements he will correspond direct with the officers commanding hospitals.

6. *Routine Pathological Examinations.*—He will be responsible for the conduct of routine examinations of material as laid down from time to time, and in order to make the necessary arrangements for this purpose may correspond direct with officers in medical charge of units.

7. *Annual Laboratory Reports.*—He will receive the annual laboratory reports of all air force clinical laboratories and will compile from them a summary, which he will forward to the Director of Medical Services not later than 31st March of the following year.

8. *Correspondence.*—Except where otherwise stated or implied above, he will correspond only with the competent medical authority.

Duties of Medical Officers.

176. References.—The chief duties in regard to hygiene of an officer in medical charge of air force personnel, and his relationship to other officers, are laid down in K.R. and A.C.I., Chapter XIX, and paras. 58, 1830 and 1845. Medical officers further will make themselves acquainted, so far as is applicable, with the following :—

Regulations for the provision of Foodstuffs and Forage, (A.P. 112).

Regulations for Works Services (A.P. 855).

Handbook for Adjutants (A.P. 837).

Field Service Pocket Book (A.P. 1081).

Instructions for Store Accounting and Store Keeping (A.P. 830).

Provisional Barrack and Hospital Schedules (A.P. 59).

A thorough knowledge of the "Manual of Military Hygiene" is essential to medical officers, who should read also the "Army Manual of Sanitation, 1926."

177. Sanitation Inspection.—When inspecting accommodation at a station, as laid down in K.R. and A.C.I., para. 1485, the medical officer will be accompanied by an officer of the unit concerned and an N.C.O. of the unit sanitary detachment. Schools will be inspected at times when the children are present, in order to ascertain whether their studies are pursued under hygienic conditions. The medical officer will note in his sanitary diary any conditions likely to affect the health of the children, and make such representations as circumstances demand.

At marching-in inspections and inspections by the P.M.O. and senior works officer, the unit medical officer will be present. He may be detailed to attend any board on appropriation of sites, etc., and at times will be called upon to advise the C.O. on the sanitary requirements of new proposals. (See K.R. and A.C.I., paras. 1833, 1837, 1849, 1850 and 1852.)

178. Medical Examinations and Inspections.—*Airmen.*—Whenever special examinations of airmen are made, each man will be examined by the medical officer in private, and in the presence of a third person, who should, where possible, be an N.C.O.

Children.—Children attending air force schools will be medically examined periodically by the medical officer of the station. These examinations will be undertaken in such a way as to interfere as little as possible with school work, and on the following occasions:—

1. At the time of, or shortly after, their first admission to school.
2. At the second, or about the third, year of school life.
3. At the sixth year of school life.
4. Immediately before finally leaving school.

In all cases where physical defects or the presence of disease is observed, the parents should be recommended to adopt suitable treatment, particularly as regards defects of vision, when the timely use of corrective glasses may save the eyesight from permanent injury. The presence of one or other of the parents is desirable at the examination of younger children.

In overseas commands, all school children will be examined annually and a record of each examination will be made in a book kept for such a purpose.

179. Space Allowance in Barracks, etc.—He will satisfy himself that the authorised cubic space for each man (see K.R. and A.C.I., para. 1844) in barracks and guardrooms is actually provided, and that beds are spaced as far away from each other as possible.

180. Ventilation, Lighting, Limewashing, etc.—He will satisfy himself that every barrack, guardroom, and detention room is suitably lighted and provided with sufficient means of ventilation; that the beds and bedding are freely exposed to the air; that the married airmen's quarters, institutes, kitchens, washhouses, workshops, lavatories, urinals and latrines are suitably ventilated and lighted; and that the walls and ceilings of barracks or quarters are clean and in a satisfactory condition. He will ensure that the instructions contained in K.R. and A.C.I., paras. 1485 and 1765, are observed. Reference to the temperature to be maintained in detention rooms will be found in K.R. and A.C.I., para. 1215, cls. 4 and 5.

181. Arrangements for cleansing Drinking Utensils.—He will frequently inspect the method of sterilization of drinking vessels in the station institutes, canteens, etc., and satisfy himself that all cups, mugs, tumblers, etc., are washed in boiling water after use by each person.

182. Food Supplies.—He will supervise the food and messing arrangements at his station as laid down in K.R. and A.C.I., para. 1486. If he considers that any foodstuff is unfit for human consumption he will give the C.O. a certificate to that effect, stating whether the food is fit for other than human consumption or not, and, if applicable, a copy to the institute manager. Should a board of officers be convened, he will be a member. (See K.R. and A.C.I., paras 1776 and 2677.)

Air Publication 112 should be consulted as regards the supply and protection of foodstuffs, ration scales and messing arrangements. Specimens of food and drink will be despatched for analysis as detailed in Section III (below).

183. Dope Workers and Dope Shop.—In connexion with the medical inspection of dope workers and of dope shops, medical officers should note K.R. and A.C.I., paras. 1485, cl. 5 and 6, 1481 and 2660, and the following :—

1. The usual symptoms attributable to the use of dope are headache, drowsiness, dryness of the throat, cough, sense of constriction of the chest, nausea, vomiting, intermittent pulse and progressive loss of weight.

2. The prevention of these symptoms depends on :—

- (a) *Efficiency of Ventilation.*—The air of a room used for doping should be changed thirty times each hour, while the temperature has to be maintained at 68° to 70° F. Mechanical ventilation is necessary, with the

extracting fans at or near the floor level on one side and the air inlets about 10 feet above that level at the opposite side of the room, and with a total area of not less than three times the total area of the extract openings. Slowing the extract fans or blocking the air inlets must not be permitted. Heating should be effected by means of hot water or steam pipes and radiators fixed close to the air inlets.

(b) *Alternation of Work*.—If possible, airmen should not be employed continuously on doping but should be transferred periodically to other work, outdoor for preference. A sufficient break in the morning, to allow of light refreshment (milk or cocoa), is a valuable prophylactic. (See K.R. and A.C.I., para. 2660.)

(c) *Periodic Physical Inspections*.—At the routine monthly inspection of dope workers the medical officer will carefully note any change in any worker's physical condition, and, if such should be observed, he will take steps to remove the worker from dope work or keep him under observation.

184. The Unit Sanitary Detachment.—This detachment, which should consist, as far as possible, of airmen specially trained at a School of Hygiene, has its duties allotted by the C.O., in consultation with the medical officer, and is responsible for executive duties in connexion with conservancy in barracks, camps and billets, and for acting as sanitary police. (See K.R. and A.C.I., paras. 1485 and 1846.)

185. First Field Dressings.—When these have been issued to airmen, the medical officer from time to time should inspect them to ensure that they are in good condition, and at the same time should question the airmen as to the care and method of use thereof. Lectures on the first field dressing will be given periodically by the medical officer.

SECTION II.—CONTROL OF COMMUNICABLE DISEASES.

A.—*General Instructions*.

B.—*Protective Vaccination and Inoculation*.

C.—*Disinfection and Disinfestation*.

D.—*Measures to be adopted in certain Diseases*.

A.—*General Instructions*.

186. Initiation and Enforcement of Preventive Measures.—In this connexion medical officers should be conversant with K.R. and A.C.I., paras. 54, 58, 1399, cl. 7, 1418 and 1474. They should maintain touch with the civil public health

authorities of their districts and arrange with them for the mutual exchange of information as to the occurrence of communicable diseases in their respective spheres. C.Os. are responsible for the enforcement of all measures designed to prevent the occurrence of disease on their stations. (See K.R. and A.C.I., paras. 54 and 58.)

187. Notification of Cases of communicable Disease.—The notification of infectious disease will be carried out as laid down in K.R. and A.C.I., Chapter XIX and para. 1799, cl. 8. Form 418 should not be completed for suspect cases until the diagnosis is confirmed, but precautionary measures should be taken and the C.O. informed.

188. Diseases to be notified.—1. *Notifiable by Law to the Civil Authority* :—

Anthrax.	Pneumonia.
Cerebro-spinal Fever.	(a) Acute Influenzal.
Chicken-pox.	(b) Acute Primary.
Cholera.	Polio-encephalitis.
Diphtheria.	Polio-myelitis.
Dysentery.	Puerperal Pyrexia.
Encephalitis Lethargica.	Puerperal Septicaemia and
Enteric Fever.	Pyæmia.
(a) Typhoid Fever.	Rabies.
(b) Paratyphoid Fever.	Relapsing Fever.
(c) Enteric Group	Scarlet Fever.
(Clinical).	Smallpox.
Erysipelas.	Tuberculosis (all forms).
Glanders.	Typhus.
Malaria (state type and	and any other disease which
whether primary case or	the Sanitary Authority
relapse).	may add with the ap-
Ophthalmia Neonatorum.	proval of the Minister of
Plague.	Health.

2. *Additional Diseases Notifiable in the Royal Air Force* :—

Beri-beri.	Measles.
Bilharziasis	Mediterranean (Undulant
(Schistosomiasis).	Fever) Fever.
Blackwater Fever.	Mumps.
Enteritis (infective).	Rubella.
Food poisoning (due to any	Tetanus.
cause).	Trench Fever.
Jaundice.	Whooping Cough.
Leishmaniasis.	Yellow Fever.
(a) Kala-Azar.	
(b) Oriental Sore.	

3. *Special Reports* will be rendered by the P.M.O. in the event of an outbreak of communicable disease of unusual extent either among R.A.F. personnel or the civil population of any unit, camp or neighbourhood, for the information of the Air Ministry. A report on the occurrence of a case of any dangerous communicable disease should also be made. (See para. 195 below, and K.R. and A.C.I., para. 1461.)

189. Definitions of Special Terms.—1. *Contact*.—Contacts are those who have closely associated with a person infected with a communicable disease, *e.g.*, those who sleep in beds adjoining or directly opposite, those who occupy the same tent, and close friends of the infected person. Medical officers are required to use their discretion in dealing with other possible contacts, having regard to the nature of the disease and the length of exposure to infection.

2. *Carrier*.—A carrier is a person who harbours and excretes pathogenic infective material without showing the usual evidences of the disease produced by the material in question. Carriers may be classified as follows :—

(a) *True Carriers*, who, according to the nature of the disease, harbour in the naso-pharynx, alimentary tract, urine, blood or skin, organisms which are pathogenic and virulent ; they may be subdivided into

- (i) Incubationary carriers.
- (ii) Convalescent carriers (temporary or chronic).
- (iii) Contact carriers (temporary or chronic).

(b) *Pseudo Carriers*, who harbour organisms indistinguishable except by strict tests from pathogenic and virulent organisms. Pending complete investigation, these must be regarded as true carriers.

3. *Suspects*.—A suspect is a person showing signs or symptoms which, though not definitely diagnostic in character, may indicate some stage of a communicable disease.

4. *Quarantine*.—Quarantine is the application of such restrictive measures to the activities of contacts, carriers, suspects and cases of communicable disease, as may be reasonably expected to prevent the further spread of the disease.

(a) *Working Quarantine* is segregation in such a manner, that those so segregated are not brought into contact with other persons, yet their performance of

certain duties such as fatigues, drill, and instruction is not interrupted.

(b) *Absolute Quarantine* is the detention of all contacts and suspects in complete isolation, either individually or collectively, as circumstances may warrant.

190. Establishment of Quarantine Measures at a unit will be made by the C.O. when necessary, on the recommendation of the medical officer. (See K.R. and A.C.I., para. 1418, cl. 4.)

Ordinary contacts should be held in working quarantine and will be medically inspected at least once daily, in order that early cases and suspects may be detected.

Absolute quarantine of large bodies of men should be instituted only when a disease of a serious nature exists or threatens to become widely disseminated.

In certain communicable disease all quarantine measures may be dispensed with, reliance being placed upon careful medical inspection conducted at intervals to ensure detection of cases in their early stages.

The medical officer will notify the C.O. when men quarantined can be released.

In case of doubt absolute quarantine should be applied under K.R. and A.C.I., para. 1418, until the S.M.O. Group or P.M.O. Area (and where the civil population is involved the local Medical Officer of Health) have been consulted.

191. Quarantine of Dogs.—See K.R. and A.C.I., paras. 876, 737 and 911.

192. Isolation of Cases.—Medical officers should ensure that all cases of communicable disease are removed from contact with other individuals at the earliest possible moment.

Wherever proper accommodation exists, isolation will be effected in hospital; but where this is impracticable, as frequently happens in the case of officers and their families and amongst the families of airmen, in certain diseases, isolation will be carried out in quarters as far as possible. (See K.R. and A.C.I., Chapter XIX.)

When considered necessary, in the event of an epidemic, cases may be isolated and treated in a suitable quarter on the station, chosen temporarily for this purpose.

Cases under observation may be accommodated in the observation ward of station sick quarters. (*See* K.R. and A.C.I., para. 1585.)

193. Disinfection of Vehicles.—The interior of the ambulance or other vehicle used to transport cases of infectious disease will be disinfected by spraying with formalin solution or by swabbing with $2\frac{1}{2}$ per cent. cresol solution, immediately after use; all articles accompanying the patient, or used in connexion with the removal, will be suitably disinfected.

194. Communicable Diseases and Attendance at Schools.—Special care should be taken to prevent children of an infected family attending school until the medical officer certifies that they can do so without risk of spreading infection. R.A.F. schools will not, as a rule, be closed in consequence of the occurrence of communicable disease, but should the outbreak assume an epidemic form or should the medical officer, for any special reason, deem it necessary that the school should be closed, he will inform his P.M.O., who, if he sees fit, will advise the air or other officer commanding to order the closure.

195. Investigation of Outbreaks.—The main inquiry should be directed to the known routes of infection for the particular disease concerned. The possibility of cases having been missed, either through errors in diagnosis or through failure of the patient to report sick, should be borne in mind. Early information should be obtained as to the movements of the first patients during the three weeks immediately preceding the onset of their illness. The subsequent series of cases and its connexion with the first cases or with a common cause should be carefully traced, recorded in detail and plotted out on a spot map. Unless there is distinct evidence of another source of infection, attention should be directed to any sanitary defects in the station, camp or their surroundings. Investigation should be made regarding food, water, milk and other supplies, both official and private; the methods of disposal of refuse and excreta; the existence of breeding places of flies and other disease vectors, and their presence in excessive numbers.

In reporting on the outbreak, reference should be made to methods adopted for the isolation of the sick, segregation and observation of contacts and carriers, disinfection, and general sanitary measures which have been taken.

196. Table of Incubation and Segregation Periods.

Disease.	Incubation Period.		Segregation Period for Contacts.
	Usual.	Ordinary Limits.	
Scarlet fever	2-3 days	1-8 days	7 days.
Measles	14 "	7-14 "	Contacts examined between 7th and 14th days.
Rubella	15-18 "	5-21 "	Contacts examined between 5th and 21st days.
Mumps	18-21 "	12-23 "	None.
Small-pox	12 "	10-14 "	Successful vaccination or 2 weeks.
Chicken-pox	12-14 "	11-21 "	3 weeks.
Whooping cough ..	7-14 "	6-18 "	None except infants.
Diphtheria	2-5 "	2-10 "	3 days ; depends on bacteriological examination.
Cerebro-spinal fever	2-5 "	—	} Swab throats. Space out beds.
Poliomyelitis ..	—	—	
Encephalitis lethargica.	—	—	
Typhoid fever ..	10-14 days	8-21 days	—
Paratyphoid fever..	10-14 "	8-21 "	—
Cholera	1-3 "	1-8 "	10 days.
Bacillary dysentery	1-3 "	1-5 "	During cholera season only.
Plague	3-5 days	1-8 days	10 days.
Typhus fever ..	5-8 "	4-14 "	16 days after disinfection.
Relapsing fever ..	8-10 "	2-14 "	14 days after disinfection.
Trench fever ..	5-9 "	5-21 "	—
Yellow fever ..	3-4 "	2-5 "	5-6 days.
Rabies	6 weeks	7 days to 6 months.	—

B.—VACCINATION AND INOCULATION.

Vaccination.

197. The duties of medical officers in regard to vaccination and inoculation are laid down in K.R. and A.C.I., paras. 1416 and 1489.

198. Re-vaccination of officers and airmen will be carried out every five years, unless special circumstances (*see* para. 201) require it to be done at an earlier date. Particulars will be noted on Form 48. Officers' families will also be given the opportunity of similar protection.

199. Families of Airmen.—Medical officers who perform the vaccination of infants required by law will complete the blank certificate of vaccination given to the parents at registration of birth, and instruct them to send it to the Vaccination Officer, whose address will be found on the certificate.

The state of vaccination of all wives and children on a station will be ascertained yearly, and steps taken to recommend and carry out re-vaccination where necessary (*see* K.R. and A.C.I., para. 1416, cl. 9).

Families, before embarkation for abroad, are required to obtain a certificate of vaccination in accordance with K.R. and A.C.I., para. 937.

200. Failure of Vaccination.—In cases where vaccination or re-vaccination of a person fails, unless the previous successful vaccination was within five years, three successive operations will be carried out at intervals of one month, to ensure that failure is due to an acquired immunity. An entry to this effect will be made in the usual documents.

The number of apparent failures to re-vaccinate suggests that there may be some misconception as to the true nature of a normal positive response to secondary vaccination. This is described as being divisible into three groups: (1) those which are practically primary vaccinations and imply the disappearance of immunity previously acquired; (2) those which show the primary reactions accelerated by a few days; and (3) those which run a very short, mild and rapid course, with a period of incubation of one day, producing no vesicle and disappearing completely within a few days.

201. Re-vaccination in Epidemics.—When an epidemic of smallpox occurs, vaccination will be recommended in all cases in which there is no satisfactory evidence that it has been done within two years.

202. Source of Calf Lymph (*see* K.R. and A.C.I., para. 1637, cl. 5).—Medical officers must ensure that all unused stocks of calf lymph are returned, and that reports on the results of all used tubes are rendered, to the Government Lymph Establishment (or other source of supply) in accordance with their requests. It is important that quantities of lymph in excess of that likely to be used in any one week should not be indented for.

For stations abroad, supplies of lymph will be sent out in cold storage at regular intervals or on demand, unless other local arrangements have been made.

203. Instructions to Vaccinators.—1. The medical officer must ascertain whether the airman is in a fit and proper state of health to be vaccinated.

2. The lymph for vaccination must be used within one week of its receipt ; in the interval it should be kept in a cool place.

3. The medical officer must keep such record of the lymph that he has used as will enable him at any time to identify the lymph used for any particular vaccination.

4. The vaccination should be performed with an instrument of such a character, and in such a way, as will obviate the drawing of blood ; a lancet with a metal handle or a needle should be used. *The handle of the instrument should not be used for rubbing in the lymph.*

5. The instrument should be sterilised by first dipping it into methylated spirit, and afterwards passing it through a flame.

6. The medical officer must keep in good condition the lancets or other instruments which he uses. When he vaccinates he must cleanse and sterilise his instrument after one operation before proceeding to another. When once he has unsealed the tube of lymph, he must never attempt to keep any part of its contents for the purposes of vaccination on a future occasion. The tube should be broken with a sterilized forceps. In no circumstances should the mouth be applied directly to expel the lymph by blowing ; an artificial expeller must be used for this purpose.

7. Vaccination should at every stage be carried out with aseptic precautions. These should include first the cleansing of the skin before vaccination ; secondly, the use of sterilized instruments ; and, thirdly, the protection of the vaccinated surfaces against extraneous infection at any time.

8. The site for vaccination is usually on the upper arm, not lower than the insertion of the deltoid muscle. Females may desire to be vaccinated on the external aspect of the thigh, immediately above the knee.

9. The cleansing of the skin should be carried out by washing with soap and water or with spirit.

10. In all ordinary cases of vaccination or re-vaccination, the operation should be done by means of a single vertical linear incision or scratch, one quarter of an inch long, merely through the epidermis. This incision should be in the long axis of the limb.

The lymph may be applied to the cleansed skin and the incision made through it, or the lymph may be applied to the whole length of the incision immediately after the latter has been made.

Only gentle rubbing with the side of the needle or lancet blade must be employed in applying the lymph.

The aim of the vaccinator should be to produce successful vaccination with the minimum of injury to the tissues.

This method of vaccination is considered to give a reasonable degree of protection against smallpox, but if any adult desires to obtain at once the greatest possible immunity, then at his request the medical officer may increase the number of vertical incisions to a maximum of four, each one quarter of an inch long, and approximately one inch apart.

11. A protective covering must be so applied as to avoid constricting the vaccinated surface. Boric lint, two and half inches square, forms a suitable protective dressing; this is kept in position by strips of adhesive zinc oxide plaster which must not completely encircle the limb. A bandage should not be used for the purpose.

12. The vaccinated person must be instructed to report immediately if the protective dressing slips and exposes the vaccinated surface.

13. Vaccinated persons should be dealt with as out-patients, and, if necessary, seen daily; this is particularly important from the 5th to the 10th day, during which period a sling for the arm may be required.

14. *If the protective dressing adheres to any part of the vaccinated surface, it must be removed with the utmost care, using boiled water for this purpose. The arm should be redressed at intervals as required until the vaccinated area has healed.*

Inoculation.

204. Typhoid and Paratyphoid Fevers.—Protective inoculation against these diseases is not considered necessary for personnel stationed at home, except under the following circumstances :—

1. When an outbreak of any of these diseases occurs in an air force station or its vicinity, or in an area in the United Kingdom to which men on leave or duty are likely to proceed.
2. On special instructions being issued by the Air Ministry.

205. Inoculation and re-inoculation.—Inoculation and re-inoculation, before embarkation for service abroad and while serving in a foreign station, will be governed by the following principles :—

1. The protection given by two doses ($\frac{1}{2}$ c.c. first dose and 1 c.c. second dose, 10 days later) of T.A.B. vaccine lasts for a period of one year and that from a single dose (of 1 c.c.) for about six months. The maximum degree of protection, however, will not be attained unless the two doses are given; this should be pointed out to persons about to be inoculated.

2. Persons who have never been inoculated and those whose immunity is either exhausted or is approaching exhaustion (as defined above) should be inoculated with two doses of the vaccine.

3. All personnel stationed abroad should be re-inoculated every year by the two-dose method, preferably during the cool season.

206. Families.—These recommendations apply also to families proceeding abroad. For women of light weight or poor physique the dose may be reduced to $\frac{2}{3}$ of that for an adult man. For children the dose should be less than that for an adult, viz. :—

For children from 5 to 10 years	$\frac{1}{4}$ dose.
„ „ „ 10 „ 15 „	$\frac{1}{2}$ dose.
„ „ „ 15 „ 18 „	$\frac{3}{4}$ dose.

No inoculation should be given to children under 5 years of age.

207. Record and Returns.—Records of the inoculation state will be entered on Forms 48 as follows :—

1. *Two-Dose Method.*— $\frac{1}{2}$ c.c. as first dose, followed by 1 c.c. 10 days later; the dates on which the first and second inoculations were given and the initials of the medical officer will be entered thus :—

$\frac{\text{T.A.B.}}{2.}$ } 1-8-31. A.B.
 } 10-8-31. A.B.

2. *One-Dose Method.*—1 c.c. only being given; thus :—

$\frac{\text{T.A.B.}}{1.}$ } 1-8-31. A.B.

208. Issue of Vaccines.—See K.R. and A.C.I., para. 1637, cl. 5. In order to minimise waste, the vaccine is sent out in rubber-capped bottles holding 25 c.c. or 50 c.c., and in ampoules holding 1 c.c. and 0.5 c.c.

In view of the labour involved in the preparation and standardization of the vaccine, every endeavour should be made to economise it as far as possible.

Each bottle is labelled with the following particulars :—

1. Nature of vaccine.
2. Serial number.
3. Dose.
4. Directions.
5. Date before which the vaccine should be used.

209. Method.—1. *Care and use of the syringe.*—A small graduated syringe of 1 to 5 c.c. is most suitable for the injection of vaccines. The syringe and needles should be sterilised by boiling in the usual way, and allowed to cool prior to filling with the vaccine.

To fill the syringe from the rubber-capped bottles, or the small ampoules :—

Shake the bottle. Sterilize the rubber cap with tincture of iodine or spirit. Invert the bottle and puncture the rubber cap with the needle through the sterilized area. Then slowly fill the syringe, taking care to keep the point of the needle immersed in the vaccine.

Shake the ampoule. A file mark should be made on the neck of the ampoule, which should then be sterilized in the flame and broken off with sterile forceps; the ampoule is inverted, the sterile needle introduced and the syringe filled.

A fresh sterile needle is required for each inoculation, but it is unnecessary to boil the syringe between each injection.

2. *Injecting the vaccine.*—The site for inoculation with T.A.B. and cholera vaccines is the outer side of the arm at the level of the insertion of the deltoid muscle, and for plague vaccine the flank.

The skin should be cleansed previously with antiseptic lotion, alcohol and ether, or by painting the site of inoculation with tincture of iodine which should be allowed to dry before the inoculation is given.

210. Precautions after Anti-Typhoid Injection.—In order to lessen the tendency to “reaction” after anti-typhoid inoculation, the following points should be remembered :—

1. The patient should remain as quiet as possible. Long train journeys are inadvisable after the inoculation, and no appointments involving exertion or fatigue should be made for the remainder of the day.

2. Alcohol in any form should be avoided absolutely for at least 24 hours after the inoculation.

3. If discomfort or malaise supervenes, the wisest course is to go to bed at once, and drink large quantities of water.

In a large proportion of cases, there is little or no reaction, while in a few there is a certain amount of discomfort or transitory illness. It is impossible to foresee, in any given case, whether the reaction will be marked or trifling.

Prophylactic inoculation when possible should be carried out on Saturday morning or afternoon in order that any slight disability resulting may not cause loss of working hours.

211. Influenza.—If an outbreak of influenza is to be anticipated every endeavour should be made to persuade officers, airmen and their families to be inoculated with influenzal vaccine. Each issue of vaccine is accompanied by full instructions.

212. Cholera and Plague.—Personnel stationed in countries where these diseases are endemic should be inoculated with the appropriate vaccine when the situation demands.

C.—Disinfection and Disinfestation.

213. Supervision.—All measures of disinfection and disinfestation will be carried out under medical supervision by fatigue parties from the unit concerned. (See K.R. and A.C.I., para. 1418, cl. 4 regarding the duty of the C.O. in connexion therewith.)

214. Disinfection of Barrack-rooms.—For routine disinfection of barrack and other rooms, it is usually sufficient to spray thoroughly the bedstead recently occupied by the patient, and the walls, floors and other surfaces immediately adjacent, within a radius of 6 feet. The bedstead and the adjacent woodwork and floor will then be washed with soap and hot water containing soda. When chemical disinfection is considered necessary, floors will be washed down with 2½ per cent. cresol solution, or the room fumigated with formaldehyde gas or sprayed with formalin solution. The mattress and other textile articles will be removed in sacks or sheets and treated as described in para. 217 *et seq.*

215. Special Disinfection.—In the presence of communicable disease of a virulent nature or repeated occurrence, this will include disinfection of the whole room, scraping of walls, whitewashing, distempering or papering, and will require the authority of the P.M.O., who will make arrangements with the W. and B. department for the work to be carried out (see A.P. 855).

216. Materials.—All materials required for the processes of disinfection will be obtained by indent from the unit stores officer. The employment of disinfectants for special purposes, or of disinfectants not usually supplied, will be sanctioned only after reference to the P.M.O.

217. Disinfection of Clothing and Equipment.—All articles which may safely be disinfected by steam, will be so treated in an approved disinfector. The following are exceptions:—

1. *Boots, Shoes, Belts, all Leather Articles, Rubber and Felt Goods.*—These should be washed over with formalin solution or $2\frac{1}{2}$ per cent. cresol solution. Exposure to the hot sun for one hour or more is equally effective. Leather will withstand a temperature of 60° C. Furs are not injured by a temperature of 60° C. for 30 minutes unless they are repeatedly subjected to it, but a higher temperature and longer exposure cause injury.

2. *Blankets and Woollen Goods.*—White blankets do not stand steam disinfection well, owing to the tendency of steam to fix stains indelibly and to alter the texture and colour. Brown service blankets are less noticeably affected. A temperature of 104° C. injures woollen articles. A temperature of 127° C. for half an hour will make flannel brittle, but if hung out on lines in the open the brittleness will be removed.

3. *Toys, Books, Papers and other Articles*, if of little value, should be destroyed. The medical officer will report the necessity of the destruction of any article and obtain written authority for carrying it out. Only when delay in carrying out destruction would involve risk or danger to personnel will the medical officer act on his own responsibility, and be prepared to justify his action when making application for covering authority. (See K.R. and A.C.I., para. 2633 (e).)

218. Hospital Bedding, etc.—Bedding, clothing, etc., used by patients in hospital suffering from communicable diseases, will be removed for disinfection immediately after use. Articles which have been in intimate contact with such patients will be steeped in $2\frac{1}{2}$ per cent. cresol solution for at least half an hour before being removed from the ward. Articles which cannot be steeped will be sprayed with formalin solution.

219. Disinfection before sending to Laundries, etc.—See K.R. and A.C.I., para. 863, cl. 6 and 1418, cl. 5 and A.P. 830, Vol. I, para. 2276.

220. Removal of Articles for Disinfection.—All articles for disinfection should be packed in sacks or sheets soaked in disinfectant solution, before being removed. The store in which infected articles were placed before removal, together with the contents, should also be disinfected; see also para. 193 above as to disinfection of vehicles.

221. Articles for Use of venereal and infectious Patients.—(See A.P. 830, Vol. I, paras. 2263 and 2264.) A supply of sheets, pillow-slips, shirts, drawers, handkerchiefs and towels distinctly marked with the letter "V" should be set apart in certain hospitals for use of patients suffering from venereal

diseases, and a supply of bedding and clothing distinctly marked with the letter "I" for the use of patients suffering from infectious diseases. These will invariably be soaked in cresol solution for at least half an hour, then rinsed thoroughly in clean water before being sent to laundries.

All feeding utensils intended for use by venereal patients will be marked with a "V" and kept solely for their use.

222. Articles for Use in the Typhoid Fevers.—All utensils, *e.g.*, feeding cups, bedpans and urinals, intended for use of these patients will be marked "E." The contents of bedpans and urinals will be mixed thoroughly with an equal quantity of $2\frac{1}{2}$ per cent. cresol solution or a 3 per cent. solution of chloride of lime, and allowed to stand for half an hour before being thrown down the slop sink. The bedpans and urinals will invariably be disinfected by washing with $2\frac{1}{2}$ per cent. cresol solution.

223. Disinfectant Solutions.—The following strengths are prescribed for guidance:—

1. *Cresol Solution (1 per cent.).*

Take of liq. cresoli saponatus fortis	..	..	1½ ozs.
„ water to	..	..	1 gall.

Mix.

$2\frac{1}{2}$ per cent. solution requires 4 oz. to the gallon.

If sea or brackish water is used, the saponified cresol should first be emulsified with 5 to 10 times its bulk of fresh water.

2. *Corrosive Sublimate Solution (0.1 per cent.).*

Take of mercuric chloride	..	..	70 grs.
„ hydrochloric acid	..	..	3 drs.
„ water to	..	..	1 gall.

Mix.

Tint with aniline blue, 1 gr. to the gallon.

3. *Formalin Solution.*

Take of formalin (40 per cent. formaldehyde solution)	..	..	8 oz.
„ water to	..	..	1 gall.

Mix.

One gallon should be used for every 400 sq. ft. of surface. Five per cent. glycerine confers viscosity and delays drying when the solution is used for spraying walls, etc.

224. Gaseous Disinfestation.—1. This method is used in barracks, buildings and ships for the elimination of vermin and rodents, and may be used for terminal disinfection in communicable diseases. All crevices should first be sealed up as far as possible, all openings closed, the floor and walls sprinkled with water, and all cupboards and drawers opened.

Any articles requiring disinfection may be put into the room and hung up loosely. Such articles, if suitable, should afterwards be removed for steam disinfection.

2. *Sulphur Dioxide*.—Ignite 3 lb. of powdered or roll sulphur for every 1,000 cub. ft. of air space on an iron receptacle, *e.g.*, shovel or tin, placed over or in another receptacle containing water. The receptacle should be placed as high as possible in the room, sulphur dioxide being a heavy gas. The room should then be vacated and the cracks and keyhole of the door sealed up. Twenty-four hours should elapse before the room is re-entered.

3. *Formalin Gas*.—About 5 oz. of formalin to $2\frac{1}{2}$ oz. of powdered crystals of potassium permanganate are required for each 1,000 cub. ft. of air space. These should be mixed in an ordinary galvanized iron pail, the permanganate being put in first and the formalin poured on the crystals. Not more than 10 fluid ounces of the solution and 5 ounces of the permanganate should be placed in one 3-gallon pail, as considerable frothing follows the mixture of these substances.

As soon as the last portion of the reagents has been mixed the operator must leave the room, seal up the door and not re-enter under 24 hours. When re-entering after this period, the nose, mouth, and eyes should be covered with a damp cloth. The remaining formalin vapour may be dispersed by sprinkling a few drops of ammonia round the room.

Formaldehyde lamps, Formic lamps, and similar authorised appliances may be used.

4. *Hydrocyanic Acid Gas*.—A valuable method for certain purposes, but one that, on account of its danger to human life, must be employed only under expert supervision.

225. Disinfection of Drains, Gutters, etc.—Complete disinfection of drains, gutters, traps and refuse receptacles, is practically impossible. The most that can be done is deodorization, but the mere fact that gullies, drains, etc., need deodorization indicates the existence of faulty conditions. These must be investigated and corrected, and reliance placed upon free flushing with water. Disinfectant solution must not be used as a means of covering up the defects.

226. Disinfection on board Ship.—Disinfection will be carried out on similar lines to disinfection on shore. Cabins, small compartments and troop decks will be disinfected as indicated for quarters and barrack-rooms. Bedding and clothing used by the sick will be disinfected by steam or other available means and, if necessary, infected articles may be destroyed. (*See K.R. and A.C.I., para. 1024.*)

Holds and bilges are disinfected by the Admiralty authorities.

Drinking-water tanks, if it is considered necessary, should have their contents chlorinated with one part per million of free chlorine which should be allowed to act for at least half an hour.

D.—Measures to be adopted in certain Diseases.

227. The secret of any prophylactic campaign against communicable disease is to know the various links of the etiological chain, and to sever as many of these as possible. It must be remembered that influences of nature are always at work and may repair all or some of these links, so that preventive measures, if they are to attain any semblance of success, must be continuous. It is imperative that this aspect of medicine should be daily borne in mind by a medical officer.

The chief factors concerned in the etiology of the communicable diseases of mankind are man, insects, and contaminated food and water supplies. The human "carrier" plays a most important part in the perpetuation and spread of such diseases (*see* para. **189**, cl. 2).

Table I demonstrates the main routes by which the infective agents of various diseases may leave the human body, and indicates on general lines the preventive measures that should be adopted for each group of diseases. In addition, to aid in the general preservation of health, there are certain dictates of common sense that should be constantly brought to the notice of all, especially those serving in warm climates. These are—

- to avoid undue fatigue, excesses and chills ;
- to be cleanly in all habits ;
- to drink water from officially approved supplies only ;
- to refrain from alcoholic drinks until after sundown ;
- to eat only cooked foods and fruit with good skins ;
- to avoid bazaars and crowded spaces ;
- to wear sensible clothing and change frequently ;
- to get protective inoculations annually ;
- to refrain from concealing disease ;
- to wage a constant war on flies, fleas, mosquitoes, sandflies, lice, bedbugs and rats ;
- to keep the mind occupied and avoid panic ;
- to keep the bowels open daily, and the skin active ;
- in short, to preserve a healthy mind in a healthy body.

TABLE I.

TYPE OF CARRIER.	NASO-PHARYNGEAL.	HÆMAL.	FÆCAL.	URINARY.	INTEGUMENTARY.
MEDIUM OF SPREAD.	By droplet infection in talking, coughing, sneezing, kissing.	By agency of biting insects; flies, fleas, lice, mosquitoes, ticks, mites, bedbugs.	By contamination of soil, food, water and hands.	By contamination of soil, food, water, clothing and skin.	By direct contact or fomites.
DISEASES SPREAD.	Cerebro-spinal fever. *Diphtheria. Encephalitis lethargica. *Enterica (at times). *Influenza. Measles. Mumps. *Plague (pneumonic). *Pneumonia. Poliomyelitis. *Scarlet fever. Tuberculosis. *Whooping cough.	Blackwater fever? Filariasis. Leishmaniasis. Malaria. Phlebotomus fever. *Plague. Relapsing fever. Trench fever. Trypanosomiasis. Typhus. *Yellow fever. Anthrax (possibly).	Ancylostomiasis. Bilharziasis. *Cholera. Diarrhoea. *Dysentery. *Enterica. Tuberculosis. Worms (intestinal).	Bilharziasis. *Enterica. Mediterranean fever. Tuberculosis. Venereal disease. Weil's disease.	Chicken-pox. Measles? Mediterranean fever (hands). *Plague via fleas. Relapsing fever via lice. Ringworm. Scabies via mite. *Scarlet fever? *Small-pox. Trench fever via lice. Typhus fever via lice. Venereal diseases. Weil's disease.

* Protective inoculation should be practised where applicable.

[Table continued overleaf.]

TABLE I—continued.

TYPE OF CARRIER.	NASO-PHARYNGEAL.	HÆMAL.	FÆCAL.	URINARY.	INTEGUMENTARY.
PREVENTION. <i>To detect carriers</i>	Examine naso-pharyngeal swabbings and sputum.	Examine blood and tissue films for parasites.	Examine fæces and urine, especially of handlers of food.		Examine clothing and skin for parasites, macroscopic and microscopic; also blood, throat swabs, and urine where indicated.
<i>General measures</i>	Free ventilation. Space out. Outdoor exercises. Naso-pharyngeal disinfection. Supervise milk supply.	Anti-insect measures. Protect healthy and diseased persons against the bites of insects by use of repellants and netting.	Proper disposal of all fæces and urine. Cresol latrines and ground around. No one to enter latrine area with bare feet. Potassium permanganate for hands. Protect food against insect and dust contamination. In tropics avoid eating uncooked vegetables (salads). Sterilise and protect water supplies. Segregate. Disinfect all excreta, bedding, clothing, feeding utensils.		Frequent bathing and clean clothing. Weekly skin inspections. Weekly disinfection. Healthy exercises. Efficient early treatment room.
<i>When case occurs</i>	Isolate. Disinfect room, clothing, bedding, feeding utensils.	Disinfection of person, clothes, bedding, room in cases of lice and flea-borne infection. Guard against infection.			Disinfect room, clothing, bedding, feeding utensils. Ointments or oils to prevent spread of infection. Wear gown and frequently disinfect hands. Disinfect where indicated (typhus, &c.).
<i>Attendants on sick.</i>	Use gowns and face masks.		Should protect their clothes and person against all infective discharges. Disinfect hands.		

Attendants on sick, if possible, should be chosen from those who have gained immunity to the disease.

228. The following brief descriptions of preventive measures applicable to certain of the commoner communicable diseases are given in order to form a basis from which medical officers can initiate necessary action, namely :—

1. The continual search for and elimination of "*carriers*" of disease ;

2. The adoption of various measures to *prevent infection* of air, soil, water, food, clothing and other articles of common use ; also the *immediate protection of man* ; and, when these precautions fail,

3. The *isolation of diseased persons*, suspects and contacts.

229. Ancylostomiasis.—1. *Carriers* of the ancylostome should be sought for by periodic examination of the fæces of personnel, especially amongst the natives. Those found to be carriers should be kept under close observation until freed from their parasites by means of systematic treatment with thymol or carbon tetrachloride.

2. *Prevention of Infection.*—To prevent the fæcal infection of soil, water, or vegetables, efficient conservancy methods should be instituted. The *Protection of Man* in infected areas should be attempted by the provision of water-tight footwear, by killing the larvæ in bathing water with cresol (1 in 10,000 dilution), by chlorinating or boiling all drinking water, and by cooking all vegetables.

3. *Isolation.*—Those suffering from the disease should be treated with at least two courses of thymol, and kept under close observation until pronounced free from infection. Special attention should be paid to the disinfection and disposal of their fæces, and the washing of their underclothing and bed-linen.

230. Anthrax.—1. *Carriers.*—Anthrax is not usually transmitted from man to man, but chiefly by means of infected wools, hairs, and hides of sheep and cattle, especially those obtained in Iraq, Persia, Russia, China and India. The anthrax spores can remain alive in such materials for years, even if the hairs or wools are converted into shaving brushes, tooth brushes or carpets. The anthrax bacillus enters the human body through abrasions of skin or mucous membrane. All personnel should be informed of the danger of infection with anthrax.

2. *Prevention of Infection.*—All wounds, bites and abrasions should be treated as soon as possible with iodine or spirit. By this means much can be done to prevent not only anthrax, but also sepsis and tetanus.

Shaving and tooth brushes should be issued with identification numbers on them and should be supplied from one common source. Before distribution, sample brushes from each batch received from this source should be forwarded to a competent bacteriologist for a certificate of freedom from anthrax. Sterile all-bristle brushes should be used when possible. Barbers' establishments should be frequently inspected. Infected brushes should be burnt immediately, and the supply of all brushes stopped until further orders.

The bodies of animals dying of anthrax or suspected anthrax should be burnt, or buried intact six feet below the ground surface and thickly covered with quick-lime. The burial place should be well away from all dwellings and water supplies. Camps should not be pitched on such sites. Byres or stables should be scrupulously disinfected.

3. *Isolation* of a case of anthrax should be complete; clothing and bedding should be disinfected. All dressings should be burnt. If Sclavo's anti-anthrax serum is not available, the P.M.O. should be asked by signal for the necessary serum to be procured and forwarded by the quickest practicable means of conveyance.

When a case of anthrax occurs, the P.M.O. concerned and the D.M.S. should be notified at once by signal, and the supply of all brushes stopped until further orders.

231. Bilharziasis or Schistosomiasis.—The life history of the parasite is the clue to the prevention of this disease: there are four chief factors in the etiological chain—the parasite, man, fresh-water snails, and fresh water. Preventive measures must aim at breaking the links of this etiological chain in the following manner:—

1. *Carriers.*—In endemic areas the urine and fæces of the native employees, and of British personnel showing albuminuria, should be examined periodically for the presence of schistosome ova. Men apparently healthy are often carriers. These should be isolated and cleared of their parasites by means of tartar emetic.

2. *Prevention of Infection.*—Strict conservancy methods should be adopted for the disposal of all urine and fæces to prevent the contamination of water. There should be no promiscuous micturition or defæcation.

Bathing should be prohibited in schistosome areas, except in waters officially approved. The absence of the special snail in the immediate vicinity of a water does not mean that there is no risk of infection, as the cercariæ may be carried for 20 to 30 miles down stream and still remain infective.

Infective forms (cercariæ) of the schistosome that might still gain entrance to the water supply should be eliminated by storing the water for over 48 hours, by boiling, or by adding sodium bisulphate (1-1,000) before use ; to water for non-drinking purposes cresol should be added in the proportion of one part per 10,000.

Fresh-water snails (*Bullinus* and *Planorbis*) should be destroyed as far as possible by chlorinating the water, or by having alternate courses for the water supply, so as to leave each water-bed dry for at least 24 hours ; drying kills the snails. In addition, sanitary parties wearing rubber waders and rubber gloves should collect these molluscs and destroy them. Remember that the infection of man takes place through the unabraded skin and mucosa.

Wire screens, 16 meshes to the linear inch, should be placed at intervals along infected water-ways to hold back snails ; this aids their collection and destruction by sanitary parties.

3. *Isolation*.—Wherever a case of the disease occurs, the P.M.O. of the area should be notified by wire, all bathing, wading and fishing stopped, and all water supplies appropriately treated to prevent infection. The patient should be admitted to hospital for treatment.

All persons found to be infected with these schistosomes should be kept under close observation and treatment until their urine and fæces have been shown to be free from schistosome ova for at least a fortnight ; after that, they should be examined periodically.

232. Blackwater Fever.—1. *Carriers* of this disease are unknown, but all persons harbouring malaria parasites should be considered as potential sources of infection.

2. *Prevention of Infection*.—In the absence of proof of the cause of this disease, all aims at prevention should be directed towards the construction of healthy camps and habitations, good food and cooking, and war on all insect life, especially mosquitoes and ticks. Anti-malarial measures should be carefully carried out (*see* under "Malaria"). Fatigue, over-indulgence in alcohol and chills should be avoided. All patients suffering from attacks of a malarial nature should be put to bed at once and kept there for at least three days.

3. *Isolation*.—All cases of blackwater fever should be properly protected with a mosquito net.

As soon as convalescence is established the patient should be removed from the endemic area, preferably to the United Kingdom, and should never return to a malarious district.

233. Cerebro-Spinal Fever.—1. *Carriers.* When an outbreak of cerebro-spinal fever occurs, all the inmates of an infected barrack block, hut or tent, as well as intimate associates of any case, should have posterior naso-pharyngeal swabbings taken, because carriers are much more numerous than cases, often in the proportion of from 10 or even 30 to 1.

2. *Prevention of Infection.*—This is spread chiefly by aerial contamination; overcrowding should therefore be avoided. The most liberal supply of fresh air should be prescribed for everyone. Barracks should be freely ventilated, especially sleeping-rooms at night; when possible, windows should be fixed in an open position. Beds should be spaced out to prevent "droplet" infection; extra buildings may require to be used temporarily for this purpose. Overcrowding in canteens, cinemas and churches should be avoided; outdoor sports should be encouraged.

All personnel should pay particular attention to nasal and oral hygiene, and, if deemed necessary, the measures given below for contacts may be instituted for the whole camp. Attendants on the sick should wear gauze face-masks.

3. *Isolation.*—All cases of cerebro-spinal fever, suspects and carriers should be isolated immediately. The P.M.O. and bacteriologist should be informed by wire of the nature of the case and approximate number of contacts. Anti-meningococcus serum should be administered intrathecally to the case as soon as possible.

A list of all contacts should be prepared and these should be segregated until bacteriological examination declares them free from infection. They must be fed, drilled and exercised apart, and, after the bacteriologist has swabbed their throats, they should be made to wash out nose and throat with a 1 in 5,000 potassium permanganate solution twice daily, or else be treated in a special hut with zinc sulphate vapour (1 per cent.) for a quarter of an hour daily. Carriers should be isolated and naso-pharyngeal swabbings taken on alternate days until six consecutive swabbings show absence of meningococci. These swabbings must be kept at body temperature and plated on suitable media shortly after collecting; delay, such as transmission by post, renders cultivation impossible and should not occur. Suitable arrangements for transmission should therefore be made with the bacteriologist concerned.

234. Chicken-pox.—1. *Carriers.*—There is evidence that cases of herpes zoster should be treated as carriers of chicken-pox, or as sufferers from a modified form of the disease.

2. *Prevention of Infection*.—Immediate contacts who have not had this disease should be segregated and medically examined daily for 21 days ; those who have had the disease previously should have their clothes and bedding disinfected and be returned to duty after three days. The quarters in which a case has occurred, together with all clothes and bedding, should be thoroughly disinfected.

All persons attending suspected cases of chicken-pox should be chosen from those who have been vaccinated against smallpox within a period of three years.

3. *Isolation*.—Every case of chicken-pox should be isolated and most carefully investigated to avoid missing instances of mild smallpox, and thus spreading that disease. Until a definite diagnosis is made, all cases of vesicular eruption should be isolated and treated on the lines of the more severe disease, but the relatives should not be informed unless the diagnosis is certain. All discharges and fomites should be treated as infectious.

The quarantine period should be 3 weeks.

235. Cholera.—Cholera is a disease closely associated with man and his food, so that preventive measures should aim at establishing a wholesome food and water supply, increasing the resistant power of man to the disease, and the isolation of cholera patients and carriers.

1. *Carriers* of the disease should be carefully looked for, especially amongst those engaged in handling food. Personnel in warm climates should be warned that all cases of diarrhœa should report sick at once ; in view of the importance of premonitory diarrhœa, especially in the hot weather, all such cases should immediately be isolated and treated as cholera—dysentery—enteric suspects.

2. *Prevention of Infection*.—The infection of food and water occurs mainly by contamination with choleraic discharges, therefore there should be the strictest supervision of conservancy methods, and adequate protection of fæces and food from all insects, especially flies.

All vegetables should be cooked.

Salads should be forbidden, unless the vegetable ingredients are efficiently cut up and soaked in 1 in 10,000 permanganate solution for two hours.

Fresh fruit should not be eaten apart from those with thick skin such as bananas and oranges, unless they are specially prepared by soaking in permanganate solution. Grapes, dates and melons are particularly prone to harbour cholera germs.

All personnel should be prohibited from buying food or drink anywhere but in service canteens.

No food or drink should be consumed in bazaars; ices are especially dangerous.

Itinerant food vendors should not be allowed to frequent station and camp areas.

All milk and drinking water should be boiled, and then kept protected against dust and fly contamination until consumed.

All bathing should be prohibited during an epidemic, and during the warm weather, except in officially sanctioned waters.

The resistance of man to cholera lies chiefly in the possession of a healthy stomach; the normal acidity of the gastric juice is sufficient to kill the cholera vibrio. Excess of alcohol and over-chlorination of drinking water are apt to lead to gastritis and so lower this resistance.

Anti-cholera vaccine increases immunity to this disease and should be given at least a month before the cholera season is expected, and repeated every two or three months as the immunity is short-lived. There is practically no reaction so that re-inoculation is not objected to.

3. *Isolation* of cases of cholera and all suspects should be complete. Those in attendance on cholera patients should have their mouths and noses protected with gauze masks, wear a waterproof apron under their overalls, and carefully disinfect their hands throughout their duties. All discharges from the case should be protected against flies and immediately disinfected.

The quarantine period for contacts and suspects should be at least ten days. Fæces should be examined daily for the possible detection of the cholera vibrio.

236. Diphtheria.—1. *Carriers* of the diphtheria bacillus should be looked for especially amongst those engaged in handling milk supplies. Whenever a case of "sore-throat" occurs, swabbings should be taken from the throat and nose and sent to the laboratory for examination. Those found to be carriers should be isolated. Chronic carriers should be brought before a medical board.

2. *Prevention of Infection.*—Routine medical inspection of men should be carried out when they return from leave or join the station. This inspection should aid in the detection of early cases of infectious disease contracted outside the station.

When a case of diphtheria occurs, the room and bedding should be disinfected; all immediate contacts should be

segregated in well ventilated quarters and drilled apart; swabbings should be taken from their throats and posterior nares and immediately forwarded to the laboratory. The Schick test should be applied in order to detect the immunes and non-immunes to this disease and each result should be entered on the appropriate Form 48 for future reference.

The immunes, if the laboratory report shows them to be free from diphtheria bacilli, should be discharged to duty, but should report to the sick quarters for inspection and naso-pharyngeal disinfection twice daily for seven days.

The non-immunes should be segregated for seven days, practise naso-pharyngeal disinfection twice daily, and on the 3rd and 5th mornings further throat and nose swabbings should be taken before local disinfection. If these swabbings prove to be negative to diphtheria, and if the person be clinically free from the disease, he may return to duty.

All persons suffering from sore-throat or malaise should be dealt with in a manner similar to that applied to contacts.

Non-immunes may be given immediate but temporary protection by means of diphtheria anti-toxin (500 to 1,000 units) intramuscularly or subcutaneously, or given delayed but more permanent immunity by the use of diphtheria toxin-antitoxin mixture (1 c.c. weekly for three consecutive weeks). The P.M.O., in consultation with the pathologist, should decide whether this treatment is necessary in any given instance.

All attendants on diphtheria patients and suspects should, if possible, be diphtheria immunes. They should wear overalls and gauze face-masks and disinfect their hands and naso-pharynx after attending the patients and before going off duty.

All milk should be pasteurised or boiled during an outbreak.

Cats and dogs should not be allowed in barracks, sick-quarters, or hospitals, as they are liable to spread the infection.

3. Isolation.—All cases of diphtheria, suspects and carriers should be isolated immediately. Each patient should be given 10,000 units or more of diphtheria anti-toxin as soon as possible; every 24 hours delay in beginning this treatment increases the death rate by about 3 per cent. Further doses of anti-toxin should be administered as required.

The quarantine period should be three days. No diphtheria patient should be discharged from hospital as free from infection until two weeks after all symptoms of the disease have ceased, especially nasal or aural discharge, and until naso-pharyngeal swabbings collected for three consecutive days, after local treatment has ceased, are negative to virulent diphtheria bacilli.

237. Dysentery.—Dysentery is a symptom-complex of many diseases, but for practical purposes it is classified into three main types—bacillary, protozoal and helminthic. Bacillary dysentery frequently occurs as an epidemic; the others are endemic.

1. *Carriers.*—Bacillary dysentery is usually carried by convalescents from the disease for a period of six weeks, in some instances for considerably longer periods. Protozoal or amoebic dysentery carriers may, or may not, have suffered from the disease, and are liable to remain carriers for many years; these remarks apply equally to the helminthic disease. In all three forms the infective agent is transmitted in the fæces of man. The bacillary and protozoal types are contracted usually by partaking of water or food infected by the agency of human or fly carriers.

The carrier problem should be energetically tackled, first, by the efficient treatment of all cases of dysentery as they arise; secondly, by the examination of at least seven consecutive daily specimens of fæces after all symptoms of the disease have disappeared, the first and last specimens being obtained by the use of calomel and salts; and thirdly, by periodic examination of fæces of all personnel engaged in handling food supplies.

2. *Prevention of Infection.*—Those with a previous history of dysentery should have at least three consecutive daily specimens of their fæces forwarded to the laboratory for examination before proceeding abroad.

Special attention should be paid to the disposal of all fæces, which should be burnt or disinfected, and efficiently protected against flies and other insects.

Water should be protected from flies and dust, especially after chlorination or sterilisation.

Kitchens, larders and dining halls should be fly-proof; this fly-proofing should be kept in repair. Food should be protected against flies—*e.g.*, meat, bread and cakes by netted guards; jam and sugar by well-fitting, self-closing lids. Salads should be forbidden. All personnel should be instructed not to partake of ices, sweetmeats and drinks in the bazaar.

Scrupulous care should be exercised in the inspection of all engaged in handling food. A nominal roll of all persons so engaged should be affixed to the door of the cookhouse or canteen, and it should be signed by the medical officer in charge to the effect that each employee has been bacteriologically examined and has been found free from dysentery, typhoid, cholera and undulant fever. Re-examination and

a fresh certificate should be made every three months. The hands, particularly the nails, of these workers should be inspected daily, and a basin of permanganate solution should be placed at the door of each cookhouse and everyone entering the building should be made to soak their hands in this solution.

A new prophylactic vaccine for bacillary dysentery has been prepared. This vaccine should only be used in conjunction with the services of a pathologist.

3. *Isolation*.—All cases of diarrhoea abroad should be treated as dysentery—enteric—cholera suspects, until proved to be otherwise. These and patients with known dysentery should, if possible, be treated in a special room; their bed pans should, not forgetting the handle, be protected against flies. Isolation should be maintained until at least seven consecutive daily examinations of fæces have proved negative to pathogenic bacterial, protozoal or helminthic infection.

Quarantine of contacts is unnecessary unless there is a large epidemic, in which case, measures should be adopted as for cholera.

238. Encephalitis Lethargica.—1. *Carriers*.—Many apparently healthy persons would appear to be oral carriers of the virus of this disease, especially during epidemics. Therefore, when a case occurs, all contacts should be segregated. Persons found suffering from herpes febrilis should be isolated, as this appears to be a condition produced by the virus of encephalitis lethargica.

2. *Prevention of Infection*.—Contacts should practice nasal douching or pass through a spray chamber (*see* "Cerebro-spinal Fever") daily, and should be segregated for a fortnight. In addition, under careful observation, urotropine 100 grains thrice daily, preceded by 60 grains each of sodium bicarbonate and potassium citrate may be given for a fortnight to all immediate contacts, as this drug has been shown to be an efficacious prophylactic in the somewhat similar disease, acute poliomyelitis. A careful watch should be kept for such early or transient symptoms of the disease as sore throat, "influenza," hiccough, headache or lethargy amongst the contacts and amongst men reporting sick on parade. The whole personnel should be encouraged to indulge in outdoor exercise, the beds should be spaced out and barracks freely ventilated. Everyone should avoid fatigue and take great care not to get below par during an epidemic. Attendants on the sick should wear gauze face masks.

3. *Isolation*.—All cases and suspects should be isolated immediately; the P.M.O. should be notified and a pathologist's

opinion should be obtained. Lumbar puncture should be performed for diagnostic and therapeutic purposes. All discharges and fomites should be treated as infectious.

Acute Poliomyelitis should be dealt with on similar lines.

239. Enterica.—The term enterica includes typhoid and the paratyphoid fevers. The occurrence of these fevers is an indication of defective sanitation. Sudden and large epidemics are usually due to contaminated water supply, more localised and smaller outbreaks to infected food (especially milk, salads and ice cream); sporadic cases arise frequently from the infected hands of carriers.

1. *Carriers.*—In warm climates, especially where there is no water carriage system of sewage disposal, a careful eye should always be given to the question of carriers. About one person in a thousand is a typhoid carrier and is the potential source of an enteric epidemic.

The detection and elimination of enteric carriers should be performed on lines similar to those laid down for dysentery. There should be early diagnosis and efficient treatment of all cases of enteric fever; during convalescence and prior to discharge from hospital at least seven consecutive daily specimens of fæces and urine should be examined, whilst in those developing cholecystitis the number of examinations should be increased to 20 or 30; the fæces and urine of all engaged in handling food should be examined periodically for organisms of the enteric group.

2. *Prevention of Infection.*—Those with a previous history of enterica should not proceed abroad until their fæces and urine have been declared free from infection by a service pathologist.

Special precautions should be taken with regard to the disposal of fæces and urine, the purification and sterilisation of water supplies, the protection of food against dust, flies and all insects. In addition, instructions should be issued in routine orders, at least once annually, as to the dangers associated with the ingestion of salads, watercress, uncooked fruit, shellfish, and especially ices, butter, milk and drinks that may be obtained in bazaars (*see under "Dysentery"*).

Prophylactic inoculation with T.A.B. vaccine should be administered to all. Re-inoculation should be carried out every 12 months abroad, preferably in the cold season.

Attendants on enteric cases should wash and disinfect their hands after touching the patients, bedpans, urine bottles and feeding utensils.

3. *Isolation* of enterics and carriers should be complete ; the feeding utensils of each patient should be clearly marked and boiled after use. Fomites, fæces, urine, sweat and sputum should be regarded as infectious. Excretions and clothing should be treated with 2½ per cent. cresol for two hours before disposal ; bedpans and urine bottles should be protected against invasion by insects. Isolation should be continued for at least three months. Patients should not be discharged to duty until certified free from infection (*see under "Dysentery"*).

The diagnosis of each case of enterica should be verified by blood, fæces and urine culture ; should these tests fail, by agglutination.

The quarantine of suspects is normally unnecessary except during the cholera season, but their blood, fæces and urine should be systematically examined for pathogenic infection.

240. Food Poisoning.—Outbreaks of food poisoning should be investigated immediately, as the cause is often evanescent, and, if not found, may delay the adoption of the correct line of treatment. Briefly, food poisoning is most commonly seen in connexion with preserved food and includes intoxications due to the ingestion of and internal action of

- (a) metallic poisons derived from the tin container and those added as preservatives or even for malice ;
- (b) some game and fish at certain seasons ;
- (c) certain vegetables and fungi eaten in mistake for innocent ones ;
- (d) various micro-organisms and their toxins, especially *B. botulinus* and *B. enteritidis* of Gaertner.

In addition, it should be recollected that infections such as typhoid, paratyphoid, dysentery, diphtheria, scarlet fever, tuberculosis and Mediterranean fever may be spread by the agency of infected food.

Articles of diet most likely to cause food-poisoning are tinned food, sausages, meat pies, stale fish, shell-fish, ice cream, cheese and potatoes.

1. *Carriers.*—Human carriers of *B. enteritidis* of Gaertner occur ; in food outbreaks due to this group of organisms, those engaged in handling food should be bacteriologically examined. Animals, domestic and otherwise, may harbour organisms of the Gaertner group or *B. botulinus* ; the flesh of these animals when ingested, or their excreta by contaminating other food, flesh and vegetables, may cause food poisoning in man.

2. *Prevention of Infection.*—All foodstuff should be examined as a routine by the medical officer and responsible stores officer. A careful watch should be kept on tinned

foods, especially as regards the brand used, signs of blowing, colour of inside of tin, firmness, colour and odour of contents. Periodically, samples should be submitted for laboratory examination. Tinned material should not be left in the tin after opening and should be consumed within 12 hours. Only local fish should be eaten in warm climates. The centre of sausages should be examined for signs of putrefaction. Slaughter houses engaged in killing animals for the service should be kept under constant supervision, clean, free from dogs, rodents, birds and flies. All food should be properly cooked when fresh, then protected against contamination.

All personnel should be careful in their choice of food, especially abroad. Attendants on patients should take similar precautions to those detailed for enterica or dysentery.

3. *Isolation*.—There is no need to isolate definite cases of food poisoning, but the P.M.O. and pathologist concerned should be notified immediately. Vomits and excreta should be treated as infectious, protected against insects, and samples thereof forwarded to the laboratory for examination. Blood culture and agglutination tests should be performed in doubtful cases. Botulinus anti-toxic serum should be administered at once to those suffering from botulism—delay is fatal.

A list of all food partaken of by patients during the previous 48 hours should be prepared; samples of these foods should be collected and forwarded, packed round with ice, to the laboratory; tinned or potted material should be forwarded in its container.

Post-mortem examination should be performed if death occurs and a diagnosis has not been arrived at.

The quarantine of contacts or suspects, unless they are engaged in the handling of foodstuffs, should not be enforced.

241. Influenza.—1. *Carriers*.—Human carriers of the virus of influenza occur even in the interval between epidemics, but they are difficult to detect. Any such that are found in the routine examination of throat swabs taken from cases of "sore throat" should be isolated and have their upper respiratory tracts disinfected. The possibility of "Pink eye" in horses being caused by the same virus should be borne in mind.

2. *Prevention of Infection*.—Epidemics once started are difficult to control; therefore, as influenza is liable to occur each winter and in epidemic form at intervals of thirty-three weeks, general precautions should be taken to forestall the onset of this malady.

The general prophylactic measures are the dictates of common sense, and should aim at the prevention of "droplet" infection from the upper respiratory tract. Thus arrangements should be made for everyone to have as much fresh air as possible—extra outdoor games should be organised for all; barrack-rooms and huts should be freely ventilated, especially at night; beds should be spaced out, facing alternately in opposite directions to increase the distance between the heads of individuals; overcrowding in canteens and cinemas should be avoided, and the floors of these places cleaned and disinfected daily with 2½ per cent. cresol solution. Great care should be taken to prevent chills; wet clothing and boots should be changed as early as practicable, and excessive sweating should be avoided or be followed up by a rub down with a dry towel.

During an epidemic, airmen should be encouraged to irrigate their naso-pharynx with a disinfectant solution such as 1 in 5,000 potassium permanganate in normal saline. In addition, all feeding utensils should be steeped in boiling water after cleansing. The danger of the disease spreading during close conversation, coughing, sneezing and spitting should be impressed on all persons.

The protection of personnel should be attempted by the judicious administration of an anti-influenza vaccine, preferably given about a month before an epidemic wave is expected; two to three inoculations should be given at weekly intervals. This vaccine, which should contain not only the *B. influenzae* but also the commoner organisms responsible for many of the secondary complications, will prevent or lessen the severity of the disease.

Those in attendance on influenza patients should wear gauze face-masks, and carry out naso-pharyngeal disinfection.

3. *Isolation*.—All persons suffering from influenza should go to bed at once; this procedure tends to limit the severity of the disease and its spread to others. During an epidemic certain huts or barrack blocks should be converted into temporary sick quarters where cases of influenza may be isolated. The patients should be well spread apart.

When the type of disease is severe, influenza vaccine or an anti-serum, the variety depending on the particular complicating organism, should be administered at once; such treatment is frequently beneficial.

Sputum and nasal discharges should be treated as infectious.

The convalescent period of influenza should not be curtailed, as there is the danger of incurring serious pulmonary and cardiac complications or sequelæ, including tuberculosis.

242. Leishmaniasis (Oriental Sore and Kala-Azar).—This term includes kala-azar, infantile leishmaniasis and cutaneous leishmaniasis (oriental sore). The last named is the commonest type of this disease that is encountered in the Service. The simplest view to adopt for public health purposes is that all forms of leishmaniasis are due to the same parasite, which may be transmitted to man by various biting insects; passage through these insects may account for the different types of infection. Where investigations tend to inculcate any particular insect vector, special measures should be instituted for its destruction.

1. *Carriers.*—Leishmaniasis in all its forms is a chronic disease, so that man untreated carries the infection for long periods, often over a year. The causal virus of oriental sore is thought to be transmitted from man to man, or dog to man by the agency of sandflies (*Phlebotomus sergenti*); whereas that of kala-azar is probably transmitted by the bite of another sandfly (*Phlebotomus argentipes*). The kala-azar parasite is at times excreted in human fæces and even in the urine, and there is some evidence that infection may occur through ingesting contaminated food.

2. *Prevention of Infection.*—In the present state of knowledge this is a wide problem and, as indicated above, should involve the efficient disposal of excreta; proper protection of food; protection of man against insect bites, especially those of sandflies; the removal of all rubbish and organic debris from the proximity of dwellings, for insects breed in filth; the removal to a safe distance of domestic animals which may act as reservoirs of infection; and, last but not least, the early detection and isolation of all human carriers of the disease. In this connexion cases of splenic enlargement should be repeatedly examined unless the cause is ascertained.

The measures necessary for the disposal of excreta, and the protection of food are given elsewhere (see "Cholera," "Dysentery," and "Enterica").

Methods for the avoidance and destruction of various biting insects are described under "Malaria," "Phlebotomus Fever," "Plague," "Relapsing Fever," and "Typhus."

When a case of kala-azar occurs in a hot climate, the patient should be isolated, the quarters vacated, disinfested and disinfected. The other inmates should be removed to clean quarters and should not re-occupy the old until special sanction is granted by the P.M.O.

3. *Isolation.*—Cases of kala-azar and infantile leishmaniasis should be isolated, disinfested, and protected by sandfly-proof netting and other means from the ravages of biting insects.

All excreta and fomites should be treated as infectious. Patients with oriental sore may be allowed to carry on their ordinary duties, but should have all lesions adequately covered with a dressing, which should be burnt when finished with, to prevent insects from feeding on them and so becoming infected.

No case of kala-azar should be considered cured until at least three consecutive monthly tests, both animal and cultural, have proved to be negative.

All kala-azar contacts should be segregated until clinical and bacteriological examination fails to reveal disease; they should be periodically examined for several months as the incubation period may be long.

243. Malaria.—1. *Carriers.*—Human carriers are common in malaria districts; every subject of malarial infection, whether he is showing active symptoms of the disease or not, is a possible carrier of the stage of parasite that is capable of infecting an anopheline mosquito when it feeds upon him. Man may carry malaria for years; the mosquito, once infected, may remain so for the rest of its life, but the infection is not passed on by heredity to its progeny.

2. *Prevention of Infection.*—In order to carry out an anti-malaria campaign satisfactorily, the whole personnel in malarious areas should understand the rudiments of the infection—that the causal organism depends for its life cycle on the close association of the necessary mosquito and man, and that any process which will separate these two links in the chain of infection will cut short the cycle of development of the malarial parasite and ultimately prevent the occurrence of the disease in man. The general prophylactic measures should aim at—

- (a) Protection of man against mosquito bites.
- (b) Isolation and sterilisation of human carriers of the infection.
- (c) Prevention of infection of mosquitoes.
- (d) Destruction of mosquitoes.

(a) *Protection of Man against Mosquito Bites* is the most important and economical method of preventing malaria. For this purpose, mosquito nets (26 holes to the square inch, woven of 30/s cotton) should be used by all personnel in malarious regions; they should be tucked in before sunset, kept in good repair, and systematically searched for rents and tears daily.

In addition, personal prophylaxis should be attempted by the prohibition of shorts after sundown. A change into slacks or preferably into some form of trouser that will preven

mosquitoes from biting the legs should be made at dusk. This change of clothing also aids in the promotion of good morale as well as of the general cleanliness so important in the heat-stroke season. Wellington boots and overalls should be encouraged for mess wear; they are a protection against insect and snake bites. The wearing of two pairs of socks gives local protection. Cane-bottomed fenestrated seats should be covered with folded paper. Repellants, such as oil of citronella, bamber oil, cassia oil, "vermijelli" or paraffin should be smeared on exposed parts of the body after dark, especially at bed time. Night sentries should be protected in a similar manner.

Electric fans should be used in permanent buildings, and should be so arranged that every part of the room is affected by the air currents derived from their revolutions. As with the sandfly, these fans render it extremely difficult for the mosquito to fly about, and in addition, tend to lessen the occurrence of heat effects.

(b) *The Isolation and Sterilisation of Human Carriers of the Disease.*—Every case of malaria or suspected malaria (including P.U.O's and N.Y.D's) should be made to use a mosquito curtain while in bed; they should retire to their mosquito-proof quarters in hospital or special building at sundown and remain there until sunrise. If possible, all malaria cases and convalescents should be removed for duty to an area free from mosquitoes capable of carrying malaria. Malaria carriers are more frequent among native personnel; in consequence they should be housed well to leeward of European quarters, and energetic treatment should be instituted immediately to rid the peripheral circulation of malaria parasites.

(c) *Prevention of Infection of Mosquitoes* depends mainly on the efficacy of the foregoing measures.

(d) *The Destruction of Mosquitoes.*—This entails considerable expense and labour, but should be carried out as circumstances permit after the foregoing measures have been adopted. An anti-mosquito campaign should be waged for a distance of at least half a mile from the camp by squads supervised by sanitary personnel specially trained in the work. These squads should be formed abroad out of the more intelligent of the native menial personnel.

Water-logged ground should be drained by the cutting of channels or gutters to carry away the surface water rapidly, as mosquitoes tend to lay their eggs in sluggish or stagnant waters. Drip cans made to discharge about 20 drops of oil a minute should be erected over the centre of the distal end of each of these channels. Channels should not be cut without surveying levels and should be bench-marked so that levels

can be kept at subsequent cleanings. For the removal of undesirable collections of sub-soil water, drainage pipes should be laid.

Hollows in the surface of the earth should be filled in, and the ground generally levelled to prevent accumulation of water. Care should be taken to leave no "borrow holes."

All receptacles likely to collect water, such as disused tins, bottles, and jars should be removed. The smallest amount of surface water is a potential breeding place for mosquitoes.

Undesirable collections of surface waters (ditches and ponds) that cannot be removed should be oiled. The process of oiling aims at clogging the "pores" of the mosquito larvæ and pupæ, so it follows that the whole surface of the water should be covered. For running water passing near camps, it is sufficient to oil the more sluggish parts such as water near the banks. The banks of all water-ways should be kept clean cut and as free from weeds and aquatic vegetation as possible to avoid stagnation. The oiling should be repeated weekly with the following mixture—paraffin oil one part, heavy oil two parts. For ditches, the oil should be allowed to drop on the surface of the water (20 drops a minute) from a height of 4 feet to break up the oil. Ponds and large pools should be oiled by adding $\frac{1}{2}$ pint of oil to 100 square feet of water and thoroughly mixing with paddles or floats.

Large areas of swamp may be powdered with Paris Green from aeroplanes. The same chemical may be dusted also by hand on irrigation ditches and small swampy patches.

All cisterns and tanks containing water for drinking and domestic purposes should be efficiently covered with well-fitting lids; they should be frequently inspected, cleaned and kept in good repair.

Ducks or predatory fish (e.g., *Gambusia*) may be introduced into pools to lessen the number of insect inhabitants. All weeds, rushes and useless vegetation should be removed from the camp area to reduce the sheltering places of adult mosquitoes, as well as pests associated with other diseases, e.g., sandflies. Creepers on barrack walls and vegetation on verandahs should be prohibited.

Rooms, tents, cellars, latrines and outhouses should be periodically fumigated with sulphur (3 lb. to 1,000 cubic feet air space), cresol vapour or formalin. Spraying with 1 per cent. cresol solution or with "Flit" is efficacious. The destruction of stupified insects should be completed with swatters. Dark corners of buildings and tents should be searched carefully, as mosquitoes congregate in such places,

especially in cold weather ; these insects should be killed by swatting. All parts of rooms should be kept as light as possible.

Quinine prophylaxis should not be necessary where the above methods of protection have been properly carried out, but when adopted the quinine should be given in soluble form, under supervision, in 5-grain doses daily.

3. *Isolation*.—All malaria patients, suspects, and convalescents should be enforced to sleep under a mosquito net as long as they are in a malarial region. No case of this disease should be considered free from infection for at least two years after the last attack or positive blood-finding was recorded.

All cases of pyrexia abroad should have a blood smear examined for the presence of malarial parasites. This rule should be strictly enforced.

Synopsis of Anti-Malaria Measures.

A.—Mosquito (True Host).

1. <i>Destruction of Mosquitoes.</i>	Ova Larvæ Pupæ	{	Confined to water. Relatively stationary.	{	Draining ground.
					Filling in hollows.
					Removing receptacles likely to collect water.
					Lowering of sub-soil water.
					Oiling of water.
					Dusting with Paris Green.
					Protection of drinking water.
					Introducing predatory fish.
					Clearing vegetation to allow of sunlight.
					Traps for egg-laying mosquitoes.
	Imagines	{	Migratory and found in houses.	{	Clearing vegetation.
					Fumigation.
					Traps.
					No dark corners.
2. <i>Prevention of Mosquitoes being infected.</i>				{	Place camp beyond reach of mosquitoes, if possible.
				{	Remove infectious human cases from area. (See B.1.)

B.—MAN (Intermediate Host).

- | | |
|--|---|
| 1. <i>Sterilisation and Isolation of all Carriers.</i> | { Rapid and efficient drug treatment.
Mosquito nets.
Removal to anopheline-free area. |
| 2. <i>Protection against Mosquito Bites.</i> | { Nets (26 meshes to square inch).
Shorts not worn after sunset.
Boots (Wellington type) recommended for mess.
Mosquito boots or buskins.
Two pairs of thin socks.
Headveils, gloves, etc.
Electric fans.
Repellants.
Quinine (to prevent infection if bitten). |

244. Measles (and Rubella).—1. *Carriers.*—This infection is spread mainly by naso-pharyngeal carriers of the incubatory type, by missed cases of the disease, and by those in the catarrhal stage. During an outbreak, therefore, all cases of coryza should be isolated as suspects of this disease.

2. *Prevention of Infection.*—At medical inspections, especially of those returning from leave, particular attention should be paid to the occurrence of rashes on the forehead, and coryza; all such cases should be isolated until the diagnosis of the condition is clear, for measles is a serious malady with a high death and disability rate, especially amongst native personnel.

When a case occurs, the room, clothing, bedding and feeding utensils should be disinfected. All immediate contacts should be segregated in a special barrack block or hut, and divided into those who previously have had the disease, and those who have not; the former, after thorough disinfection of their clothing, personal effects, and feeding utensils, should be returned to duty, but should be instructed to report to the sick quarters twice daily for a week to carry out naso-pharyngeal disinfection. The non-immunes should irrigate their throats twice daily with 1 in 5,000 potassium permanganate solution, should be medically inspected daily, and, if any are found to be suffering from malaise or coryza, they should be further isolated.

Instructions should be issued to all regarding the danger of overcrowding, insufficient ventilation, and chills during outbreaks of this disease.

If it is desired to augment the natural resistance by the use of serum from convalescent cases, the pathologist should be consulted with special reference to the Wassermann reaction—this treatment is most suitable for individual families.

3. *Isolation* of all cases of measles, German measles, and suspects should be maintained for three weeks, or until nasopharyngeal or ear discharges have ceased. Great care should be exercised in the final bathing and disinfection of patient and clothing.

Special precautions should be taken during the disease and for several months afterwards to avoid the onset of pneumonia and tuberculosis. Officers commanding units should be informed of the danger of employing these men on all-night guards, long and strenuous route marches, and on any duties which may unduly expose them to inclement weather or draughts.

The quarantine period for non-immune contacts should be 14 days ; this length of time should be strictly adhered to.

245. Mediterranean, Malta, or Undulant Fever.—Recent observations tend to show that the casual organism of undulant fever and the *Bacillus abortus* of cattle are variants of the same organism, and, for the purposes of preventive medicine, this is the view that should be held.

1. *Carriers.*—Human carriers of this disease are usually of the urinary type, and should be searched for when those engaged in handling food are being examined bacteriologically (*see under "Dysentery" and "Enterica"*). Goats, cows, and other domestic animals carry the disease, especially in the Mediterranean area and Middle East ; therefore milk and milk products from these sources should be forbidden or sterilised before use.

2. *Prevention of Infection.*—Mediterranean fever may be spread by food, fingers, flies, and sexual intercourse, so that preventive measures should be directed against these routes of infection.

In endemic or suspicious areas, goats' milk and its products should be prohibited as articles of food. All milk should be sterilised before use, or tinned milk should be substituted.

All personnel should be warned as to the danger of partaking of milk and milk-containing foods in hotels, cafes and bazaars.

Cookhouses and canteens should be inspected daily, and special precautions taken with regard to the cleansing of the hands of employees (*see under "Dysentery"*).

All kitchens, larders, and latrines should be fly-proof. All food on mess tables should be protected against insects.

All personnel should be informed of the dangers associated with promiscuous intercourse.

The dust nuisance should be dealt with by watering or tar-spraying, where possible.

3. *Isolation* of cases and carriers of this fever should be continued until repeated bacteriological examination of urine and faeces shows the absence of the specific virus—usually six to twelve months. Even then these men should not be permitted to touch general food supplies for another year. Fomites, feeding utensils, excreta, and hands should be disinfected as for a case of enteric fever. Clinical diagnosis should be confirmed by blood and urine culture, and by agglutination tests.

The quarantine of contacts is not necessary.

246. Mumps.—1. *Carriers.*—The infection is chiefly spread during the incubation period and throughout the disease by means of particles of moisture derived from the buccal and nasal cavities.

2. *Prevention of Infection.*—The medical inspection of personnel on joining a unit or on returning from leave should include the examination of the parotid region and testicles. When a case of mumps occurs, the room, clothing, bedding and feeding utensils should be disinfected.

Those in attendance on the sick should guard against "droplet" infection.

3. *Isolation* of all cases of mumps should be maintained for at least three weeks. Patients should be confined to bed for 14 days as a safeguard against the development of orchitis.

The quarantine of contacts is not necessary. Contacts should be medically examined daily for three weeks and, during the first week, should have their throats painted daily with carboglycerine.

247. Phlebotomus or Sandfly Fever.—Phlebotomus fever is one of the chief causes of inefficiency, due to sickness, in the personnel of the Royal Air Force serving abroad. The seriousness of this disease lies in the fact that whole communities may be affected at the same time. Convalescence is often prolonged and accompanied by considerable nervous debility.

1. *Carriers.*—Man carries the virus of sandfly fever in his blood for the first two days of fever. *Phlebotomus papatasi* (the sandfly) is the true carrier of the infection; the adult female insect bites usually at night and transmits the disease to man during the warm weather. The virus would appear

to survive the winter either free in the soil, or within the bodies of phlebotomus larvæ which inhabit such sites as moist soil and porous damp walls. These larvæ become infected by feeding on the dead bodies or excreta of parent flies.

2. *Prevention of Infection.*—The prevention of sandfly fever consists in the extermination or avoidance of the phlebotomus; this should be attempted by the abolition of the breeding grounds of the fly, the destruction of the adult insect, and the protection of man against its bite. These measures should be carried out as a strict routine if success is to be attained.

To abolish the breeding grounds in camps, all rubbish should be burnt; the ground surface should be levelled and rendered as impervious as possible by rolling, tarring, or sprinkling with disused engine oil; buildings, walls, and embankments should be properly faced, pointed, and treated with tar or some coal tar preservative; no gardens or cultivated ground should be permitted in the immediate vicinity of buildings, and creepers should not be allowed on barrack walls, as they afford shelter to various insects; fowls or other animals should not be housed near living quarters. In addition, internal walls, woodwork and ceilings of buildings should be distempered or limewashed yearly at the end of the rainy season.

The adult insect seeks shelter in barrack rooms in dark corners, cupboards, cobwebs, kit and other hangings on the walls. All barrack rooms should be cleansed daily, especially the corners. Cobwebs should be removed. All hangings should be shaken about an hour before sunset to dislodge any hiding insects. After such a procedure most of the sandflies congregate in the upper corners of the room, and a special sanitary party armed with suitable ladders and swatters should kill these flies. Once a week all barrack rooms should be sprayed thoroughly with 1 per cent. solution of cresol.

To reduce the incidence of sandfly bites certain general measures should be instituted. Shorts should not be worn after sundown. Night sentries should smear the exposed parts of their bodies with Bamber oil or "vermijelli." Punkahs and electric fans should be utilised to create air currents which drive off many flying insects. As many sleeping quarters as possible should be upstairs.

Individuals should be encouraged to protect themselves against sandfly bites by the use, where possible, of sandfly-proof nets (45 meshes to the square inch) or of a moistened mosquito-proof net; should smear their wrists and ankles with "vermijelli," oil of citronella, or paraffin; wear slacks

and two pairs of socks or Wellington boots after dusk ; not loiter about when bathing at night ; place a few lumps of camphor in their beds.

3. *Isolation*.—All cases of this fever and suspects should be protected by an efficient sandfly-proof net to prevent extension of infection to non-infected phlebotomi.

The quarantine of contacts is not necessary.

248. Plague.—Bubonic plague occurs chiefly in warm climates, during or after the rains. The pneumonic type of the disease usually occurs in colder climates, during the winter months, especially in damp confined atmospheres. There is always a certain degree of septicæmia in plague, but some cases are highly septicæmic from the onset.

1. *Carriers*.—All types of plague epidemics probably originate from a bubonic case.

(a) *Bubonic plague*.—Many rodents (rats, bats, squirrels) harbour the plague bacillus and are potential sources from which the disease may spread to man. Those rodents which come in closest contact with man and his habitations are chiefly concerned in the spread of the human disease. The virus is transmitted from rat to man by fleas. As rats desert a sinking ship, so fleas leave their dying host and seek shelter in the first suitable warm-blooded animal. The regurgitated stomach contents or fæces of these insects may contain the plague bacillus, which is inoculated through bites or abrasions of the skin. Fleas may remain infective for six weeks.

Man carries the virus of the disease for three weeks after convalescence is established.

(b) *Pneumonic plague* is spread by droplet infection.

(c) *Septicæmic plague* may originate from either of the above types.

2. *Prevention of Infection*.—This should consist chiefly in the destruction of rats and fleas, the protection of man against infestation and bites, the early detection of ambulant cases of the disease, and prophylactic inoculation with vaccine or serum.

Fleas should be kept out of human habitations or destroyed by means of general cleanliness, disinfectants, and repellants. Floors should be treated daily with 1 per cent. cresol solution, "pesterine" (kerosine 20, soft soap 1, and water 5 parts), or naphthaline powder, then swept and all sweepings burnt. Paraffin should be lightly smeared over bedsteads. Bedding and textiles should be exposed for an hour daily to the full force of the sun. Personnel should not sleep on the ground, but on a raised bed, as the maximum height for a flea to jump is 4 inches.

Plague-infected areas, especially native bazaars, should be placed out of bounds. Native personnel should be inspected frequently and freed of vermin.

Free ventilation of all barrack rooms and tents should be enforced to lessen the chance of pneumonic infection.

Domestic animals and pets should not be permitted in barracks during the plague season.

In plague districts the medical inspection of all cases reporting sick should include an examination of the inguinal, axillary and cervical lymph glands. Suspects should be isolated.

Haffkine's plague vaccine induces considerable immunity to the disease, and should be given in a dose of 3 c.c. about a month before the plague season is due. The reaction to subcutaneous inoculation is marked, so that all personnel vaccinated should be granted 48 hours off duty with bed down.

Those in attendance on plague patients should receive 20 c.c. of Yersin's anti-plague serum and 3 c.c. anti-plague vaccine on the same day; ten days later a second dose of vaccine should be given. Attendants should wear lysol-impregnated gowns fastened at wrist, ankles, and neck; rubber gloves and gum boots; and to prevent droplet infection should use close-fitting goggles over their eyes, and gauze face masks 8-fold thick. They should wash thoroughly before shaving, and their clothes and persons should be disinfected daily.

3. *Isolation*.—When a case of plague occurs it should be isolated immediately, the building vacated, and the inmates treated as contacts and segregated in clean temporary quarters. The infected building and all its contents, including clothing and personal effects, should be disinfested and disinfected. This should be attained by soaking the floor with "pesterine," then fumigating with sulphur dioxide, and leaving this to act for 12 hours. Personnel carrying out these duties should be protected with gum boots, gauntlet gloves, and special overalls. Further treatment with "pesterine" should be carried out the following day. Clothing and bedding should be sterilised by steam. Old bedding should be burnt. If the building concerned is a native quarter, the floor should be carefully fired by igniting a thin layer of straw carefully spread over it. Old defective quarters are best treated by completely burning them out. Sputum, urine, fæces, purulent discharges and fomites of patients suffering from plague should be treated as infectious. Feeding utensils should be boiled after use. Isolation should be maintained for a month after convalescence is established.

Buboes of a doubtful nature should be subjected to bacteriological examination, the patient being isolated until the result of the examination is known.

Contacts should be thoroughly disinfested and disinfected, segregated, and medically examined daily for ten days. They should be given anti-plague vaccine and serum, if vaccine treatment has not been given previously.

4. *Rats*.—In all units at home and abroad there should be an organised war against rats, for, in addition to carrying plague, they disseminate the virus of spirochætal jaundice (Weil's disease) and of rat-bite fever, and are very destructive to crops. Areas should be marked out, especially any known to harbour diseased or dying rats, and a cordon being formed around these areas, ratting parties should work from the periphery towards the centre. Various anti-rat measures should be tried and frequently changed, as rats get very wise to traps and poisons. For a few days all traps and baits should be innocuous to allay the suspicions of these rodents. Traps should be plunged into boiling water before resetting to remove all odours of previous use. Fresh tomatoes, cucumbers, fish or grain are suitable baits, and should be impregnated with such rat poisons as squills, barium, strychnine, phosphorus, arsenic or specific viruses. These baits should be placed in definite situations at night, and collected systematically in the early morning to prevent the poisoning of domestic animals. Barium carbonate is a satisfactory bait, and one pound of this substance should be mixed with three pounds of flour, made into a firm paste with water, and divided up into three-grain pills; these should be made fresh daily. Rat-infested buildings should be fumigated with sulphur dioxide (three pounds of sulphur to 1,000 cu. ft. air space) and left sealed up for twelve hours. Rats caught or killed should never be handled, except with special tongs; they should be burnt immediately, unless orders are issued that all rats must be sent to a laboratory for examination. In the latter case the animal should be dipped in strong cresol to kill any fleas, and then a label attached to indicate where it was caught. Buildings should be rendered rat-proof, where possible, by providing iron gratings to drain pipes, avoiding the use of hollow walls and the stopping up of all rat holes.

All food for human consumption should be protected against contamination by rats or their excreta.

249. Pneumonia.—Pneumonia may be due to a variety of causes—pneumococcus, pneumobacillus, streptococcus, tubercle bacillus, the bacilli of influenza and typhoid, plague bacillus, spironema of relapsing fever, micrococcus of

Mediterranean fever and the protozoa associated with malaria and leishmaniasis; therefore great care should be exercised in making a diagnosis of pneumonia.

It is especially important that when an outbreak of pneumonia occurs, investigations should be commenced at once to ascertain the causal organisms, so that appropriate preventive and therapeutic measures may be instituted to prevent the outbreak assuming an epidemic character.

1. *Carriers*.—These are mainly of the respiratory type, so that naso-pharyngeal swabbings of contacts and suspects should be examined. In the case of the pneumococcus the type should be reported on, as Type IV carriers may be considered innocuous.

2. *Prevention of Infection*.—Careful attention should always be paid to the provision of efficient floor space per man, and to the proper ventilation of barracks and other buildings to avoid droplet infection, especially during the colder months when overcrowding and respiratory diseases are common. Personnel should be warmly clad, should be encouraged to keep their feet warm and dry, and to change their undergarments after strenuous exercise. Oral cleanliness and tooth-brush drill should be insisted on. Spitting should be prohibited. All cases of pneumonia, and all contacts during severe epidemics, should be isolated (*see* under "Influenza"). Attendants on pneumonia cases should wear gauze face-masks, and should receive preventive inoculation against the disease.

Prophylactic vaccination with anti-pneumococcus vaccine may be given in the autumn to specially susceptible persons, and, when epidemics threaten, to all. Other forms of pneumonia are described under their appropriate headings.

3. *Isolation*.—All cases of pneumonia should be isolated, especially when dealing with the native races in whom the disease is apt to spread rapidly and to be fatal. Fomites, feeding utensils, sputum and nasal discharges should be treated as infectious. The causal organisms should be searched for in the sputum and in blood culture.

The quarantine of contacts should not be required, except in severe epidemics when special buildings should be set apart for this purpose. Carriers of virulent strains of organisms should be segregated and subjected to naso-pharyngeal disinfection until pronounced free from infection.

250. Rabies.—1. *Carriers*.—The virus of rabies is carried by canine and feline animals, chiefly dogs and jackals. The disease is transmitted to man by the bite of a rabid beast, and it should be remembered that though the animal may appear normal at the time of biting, yet the virus may be present in its saliva for a week prior to the onset of definite symptoms.

2. *Prevention of Infection.*—In districts where rabies is known to occur, personnel should be warned against interfering in any way with strange dogs. Stray dogs should not be allowed in the camp; any found should be destroyed or locked up until handed over to the civil police.

No dogs should be kept in the camp without a written permit from the C.O. All dogs should wear a collar labelled with the name of the owner. If a dog shows signs of distinct alteration in its behaviour, the owner should report the fact to the C.O., have the animal examined by a veterinary surgeon, and muzzled for ten days.

When rabies is prevalent, all dogs should be muzzled and kept on a lead.

All bites and scratches received from animals should be reported as soon as possible to the medical officer. The wound should be sucked immediately (the gastric juice destroys the virus of rabies), made to bleed, well cleansed with soap and water, thoroughly cauterised with pure carbolic, lysol or the crystals of potassium permanganate, and finally flushed out with clean water. Every wound and every part of each wound should be thoroughly treated. A tourniquet should be applied above the site of the bite in a limb.

The animal responsible for the bite should be secured, if possible, and handed over to the medical authorities for observation. If the animal has been killed, its whole body or head should be wrapped in a clean towel, packed in ice, and forwarded at once to the pathological laboratory. Transport should be by air where necessary. The further treatment of the case should be guided by the pathological or veterinary report.

The medical officer attending the case should secure and forward in duplicate to the P.M.O. concerned the following particulars :—

- (a) name, rank, age, and unit of person bitten ;
- (b) time and date when bitten ;
- (c) locality where injury occurred ;
- (d) part of body bitten and whether through clothing ;
- (e) number of bites received and their severity ;
- (f) kind of animal causing bite ;
- (g) whether animal was captured and what action has been taken regarding it ;
- (h) whether rabies has been diagnosed in the animal and by whom ;
- (i) name and address of owner of animal, or other information which will enable the animal to be identified.

Specific anti-rabic treatment should be given where the animal is strongly suspected or proved to be rabid, where the beast is unknown and has escaped, and in cases where the wounds are deep, multiple, or involve the head, face, or neck. This treatment should be commenced early, for the necessary course of vaccine occupies 15 days, and because the inoculation period for the disease following on face injuries may be as short as three weeks.

The Director of Medical Services in home commands, and the P.M.O. in commands abroad should be notified by signal of all cases requiring specific anti-rabic treatment, so that immediate arrangements can be made.

3. *Isolation*.—Patients suffering from rabies should be isolated, and treated with atropine and anti-rabic specific vaccine.

Attendants should protect their skin against contamination by the saliva of the patient.

The quarantine of rabies-suspected animals, that may or may not have bitten man or other animals, should be maintained for at least ten days—symptoms of rabies, if present, should be in evidence by the end of this time.

251. Relapsing Fever.—There are several varieties of relapsing fever—European, Indian, Egyptian, American, Persian, and Central African—but for practical purposes these may be separated into two classes, louse-borne and tick-borne.

1. *Carriers*.—Man has not been shown to carry the causative organisms (*Spironema recurrentis* and other species) after the termination of the disease, but infected lice and ticks appear to remain infective for the rest of their lives.

2. *Prevention of Infection*.—Preventive measures should aim at the avoidance and destruction of lice, ticks and all biting parasites.

Anti-louse campaigns should be carried on as described under the prevention of typhus; body and head lice are both concerned.

In tick-infected areas, all buildings and quarters used by natives should be avoided and frequently disinfected. Natives should not be allowed to sleep in the same quarters as Europeans. Beds and sleeping apartments of all personnel should be inspected daily for ticks and other vermin, and the bedding exposed to the sun. Pyrethrum or Keating's powder may be dusted in the bedding. Personnel should not sleep on

the ground, and should use a mosquito net at night. Bed-legs should be rendered smooth. Bedsteads should be smeared frequently with paraffin. The floors of all buildings should be kept clean and sprinkled daily with crude cresol in water. Where possible the walls of huts and side curtains of tents should be 8 to 10 inches clear of the ground to prevent ticks and bed bugs climbing up the sides—they delight in dropping on their victims. Tent poles and guy ropes should be provided with guard cups facing downwards and well smeared internally with grease or carbolised vaseline. These cups can be improvised out of small tins ; they should be inspected daily, and any ticks or insects found therein removed and destroyed. Similar cups should be fitted to all legs of beds and tables. Any gap between neck of a cup and its support should be closed up with grease. Trenches with perpendicular sides, about six inches wide and nine inches deep, should be made around all buildings ; the bottom of the trench should contain wood ash, and should be sprinkled with crude cresol or paraffin weekly to kill off any trapped ticks. The site of temporary camps should be well away from the beaten track, and when possible should be fired. Living quarters should be fumigated frequently with sulphur or pyrethrum. Daily ablution, inunction and the wearing of lysol-treated undervest or shirt should be encouraged (*see under "Typhus"*).

3. *Isolation*.—Relapsing fever patients should be isolated until disinfested, and protected against further bites from ticks and lice by a mosquito net or other means for at least a fortnight after the temperature has returned to normal, and blood examination has proved negative to parasites. The blood, sweat, saliva, urine and fomites should be considered infectious. Novarsenobillon (0·6 gramme) should be given intravenously for curative purposes ; this drug rapidly renders the patient non-infectious.

Nursing attendants should take great care to avoid infection by the human body fluids and by vermin off the patients (*see under "Typhus"*).

The quarantine of all verminous persons should be enforced for 14 days ; their bodies, clothing, quarters and effects should be disinfested and disinfected.

252. Scarlet Fever.—1. *Carriers* should be looked for, especially amongst those handling milk supplies. Dairymen, cookhouse and canteen personnel should have their hands examined during routine inspections for signs of desquamation. Tonsillitis and otitis cases should have swabbings from their throats searched for the presence of *Streptococcus scarlatinae*.

2. *Prevention of Infection.*—Routine medical inspection of men should be carried out on returning from leave or on joining the station, and special attention should be paid to the inter-digital clefts for evidence of peeling.

When a case of scarlet fever occurs, the room, bedding, clothing and feeding utensils should be disinfected; all immediate contacts should be segregated in well ventilated quarters, and drilled apart; swabbings should be taken from their throats and forwarded to the laboratory for examination for *Streptococcus scarlatinae*; the Dick test should be applied in order to detect the immunes and non-immunes to this disease, and the result should be entered on the man's Form 48 for future reference.

The immunes, if their throat swabbings are free from *Streptococcus scarlatinae*, should be discharged to duty, but should report to the sick quarters for inspection and naso-pharyngeal disinfection twice daily for seven days.

The non-immunes should be segregated for seven days, practise naso-pharyngeal disinfection twice daily, and be medically inspected daily, especial attention being paid to the skin over the front of the chest, and to the condition of tongue and tonsils. Non-immunes may be given immediate but temporary protection by means of scarlet fever anti-toxin (5 c.c.) subcutaneously into flank; or be given delayed but more permanent immunity by the use of scarlet fever toxin 500, 1000, 2000, and 3000 minimal skin doses, respectively, at weekly intervals for four weeks. The P.M.O., in consultation with the pathologist, should decide whether this treatment is advisable in any given instance. Any non-immunes found amongst the staff of a fever hospital or block should be immunised in this manner.

All persons suffering from sore throat or malaise should be ordered to report sick. They should be dealt with in a manner similar to that applied to contacts.

All milk should be pasteurised or boiled during an outbreak, dairies should be inspected, and samples of the milk collected for analysis. All feeding utensils in messes and canteens should be steeped in boiling water after use during an epidemic of scarlet fever.

All attendants on scarlet fever cases should, if possible, be immunes to the disease. They should wear overalls and gauze face-masks, disinfect their hands and naso-pharynx after attending the patients and before going off duty.

3. *Isolation* of all cases of scarlet fever and suspects should be immediate and complete. To make a diagnosis in doubtful cases the Dick and Schultz-Charlton tests should be carried

out. Patients should be given 10 to 20 c.c. scarlet fever streptococcus anti-toxin subcutaneously or intramuscularly as soon as a diagnosis is made ; this lessens the severity and duration of the disease.

All excreta, discharges, fomites and feeding utensils should be treated as infectious.

The quarantine period for suspects and contacts should be seven days. No scarlet fever patient should be discharged from hospital as free from infection until desquamation and all nasal and aural discharges have ceased.

253. Smallpox.—No matter whether the diagnosis made is that of smallpox, amias, alastrim, or chicken-pox, the preventive measures should be on the lines of those adopted for true smallpox.

1. *Carriers.*—Man carries the infection until all epithelial eruption and desquamation has ceased, that is, for about four weeks after the first symptoms of the disease. The infection, which is extremely virulent, is spread usually by contact with missed, mild, or abortive cases, and with contaminated materials such as clothing, bedding, rags, and personal effects. Biting parasites, for instance lice and bed-bugs, may convey the infection from the sick to the healthy. Winds may carry the infected skin scales for considerable distances.

2. *Prevention of Infection.*—At the medical inspection of personnel returning off leave, attention should be directed to the forehead, back of wrists, dorsum of body, and extensor aspects of limbs, for signs of papules, vesicles, pustules, or scales. All suspects should be isolated, especially men who have returned from areas known to be infected with smallpox.

The vaccination state of the station should be kept up to date at all times, as vaccination with glycerinated calf lymph gives great protection against smallpox. All personnel should be re-vaccinated at five-yearly periods and, in times of epidemics, every two years. No statement regarding the date of vaccination should be accepted unless there is official documentary evidence of the fact. For details of the procedure of vaccination, see para. 203.

Close touch should be kept with civil health authorities, and all known smallpox areas should be placed out of bounds.

When a case of smallpox occurs, the building should be placed out of bounds and a sentry mounted on duty at the door. The case should be removed to isolation, and all contacts segregated, re-vaccinated and medically examined daily. All bedding, clothing and personal effects should be thoroughly disinfected, while the building should be fumigated with sulphur dioxide and cleansed out with cresol-treated

water. Every corner should be gone into thoroughly. All personnel should be confined to camp, and no strangers permitted to enter it without a special permit. Camp laundries and their personnel should be inspected, and great care should be exercised in the disposal and washing of all clothes. All transport should be disinfected daily. Cinemas should be closed. Barbers' establishments should be supervised.

3. *Isolation*.—All cases of supposed smallpox, chicken-pox or other vesicular eruption should be isolated immediately, their previous medical history and movements carefully inquired into, and treated as smallpox suspects until proved to be otherwise.

Those suffering from smallpox should be housed in the nearest civil smallpox hospital, but failing that, in some building or tent situated at least $\frac{1}{4}$ mile to leeward of any habitation, and no-one, except those in attendance on the case, should be allowed to come within this $\frac{1}{4}$ mile radius. Temporary structures are useful for this purpose as they may be destroyed when finished with.

All discharges, skin particles and fomites should be treated as infectious. The patient's skin should be anointed with vaseline or some antiseptic ointment, or treated with 5 per cent. potassium permanganate solution. No case should be discharged from hospital until all desquamation has ceased for a week. Patient, fomites, effects and room should be thoroughly disinfected prior to discharge.

Attendants on smallpox cases should be chosen from amongst those who have been vaccinated within the previous two years; they should wear gauze face-masks, gowns and rubber gloves, and should be isolated completely from the rest of the community whilst engaged in these duties.

Application should be made to the pathologist to investigate material from the vesicles of doubtful cases.

Quarantine.—Contacts and suspects should be isolated for two weeks unless successfully vaccinated when, after thorough disinfection, they may be released to duty; they should, however, be medically examined daily for a fortnight.

254. Tetanus.—Tetanus is liable to occur whenever a wound is contaminated with manured soil; a pin-prick is sufficient to harbour the spores of the tetanus bacillus, and wounds that contain foreign bodies, damaged tissues, septic organisms, or blood clots are specially favourable to the development of this organism, which proliferates and remains localised while its toxins ascend to the central nervous system by way of the sheaths of motor neurones.

1. *Carriers*.—*Bacillus tetani* is a frequent inhabitant of the intestines of horses and cattle, and through their faeces infects the soil. At times man carries this organism in his intestine, and tetanus has occurred after abdominal operations in this type of carrier. Biting insects, such as stable flies, may convey the infection.

2. *Prevention of Infection*.—Personnel should be repeatedly warned of the dangers associated with all wounds and bites.

All soil-contaminated wounds, however trivial, should be treated as potentially tetanic. The wound should be thoroughly cleansed, irrigated with hydrogen peroxide, and dressed with some antiseptic to remove or kill any contained organisms. At the same time 500 units of tetanus anti-serum should be injected intramuscularly or subcutaneously to neutralise any toxin; this dose should be repeated at the end of a week and, in very dirty or badly contused wounds, two further doses should be given at weekly intervals.

When foreign bodies or compound fractures are being operated on after the original wounds have healed, a prophylactic dose of tetanus anti-serum should be given intramuscularly just proximal to the proposed site of operation, as spores may remain latent until a further wound is made.

All cases of trench foot and severe burns should receive this prophylactic treatment.

Everyone should be encouraged to cleanse and apply iodine to all scratches and insect bites. The more severe wounds should be treated as detailed above.

255. Trench Fever.—Trench fever, like typhus and relapsing fever, is liable to occur whenever troops become verminous. The notes on this disease should be read in conjunction with those on typhus fever.

1. *Carriers*.—Man, once infected with this fever, may remain infective for more than a year. The virus may be present in blood, urine, and sputum of a trench-fever case, and may be transmitted to the louse (*Pediculus humanus*) when it feeds on infected persons. The louse is the common means of spreading the disease from man to man, chiefly through its excreta being scratched or rubbed into abrasions of the skin.

2. *Prevention of Infection*.—All personnel should be taught to cultivate a healthy skin—free from abrasions, impetigo, and scabies—by means of frequent lavage, and a change of underclothing at least once a week.

Any persons found verminous at weekly inspections should be disinfested, and their clothing and effects disinfected.

All clothing and bedding should be disinfected before handing into store.

During outbreaks of the disease, the close approximation and parading of men together should be avoided until they have all been disinfected.

3. *Isolation*.—All cases of trench fever and suspects (including verminous persons) should be isolated, and their person, bedding, clothing, and effects disinfested and disinfected. Their sputum, excreta and fomites should be treated as infective. Their bodies should be smeared with some oily disinfectant preparation to counteract the activities of any stray lice. Further disinfection of patient, bedding, and clothing should be carried out prior to discharge from hospital. These cases, after discharge, should be frequently inspected for vermin, as they are liable to carry the infection in their blood for several months.

256. Tuberculosis.—Tuberculosis is most likely to be spread amongst personnel by droplet infection from the respiratory passages, especially amongst those employed in confined spaces, for example in offices and aboard aircraft carriers. Milk containing the bovine tubercle bacillus may cause infection of adolescents under training, leading usually to localised tuberculosis of the lymphatic glands. Further, it should be remembered that in native races tuberculous glands of the neck are said frequently to herald the onset of acute tuberculosis.

1. *Carriers*.—Every effort should be made to detect human carriers and early cases of tuberculosis without arousing the suspicions of the individuals concerned. About 10 per cent. of cows are tuberculous and, therefore, a constant watch should be kept on the milk supply. Cats frequently suffer from tuberculosis, and should not be allowed in sick quarters.

2. *Prevention of Infection*.—Promiscuous spitting should be prohibited. Barracks and workshops should be efficiently ventilated, and kept clean. Floors and furniture should be scrubbed or mopped out with water, to which has been added some disinfectant, such as crude cresol; thereafter the rooms should be thoroughly dried before re-occupation. This should be done daily except in very damp weather. The floors should never be dry-scrubbed.

On board troopships and aircraft carriers, where the sleeping space below decks is limited, personnel should be made to spend as much time as possible on deck. The

between-decks should be wet-scrubbed, and portholes and ventilators should be used to their utmost. Electric fans should be provided for warm climates.

All milk should be boiled before use, and periodic inspection should be carried out of the concerned dairies, farms, and those working in them. At least once a year samples of milk should be sent for bacteriological analysis.

Early symptoms of tuberculosis should be looked for constantly at medical inspections and sick-parades. All cases suffering from alteration of voice (hoarseness), undue lassitude, continued loss of weight, chronic cough, pleurisy, night sweats, or fever without apparent cause, should be carefully examined for tuberculosis (*See* K.R. and A.C.I., para. 1452.). Doubtful cases should be sent to hospital for thorough clinical overhaul. Sputum, when available, should be forwarded to the laboratory.

Those who have recently suffered from certain diseases which are thought to predispose the patient to tuberculosis should be excused the more arduous duties (*see* under "Measles" and "Whooping Cough").

3. *Isolation*.—Those suffering from tuberculosis and suspects should be admitted to hospital and isolated; the respiratory type separated from the others, and each case kept well apart from his neighbour. They should be housed in a sheltered, sunny spot in a dry, airy building. Patients should be kept in the fresh air and sunlight as much as possible. All discharges should be treated as infectious. Specimens of sputum, fæces and urine should be forwarded to the laboratory for examination for the tubercle bacillus.

The quarantine of suspects should be continued until extensive clinical, bacteriological and radiographic examinations have failed to reveal the presence of tuberculosis. These cases should not be employed in cookhouses, canteens or offices.

257. Typhus.—For practical purposes there are two main types of typhus:—*Epidemic*, which is common in temperate climes, is highly infectious, and is spread by lice; this includes Brill's disease and tarbadillo, and *Tropical*, which is of low infectivity, appears to be spread by ticks and mites, and is the form of the disease seen usually in warm climates; examples of this type are Rocky Mountain fever, Himalayan and Malayan typhus, and the so-called "mouse," "wheat" and "sugar diseases" (Mossman fever) of Australia.

Every outbreak of typhus-like fever, irrespective of the actual type, should be treated on the lines of the more severe infection.

1. *Carriers*.—It should be remembered that man carries the virus of typhus so long as he has the disease ; that lice (*P. humanus*) become infected by feeding on the blood of typhus cases, and remain infective for the rest of their lives ; that the tick and mite bearers of the disease are similarly infected, and probably hand on the infection to their progeny ; and finally, rodents and domestic animals appear to act as reservoirs for this virus. Thus preventive measures should aim at severing the various links of this etiological chain.

2. *Prevention of Infection*.—At all times there should be a continued and vigorous campaign against lice and other biting insects. General and personal cleanliness should be insisted on to prevent personnel from becoming verminous—cleanliness should go deeper than the buttons. There should be a weekly inspection to detect vermin and infectious diseases, after which every man should be made to bath, and then change into clean underclothes. Bedding and personal effects should also be examined for vermin. Anyone found to be verminous should be isolated immediately ; his clothing and bedding disinfected by hot air or steam ; his person disinfested by cutting or shaving all hairy parts and by supervised bathing, aided by the use of 1 per cent. lysol, Jeyes' fluid, paraffin and diluted vinegar—all hairs removed should be burned. Floors should be scrubbed daily and lightly smeared with a paraffin rag.

In tick or mite infected areas the ground in and around the camp should be fired, when practicable. For other measures see under "Relapsing Fever."

The dwellings of natives and all animals should be kept as far away as possible from European living quarters. Typhus endemic areas should be placed out of bounds.

War should be waged on rats and other rodents as described under "Plague."

When a case of typhus occurs, the whole camp should be disinfected, including stores ; if possible the camp should be moved to clean ground.

In verminous districts and in typhus epidemics everyone should bath daily, and lather his body thoroughly with soap ; all hair should be kept short. A clean cotton undervest, previously soaked in $2\frac{1}{2}$ per cent. lysol solution and dried, should be donned after the ablution. All clothes should be carefully examined for lice and dusted with some insecticide, or better, the seams should be hot-ironed, before re-dressing.

Those in attendance on the sick should wear overalls, close fitting at the neck, wrists, and ankles, and a skull cap ; these should be lysol-impregnated as described. In addition,

gum boots and rubber gloves should be worn. When duty is finished, all clothes should be removed, searched for lice, and disinfected ; fresh clothes should be put on.

The question of prophylactic inoculations requires specialist's opinion and should not be performed without the written sanction of the P.M.O.

3. *Isolation*.—All cases of typhus and suspects should be isolated at once, and their clothing, bedding and person disinfested as described above ; thereafter, their bodies should be anointed with yellow oxide of mercury ointment, carbolised vaseline or olive oil. Disinfestation should be continued daily throughout the disease. Isolation should be for at least six weeks.

The quarantine of contacts should extend after disinfestation to sixteen days, during which time the most scrupulous cleanliness should be practised by all. All contacts should be medically inspected daily.

258. Venereal Diseases.—The greatest care should be taken in the early diagnosis and efficient treatment of venereal diseases, for their after-effects are so far-reaching. Every effort should be made to gain the personal and professional confidence of all officers and airmen, so that they will come readily for advice on all subjects of health.

1. *Carriers*.—The causal organisms of gonorrhœa, syphilis and soft sore are obligatory parasites, so that the majority of infections take place by direct contact with an infectious person, although the possibility of indirect infection from feeding utensils, kissing, towels and latrines should be guarded against.

2. *Prevention of Infection*.—When airmen are joining the unit or returning off leave, the medical officer should pay particular attention to the external genitals for evidence of venereal disease, including pediculosis.

Healthy sports, outdoor and indoor, should be organised for everyone ; especially games of a competitive nature that will absorb the interest of the men. Cinematograph theatres, concert parties and popular lectures should be encouraged for a similar reason. Talks should be given frequently to the men on the dangers of promiscuous intercourse and the best methods of attempting to prevent infection. There should be a daily ablution of the external genitals with soap and water.

Feeding utensils should always be thoroughly cleansed after use to prevent extra-genital chancres and other infectious diseases. Latrines seats should be kept clean, and washed

with soap and water daily. Barbers' establishments should be inspected frequently to ascertain that all shaving brushes, razors, etc., are steeped in disinfectant after use.

When cases of infection occur, endeavour should be made to prevent others from getting infected from the same source.

Prophylactic outfits should be available for all—tubules of 33 per cent. calomel cream, and one ounce bottles of 1–1,000 potassium permanaganate solution—these should be stored in the sick quarters, and men that draw them should be made conversant with their mode of use.

Early treatment rooms should be situated near the sick quarters or at the entrance to the camp, and should be inspected daily to see that all apparatus and solutions are in order.

3. *Isolation*.—All suspects and cases of venereal disease should be isolated immediately, and remain in isolation until free from active infection. Gonorrhœa cases should be considered infectious so long as gonococci can be detected in urethral discharge or prostatic secretion. Syphilitics, who are free from open lesions and who have had at least three consecutive weekly intravenous injections of some preparation such as novarsenobillon, should be able to carry out light duties in the hospital compound, or even return to light duty in their unit, provided that they report regularly to the sick quarters for the completion of treatment. Since incomplete treatment of this disease often leads to neuro-syphilis, every case of syphilis should be given a full course of treatment, even if the Wassermann reaction remains persistently negative and all symptoms of the disease rapidly disappear.

All suspected chancres, hard or soft, should be subjected to a definite routine of examination before pronounced as non-syphilitic. The sore should be well cleansed with saline, and, with a capillary tube, some serum should be collected from below the surface of the ulcer. If this should prove negative to *Spironema pallidum*, further specimens should be collected on the two following days. If still negative, gland puncture should be carried out on any enlarged inguinal or other superficial lymph gland to search for parasites. At the end of a week blood should be withdrawn for the Wassermann test, and 0.45 grm. N.A.B. injected intravenously as a provocative dose. A week later a further blood sample should be submitted to the Wassermann test. Cases that still show a negative reaction should have their blood examined once a month for three months before being declared free from infection.

The urine and all discharges of venereal cases should be treated as infectious. Every patient should be given written instructions regarding the general management of his disease.

Venereal patients should have their minds and hands adequately occupied, otherwise their attention is focussed unduly on the diseased part of their anatomy.

Specimens sent to the laboratory from these cases should be accompanied by Form 3212 fully filled in as indicated in paras. 270, 274 and 280.

Particulars relating to venereal patients, written and oral, should be treated as confidential. All information regarding any case transferred from one unit to another should be transmitted through the P.M.Os. and M.Os. concerned.

Venereal disease case cards (Form 478) will be completed as laid down in A.M.W.O. 751/29.

259. Weil's Disease or Spirochætosis Icterohæmorrhagica.

—1. *Carriers*.—Rats appear to be the natural carriers of the virus of this disease, which they evacuate in their fæces and urine. A similar organism (leptospira) has been found in tap water and in the slime of the roofs of certain mines, at home and abroad. Man becomes infected through contact of his skin or mucosa with water or food that has been contaminated by rat excreta containing the specific leptospira, and may disseminate this organism by means of sputum and urine for a month or more.

2. *Prevention of Infection*.—Food should be protected against contamination by rats and other animals. A constant war should be waged against rats (*see* under "Plague"). All cases of jaundice should have their urines sent to the laboratory for the possible detection of leptospira.

During epidemics of this disease, prophylactic inoculation with Noguchi's vaccine might be tried.

3. *Isolation*.—Patients suffering from Weil's disease should be isolated, and their excreta and fomites treated as infectious. Their urine should be certified free from leptospira (after guinea-pig inoculation) before discharge from hospital. These cases should not be employed in handling food supplies for at least six months after discharge from hospital.

In every case of jaundice the blood, fæces and urine should be examined for the detection of pathogenic organisms, and a total and differential leucocyte count should be carried out; otherwise infectious cases may be treated as simple catarrhal jaundice.

260. Whooping Cough.—1. *Carriers.*—These are of the respiratory type and are difficult to detect ; after suffering from this disease the patient may harbour the causal virus for a prolonged period and, therefore, the sputum of convalescents and contacts should be searched for the *B. pertussis* to eliminate carriers, if possible.

2. *Prevention of Infection.*—When a case of whooping cough occurs, the room, clothing, bedding, and feeding utensils should be disinfected. All immediate contacts should be segregated and drilled apart, and should thrice daily practise naso-pharyngeal disinfection with 1 in 5,000 potassium permanganate solution in normal saline. Contact children should not attend school for at least a fortnight. Sputum of contacts, where available, should be forwarded to the laboratory.

During outbreaks of the disease, children and young adults should be protected by means of anti-whooping cough vaccine. Subcutaneous injections of the vaccine should be given at three-day intervals for four doses, the first dose consisting of 100 millions, the second 200 millions, the third 300 millions, and the fourth 400 millions *B. pertussis*.

All attendants on the sick should wear gauze face-masks to lessen the danger of "droplet" infection.

3. *Isolation.*—All cases of whooping cough, suspects, and carriers should be isolated immediately ; the isolation should be maintained for fourteen days after the last whoop is heard, and the sputum is pronounced free from *B. pertussis* and *B. tuberculosis*. Every case should be isolated for at least six weeks. Precautions should be taken to prevent the occurrence of broncho-pneumonia throughout the disease and during convalescence.

Quarantine for contacts and suspects is not necessary, except for infants who should be medically inspected for at least a fortnight.

SECTION III.—INSTRUCTIONS FOR COLLECTING AND DESPATCHING SAMPLES AND SPECIMENS FOR CHEMICAL AND BACTERIOLOGICAL EXAMINATION.

261. Samples of Water, Sewage and Food for examination and analysis from R.A.F. stations at home will be sent to :—

The Officer Commanding,

The R.A.F. Pathological Laboratory,

Halton Camp, Wendover, Bucks,

who will arrange to carry out a routine examination of water once a year from each R.A.F. station at home (A.M.W.O.

189/25). If at any time a special analysis is desired, owing to suspected contamination of the supply, the medical officer will inform the P.M.O. of the area or command, who will arrange with the Officer Commanding, R.A.F. Pathological Laboratory, to have the necessary samples taken.

262. Pathological Material will be sent to the R.A.F. Pathological Laboratory, Halton, whenever the examination and diagnosis cannot be carried out in the clinical laboratory of a hospital or a unit, and when a confirmatory opinion or special investigation is required.

Laboratory report form (Form 3212) will be completed in duplicate and forwarded with each sample or specimen, except water and sewage samples.

Samples should not be sent during the week-end, except by special messenger, as they are liable to be held up in the post or the railway over Sunday.

Analysis of Water.

263.—1. The water should be collected

(a) for *chemical* analysis in a Winchester quart bottle ;

(b) for *bacteriological* examination in a sterilized 8-oz. bottle.

These bottles and containers will be supplied, ready for immediate use, by the Officer Commanding, R.A.F. Pathological Laboratory, Halton Camp.

When a medical officer has to prepare his own bottles, the simplest procedure is to cleanse a Winchester quart bottle with a little weak sulphuric acid, afterwards removing all traces of the acid by repeated washings with the water to be examined. A bottle that has contained ammonia should never be used. The bottle should be closed with a well-fitting glass stopper, or a new, freshly boiled cork. For bacteriological examination an 8-oz. medicine-bottle and a new cork should be boiled in a steriliser or saucepan for 30 minutes ; the boiling water is poured off, the bottle stoppered with the aid of sterile forceps, and allowed to cool before use.

2. The Collection of Water Samples should be carried out under the direct personal supervision of the medical officer of the unit concerned. At R.A.F. units, the water samples should be collected from the drinking water supply in the airmen's kitchen.

The water samples should be collected under similar conditions to those under which the water is drawn for drinking purposes. Specimens for chemical and bacteriological examination from any one source should be taken at the same point and at the same time. Before the bottles are filled they should be rinsed out thoroughly with the water to be examined.

(a) In the case of a *house tap*, the water should be taken from the lowest tap supplied from the cistern, which is usually that in the kitchen, in order to obtain the water which has run the greatest distance in the house pipes. The mouth of the tap should be flamed for a minute with a spirit lamp and then the water should be run to waste for five minutes before the samples are collected.

(b) A *well* should be pumped vigorously for five minutes before the water is collected. This aids in the detection of any flaw or contamination in the drainage area.

(c) *River, Reservoir, and Lake Waters* require a different procedure. A stout piece of string should be tied securely round the neck of the bottle in such a way as to leave a short and long end. The short end of the string should be about a foot in length and should have affixed to it a stone or weight sufficiently heavy to immerse the bottle below the surface of the water. The longer end, several feet in length, should be held in the hand of the collector to enable him to regulate the position of the vessel. A second piece of string should be attached to the stopper; thus the stopper can be removed from the bottle when the latter is immersed. In this manner contamination of the sample with surface scum will be avoided.

In every case the bottle should be filled so as to exclude all air, and then firmly stoppered.

Stoppers should be tied with string and finally secured with sealing wax.

Immediately after collection all samples should be clearly labelled, giving the following particulars :—

- (i) Name of station.
- (ii) Date and hour of collection.
- (iii) Source of sample (tap or well).
- (iv) Method of collection.
- (v) Geological character of soil and sub-soil of district.
- (vi) Nature and distance of evident or possible source of pollution.
- (vii) Rainfall during previous week (nil, small, moderate or great).
- (viii) Any special treatment that the water has received (boiling, chlorination, softening or clarification).
- (ix) Reason for desiring analysis.
- (x) Signature of officer sending water.

3. *Transmission of Samples*.—All samples should be carefully packed in their respective containers, labelled "Water sample," "With care," "Urgent," and forwarded immediately to the laboratory.

The specimen for chemical analysis should be forwarded by passenger train, R.A.F. Form 1486 being inscribed at the top "Per passenger train."

The smaller bottle, containing the water for bacteriological examination, should be despatched by post, or else packed in ice and sawdust and forwarded by passenger train.

Analysis of Sewage Effluent.

264.—1. All R.A.F. stations at home that have their own sewage purification works will have a sample of the sewage effluent examined at least once a year. The necessary apparatus will be supplied from the R.A.F. Pathological Laboratory, Halton.

2. *Collection of Sewage Effluent.*—The effluent should be collected from the pipe which discharges from the humus tank. There is no need to collect samples at different times of day, as the fluid derived from the humus tank is a good representative mixture of at least 24 hours sewage. A Winchester quart bottle should be completely filled for the chemical analysis, and an 8-oz. bottle for the bacteriological examination.

All samples should be clearly labelled giving the following particulars :—

- (i) Name of station.
- (ii) Date and hour of collection.
- (iii) Source of sample.
- (iv) Method of sewage disposal on station.
- (v) Rainfall during previous week.
- (vi) Reason for desiring analysis.
- (vii) Signature of officer sending sample.

3. *Transmission of Sewage Effluent Samples* to the laboratory should be carried out as detailed for water samples.

Analysis of Food and Beverages.

265.—1. The analysis of food may be required when its wholesomeness or quality is in doubt, or in the event of suspected food poisoning. In the latter case the P.M.O. of the area or command concerned and the pathologist should be informed immediately, so that their opinion can be obtained as to what articles of diet should be specially sent for examination.

2. *Method of Collection of Samples.*—Special containers are not usually required. The *original container* should be forwarded if possible. If the original container is not available, the food sample should be packed in clean, sterile glass-stoppered bottles or jars of suitable size. The glassware should be sterilised by boiling for one hour.

All food samples should be collected under the direct personal supervision of the medical officer of the unit concerned.

A fair average sample of the food should be obtained, for instance, both crust and crumb of bread, and rind and interior of cheeses should be included; milk should be thoroughly mixed before the sample is collected.

The minimum quantities to be forwarded for examination are as follows :—

Milk	..	..	..	..	1 pint.
Condensed milk	..	..	..	..	1 tin.
Dried milk	..	..	..	..	3 ozs.
Butter	..	..	..	..	4 ozs.
Margarine	..	..	..	..	4 ozs.
Cheese	..	..	..	..	4 ozs.
Bread	..	..	..	..	8 ozs.
Biscuits	..	..	..	..	8 ozs.
Flour	..	..	..	..	4 ozs.
Oatmeal	..	..	..	..	2 ozs.
Arrowroot	..	..	..	..	2 ozs.
Tea	..	..	..	..	2 ozs.
Coffee	..	..	..	..	4 ozs.
Cocoa	..	..	..	..	2 ozs.
Tinned meat or fish	..	..	..	..	1 tin.
Sausage	..	..	..	..	8 ozs.
Dried or smoked meat or fish	..	..	..	..	8 ozs.
Lard	..	..	..	..	4 ozs.
Tinned or bottled fruit or vegetable	..	..	..	..	1 tin or bottle.
Sugar	..	..	..	..	4 ozs.
Jam	..	..	..	..	4 ozs.
Golden syrup	..	..	..	..	4 ozs.
Confectionery	..	..	..	..	4 ozs.
Pepper or mustard	..	..	..	..	1 oz.
Vinegar	..	..	..	..	5 ozs.
Lime juice	..	..	..	..	5 ozs.
Beer or stout	..	..	..	..	10 ozs.
Spirits	..	..	..	..	10 ozs.
Aerated water	..	..	..	..	1 bottle or syphon.

The following particulars should be forwarded to the laboratory :—

- (i) Name of station.
- (ii) Date of forwarding specimen.
- (iii) Nature of article of food sent.
- (iv) Source of the article.
- (v) Date of purchase or issue of the article.
- (vi) Exact examination required.
- (vii) Reasons for desiring analysis.
- (viii) Signature of officer sending sample.

In addition, in cases of suspected food poisoning, specimens of the patient's vomit and faeces should be forwarded, and a concise history of the illness stating :—

- (i) Name of patient or patients.
- (ii) Time elapsed between ingestion of suspected food and onset of symptoms.
- (iii) Synopsis of symptoms in order of occurrence.
- (iv) Condition of other people who had partaken of the food.

3. *Transmission of Samples.*—In the case of suspected food poisoning, all samples should be immediately forwarded packed in ice, the procedure being similar to that detailed for the transmission of water samples.

Pathological Material for Laboratory Examination.

266.—1. Apparatus and containers for the transmission of pathological specimens should be indented for on Form 1209. Indents should be forwarded to R.A.F. Medical Stores, Kidbrooke, through the usual channels.

2. When a specimen is forwarded to the laboratory, the nature of apparatus and container should be written at the top left-hand corner of Form 3212. The officer in charge of the laboratory will return either the same or a similar piece of sterile apparatus and container along with the pathological report to the unit concerned. By this means the stock of laboratory apparatus in each unit will remain constant, without the necessity of vouchering stores when each specimen is sent for examination.

267. Agglutination Tests.—1. These tests, commonly called "Widal," are performed for the diagnosis of abdominal fevers and pyrexias of uncertain origin, such as enterica group, bacillary dysentery, food poisoning and undulant fever. In many of these conditions the infecting organism can be isolated from the blood before a positive agglutination test is obtainable. Thus it is advisable to make a blood culture at the same time, the blood being obtained by vein puncture.

2. *Method of Collection. Technique of vein puncture.*—The skin over the front of the elbow should be cleaned with methylated spirit or tincture of iodine.

The median basilic or cephalic vein should be rendered prominent by means of a bandage applied around the upper arm, aided by massaging upwards the skin of the lower arm, and by the patient firmly clenching his hand.

The fingers of the left hand should be placed behind the patient's elbow to support and extend the joint, while the left thumb should be used to fix the chosen vein.

A sharp sterile needle attached to a sterile 10 or 20 c.c. syringe should be held almost parallel to the chosen vein, and inserted into the vessel in the direction of the blood flow with the eye of the instrument facing the operator. If the puncture is successful, blood will enter the syringe.

With gentle traction on the plunger of syringe at least 10 c.c. of blood should be drawn off. The bandage should be removed from the upper arm, the syringe with needle should be withdrawn, and a pad of cotton wool soaked in spirit should be applied to the wound. The punctured skin should be gently moved to one side of the vein, and digital pressure re-applied over the wound for a few minutes to prevent the development of a hæmatoma. No dressing should be necessary.

Five c.c. or more of blood should be used to inoculate broth tubes for cultural purposes, while the remainder of the blood should be transferred to a clean, dry sterile test tube for agglutination tests. If the agglutination test is all that is desired, then 1 c.c. of blood is sufficient, and should be obtained with a sterile hypodermic needle and syringe. Immediately after use the syringe and needle should be immersed in, and washed out with, cold water to prevent blood clotting in the needle. After an hour, the blood clot should be loosened from the sides of the agglutination tube by means of a sterile platinum needle, wire or glass rod.

3. *Transmission*.—The tube should be securely corked and forwarded at once to the laboratory ; the serum will separate off *en route*.

4. *Information to be forwarded* with the specimen should include name of patient, a summary of symptoms, day of disease, dates and dosage of T.A.B. or other protective inoculations, and any history of previous diseases of this group.

268.—Blood Cultures.—1. These should be made on all cases of pyrexia of unknown origin when the temperature remains up for more than three days. The earlier that blood cultures are performed in the course of a fever the more likely is a positive result to be obtained.

2. *Method of Collection*.—(a) The blood should be collected as described under the heading "Agglutination Tests" (para. 267).

(b) *Media*.—Broth cultures are most valuable for the early isolation of organisms of the enteric, food poisoning and dysentery groups ; for detecting septicæmia due to the

streptococcus, staphylococcus, pneumococcus, *B. pestis*, *B. melitensis* and at times the meningococcus. For the cultivation of spirochetes, such as those of Weil's disease and rat-bite fever, or of leishmania, a special Wenyon-Noguchi medium is desirable.

(c) *Inoculation of Media*.—Small bottles of media ready for inoculation should be obtained from the nearest laboratory. If the bottle is protected with a rubber cap, the cap should be wiped with spirit and iodine, then punctured with the needle attached to the syringe containing the blood. From 5 to 10 c.c. of the blood should be ejected into the medium, the needle withdrawn, and a drop of melted wax spread over the top of the cap. The blood remaining in the syringe should be transferred to a sterile test-tube for the purpose of obtaining serum for agglutination or complement fixation tests.

3. *Transmission*.—The bottle containing the culture should be wrapped well in cotton wool, placed in a strong wooden box, and forwarded to the laboratory at once.

4. *Information to be forwarded* with specimens should include name of patient, summary of symptoms, date of collection, day of disease and amount of blood inoculated into the medium.

269. Blood Smears.—1. These may give direct evidence of such diseases as malaria, relapsing fever, trypanosomiasis, kala-azar and at times septicæmia, by revealing the presence of the parasite concerned. Indirect evidence of disease may be gained by a differential leucocyte count carried out on a blood smear; thus an eosinophilia would suggest a helminthic infection such as schistosomiasis (bilharziasis), ancylostomiasis, trichinosis or filariasis. Sepsis would show a polymorpho-nuclear leucocytosis, while an increase of the large lymphocytes would point to a protozoal infection.

2. *Method of Collection*.—To prepare a blood smear, two absolutely clean glass microscope slides should be taken. A rapid method of cleaning these slides is to rub them firmly about a dozen times with "00" sandpaper, and then to immerse them in absolute alcohol until required. The slides should be removed from the alcohol, dried and polished with a clean soft handkerchief immediately before use.

The thumb or lobe of the ear should be pricked with a sharp needle, the first drop of blood removed with a piece of cotton wool, and the succeeding drop received on a slide near the end. The lower end of a second slide should be placed on the first just in front of the drop of blood so that the blood spreads out between the slides in the acute angle thus formed. The slides should be kept at an angle of 45° to one another

and the upper slide should be carried gently and evenly along the whole length of the lower one. The upper slide should rest solely by its own weight on the other. The films should be dried in the air. They may be waved about to aid drying, but should never be heated. They should be labelled and wrapped up at once to prevent flies and other insects contaminating them.

3. *Transmission*.—These slides should be sent to the laboratory in a small box (match, cigarette or safety-pin box). Two smears should always be sent; these, but only when thoroughly dried, should be placed face to face and wrapped round with paper to prevent damage in transit.

4. *Information to be forwarded* with specimen should include name of patient, summary of symptoms, date of collection, day of fever, and date when last dose of quinine or other medicine was taken.

270. Complement Deviation Tests.—1. These tests are usually performed for the diagnosis of syphilis (Wassermann or Sigma reaction). At times similar tests are carried out to help in the diagnosis of hydatid disease, schistosomiasis, gonorrhœa, etc.

2. *Method of Collection*.—Blood serum is the usual fluid submitted to the complement deviation test, but the cerebro-spinal fluid is frequently used in neuro-syphilis and para-syphilitic conditions. The blood sera should be collected with all aseptic precautions as described under agglutination tests and transferred to the narrow glass tubes provided for the purpose.

3. *Transmission*.—At least 10 c.c. of blood, or 2 c.c. of serum, should be forwarded to the laboratory immediately.

4. *Information to be forwarded* with specimen should include name of patient, summary of symptoms, date of infection, amounts and dates of anti-syphilitic treatment, and results of previous complement deviation tests.

271. Cerebro-spinal Fluid.—1. This should be collected to assist in the diagnosis and treatment of cerebro-spinal meningitis, meningo-encephalitis, and indeed in any case where increased intra-cranial pressure is known or suspected.

2. *Method of Collection*.—A general anæsthetic should not be required, unless the patient is delirious. Local anæsthesia over the site of puncture should suffice.

The patient should lie on his right side with his back near the edge of the bed. The head should be bent forward with the knees well drawn up so as to arch the back thoroughly and

extend the inter-laminar spaces as much as possible. The spinous processes of the vertebræ should be palpated to ensure that the spine is in the horizontal position. The highest point of each iliac crest should be marked and a line joining these points should cross the vertebral column at the level of the 4th lumbar spinous process. This process should be marked.

The puncture should be made slightly to one side of the mid line between the 4th and 5th, or 3rd and 4th lumbar spines. The skin over the site of puncture should be prepared with spirit, and a stout needle of at least 4 inches in length, pushed firmly forward, upwards and slightly inwards. A feeling of lessened resistance should indicate the penetration of the dura and, if the stylet be removed from the needle, spinal fluid should flow out unless the lumen be blocked. If this be so, the stylet should be inserted again to clear the blockage. The cerebro-spinal fluid should be allowed to flow directly into sterile test-tubes; at least two, preferably three, test-tubes should be used. From 5 to 10 c.c. of the fluid should be collected in each tube.

3. *Transmission*.—The tubes should be closed with sterile rubber corks and maintained at body temperature (37° C.), otherwise such organisms as the meningococcus will die. A simple method of maintaining this temperature is to wrap the test-tubes in several layers of cotton wool and then carry them to the laboratory either in the inside pocket of a jacket or in a bag along with a hot water bottle filled with water at about 40° to 45° C. A throat swab, or West's swab containing material from the posterior naso-pharynx, should be forwarded at the same time, as the meningococcus may be recovered from this situation when it is absent from the cerebro-spinal fluid. Such specimens should be sent by a special messenger.

4. *Information to be forwarded* with specimens should include name of patient, summary of symptoms, date and time of collection, and whether fluid was under pressure or not (rate of flow).

272. **Fæces**.—1. These may be required to be examined with the naked eye for foreign bodies, gall stones or worms; chemically for the presence of fat, bile or blood, as aids to diagnosis in cases of suspected pancreatitis, hepatic disease, or ulcer of stomach or intestines; or bacteriologically for pathogenic bacterial, protozoal or helminthic infection of the gut.

2. *Method of Collection*.—Three grains of calomel should be given at bedtime, followed by a quarter of an ounce of

magnesium sulphate in the morning to obtain a free movement of the intestines and to increase the chance of sweeping out any infecting agent or material that may be in close apposition to the mucosa of the bowel.

Suspicious portions of the stool (blood or mucus) should be picked out with the scoop attached to the cork of the special fæces tube provided. Should the case be that of a suspected "cyst carrier" some of the solid part of the stool should be forwarded. In cases of urgency, a rubber catheter may be passed into the rectum and a specimen of fæces obtained in this manner.

When the test is for the presence of occult blood, the patient should be specially prepared for three days prior to the collection of the specimen of fæces. The preparation should consist of total abstinence from red and white meat, meat extractives, soups, coloured foods and medicines, especially iodides, iron and bismuth. On the morning of the fourth day the bowels should be moved with the aid of salts, and a specimen of the fæces sent to the laboratory.

In the case of suspected enteric or dysentery infection, the stools should be sent daily for at least a week. The urine and blood should be examined at the same time, as the causal organism may be present in one situation only.

It should be noted that in dysentery the bacilli are most easily found in the fæces during the first week, in enterica during the second or third week of the disease.

3. *Transmission*.—All samples of fæces for examination should be sent to the laboratory with the minimum of delay, as the non-pathogenic fæcal organisms are apt to outgrow and thus mask or destroy many of the pathogenic varieties.

4. *Information to be forwarded* with specimen should include name of patient, summary of symptoms, date and nature of any protective vaccine inoculations (T.A.B., etc.), any previous history of typhoid, dysentery or diarrhoea, and the time and place of service abroad.

273. Gastric Analysis.—This should be carried out in cases of suspected gastric or duodenal disease to investigate the digestive and motor power of the stomach. The fractional test meal will be required in most circumstances, and for this purpose arrangements should be made to send the patient to the laboratory.

Preparation of the patient: a light supper before eight o'clock in the evening prior to the test. Two charcoal biscuits with a glass of milk at nine p.m. Nothing to eat or drink thereafter until the test meal is given in the morning in the laboratory.

Preparation of the test meal: two tablespoonsful of fine oats in two pints of water, simmered down to one pint, and then strained through gauze. This meal is to be sent with the patient to the laboratory.

274. Gonorrhœa.—1. The discharge in all cases of urethritis and balanitis should be examined for the presence of the gonococcus or other pathogenic organisms.

2. *Method of Collection.*—(a) *In cases of acute gonorrhœa*, the anterior urinary meatus should be cleansed with a swab to remove extraneous organisms, then a drop of the discharge should be expressed from the urethra and received on a glass microscope slide, previously flamed. A second flamed and cooled glass slide should be lowered on the top of the pus, which should now be spread out between the two slides. The slides should be gently and slowly drawn apart in the direction of their long axes and allowed to dry in the air. The dried films should be placed face to face, and packed as described under blood smears (para. 269). Two films should be sent in every instance. If the discharge is scanty, a specimen should be obtained by carefully passing a throat swab inside the meatus. The material thus obtained should be spread on two slides.

(b) *Patients with chronic gonorrhœa* should pass part of their urine into a sterile medicine bottle, then the prostate and vesicles should be massaged to obtain some of the secretion, which should be received on glass slides as described above, and, finally, the remainder of the urine should be voided into another sterile bottle. It should be remembered that the early morning specimen is the most valuable.

3. *Transmission.*—Two films should be sent in every instance, and should be packed in a small box to prevent breakage in the post.

4. *Information to be forwarded* with specimen should include name of patient, summary of symptoms and treatment received, time and method of collecting specimen.

275. Histological Specimens.—1. *Transmission.*—Pathological material for sectioning should be forwarded to the laboratory immediately after removal. If possible, the whole specimen should be sent; failing that, good representative portions should be picked out. The specimen should be wrapped in sterile jaconet or gutta-percha tissue, and placed in a sterile bottle or tube, especially when tuberculosis is suspected, so that some of the tissue may be used for animal inoculation. Otherwise specimens should be placed in 10 per cent. formalin solution.

2. *Information to be forwarded* with specimen should include name of patient, summary of symptoms, exact origin of specimen, time of removal, nature of fixative and time of placing specimen in it, and any special examination desired.

276. Malaria Parasites should be searched for in ordinary blood smears (*see* "Blood Smears," para. 269).

277. Peridental Smears and Cultures.—1. These should be made in cases of pyorrhœa alveolaris and suspected oral sepsis. It should be remembered that a streptococcal infection of the alveolar tissues may be the cause of septicæmia, muscular rheumatism, sciatica and iritis.

2. *Method of Collection.*—To collect a specimen, the patient's gums should be thoroughly rinsed with water, and the mucosa around the neck of the chosen tooth should be cleansed with cotton wool. Digital massage should be applied to the gum to remove as much of the surface pus as possible; this pus should be wiped away, and massage re-applied. The pus that now appears should be carefully collected on a sterile throat swab.

3. *Transmission.*—All swabs should be sent to the laboratory as rapidly as possible.

4. *Information to be forwarded* with specimens should include name of patient, a summary of symptoms, and a statement as to whether an autogenous vaccine is required.

278. Pus should be collected in a sterile test-tube or on a sterile throat swab. The information to be forwarded with specimen should include nature and duration of infection, exact origin of pus and whether a vaccine is desired.

279. Septic fluids, such as those obtained by aspiration from pleura, pericardium, peritoneum, tunica vaginalis or joints, should be collected aseptically in a sterile bottle or tube. The specimen should be kept at body temperature and forwarded with the following information:—name of patient, summary of symptoms, and source of fluid.

280. Spironemata from suspected syphilitic sores should be searched for in the serum obtained from them. The sore should be cleansed with saline, dried with wool, and then gently squeezed to cause serum to exude. This serum should be collected in capillary glass pipettes and the ends sealed in the spirit flame. The pipettes should be carefully packed in a box and forwarded to the laboratory with the name of the patient, summary of symptoms, any history of exposure to infection and any treatment received.

281. Sputum.—1. This should be examined in all cases of chronic cough or any pyrexia associated with expectoration.

2. *Method of Collection.*—It should be ascertained that the specimen has been derived from the lower, and not the upper air passages. In addition, contamination of the sputum with organisms derived from the buccal cavity should be guarded against. For these reasons the early morning sputum should be collected, after the patient has cleansed his teeth, and washed out his mouth several times with cooled boiled water. The specimen should be expectorated directly into a sterile sputum pot. If a culture of the sputum is required, carbolic or other disinfectant should not be added to the collecting vessel.

It should be remembered that the tubercle bacillus is most frequently found in purulent, muco-purulent or cheesy sputa, rarely in mucus, saliva or blood. After a hæmorrhage it may be necessary to wait until the character of the sputum has changed before the tubercle bacillus can be detected. Should the sole object of the examination be the preparation of smears for the tubercle bacillus, a little 1-20 carbolic solution should be added to the sputum. A potassium iodide mixture stimulates expectoration in cases with scanty sputum.

3. *Transmission.*—The sputum should be forwarded to the laboratory in a sterile sputum pot.

4. *Information to be forwarded* should include name of patient, a summary of symptoms, and a statement as to whether any disinfectant has been added to the sputum.

282. Throat swabs.—1. These should be collected from all cases of tonsillitis where there is the least suspicion of diphtheria or suggestion of a membrane.

2. *Method of Collection.*—No local antiseptic treatment should be applied during the previous 12 hours. The tonsils should be well exposed, and the swab should not touch anywhere except the ulcer or chosen mucosa. A second swab should always be taken from the deeper part of the ulcerated area. In cases suspected of cerebro-spinal meningitis, a swab should be taken from the posterior naso-pharynx. The throat swab should be bent at an obtuse angle or a West's swab used, and kept at body temperature (*see para. 233, clause 3*).

3. *Transmission.*—All swabs should be sent to the laboratory as rapidly as possible.

4. *Information to be forwarded* with specimen should include name of patient, summary of symptoms, day of disease, temperature, site and nature of any pain, and exact source of specimen.

283. The Urine.—This should be examined by the medical officer in charge of the patient for albumin, blood, sugar and bile, in every case of illness. Should any abnormality be found, a specimen should be forwarded to the laboratory for a more detailed examination.

2. *Method of Collection.*—(a) In most cases the urine passed on first rising in the morning should be collected. The foreskin should be retracted, the glans cleansed with 1-60 carbolic, a little of the urine voided and the remainder passed directly into a sterile 8-oz. medicine bottle, which should be closed with a sterile cork. The cork should be sterilised by boiling for at least 10 minutes.

(b) *Quantitative Estimation.*—Should a quantitative estimation of sugar be desired, the patient's urine should be collected in a large vessel for twenty-four hours, thoroughly mixed, measured, and an 8-oz. medicine bottle filled with a representative portion. The total amount of urine passed should be stated on the bottle.

3. *Transmission.*—The sterile bottle containing the specimen of urine should be securely sealed and packed in a strong wooden box ready for transmission to the laboratory (see para. 287).

4. *Information forwarded* with specimen should include name, summary of symptoms, examination required and method of collection.

284. Vaccines.—1. All material to be sent for the preparation of autogenous vaccines should be collected aseptically and forwarded by express post. The advice of the pathologist should be sought in all doubtful cases. Information forwarded with specimen should include name, age, summary of symptoms, duration of complaint, any previous vaccine treatment and result.

If it is considered advisable to interrupt or cease the vaccine therapy, the medical officer in charge of the case should inform the pathologist as soon as possible, and at the end of a course of vaccine treatment, he should inform the pathologist of the result of such treatment.

285. Wasserman test.—See para. 270.

286. Widal's.—See para. 267.

287. Post Office Regulations regarding Substances sent by Post for Medical Examination or Analysis.—The Post Office has drawn up stringent regulations regarding the sending of

articles for medical examination or analysis. The following is an extract from the "Post Office Guide" for January, 1931 :—

" Deleterious liquids or substances, though otherwise prohibited from transmission by post, may be sent for medical examination or analysis to a recognised medical laboratory or institute, whether or not belonging to a public health authority, or to a qualified medical practitioner or veterinary surgeon within the United Kingdom, *by Letter Post, and on no account by Parcel Post*, under the following conditions :—

Any such liquid or substance must be enclosed in a receptacle, hermetically sealed or otherwise securely closed, which receptacle must itself be placed in a strong wooden, leather, or metal case in such a way that it cannot shift about, and with a sufficient quantity of some absorbent material (such as sawdust or cotton-wool) so packed about the receptacle as absolutely to prevent any possible leakage from the package in the event of damage to the receptacle. The packet so made up must be conspicuously marked 'Fragile with Care,' and bear the words 'Pathological Specimen.' "

CHAPTER VI.

NOTES FOR THE GUIDANCE OF OFFICERS IN MEDICAL CHARGE OF HIRED TRANSPORTS (*vide* K.R. and A.C.I., Chapter XIV, Sections III to VIII).

I.—Applicable to both outward and homeward Voyages.

288. Inspection of Ships, before sailing, by S.M.O.—The S.M.O. should accompany the board at the first and final inspections of the ship in accordance with K.R. and A.C.I., para. 930. Details regarding medical and sanitary requirements are to be found in "Specification for Fitting Freight Ships and Transports—T. 137 (Sea Transport Regulations—Appendix)."

289. Medical Charge of Crew.—It is customary, when a ship's surgeon is carried, for the S.M.O. not to interfere with the crew's quarters, or the medical treatment of the crew. Nevertheless, the S.M.O. should bear in mind that he is responsible for the sanitary and medical charge of the ship and crew (*see* "Regulations for H.M. Sea Transport Service").

290. Venereal cases.—All venereal cases will be allotted to a separate mess. They will be issued with special utensils marked "V," and their hammocks and bedding will be disinfected on disembarkation or discharge. Special washing places and latrines are set aside for their use.

291. Isolation Ward.—The isolation ward is in charge of the master except when required for use, when the keys will be handed over to the O.C. Royal Air Force, or O.C. troops if no air force officer is on board, on his requisition. When no longer required, the keys should be returned to the master.

The isolation ward may be used for any class of infectious disease which may occur on board except tubercle, and for all classes of passengers, at the discretion of the S.M.O.

Should cases of tubercle be discovered during the voyage, measures should be taken for isolating them elsewhere than in the isolation ward. Should a case of infectious disease occur among the crew, the isolation ward may be used for such a case with the consent of the C.O., after consultation with the S.M.O.

292. Disinfection.—*See* para. 226.

293. Hospital Bedding and Clothing.—Sheets, bedding, pillow slips, blankets and pyjamas will be drawn for use in the sick quarters as laid down in K.R. and A.C.I., para 984, cl. 6.

294. Soiled Hospital Bedding and Clothing.—The personal clothing and bedding of all men admitted to sick quarters will be disinfected. (See K.R. and A.C.I., para 1024.) The bedding, clothing and utensils used by the sick will be disinfected directly there is no further use for them. Soiled articles of bedding will then be returned to the master for washing, and fresh stocks obtained in lieu.

295. Serious Illness or Outbreak of Disease.—In the event of a case of serious illness or an outbreak of disease necessitating a call at the nearest port, the matter should be brought to the notice of the O.C. Royal Air Force with a view to particulars being transmitted by wireless to the port where it is proposed to land the patients or contacts.

296. Canvas Sling Cots and Screens.—In the event of the sick quarters being full, canvas sling cots can be obtained from the troop officer and utilised for any additional sick. Canvas screens can also be obtained from the same source. in order to screen off additional space allotted for this purpose.

297. Patient's Valuables.—Money and other valuables of the sick will be dealt with as laid down in K.R. and A.C.I., para. 1004, cl. 2.

298. Medical Returns and Records.—See paras 122 and 123.

299. Medical Stores.—See paras. 159–164.

300. Inspection on Disembarkation.—See K.R. and A.C.I., para. 1052. Care should be taken that the sick quarters and dispensary on board are left clean and tidy after disembarkation.

301. Sick Quarters Equipment is supplied from four sources :—

1. *Medical Stores*, in accordance with the "Unit equipment table for R.A.F. Transport Vessels" (A.P. 1373).

2. *Equipment Stores.*—These are held on inventory charge by the permanent medical N.C.O.

3. *Bedding and miscellaneous Articles.*—These are supplied by the Admiralty and placed in charge of the ship's master. A list is given in "Regulations for H.M. Sea Transport Service." They are drawn by the S.M.O. from the master, as required by K.R. and A.C.I., para. 984, and are returned at the end of each voyage.

4. *Owner's Stores*, as laid down in "Regulations for H.M. Sea Transport Service." These stores are drawn by the S.M.O. from the ship's master as required, and returned at the end of the voyage.

302. Milk.—Milk for 3rd class passengers is supplied in accordance with the "Scale of Rations" displayed on all troop decks. Milk for 1st and 2nd class infants may be supplied as a medical comfort only.

303. Dieting of Sick.—Although the troopship term for the sick accommodation is "Troop Hospital" it should be treated as a sick quarters and not as a hospital. For suitable cases, ordinary rations will be drawn. Those who are unable to eat the ordinary ration will be subsisted on medical comforts drawn in accordance with K.R. and A.C.I., para. 1004. Patients need not be struck off rations on admission to sick quarters. Care should be taken not to indent for medical comforts outside the scale unless considered essential.

In order to obtain the day's supply of medical comforts in good time, an indent should be handed in to the chief steward the evening before.

304. Accommodation for the S.M.O.—Separate cabin accommodation will be provided for the S.M.O. (see K.R. and A.C.I., para. 910, cl. 2).

II. Applicable to outward Voyage only.

305. Lectures on the Care of Health overseas.—1. A series of lectures on the care of health overseas should be delivered to all ranks on outward voyages. It is more important to deal in very elementary details which can be frequently repeated, than to cover a considerable amount of ground without repetition. Thirty minutes for each lecture will be found to suffice in the case of officers, and fifteen minutes in the case of airmen. A series of four lectures will usually be sufficient. The following outline is suggested :—

2. *First Lecture.*—A quick sketch of the sort of climate the troops are going to, *e.g.*, differences between Iraq, Egypt and India, the hot and cold weather, and plain and hill stations.

Having got men interested, devote rest of time to emphasising the importance of (i) keeping the stomach covered up when lying down ; (ii) keeping the bowels open ; and (iii) never drinking intoxicants before sundown, explaining reasons for these.

3. *Second Lecture*.—Repeat the " Three Golden Rules of the Tropics " given above. Explain that tropical diseases are of three main kinds :—

- (1) Those caused by food and drink.
- (2) Those caused by insect bites.
- (3) Heatstroke and sunstroke.

Devote rest of lecture to (1) above. As regards food, emphasise the danger of eating rindless fruits and uncooked vegetables. As regards drinks, explain importance of drinking water and mineral waters from approved supplies only. Tell them something about the symptoms of dysentery and its after effects, so as to impress them.

4. *Third Lecture*.—Repeat " Golden Rules " and go on to insect-borne diseases, *e.g.*, malaria, sandfly-fever, dengue. Lay stress on proper use of mosquito nets, wearing slacks at sundown, use of insect deterrents, such as Bamber oil. Leishmaniasis and bilharziasis should be referred to, and in the latter connexion, the possibility of infection through bathing in infected water should be explained.

5. *Fourth Lecture*.—Explain seriousness of heatstroke and sunstroke. Describe elementary first aid, *e.g.*, fresh air and wet sheets. Lay particular stress on constipation and alcohol as the two commonest predisposing factors. Conclude with a quick resumé of all four lectures.

306. Vaccination and Inoculation.—1. *Outward Voyage*.—An inoculation and vaccination state of all drafts in the ship, including women and children, should be in the possession of the O.C. troops. An inspection of this will show the unprotected individuals, all of whom should be urged to avail themselves of the protection afforded by vaccination and inoculation.

A certain number may give a recent history of inoculation or vaccination, without documentary evidence in support of this. The S.M.O. should use his discretion as to action in each particular case. Every effort should be made to complete all inoculations before arrival at Port Said. An inoculation and vaccination state, in the form given below, for all drafts disembarking at each port of call, will be rendered to the P.M.O. of the command concerned, and a copy sent to the Secretary, Air Ministry.

To the Principal Medical Officer,
.....Command.

INOCULATION AND VACCINATION STATE.

Name of Ship.....

Port and Date of Embarkation.....

Port and Date of Disembarkation.....

—	Officers and P.M.R.A.F.N.S.	Airmen.	Women and Children.	Total.
Strength of Draft Dis- embarking				
INOCULATION, No. fully protected				
Remainder				
VACCINATION, No. fully protected				
Remainder				

Nominal roll of persons requiring inoculation.

Nominal roll of persons requiring vaccination.

Date.....

Sig.....

S.M.O., H.M.T.....

Inoculation against cholera will not be performed, unless special instructions to the contrary are received.

2. *Homeward Voyage*.—No inoculation should prove necessary, but vaccine and lymph are available in case of need.

Applicable to Homeward Voyage only.

307. Mental Patients' Exercise.—All transports fitted with accommodation for mental patients are supplied with netting sufficient to close entirely the space on the upper deck set apart for their exercise, and this netting must invariably be spread before such patients are exercised.

308. Outbreak of Infectious Diseases.—See K.R. and A.C.I., para. 1028 for instructions regarding report to the Air Ministry.

309. Advance Notification of Numbers of Invalids.—Details of the information to be telegraphed in advance to the embarkation officer at the port of disembarkation in the United Kingdom will be found in A.M.W.O. 597/25, para. 7 (iv), and "Instructions to O.C. Troops on Transports."

310. Medical Officer to accompany Invalids to Hospital.—Unless other arrangements are made by the E.M.O., the S.M.O., if an air force officer, is responsible for invalids, their documents, valuables and the effects of mental patients, until he hands them over to the O.C. hospital for which they are destined. The S.M.O. or his representative will therefore accompany the invalids to hospital, taking with him—

1. Medical documents.
2. Patients' valuables and the effects of mental patients, with a list thereof in duplicate.
3. Separate nominal rolls in duplicate for (1) R.A.F. personnel and (2) all others.

In accordance with the terms of K.R. and A.C.I., para. 1053, he will remain until the documents, etc., have been checked and a receipt for valuables obtained.

311. Infectious Cases.—All cases of infectious disease will be sent to hospital under arrangements made by the E.M.O. A nominal roll in triplicate, giving full particulars and address of patients, and of all direct contacts will be prepared; two copies for the E.M.O. and one for the Port Sanitary Authority.

The Port Sanitary Authority also requires a certificate that all bedding and personal effects have been disinfected by steam, and that the wards and cabins have been sprayed with formaldehyde solution. Contacts will be disinfected on board. See also "Disinfection on Board Ship," para. 226.

312. On Arrival at Port of Disembarkation in the United Kingdom.—The S.M.O. will hand over to the E.M.O., the documents detailed in paras. 122, cl. 4, and 123, together with information regarding the incidence of infectious disease.

313. Disembarkation of Invalids, Sick, etc.—The S.M.O. will see that the sick are ready for disembarkation with all their kit by the time the ship is berthed. Where a lift is fitted, he will arrange that the hatchway over it is open, and that there is a clear passage-way for stretchers thence to the nearest gangway.

The order of disembarkation will be as follows :—

1. Invalids able to carry their kit who will be paraded in the shed with their kit bags and baggage.
2. Women and children.
3. Lying cases.
4. Mental patients.

Airmen invalids should have in their haversacks, or on their person, the following :—1 service cap, 1 pair boots, devotional books, hairbrush, comb, razor, tooth and shaving brushes.

Great coats should be worn ; particular care should be paid to the dress of mental patients. Lying-down cases should not be dressed in uniform, but should remain in hospital clothing ; their pillows and blankets will be taken to the train, if necessary.

314. Baggage.—The baggage of the sick should, as far as possible, accompany them to hospital. The baggage not unshipped before the sick depart for hospital, will be collected by the E.M.O.'s staff, and sent to hospital subsequently. A nominal roll of the owners of such baggage, with a description of the packages left behind (together with labelled keys if any), will be prepared beforehand and handed to the E.M.O. for collection. On board ship the kits and baggage of invalids should be stored separately from those of other troops. The O.C. troops will detail a baggage party to unload the whole of the heavy baggage from the vessel.

315. Customs Declaration.—This form must be signed by owners of baggage, whether they are in possession of dutiable articles or not.

PART II.

CHAPTER I.

GENERAL CONSIDERATIONS.

316. Part II deals with points connected with the effective selection and care of flying personnel. It is important that all medical officers shall be in a position to decide whether an individual is fit for flying. Ordinary clinical methods of examination are not sufficient for this purpose, but require to be supplemented by certain special tests, of which the examination of fit and successful flying officers forms the original basis. These tests are set forth in A.P. 130.

317. In respect of fitness for flying, it may be laid down as a general principle that physical fitness is within the province of the medical authorities, while flying skill is within that of the executive. Since, however, both are necessary for successful flying, it is obvious that the closest co-operation must exist between the two branches, and it will be frequently found that only after careful consultation between the two can the cause of a subject's non-effectiveness be elucidated.

318. The advice of a medical officer, well-grounded in the principles of aviation medicine, can be of the greatest value to C.Os., since it is to be realised that it is equally a medical officer's duty to report a man as fit to fly as to recommend his being excused from flying duties.

319. Flying duties necessitate—

1. the guidance and control of an aircraft moving at considerably higher speeds than those hitherto experienced by the human body ;
2. the performance of manœuvres submitting the pilot to the effects of rapid rotation in a position of instability ;
3. the attainment of great heights with exposure to extreme cold and the effects of diminished oxygen pressure ; and
4. combatant service.

320. Simple flying calls for certain co-ordinated limb movements which are initiated as the result of sensory impressions. Of such afferent impulses those of vision are the most important, since without good visual judgment accurate

flying is not possible. Although the contrary has been stated, tests undertaken under dual control have proved that a blind-folded pilot cannot fly an aircraft with safety. In fog- and cloud-flying, a pilot has to rely upon information obtained from instruments by the use of his eyes. The same is true in a large measure of night flying, although here a certain amount of visual information is generally also available from external sources (horizon, stars, etc.). In all stages of flying experience, therefore, it may be stated that a pilot is dependent upon visual information, gathered either from objects outside the aircraft or from instruments within it. In particular this is true during the stage of training, when all co-ordinated movements are initiated consciously. Later, the experienced pilot derives an increasing amount of information from the nerves of "deep" sensation—namely, the "feel" of the control column, rudder bar and seat, and as a result can more or less automatically initiate the appropriate movements necessary for the accurate control of his aircraft.

321. Except to the experienced pilot, tactile sensations play but little part in flying, although information is derived from the "feel" of the wind and varying air currents upon the face.

322. Auditory sensations also play but relatively little part in flying, although good hearing is advantageous and necessary from other points of view—*e.g.*, the appreciation of the "note" of the engine, the reception of wireless, and so forth.

323. Delicately co-ordinated movements of arm and leg are necessary for the accurate control of an aeroplane. Some are incapable of achieving this delicacy and are consequently heavy-handed or heavy-footed, or both. Others are incapable of combining arm and leg movements with sufficient accuracy, owing to an inability to perform successfully two relatively simple movements at the same time. Although such ineptitude falls within the province of the executive as lack of skill, the examination of the aptitude for the performance of the co-ordinated movements necessary for flying, by means of a special apparatus devised for the purpose, is of value in certain cases.

324. Lack of aptitude for flying may be due either to defective afferent impressions—chiefly visual—or to defective co-ordinated movements. The latter defect is deemed to fall within the province of the executive, but the former definitely falls within the province of the medical officer, whose business it is to test the visual judgment in cases of erratic flying and continued bad landings, and, if necessary, refer them for specialist opinion.

325. Further, to become a good pilot the possession of good general judgment and coolness in emergency is necessary; by the tests for nervous stability the medical officer can help the executive to ascertain the potential presence of these qualities in any particular subject. It will, however, not infrequently be found that bad judgment is not associated with any lack of nervous control in the accepted medical sense. Such cases of bad judgment, often combined with temperamental unfitness for flying, fall outside the scope of medical responsibility.

326. From the medical officer's point of view a pilot requires careful, but not ostentatious, supervision :—

1. when learning to fly, especially immediately before and during the first solo flights ;
2. during a period of flying involving long hours or high altitudes ;
3. during the first few hours flying against the enemy.
4. during the fourth to sixth months of active service.

CHAPTER II.

MEDICAL CARE OF FLYING PERSONNEL.

SECTION I.—TEMPERAMENTAL FITNESS OF THE MEDICAL OFFICER.

327. As in other branches of the medical profession, the success of an officer depends largely upon his mental aptitude for, and his attitude towards, his work. Experience has shown that the most successful medical officers for R.A.F. work are those who take a keen interest in the special conditions associated with their work, and combine with the efficient performance of ordinary routine duties the spirit of sympathy and inquiry into the new aspects of their subject. First among such conditions is air experience.

The medical officer should make a point of understanding the various conditions associated with the daily life of the flying personnel. For instance, he will find it particularly helpful to have experienced himself the various forms of aerobatics which pilots are called upon to practise in the course of their training. If possible, he should obtain a first-hand experience of the methods of instructors; he will then appreciate the nervous strain of training, particularly that connected with the first solo flights. Moreover, he will find that he has greatly enhanced his status with those under his charge. He is in a position to understand better the various trials and troubles that may beset the path of the pilot. Tact and sympathy are all-important. The foundation of sympathy lies in the fact that to every medical officer the pilots under his care are so many human machines, that he recognises that it is his duty to keep their engines as far as possible in fit condition, properly attuned, to overhaul them periodically so that he can say after appropriate examination whether these human machines are wearing well, or showing signs of stress, and, if the latter, to take the necessary measures to prevent any disaster. As already stated, he should be prepared to advise the C.O. as to who is fit to take the air, as well as to who is unfit. In a word, the essence of an effective medical service in respect of flying duties is preventive treatment, built up by a close and thorough understanding between the medical officer, the C.O., and his charges. By such an understanding, mutual confidence is gained, and the health and efficiency of the pilot is maintained.

328. The medical officer should live as much as possible among the officers under his charge, so as to acquire an intimate knowledge of their characters, which he may use sympathetically and confidentially as occasion arises. Each pilot is, so to speak, an individual unit, and requires his own special study. Much of the medical officer's best work, therefore, can be done in the mess, on the aerodrome or at games. For example, indications of "fatigue" may be observed when an unusually efficient pilot begins to land badly, or returns from a relatively simple flight thoroughly "washed out"; when a moderate drinker begins to take more than is good for him or when a usually sociable pilot prefers always to sit quietly reading in the corner by himself. A little tact and sympathy on the part of the C.O. or medical officer on such occasions means all the difference between recovery and breakdown.

SECTION II.—EFFECTIVE CARE FROM THE PHYSIOLOGICAL ASPECT.

329. Inasmuch as the care of the flier is largely preventive, such care becomes one of the main duties of the medical officer attached to a flying station. For this reason, the periodic examinations which occur in conjunction with the sending in of confidential reports on officers are particularly important. In such examinations, care should be taken that the forms are filled in accurately in every detail, since these are not only of service to the medical officer himself, but also to others at a later date, when any question of the previous degree of fitness arises. From their statistical examination at the Air Ministry valuable information is gleaned, the utility of which depends upon the accuracy with which the forms are completed. When the re-examination of pilots is taking place, it should always be impressed upon the officers examined that they are being overhauled from the point of view of efficiency, and not because it is believed that they are in any way unfit. Once this is explained to an officer it has been found from past experience that such periodic examination is welcomed by both the C.O. and the flying personnel.

330. In forming an opinion as to suitability for full flying duties, assessment is made on the lines already set forth in the selection of candidates (A.P. 130). Where the responses to the efficiency tests are not up to standard, the question of advisability of "limited flying" arises. Before such categorisation becomes operative, the subject must be referred for a medical board. The necessity, or otherwise, for this must be assessed from the results of the tests in conjunction with the history of the case and general clinical examination.

For guidance it may be laid down that :—

1. Where there is evidence of considerable lack of respiratory and circulatory efficiency, and of stability of his nervous control, the subject should be deemed unsuited for high flying above 12,000 feet, owing to the strain imposed by higher altitudes upon these systems.

2. Where the general physical efficiency is impaired and the subject tends to become tired by exertion, the length of flight should be limited in duration to such period as is deemed advisable, *e.g.*, one hour.

3. Where there is marked lack of general nervous stability and muscular co-ordination, together with signs of lack of adequate nervous control of the heart and respiration, it is advisable to limit the subject in respect of aerobatics. Especially is this so when the subject, from the history recent or otherwise, appears unduly sensitive to rotary movement.

4. It must be borne in mind that such a subject must be physically fit to endure the effects of "spinning," which is not included under the term "acrobatics." This is of importance, not only in respect of instruction in spinning, but because no subject should be passed for any form of flying who is not in a physical state to withstand the effects of a spin, whether intentional or otherwise.

In view of the above, it is advisable, therefore, that all subjects in whom a doubt exists as to fitness for full flying duties should be tested by the examining board on the lines set forth in A.P. 130. An ordinary rotating office chair can be used for the purposes of rotation where a rotation chair is not available.

If there is any doubt as to the normality of the responses of the blood pressure and the pulse rate, the subject should be temporarily withdrawn from flying and not categorised A.2. Such a category should only be given with relatively normal responses.

As a guide, after rotation there should be :—

(a) No undue rise in systolic pressure (20mm. Hg. or more).

(b) No undue fall in the diastolic pressure (10mm. Hg. or more).

(c) No undue widening of the pulse pressure (20mm. Hg. or more).

(d) No undue persisting acceleration of the pulse rate (beginning with an increase in rate of 36 or more per minute).

(e) No marked loss of control, undue pallor, etc.

There should be also no marked anticipatory rise of blood pressures and pulse rate prior to rotation.

331. In cases of slight deterioration of efficiency, the medical officer should not be too ready to take men off flying altogether, but, in conjunction with the C.O., should grade their duties and prescribe such measures as exercise, moderation in consumption of alcohol, tobacco, etc., or whatever he thinks fit to aid return to full efficiency. A fortnight's rest, however, taken as ordinary leave at an opportune moment, will frequently prevent a prolonged breakdown later, and, from the point of view of the State, therefore, is an economy. The importance of the medical officer keeping an eye upon the flying personnel, both on the aerodrome and in the mess, has already been emphasized. The medical officer should take an early opportunity of examining any individual who, from observation, he thinks requires it, altogether apart from the routine examination referred to above.

SECTION III.—EFFECTIVE CARE FROM THE PSYCHOLOGICAL ASPECT.

332. It should always be borne in mind that a pilot is liable to develop an "anxiety" in regard to his occupation, especially as the result of the stress of early training or of prolonged service in the air. As already pointed out, the first symptoms of such anxiety are best detected by a medical officer knowing each of his pilots personally. In dealing with such cases it is to be emphasized that no abstruse psychological methods are required, but common-sense. In gleaning information as to the anxiety state, note should be made of such points as change of habits, restlessness, irritability, tendency to jump at any sudden noise, or inability to concentrate. Enquiry should be made as to sleep and the nature of dreams or nightmares. The anxious pilot is particularly liable to insomnia, anxiety dreams, and nightmares. In his dream or nightmare he is nearly always performing something connected with his daily duties, and failing in its performance. The importance of good refreshing sleep to a flying officer cannot be over-estimated.

333. In connexion with the "anxiety" state, the following remarks by the late Dr. W. H. R. Rivers, F.R.S., the eminent psychologist who was in charge of beds at the Central R.A.F. Hospital during the later stages of the war, are of particular value :—

"In the form of reaction to danger which seems to be characteristic of the normal healthy man, there is a complete absence of the emotion of fear. No effort is needed to keep fear out of his mind, for it shows no tendency to appear in consciousness; and yet fear in the presence of danger is so necessary a part of the mental equipment of animals and is so frequently manifested in

childhood, that we can confidently assume this emotion to be potentially present but in a state of suppression. This assumption is supported by several lines of evidence. A man who when exposed to danger experiences no traces of fear and behaves with the utmost coolness and bravery may yet suffer subsequently from acute fear in his dreams. If, as there is reason to believe, suppressed affective states find expression in dreams owing to the weakening of control normally exerted in the waking state, the occurrence of fear in dreams following a dangerous experience would be a natural consequence of its ordinary existence in a state of suppression."

334. " Still more important and conclusive is the occurrence of fear as the result of shock or long-continued strain and fatigue which lower the efficiency of the higher controlling levels of mental activity. Thus, one of the earliest signs of the strain of warfare is the occurrence of apprehensions in one who till then has passed through the dangers of warfare without fear. The occurrence of fear, either manifestly or in the form of vague apprehensions when shock or strain has lowered efficiency, is naturally explained if the fear has been there throughout, but in so complete a state of suppression that it never passed the threshold of consciousness. As soon as fear or apprehension begin to show themselves in consciousness, a new process comes into action. The fear, no longer held unconsciously in check, has now to be consciously repressed. One who has flown or fought, perhaps for many months, without knowing fear, finds himself the subject of apprehensions which he regards with shame and strives to banish from his mind. A short rest at such a time, by allowing the unconscious controlling process again to take the upper hand, will often bring about the disappearance of the apprehensions so that danger can again be faced with equanimity and without the necessity for conscious repression ; or the lowered efficiency of the controlling forces may be temporary, and the recuperative power of the sufferer may be so great that recovery of the normal state of suppression may come about, so that conscious repression again becomes unnecessary. More frequently, however, the conscious repression of fears or apprehensions only adds to the strain and fatigue which has led to the failure of suppression. Through the vicious circle thus set up there is produced a state of persistent anxiety in which even ordinary incidents of life, incidents wholly devoid of danger, come to be viewed with apprehension. The fears which are repressed with apparent success during the day find expression in an accentuated form at night, when the control exerted by day is removed

in sleep or weakened in the state preceding or following sleep. The interference with rest so produced only serves to increase the state of strain and fatigue to which the nightmares or disturbing night-thoughts are primarily due, while disturbance of digestion or circulation due to the anxiety may react on and accentuate the state to which they are primarily due. Finally, some shock or additional strain, a slight accident which a few months before would only have raised a laugh, a misunderstanding with a superior officer or some domestic trouble, will bring about a crisis and reduce the sufferer to a state in which he becomes wholly unfit for any kind of duty. The morbid state which most frequently supervenes is that known as anxiety-neurosis, which is only an exaggeration of the morbid state of anxiety which precedes his definite breakdown. In other cases, the trouble may find expression in some mimetic disability usually known as hysteria ; while in those of psychopathic disposition there may be complete mental collapse, or the unbearable situation may be solved by the occurrence of these false rationalisations we call delusions."

335. " The special feature of practical importance in the foregoing statement of the various forms taken by the emotion of fear is that the occurrence of this emotion may be a symptom—often the earliest symptom—of a state of fatigue and strain. Owing to the way in which the society to which we belong, and especially those whose business it is to fight, look upon fear, its occurrence, especially without adequate cause, arouses other emotions, and especially that of shame, which greatly enhance the strain to which fear is primarily due.

It is evident that the state so produced is one which gives ample scope for treatment, both preventive and curative. There is no department of medicine in which a medical officer can gain results so definite as in the treatment of the early stages of the anxiety-neurosis of warfare. The earlier he can act the better, for the longer the state of anxiety is allowed to last, the greater the conscious repression which becomes necessary, the longer is the period of rest which is required to enable the process of repression to become again effective. Moreover, the occurrences of disturbances of circulation or digestion and of other organic functions may produce complications which greatly prolong the process of recovery. Nowhere is the adage more appropriate that ' a stitch in time saves nine.' "

336. " A medical officer can only hope to succeed if he is on such terms with those under his care that they are ready to give him their full confidence, for owing to the general sentiment regarding fear, it is only with the greatest reluctance

that its presence is acknowledged. It is here that the expression 'wind-up' has its peculiar utility in that it enables one in whom strain is producing apprehensions to refer, half seriously, half humorously, to his trouble. The first step in the treatment is to assure the patient that there is no cause for shame, that the fear he experiences is a well-recognised symptom of strain, and is due to the temporary failure of the mechanism by which in the healthy and normal man fear is kept under adequate control. If sleep is already disturbed by dreams, a second line of treatment will be to induce the sufferer to give up the process of voluntary repression to which, in the vast majority of cases, these dreams are due. Having by this process of education put the patient on the road to recovery, a short rest, followed perhaps by a period of limited duty, will usually restore him to his normal level of efficiency. To send him for a holiday without the necessary process of education and reassurance is open to the serious risk that he will only continue during the holiday to repress or brood over his painful thoughts and feelings with the result that the state of anxiety is accentuated and becomes a fixed habit."

337. "Finally, it must be pointed out that this line of treatment only holds good for those in whom the occurrence of fear is clearly the result of shock or strain. Those who are naturally apprehensive require a different line of treatment. Their case is far more difficult and less hopeful than that in which fear is secondary to strain or shock, but much can be done with them by sympathetic encouragement in fighting their disability, and, when possible, by gradually introducing them to the conditions which rouse their apprehensions. There is reason to believe that in some cases such apprehensions are the definite sequel to some emotional shock in childhood or youth which has set up faulty trends in feeling and behaviour.

In such cases a thorough and sympathetic discussion of the history of their fears may be of great service and may at least allow the medical officer to recognise how far the state is capable of amendment, and whether there is a reasonable hope that the patient may acquire that state of suppression of fear which in his more fortunate comrades has come into existence in childhood."

338. Experience has shown that the efficiency tests are of great value in connexion with the diagnosis of the "anxiety state," especially when this is due to stress. These tests afford indications as to the stability control of the circulatory and respiratory systems as well as of the general nervous stability, aiding also the assessment of the mentality of the subject.

In real cases of psycho-neurosis, there will generally be found some objective signs to confirm the subjective symptoms complained of. When no such signs are found, and there is no evidence to suggest mental disease, the majority of such cases are, generally speaking, best dealt with by the executive as cases of "temperamental unfitness." From the point of view of the Medical Branch, it is in the best interests of the service that, as a working rule, subjective symptoms without objective symptoms should not come within the category of medical unfitness. Cases of doubt should be referred for the opinion of a medical board.

SECTION IV.—CLASSIFICATION OF FUNCTIONAL NERVOUS DISEASES.

339. Psycho-neurosis.—This term will be adopted to include all disorders of function whose symptoms, on investigation, are considered to be psychogenic in origin. By this is meant that no discernible organic basis can be found for the symptoms manifested, which are then assumed to arise from disturbed mental equilibrium. Their development is held to be due to a failure on the part of the patient to adapt himself successfully to his environment; in other words, he has failed to obtain adequate satisfaction for some impulse springing from one of the primitive instinctive tendencies.

This may be due to a frustrated desire to attain some end for which he has been striving, or to escape from some intolerable situation in which he finds himself.

The failure to adapt may be due to—

1. An innate or acquired weakness of adaptive power (in the latter instance toxic or traumatic factors may be at work).
2. Some insuperable difficulty or complexity of the situation (*e.g.*, financial or domestic troubles).

The appearance of symptoms (which corresponds to the popular conception of a nervous breakdown), is to be regarded as a faulty form of reaction to the environment.

The unsolved conflict between the patient's tendencies and his surroundings may be either realised consciously, in which case he has complete insight into the state of affairs, or it may be completely unconscious. The method of coping with the conflict is to some degree dependent on the patient's intellectual status and education. Where the conflict is unconscious, the painful conflict has often been deliberately avoided by a process of suppression. The patient refuses to face his difficulties, and avoids them by the simple expedient of turning his back on them in an endeavour to forget. Symptoms vary greatly in each case, and from time to time, in the same individual. They fall more or less into certain clinical

entities, and for convenience, although not founded upon any causative basis or underlying pathological condition, the classification into clinical groups as below has been adopted in the Service.

340. Subdivisions of Psycho-neurosis.—The subdivisions into clinical groups are as follows :—

Anxiety neurosis.

Hysteria.

Neurasthenia.

Obsessional (corresponding to the term Psychasthenia).

Borderline.

In many cases exact diagnosis is difficult. Symptoms common to one or more entity are present, and a broad view must be taken. Predominant symptoms will act as a guide in correct classification, and the more striking symptoms in each of these groups are enumerated below for this purpose. It should be noted, however, that where symptoms of a psycho-neurosis arise after head injury, the case should be diagnosed in most instances as "Concussion, effects of," to avoid the stigma of functional nervous disease.

341. Psycho-neurosis—Anxiety Neurosis.—Anxiety, in the generally accepted sense of the term, is the predominant feature.

Symptoms are mainly psychic and subjective—insomnia, occupational dreams of a worrying nature, nightmares, nervousness, irritability and a tendency to worry unnecessarily over trifles. Mild apparent intellectual defects such as defective memory and concentration may occur as the result of pre-occupation.

Physical signs dependent on disturbance of the autonomic system due to a persistent emotional state, such as tremor, tachycardia, sweating and indigestion may be accompaniments, and the facial expression is often one of worry.

Fears of "phobias" are complained of. These must be distinguished from those met with in the obsessional states. In the latter, they are usually confined to some definite object or situation. In anxiety states, the fear is more widely diffused and tends to attach itself to any convenient object or situation in the patient's surroundings.

342. Psycho-neurosis—Hysteria.—Manifestations may be psychic or somatic, or a combination of both.

(1) Under the former heading are *amnesias* (a clean cut loss of memory for the events of a definite period of time, as opposed to a vague forgetfulness), automatisms, fugues and "fits."

(2) *Automatism* is applied to those states of suspension of normal consciousness in which a series of actions may be performed apparently in normal fashion, and as though directed by full consciousness.

It is well exemplified by the state found in some subjects after concussion, who may carry out complicated and well-directed actions, and answer questions rationally, of which they have no subsequent recollection on recovering normal consciousness. Comparable to this condition are the automatisms of post-epileptic states and petit mal.

(3) *A Fugue* is a state of extended automatism, the duration of which may last from an hour or so up to years. The subject appears to lead a normal existence, but on recovery he has no recollection of any events of this intervening period.

(4) The *Hysterical "fit"* is probably an example of the same mechanism of dissociation of consciousness. Here the actions carried out usually lack direction and co-ordination, appear purposeless, and may be convulsive. It may very closely resemble the convulsive attack of epilepsy, and differs from the latter in having a psychic content. In the attack, the individual may re-enact some previous experience, which has a strong emotional tone. The differential diagnosis is often one of considerable difficulty. The occurrence of clonic and tonic phases in the attack, with tongue-biting and sphincter involvement, are in favour of epilepsy.

343. Hysteria.—Under the heading of somatic symptoms of hysteria come those of gross disturbance of the sensori-motor system, which must be differentiated from those due to organic nervous disease, since these may be closely simulated. Such are functional anæsthesias of the "stocking and glove" type following no recognised distribution due to nerve lesion.

The functional paralyses and contractures may be of any type and include aphonia, mutism and loss of the function of walking upright (astasia abasia).

Differential diagnosis depends upon careful examination of the nervous system, which in the organic case should disclose some evidence of structural involvement.

344. Psycho-neurosis—Neurasthenia.—Here the chief complaint is of fatigue, mental and physical, with lack of energy and interest in work and surroundings. Physical concomitants such as headache, pressure on the vertex, mild digestive disturbances and insomnia are common.

In these cases, no physical basis for the symptoms can be discovered after investigation. Where any underlying toxic cause is present, or where there is a definite history of recent physical illness such as malaria, or influenza, the diagnosis of

"Debility following—————" in place of Neurasthenia is more applicable. Physical symptoms here are more prominent than the psychic.

345. Psycho-neurosis—Obsessional.—The term "Obsessional Neurosis" has been used in different senses by various authorities. It should be restricted to those cases whose predominant symptoms take the form of obsessions and compulsions and corresponds broadly to the term Psychasthenia.

The obsession may appear as an idea, emotion or action (compulsion). Its characteristics are that (1) it fails to fill the field of consciousness or to dominate it completely and its presence in the mind is resented by the patient as though it were a "foreign body" and (2) it is an incomplete and imperfect thing and is recognised by the patient as being inadequate and unsubstantial.

Obsessions may be grouped into :—

(1) Those of *indecision* and *doubt*. Examples of such cases are those who fail to convince themselves of generally accepted facts, and are continually in states of doubt ; those who are overscrupulous, or who are compelled to re-assure themselves constantly that they have really carried out some action.

(2) Those of *fear*. The fear is usually confined to one particular object or situation. Such fears are mysophobia, and claustrophobia, and are to be distinguished from the fears or anxieties of the anxiety state.

(3) Those of *irresistible propensities*. Examples of these are the meaningless repetition of words, tics and manias, *e.g.*, kleptomania. In certain instances, these obsessional cases enter the Borderline class.

346. Psycho-neurosis-Borderline.—This is a euphemism for those early cases whose mental state is such that they may require supervision on account of their inability to manage themselves or their affairs, or when they are becoming dangerous to themselves or others.

Psychosis is the general term used to cover those entities which constitute insanity, *e.g.*, schizo-phrenia, manic-depressive states and confusional and toxic insanities.

A careful discrimination is called for in cases where the predominant symptom is a depression of the autogenous type, *i.e.*, where the depression is apt to descend suddenly upon the patient like a cloud without an adequate external cause. This may be indicative of a manic-depressive state and not of an anxiety state which it may closely resemble. Such cases are apt to be suicidal, and therefore call for a careful diagnosis and suitable treatment.

CHAPTER III.

THE EFFECTS OF HIGH ALTITUDE FLYING, WITH REASONS FOR THE ADMINISTRATION OF OXYGEN.*

347. The human machine runs on air, or rather on the oxygen in the air, of which there is normally approximately 21 per cent. If the supply of oxygen be suddenly withdrawn, as in breathing "choke damp" or by submersion under water, death quickly ensues. If the supply be gradually withdrawn, the human machine begins to function badly in the various ways about to be described. It is important to realize, therefore, that, for bodily efficiency to be carried on, not only must an adequate supply of oxygen be available, but also the mechanisms responsible for provision of the body with oxygen must be functioning efficiently.

348. For the provision of oxygen the body depends upon the adequacy of its "air intake mechanism," the muscles of inspiration, by which the lungs are filled. For "scavenging the exhaust" the body relies upon the action of the expiratory muscles which rid the lungs of the accumulated products of bodily combustion.

If both these mechanisms are working well, then, as the result of rhythmic breathing, the body is provided with the correct air "mixture" on which it runs sweetly and efficiently; if either the air intake or exhaust mechanism is at fault then a wrong "mixture" is provided and the engine "starves" with resultant embarrassment of all functions. Generally speaking, when a defect develops, it occurs on the exhaust side rather than on the intake side; in other words, when the respiratory function fails, it is owing to failure to breathe out properly rather than to breathe in properly.

This failure to exhale adequately, besides leaving a residue of the exhaust products, also limits the extent of fresh air which can be inhaled—resulting in a wrong mixture within the lungs, a mixture upon which the optimum performance of the bodily machine cannot be maintained.

349. It is necessary to make clear, however, that the combustion processes of the body do not occur within the lungs themselves.

* Paras. 347 to 365 are written as far as possible in non-medical language to provide the basis of a lecture to flying personnel.

At ground level (normal barometric pressure) the pressure of the air taken into the lungs is such that by "pressure-feed," so to speak, the air, particularly the oxygen, passes through into the tissue of transport (the blood) and is then conveyed by means of the circulation all over the body, combustion taking place mainly in the muscles but also to a lesser extent in the other tissues. The reason that oxygen, as the result of this pressure-feed, passes into the blood far more than does the nitrogen, is that the red blood pigment has a special affinity and capacity for combining with oxygen.

The oxygen-carrying capacity of the blood, however, is limited, so that no matter how much oxygen is available in the lungs, the blood cannot become more than 100 per cent. saturated. Any excess of oxygen in the lungs is therefore not taken up, but passes out of the body again at the next expiration. There is no danger in breathing pure oxygen—even pure oxygen unmixed with air. For airwork, however, oxygen is given only in amounts sufficient to supply the deficiency arising from altitude.

350. This is a point of considerable importance because certain people have come to regard oxygen as a "dope" or stimulating drug. They have an idea, remembering the elementary science experiments of their school days, that just as a glowing splinter bursts into flame when put in oxygen, so will the combustion of their bodies proceed at a higher rate when oxygen is breathed. In consequence they believe that, although while breathing it they may feel brighter and perform better muscular work, yet, after breathing it, they are bound to be "washed out" owing to the high rate at which they have lived.

The error of such a conception is immediately appreciated when the facts given above are understood, namely, that the capacity of the blood to carry oxygen to the seats of combustion is strictly limited, and that no excess beyond that for which the body is designed can be carried by the blood (except possibly for an almost inappreciable extra amount, not combined with the pigment, but carried in solution).

351. The beneficial effects of oxygen when given at ground level are due to the fact that practically no men of the present day are capable of oxygenating their blood to its proper 100 per cent. Consequently, when they are given oxygen, their bodily performance is improved. Thus it has been shown that oxygen greatly improves the performance of certain athletes (runners, hockey players and boxers); 1. if administered *before* a short period of exertion, *e.g.*, a 100 yards race, it improves the time of the performance and alleviates

the distress of it ; 2. if administered at intervals during a prolonged but intermittent period of exertion, *e.g.*, boxing, it greatly diminishes the distress caused by the previous round, improves the form for the next round, and increases the staying power of the combatant ; 3. if administered *after* a continuous period of long work, *e.g.*, a three mile race, it decreases the subsequent symptoms of fatigue—the runner will suffer little or no “stiffness” or other after effects. By the administration of oxygen a cross-channel swimmer, delirious as the result of his exertions, was restored to consciousness and braced to renewed effort.

352. Briefly stated, it has been shown that in man administration of oxygen :—

- (1) Tends to keep an efficient slow pulse.
- (2) Tends to keep up a good blood pressure.
- (3) Keeps off the onset of distressful breathing.
- (4) Mitigates any ill effect due to excessive deep breathing.
- (5) Increases the power for nervous concentration and muscular work.

As pointed out, however, such improvement in man at ground level is, in part, due to his own inefficient respiratory powers, particularly when the exercise performed is not excessive. It is most probably one of the effects of modern civilisation and relatively sedentary habits. Theoretically, oxygen should confer far less benefit upon the fit primitive athlete.

It has been found, for example, that the performance of race horses over five furlongs is not improved by the administration of oxygen. In contrast, however, an old somewhat broken-winded cart horse, when given oxygen, cantered gamely right up a hill on which he had previously always dropped into a walk half way up.

353. This point in regard to the relative respiratory insufficiency of modern man must be emphasized, since it shows the importance to pilots of keeping their respiratory apparatus properly “tuned up” on the ground ; particularly the expiratory musculature which is the most likely to be, and to get, out of condition and fail during prolonged exertion. Therefore, indulgence in all forms of sport which exercise the muscles of the trunk and “train” those of respiration, are of particular value in such “tuning up.” Shortly put, *the best preparation for prolonged flights at high altitudes is to keep the respiratory muscles “tuned up” whilst on the ground.* The man who easily becomes breathless on the ground will suffer distress in breathing at high altitudes, just as the man

whose circulation gives out upon exertion on the ground will show signs of circulatory failure on prolonged flights and at high altitudes. The various mechanisms of the human machine should preferably be tuned up daily and kept in such working order that they will function well, not for a short period only, but over a prolonged period of exertion. It is a fact that even the fit man becomes "fatigued" as the result of severe and prolonged exertion, because his muscles eventually give out from hard work and exhaustion. In contrast, however, the unfit man frequently breaks down, owing to defective breathing and circulation, before his muscles have had a real chance to work, such breakdown being due to the fact that the oxygenation of the blood is insufficient for the demands made by the working muscles, and that the transport facilities for conveying the blood to them are inadequate.

354. Such are the causes of breakdown on the ground; but in high flying the cause of trouble is not the demand by the muscles for a larger supply of oxygen, but for a normal supply under conditions where the head of pressure of the "pressure feed" is failing.

As stated, oxygen constitutes about one-fifth of the air, the pressure of which at ground level is 760 m.m. of mercury (30 inches). The pressure of the oxygen alone is therefore $\frac{760}{5} = 152$ m.m. Hg.—which represents the amount of the pressure feed. At 19,000 feet, however, although the percentage composition of the air is unaltered, the total atmospheric pressure is only half normal, the pressure of the oxygen is also only half = 76 m.m. Hg.; that is, the pressure which drives the oxygen into the blood is only half the normal, and accordingly the body will receive only half the amount to which it is accustomed, actually less, since here no allowance is made for the pressure of water vapour. This gradual failing of the pressure feed of oxygen of the body necessitates deeper and deeper breathing to get in the required amount of oxygen and a proportionately quicker rate of heart beat to keep up the circulation of the blood, which carries the oxygen to the seats of combustion. For this work alone, more and more oxygen, therefore is required in an atmosphere in which oxygen is progressively diminishing. This throws a certain strain upon the muscular mechanism of respiration, a strain which is increased owing to the relatively immobile position of the pilot. Unless, however, such strain is unduly severe or prolonged, it is readily tolerated by the body, provided that the respiratory and circulatory mechanisms are properly tuned up.

355. If the embarrassment of the respiration and circulation were the only effects of altitude, then until this became really excessive, the administration of oxygen to pilots, although an advantage as conserving the normal action of the lungs and heart, would not be altogether a necessity. *A more subtle and therefore often a less appreciated danger exists which renders the administration of oxygen necessary, namely, a dulling of perception and judgment in addition to a gradually increasing general muscular weakness.*

356. The earliest aeronautical experiments in regard to the effects of altitude were made in balloons. Glaisher in 1862 noticed that at 26,000 feet, although he could see his instruments he could not read them. Shortly afterwards he became paralysed in his hands, as did his assistant, who, however, managed to pull the valve rope with his teeth. In 1875, three Frenchmen, Crocé, Spinelli and Tissandier, made their famous ascent, only Tissandier surviving. Although warned of the necessity of using oxygen, they were all paralysed before they realised the necessity of taking it. Tissandier gave a graphic account of his experience, from which the following is quoted :—" At 24,600 feet the condition of torpor which comes over one is extraordinary. Body and mind become feebler little by little, gradually and insensibly. There is no suffering. On the contrary, one feels an inward joy. There is no thought of the dangerous position ; one rises and is glad to be rising." The balloon ascended to 28,820 feet and then descended.

357. At present, altitudes such as those referred to above are not demanded of the average pilot, hence these extreme dangers do not arise. What is important to realise is that the dulling of perception and judgment begins lower, in most people after 12,000 to 15,000 feet. The pilot himself may not be, and usually is not, aware of it, and even possibly has an extra feeling of confidence. Many cases of the dulling of perception and judgment are on record from the Great War. As examples may be quoted, 1. an observer who returned from high flying reconnaissance, thoroughly pleased with himself, only to find later that he had taken 18 photographs on the same plate ; 2. a pilot, who, meeting enemy aircraft at 19,000 feet, in spite of the protests of his observer cheerfully waved his hand to them but took no further action. Nearly all pilots notice the tendency to somnolence at high altitudes ; many have difficulty in finding their way, being able to see the ground but not to read their maps. As a rule, scout pilots are less affected by altitude than high reconnaissance pilots, since they do not maintain high altitudes for the same length of time. It is important, however,

that all pilots should realise that man's efficiency as a fighter is affected by altitudes. At great heights it takes longer to see, to hear and to act. After being for an hour at a height of 15,000 feet, it takes a man nearly twice as long to get a sight on a target and fire as it does on the ground, while owing to deterioration of muscle power the time of firing is lengthened, but to a lesser extent. Accuracy of aim is also greatly lessened. The lessening of muscular power is more obvious; most pilots are aware of the difficulty of swinging a gun or even drawing the shutter of the camera at very high altitudes.

358. Oxygen abolishes these phenomena; in other words the man with oxygen perceives and acts far more quickly and accurately than does the man without oxygen, so that a man with oxygen certainly "gets going" first, and in combat may possibly even have disposed of his enemy before the latter has had time to enter the fight. Many similar instances of a confirmatory nature as to the ill effects of oxygen want could be given, and it should therefore be realised that although all healthy individuals can fly at heights without oxygen by enduring a certain amount of discomfort, yet if the altitudes are to be great and the flights prolonged, breakdown will follow, and this can only be prevented by the proper use of oxygen. It is for this reason that during the war all long distance bombers and high photographic aircraft, both enemy and British, were eventually equipped with oxygen apparatus. On such aircraft the use of oxygen is an absolute necessity, if really efficient service is to be rendered.

359. The Proper Administration of Oxygen.—By proper administration of oxygen is meant the taking of oxygen as directed.

The oxygen apparatus provided is so constructed that the amount of oxygen breathed from the external air *plus* that supplied by the apparatus for various altitudes are together equal to the amount available on the ground. In other words, it keeps the pilot under normal, instead of artificial conditions. It follows that if oxygen is carried it should be used throughout the flight, beginning directly the aircraft has left the ground, or just before. It should not be reserved until the individual feels he wants it, it having been shown above that the particular effects of want of oxygen which matter most are apt to be unnoticed by the individual.

360. The best method of taking oxygen is by means of a mask. This is more satisfactory than by a pipe, because it ensures a larger amount of the oxygen delivered reaching

the lungs ; moreover there is not the same danger of the tube being blocked by frozen condensation, water or saliva. Further, a mask also protects the face from frostbite. It is to be remembered that no one likes a mask at first, but everyone can become accustomed to it ; in fact many officers who habitually used oxygen during the war always fought with the mask on.

The mask can easily be removed if necessary. There is no danger in this ; if removed at 20,000 feet one does not suddenly faint as is sometimes supposed ; on the contrary, one has derived great benefit from having kept the oxygen supply of the blood up the normal level. This point has been proved by actual experiment in the air.

Instead of the usual mask some prefer a combination of mask and pipe, since it can be discarded more quickly should this be necessary.

361. The advantages derived from the use of oxygen at high altitudes may be summarised as follows :—

1. It keeps a man alert and in a condition in which quickness of perception, accuracy of judgment and action are preserved to the full.
2. It gives a man more power to control the aircraft and to fire his gun, and gives him a better chance of getting in the first shot.
3. It gives the tactical advantages of height without its disadvantages.
4. It abolishes the disagreeable symptoms—head-ache, lassitude, etc.—which are so frequently experienced during and after long flights at high altitudes.
5. It keeps the heart and respiration efficient for a much longer period and prevents their overstrain.
6. It helps to keep the body warm.

362. It will thus be seen that the chief reason for the administration of oxygen to flying personnel lies in the fact that the symptoms experienced at high altitudes may in the main be attributed to oxygen want. As regards the effects of the reduction of air pressure in itself, changes of absolute pressure of the atmosphere produce no mechanical effects, since the altered pressure is transmitted equally in all directions through the semi-fluid body tissues.

¶ **363.** The suggestion has been made, however, that, owing to the diminution of atmospheric pressure, the airman may be liable to a special disease, somewhat akin to that experienced by the diver or the worker in compressed air. This, however, is not so, since the diminution in pressure is not sufficiently

great or rapid to bring about any liberation of gases held in the blood plasma, which, as is now well known, is the cause of "caisson disease" or "diver's palsy." By breathing oxygen from the start of the experiment, it has been possible in a rarefaction chamber to attain a condition corresponding to an altitude of 43,800 feet, without any ill effects.

Such effects of diminished pressure as are produced are due to the action of diminished pressure upon gases which are, so to speak, enclosed by the body. In particular is this so in regard to the gases pent up within the air spaces of the nose, and particularly in the Eustachian tubes. Attention is drawn to the importance of this later. (Paras. 375 and 376.)

364. The diminution of atmospheric pressure also effects the gases of the alimentary tract. Any gases that there are in the intestines will expand and occupy a larger volume, and if this volume is at all great the aviator may experience a distension of his abdomen and a pushing up of his diaphragm, and perhaps some interference with his respiration. But inasmuch as the amount of this gas is normally not large, and its expansion induces increased contractions of the intestines, it is soon voided from the body, and inconveniences from this cause are rare.

365. In addition to the effects of pressure, the effects of the cold of altitudes must also be borne in mind, since these in themselves tend to throw added strain upon the respiratory and circulatory mechanisms as well as inducing numbness and sensations of fatigue.

366. Generally speaking, cases of breakdown may be classed as cases of "fatigue" or "asthenia." It must be recognised that flying imposes a very definite stress upon the body, especially when flights are made without the aid of oxygen for long periods at relatively high altitudes. When to this is added the stress of offensive and defensive warfare in the air, it is obvious that bodily strain or breakdown as the result of stress is likely to ensue. But the signs and symptoms of "flying strain" are varied, and might occur in an individual quite apart from flying. In the past war it was found that "flying strain" presented various manifestations, such as a gradual loss of power to fly high, respiratory embarrassment, palpitations of the heart, persistent headaches and lassitude, dizziness in the air. Generally speaking, fainting in the air and syncope were rare. Mental symptoms, usually in the form of an "anxiety neurosis," might or might not be present. In many cases it was difficult to say whether breakdown was to be attributed primarily

to the effects of flying or to the nervous strain of air warfare, but such symptoms were frequently found to occur in those who had taken no part in active service in the air.

367. The cases, in general, might be divided into three types, although many cases presented symptoms characteristic of all three. For clinical purposes these may be classified as the respiratory, circulatory and nervous types.

The first two types were due in the main to the accumulative effects of oxygen want, as proved by observation in rarefaction chambers and other experiments.

368. The respiratory type was characterised by gradual loss of power to fly high owing to respiratory embarrassment, early onset of dyspnoea, or Cheyne-Stokes breathing, frequently attended by a feeling of giddiness or faintness, (possibly due to the elimination of carbon dioxide by excessive breathing) although, as previously stated, actual fainting was rare. Signs of secondary circulatory insufficiency, such as marked increase in pulse rate and irregular action of the heart on exertion, were also present. These cases failed primarily owing to a respiratory sensitivity due to the effects of oxygen want. In them was found a great falling off of the vital capacity from a normal average of 4,000 c.c. to figures as low as 2,700 c.c. to 3,000 c.c., due to a marked diminution of the supplemental air owing to fatigue of the expiratory muscles.

369. The circulatory type failed primarily owing to the effect of high altitudes and cold upon the vasomotor control of the circulation. In this type of case a period of arterial hypertension, particularly as regards the diastolic pressure, which in itself may produce symptoms, is followed either suddenly or gradually by a marked arterial hypotension, particularly of the diastolic pressure. It is in such cases that syncope is likely to occur. The arterial hypotension following flights in such persons leads to an intense feeling of lassitude, frequently associated with nervous symptoms. Such symptoms are characteristic of fatigue due to physical over-exertion on the ground, and are not peculiar to the result of work in the air. In some cases there is an attendant cardiac enlargement with markedly irregular heart rhythm. The most marked sign, however, is instability of vasomotor control which is well manifested by marked alterations of pulse rate on change of posture and after exercise, and during the 40 m.m. Hg. test, and by great instability of the arterial pressures under like conditions.

370. The nervous type of case was most frequently due to the mental overstrain of combatant service in the air, such as repeated attacks of enemy aircraft or anti-aircraft fire. It

was particularly prone to occur in balloon observers who were frequently exposed to being shot down in flames. There is no particular neurosis due to air work. The symptoms are those characteristic of an anxiety neurosis in any walk of life.

Subjectively, insomnia, mental irritability, and depression and occupational nightmares, loss of memory and concentration were of frequent occurrence, with attendant objective signs of nervous instability such as increased patellar and other reflexes, marked tremors, and unstable nervous control of respiration and circulation, with consequent defective physical efficiency.

371. So-called "aviator's asthenia" has been attributed by some authorities mainly to an adrenal insufficiency—an explanation which certainly helps to explain the signs and symptoms of certain cases. By others, however, great importance is attached to renal insufficiency which is stated to follow exposure to high altitudes. Owing to anoxæmia, inadequate oxidation of the products of bodily katabolism is supposed to take place. These bodies react upon the kidney, impairing its function and thereby causing a diminished secretion of urine, with a resultant retention of nitrogenous bodies and salts within the body. As a consequence auto-intoxication ensues, causing the various symptoms and signs to which attention has been drawn.

CHAPTER IV.

PREVENTIVE HYGIENE IN RELATION TO FLYING.

372. What may, broadly speaking, be called preventive hygiene plays an important part in maintaining flying efficiency. The importance of the use of oxygen has already been dealt with. In the following paragraphs attention is directed to certain other aspects over which the medical officer should keep a watchful eye and upon which from time to time he may be called upon to give advice.

373. Care of the Eyes.—Owing to the importance of good visual judgment in respect of flying efficiency, care should be taken to prevent as far as possible the development of any condition of the eyelids and conjunctivæ, which, if allowed to progress, may result in definite deterioration in the power of making accurate visual judgments. Pilots vary greatly in their power to resist the effects of dust, wind and glare. On this account, therefore, the medical advice in respect of the use of goggles when flying is always to wear them. In the tropics, the medical officer should always advise the use on the ground of anti-glare glasses with protective side-screens, more especially during the hot seasons. It is to be remembered that it is of little service to wear protective goggles in the air under these conditions, and to neglect the true precautions on the ground, where the degree and length of exposure to the irritant causes of eye trouble are more extensive and more prolonged.

374. Further causes, to be borne in mind, of the development of defective visual judgment are :—

1. recent influenza and other debilitating diseases, *e.g.*, sandfly fever ;
2. accidents involving but slight concussion ;
3. occupations of a technical nature and those which involve the use of one eye, *e.g.*, use of micrometer screw gauges, slide-rules, microscopes, etc. ;
4. prolonged fatigue, especially that associated with office work and prolonged flights at high altitudes.

375. The Care of the Ears, Nose, Throat and Teeth.—In flying, particularly in high flying, it is very important that the pilot be able to accommodate himself to the effects of diminished pressure upon the air enclosed within the tympanic cavity and the air sinuses of the nose. Any hindrance, for

example, to efficient ventilation and drainage of the frontal sinuses may lead to headaches of varying duration. As regards the ear drum, the normally patent external auditory meatus affords a wide passage by which alterations of air pressure are easily transmitted; the Eustachian tubes, on the other hand, are narrow passages which normally open only during the act of swallowing, and, therefore, do not so readily transmit pressure changes. Any catarrhal condition or congestion of these tubes, therefore, will tend to produce difficulty in the equalisation of pressure within and without the tympanic cavity. The differences of pressure which may arise on either side of the ear drum are not always fully appreciated. Generally speaking, during an ascent the ears are unconsciously "cleared" by swallowing, which under ordinary circumstances is sufficient to open the Eustachian tubes and equalise the pressure on both sides of the ear drum. Occasionally a very graduated self-inflation, just sufficient to open the tubes, may be required to dispel the sensation of fullness. If, however, owing to very marked Eustachian obstruction no equalisation of pressure has taken place, then at 20,000 feet the pressure in the external auditory meatus is approximately 380 mm. Hg., while in the middle ear it is still 760 mm. Hg., a difference of 380 mm. Hg., tending to push the drum outwards. If, on the other hand, during the relatively slow ascent, equalisation of pressure is made, but owing to Eustachian obstruction little or no equalisation is made during a rapid descent, then on reaching ground level there is a pressure of 760 mm. Hg. in the external meatus but only about 380 mm. Hg. in the tympanic cavity, with the result that the drum is forced inwards, often painfully. Such an "invagination" of the drum is sometimes found immediately after landing in pilots who complain of deafness, discomfort or pain in the ears, headaches, dizziness, nausea and, in certain cases, vomiting and fainting in the air. In less severe cases inspection of the ear drums often shows marked distention of the blood vessels. On enquiry it will usually be found that the symptoms complained of have come on during descent or immediately after landing, and are in many cases attributable to difficulty in equalising the pressure within and without the tympanic cavity.

376. It is important to remember also that unilateral Eustachian obstruction has been found to be a cause of vertigo and incoordination.

The importance, therefore, of adequate ventilation and drainage of the middle ear through the Eustachian tube under rapidly varying degrees of atmospheric pressure is manifest. Broadly speaking, any condition of the nose or throat causing

or likely to cause post-nasal or pharyngeal catarrh or inflammation is a potential factor in the causation of Eustachian obstruction. The principal of these conditions are, deflected septum, the various forms and causes of rhinitis, accessory sinus disease, unhealthy tonsils, adenoids and infectious catarrh of the nose or throat. Mouth breathing, as also excessive smoking and drinking, are other predisposing causes. It must also be constantly kept in mind that conditions of the nose, throat and ears of apparently trifling importance on the ground tend to become considerably aggravated in the air. Free nasal respiration, a healthy upper respiratory tract and satisfactory methods of life are essential to the pilot; and if one of the above-mentioned pathological conditions be present with concomitant signs or symptoms, it should be corrected.

377. Equality of pressure within and without the ear cavity can often be maintained by the act of swallowing. Above 12,000 feet, however, the throat is apt to become parched owing to the necessity for breathing through the mouth as well as through the nose, and swallowing may become difficult. On this account there is much to recommend the use of chewing gum in the air, since this provides the saliva necessary for the act of swallowing.

If a descent be very sudden, the pressure within the tubes is in many people best equalised by gently inflating the ears; namely, by pinching the nostrils, closing the lips tightly, and then gently forcing the air out of the chest into the nose and ears until a clicking sound is heard in both ears. Such inflation should be gentle, and should be practised, generally speaking, once for every 1,000 feet in drop.

378. A simpler procedure for equalisation of pressure within the ears which may be efficiently acquired by practice is the following:—As if beginning to yawn, open the mouth slightly while trying to maintain the lower incisor teeth as far in front of the upper as possible. The effort can only be strongly sustained for a minute or less, and one should be conscious of tightly contracting the muscles of the throat at the same time. If the procedure succeeds one can pass through considerable changes of atmospheric pressure without having to swallow or inflate the ears, as the walls of the Eustachian tubes are kept apart for an appreciable time by this voluntary muscular action alone.

If, for any reason, a pilot finds difficulty in equalising pressure in his ears, or can equalise the pressure easily in one ear only, and therefore experiences discomfort during flying, medical advice should be sought.

379. The attention of medical officers is also directed to the fact that flying personnel are particularly liable to suffer from pyorrhœa alveolaris. It has been found that this condition accelerates the onset of flying stress and delays convalescence. This condition of bacterial infection is probably aggravated by changes induced by breathing cold dry air by the mouth at high altitudes. Permanent mouth-breathing is a contributory cause. The importance, therefore, to flying personnel of keeping the teeth and gums in a sound and healthy condition should be impressed upon all engaged in flying.

380. Clothing.—Although a specially designed flying-suit is issued for the protection of the pilot, other measures are frequently necessary for a pilot's comfort, according to the nature of the flight to be undertaken. The main points to be considered are :—

1. the height expected to be reached ;
2. the prevailing meteorological conditions ;
3. the speed and protection afforded by the aircraft.

The main consideration is to prevent the subject getting cold, since this greatly increases the bodily katabolism and, therefore, the usage of oxygen in an atmosphere where less is available. During an ascent the drop in temperature is frequently 5° F. per 1,000 feet, so that at altitudes of 30,000 to 40,000 feet temperatures of —50° to —70° F. may be encountered, according to the season of the year and the prevailing meteorological conditions. Efficient bodily protection is very necessary, therefore, to prevent the pilot from becoming "chilled."

381. The cardinal principle of clothing is to surround the body with a layer of warm air and prevent this, as far as possible, from being dislodged. Such storage of heat is best ensured by surrounding the body with several layers of relatively loosely fitting clothing of different textures, the best materials being wool or silk. It is the mesh of clothing, not its thickness, which prevents loss of heat ; therefore, two thin woollen vests are of greater service than a single thick one. According to the height of the flight a pilot will be well advised to grade the number of garments of relatively thin closely woven underclothing, which will provide warmth without unduly hampering movement. For instance, one noted altitude flyer found that seven thin combination suits worn beneath his flying suit greatly helped in securing warmth at 40,000 feet, where the temperature was approximately 60° below zero.

It is important to remember that underclothing should not fit too tightly, otherwise, in addition to the fact that insufficient air is stored next the body and the meshes are pressed too closely together, inconvenience may arise from hampering the circulation by pressure on the cutaneous vessels.

As regards flying-suits, it is important for protection against cold that care should be taken to close all orifices through which draughts can blow, so as to prevent dislodgement of the warm air surrounding the body. This is important even when electrically heated clothing is provided.

382. Protection of the Head and Face.—It is important that flying-caps fit snugly, and that the crown of the head be protected by a lining of fur. In the past it was found that the fur lining was not carried over the top of the head, and headaches after flying at 15,000 to 20,000 feet were aggravated by this cause. In particular, the cap should fit comfortably but tightly in front of the ears, not only to prevent draughts, but also to diminish any deafness which may tend to arise from the noise of the engine or engines.

For high flights it is advisable that a woollen "balaclava" be worn beneath the cap, so knitted as to come well forward and protect forehead, cheeks and chin. The oxygen mask which will generally be worn on such flights serves further to protect the nose and cheeks. In addition, the face should be smeared with a protective grease to prevent frost-bite. The best grease has been found to be a special petroleum jelly which can now be obtained as an issue. When face grease is used the "balaclava" is especially serviceable since it prevents undue soiling of the flying-cap and can easily be washed. For high flights it is advisable also that the flying-cap be fitted with a chin muff.

Attention has already been drawn to the importance of protection of the eyes.

383. Protection of the Hands.—It is important that the hands be adequately protected, since the manual operations of working the throttle, gun, camera, bomb gear, wireless and other apparatus present greatly increased difficulty when the hands are "frozen." Very thick gloves are clumsy. The best means of protecting the hands is to smear them with grease and then to wear a pair of silk gloves, followed by a pair of woollen gloves beneath the ordinary gauntlets. Over the fingers of the gauntlet a finger muff attached to the back of the glove may be worn, which can be slipped off when delicate work has to be done. If necessary, the tips of the first

or second finger of the under gloves may be removed so as to enable very delicate work, *e.g.*, Morse signalling, to be more satisfactorily performed.

When electrically heating devices are provided, fur-lined outer gloves are not necessary.

384. Protection of the Legs and Feet.—For the upper part of the legs the advice in respect of several layers of relatively loosely fitting silk or woollen garments holds good.

For the feet two or three pairs of thin closely woven socks are preferable to one thick pair.

It is to be remembered that woollen stockings often shrink and tend to fit too tightly. Warmth is also given best by frequent changes of socks (particularly woollen), since, when compressed by wear, the heat-retaining power is considerably diminished. Fur-lined boots, fitting well up the calf, or even to above the knee, or electrically heated soles complete the efficient protection when especially high flights are to be undertaken.

385. Training and Exercise.—The importance of adequate exercise in the life of flying personnel cannot be over-emphasized. Sports and games serve:—

1. to train and develop eye and limb co-ordination ;
2. to endow the subject with circulatory and respiratory efficiency (especially such sports as Rugby football, boxing, and swimming) ;
3. to inculcate morale—the desire to go all out for one's side.

The rower, the mountaineer, the long distance runner, the swimmer, the boxer, in fact, any man who wishes to bring off any particular performance, is obliged to train his body. In the same way it is incumbent upon the pilot who wishes to do his best to keep himself in training. Thus deep breathing can be cultivated, the expansion and movements of the chest increased, and, to a certain extent, the habit unconsciously formed of breathing deeply and efficiently.

386. For this purpose slow chest expansion exercises with arm movements, as provided by physical training, are good. Since efficiently working abdominal and thoracic muscles are important, care also should be taken to preserve the tone of these by suitable exercises. At the same time a healthy outdoor life is necessary, with vigorous games, so that the subject may have his muscles, including his heart, in the best condition, ready and fit to undertake any amount of effort.

Of particular value from this point of view are those forms of sport in which the subject performs vigorous work with the breath held, as, for example, boxing and under-water

swimming. It is well known that experts in these forms of sport make very efficient high altitude fliers. Rugby football is also to be recommended.

387. The following exercises are suitable for daily practice by those who cannot otherwise obtain adequate exercise. Moreover, even when this is available the daily tuning up by these means serve to render such exercise more health-giving and enjoyable. In all these exercises it is of great importance that inspiration is begun by the contraction of the diaphragm protruding the "pit" of the abdomen, together with a movement of the lower ribs, full inspiration being attained by a wave-like movement spreading from the lower ribs to the upper part of the chest. On no account must the upper part of the chest be expanded first. Expiration is accomplished by the contraction of the muscles of the abdomen and of the lower part of the chest.

388. Physical Training Exercises.—1. *In bed.*—(a) Lying flat inhale to the fullest extent, at the same time raising the hands above the head in a natural "stretching" motion.

(b) Exhale to the utmost extent, using the abdominal muscles forcibly to press out as much air as possible from the lungs, at the same time carrying the arms to the sides.

Repeat five times.

2. Using the weight of the bed-clothes turned down to the hips as a means of keeping the legs down, raise the body from the hips and bend forward as far as possible, at the same time breathing out forcibly to the fullest extent, then slowly return to the lying posture, inhaling deeply meanwhile.

Repeat five times.

3.—(a) Using the bed-clothes as before, from the lying position raise the trunk with the hands by the sides through an angle of 45° , then twist round the trunk upon the hips, keeping the legs flat, and endeavour to make the forehead touch the bed, meanwhile exhaling forcibly as far as possible.

(b) By a reverse movement assume the lying position exhaling deeply meanwhile.

Repeat five times to right and left sides.

4.—(a) From the lying position, flat on the bed with the hands clasped behind the head, raise the legs from the hips, carrying them as far over the head as possible, inhaling as deeply as possible meanwhile.

(b) Lower the legs slowly to the fullest extent, meanwhile exhaling deeply and forcibly.

Repeat five times.

5. *Out of bed.*—(a) By a kind of “stretching” movement raise the arms slowly and strongly forward and upward, then lower them sideways until they are in line with the shoulders, meanwhile inhaling to the fullest extent. Brace up the muscles of the abdomen and all accessory muscles of inspiration.

(b) Keeping the body as upright as possible, carry the arms forward until they overlap and hold sides of trunk. Expire meanwhile to the utmost extent, working especially the lower chest and abdominal muscles. When in the position of full expiration brace up all muscles of lower chest and abdominal wall.

Repeat five times.

6.—(a) With the feet about 18 inches* apart (or other comfortable distance), carry the arms forward and upward, inhaling meanwhile to the fullest extent.

(b) Bend trunk forward and full downward, carrying the arms between the legs and touch the ground with the fingers as far as possible behind the feet, meanwhile exhaling to the fullest extent.

Repeat five times.

7. With the feet about 18* inches apart and arms raised sideways and in line with the shoulders, bend the trunk to the left (right) until the left (right) hand touches, or nearly touches, the ground, keeping the legs straight, meanwhile breathing naturally or holding the breath.

Repeat five times to each side.

8.—(a) With the feet about 18 inches* apart, carry the arms forward and upward, inhaling meanwhile to the fullest extent.

(b) Turn and at the same time bend the trunk to the left (right) and touch the ground on the outside of the left (right) foot, expiring meanwhile to the fullest extent.

(c) Stretch trunk upward to upright position, inhaling meanwhile to full extent.

Repeat five times to each side.

9. Inhale as fully as possible and then in turn forcibly work the abdominal muscles upon the abdominal contents with a kind of massaging movement, *e.g.*, in and out, side to side, in circular fashion.

Repeat two or three times, and during the day.

10. Stationary running (often known as the “100 up”), shadow skipping, shadow boxing, rhythmic balancing exercises, jumping or any other form of exercise preferred by the subject, until out of breath.

* This distance can be gradually decreased as proficiency is attained.

The exercises, which should occupy from 10 to 15 minutes, may be followed by a cold or tepid bath, or a rub down with a hard towel wetted with warm or cold water according to the taste of the individual.

389.—“Hardening” the Body.—Attention is also drawn to the value to flying personnel of “hardening” the body, that is, accustoming it more or less to exposure. The reason that pilots from overseas are as a rule successful in flying at high altitudes is largely because they have not “coddled” themselves but have been accustomed to leading a life in the open, wearing often a minimum of clothing; thus they have inured their bodies to withstand discomfort arising from cold. The “hardened body” when exposed to the cold of high altitudes has not the same tendency to use up bodily fuel extravagantly in order to maintain bodily warmth, and there is a consequent lessening of the oxygen required. The same is true of the athlete generally, and there is no need to emphasize the fact that the true athlete has made, and is still making, the finest type of flier. Generally speaking, the man who coddles himself, who likes to live luxuriously, too warmly clad, who shirks a cold dip in the mornings, is not the man who will stand the strain of exposure, or fly well on long-distance flights.

390. Sleep and Rest.—Just as in training for sport, the pilot should endeavour to get regular hours of sleep in a well-ventilated chamber, no matter how great be the temptation to break the rule. Adequate hours of rest are all-important. Although every measure should be taken to ensure adequate warmth during sleep, there is frequently a tendency to employ too much bed clothing, which to a certain extent has the same effect as “coddling.” As with clothing, it is possible to accustom the body to the minimum amount of protection necessary to preserve the bodily warmth.

391. Diet.—It has already been hinted, in regard to diet, that gas-producing foods are best avoided, but in practice there is little need for the average healthy pilot to worry about the constitution of his diet. It is important, however, that no flying should, under any circumstances, take place upon an empty stomach. It is quite probable that accidents which have occurred during early morning flying are due to the fact that the pilot has not partaken of an adequate meal before going into the air. Before long flights it is advisable not to partake of food of too fluid a nature or of too much liquid. By this means the desire to urinate in the air during a flight is avoided.

392. Tobacco and Alcohol.—Tobacco and alcohol also have their importance as regards the question of training and well-being of personnel, and for this reason too much stress cannot be laid upon the importance of avoidance of over-indulgence in either. Excessive smoking of cigarettes, especially the inhaling of the smoke, produces shortness of breath and quickening of the heart beat. As anything which interferes with efficient breathing and circulation is particularly harmful to the flying man, there is little need to labour this point. It is to be noted, however, that the heart, quickened by smoking, does not slow adequately during the hours of sleep and rest; since this slowing is really the rest period for the heart, excessive smoking is particularly pernicious inasmuch as it robs the heart of adequate rest. Smoking is too often an expression of sociability at the expense of efficiency.

393. Undoubtedly alcohol is best avoided by flying personnel, although really moderate drinking cannot be pronounced harmful. In this respect the difficulty is that what is moderate for one person is distinctly immoderate for another, since individuals vary so greatly in their susceptibility to the drug. The unsatisfactory things about alcohol are:—1. that in many people one drink begets a desire for another, and that a gradually increasing amount becomes necessary to produce the desired effect; 2. that this effect is too evanescent. Experimental work on the effects of alcohol upon the human body shows that from the point of view of efficiency the so-called beneficial effects are entirely illusory. The judgment is affected, "reaction time" is slowed, and fine co-ordination of movement impaired. The importance of this to the pilot is at once apparent. To avoid disaster he has always to be on the "qui vive" and ready at the shortest notice to put into necessary action, by relatively delicate muscular movements, any message which reaches his brain.

The above applies particularly to what may be termed "steady drinking" of a degree insufficient to produce intoxication. It is not suggested that an occasional convivial evening is in itself productive of great harm to the system, particularly if it is certain that no flying shall take place while the body is still under the influence of the drug. On the other hand, the idea of priming up the system by alcohol before a flight is wholly pernicious and cannot be too strongly condemned. It leads to destruction of "morale," and such a course even in the strongest cannot, if habitually persisted in, end otherwise than in disaster.

CHAPTER V.

TREATMENT OF HEAD, SPINE AND EYE CASES.

SECTION I.—HEAD CASES.

394. In addition to preventive care, the medical officer at a flying station must needs be called upon to exhibit his curative skill. Especial attention is drawn to the very great importance of the careful handling of all cases of head injury, and also of apparently minor eye troubles.

395. General Attitude to be adopted towards Head Injuries.—Even apparently trivial injuries to the head may have serious consequences, a fact of great importance to R.A.F. medical officers. Caution is urged against the adoption of the attitude that a man has not injured his head unless he has fractured his skull or been knocked unconscious. It is true that these are the principal signs of head injury, which force themselves on the attention; but when they are absent it does not necessarily mean that the case is trivial. To consider cases, not showing these signs, as trivial is a common error. The results of such an error have been, and are, disastrous.

An unrecognised injury is an untreated injury. An untreated head injury is an injury with potential after effects—often of a most serious and incapacitating kind. Such after effects, moreover, are particularly prone to occur in head injuries, even if properly treated from the start.

Recognise, diagnose, and treat early is the golden rule for head injuries in whatever degree. The importance of the sign of a fracture of the skull is not because it is a fracture, but because it means that the brain inside the skull is unlikely to have escaped damage in an injury sufficiently severe to have fractured the skull itself. The important thing is to find out the amount of that damage. The presence of a fracture should be regarded in large measure as incidental, though it adds to the gravity of the condition.

396. Concussion.—For the purposes of official nomenclature the term Concussion should be used only to express the fact that force has been transmitted to the cranial contents, and not to describe a clinical entity. Where unconsciousness or paralysis are present, the occurrence of concussion is obvious. In their absence, however, the diagnosis of concussion can only be decided subsequently, according to the development or absence of later symptoms.

In the production of concussion force may be applied to the head and its contents either 1. directly—the head striking or being struck by some object ; or 2. indirectly—through the spinal column from the pelvis or feet.

The resultant effects on cerebral tissues may be, in order of severity :—

(a) Temporary circulatory disturbance from transient distortion of the skull, and possible “ commotion ” of the nerve cells.

(b) Contusion.

(c) Laceration.

(d) Compression :—

(i) general—due to an increase in intra-cranial pressure, *e.g.*, hæmorrhage ;

(ii) local—by a compressing agent, *e.g.*, depressed fracture.

The cases in group (a) and the milder cases of contusion in group (b) may be classified as Minor Cases ; those in groups (c) and (d) and certain of group (b) as Severe Cases.

397. Minor Cases of Concussion. Pathology and Symptoms.—These are divided into two main types :—

1. Where the effects of the force have been diffusely distributed.

2. Where the effects of the force are limited.

In regard to 1 the immediate effects are loss of consciousness and transient widespread paralysis. These are probably the result of temporary cerebral anæmia, due to a momentary diminution in the volume of the skull, brought about by its distortion. Remote effects are given below in connexion with 2.

In regard to 2 where the force has been applied locally and directly to the head with limited violence, immediate effects may not be produced. Unconsciousness is typically absent, or is so transient as to pass unnoticed.

The remote effects of both the above types of injury 1 and 2 appear hours or sometimes days after the accident, and are :—

Headache (suggesting cerebral œdema).

Dizziness (sometimes accompanied by vomiting).

Loss of concentration, attention and memory.

Signs of emotional instability—such as depression, instability and restlessness.

Heterophoria should be borne in mind as a common sequela.

Physical signs are often absent, and when present are usually unreliable. Deep reflexes, however, may be increased and tremors present. Where the pathology is confined to localised contusion and œdema of the cortex, disturbances of function in the motor or sensory systems—*e.g.*, affection of finer limb movements or numbness may be present.

398. Diagnosis.—Either type of injury, 1 and 2 above, may be encountered in flying accidents (or both in combination) and it is the evidence of degree of disturbance of the cranial contents which must guide diagnosis, prognosis and treatment.

It cannot be too strongly impressed that symptoms may be delayed until some time after the accident. A man may have a "crash"—walk out of the aircraft unaided, light a cigarette and converse quite normally, and subsequently have no recollection whatever of doing so. The first point in diagnosis, therefore, is to discover what recollection, if any, the patient has of the actual "blow to the head," and what exactly were his impressions of the accident. *Failure to recall the events of the accident is a certain indication that a disturbance of the brain was produced during which period the incoming impressions could not be synthesized.* The unconsciousness may have been so transient as to have been unrecognised by the patient himself at the time and may, as above stated, have been followed by a period of automatism, also unrecognised at the time.

With regard to the diagnosis at the time of the accident—if unconsciousness is absent the diagnosis can only be tentative, pending confirmation by the development of after symptoms. The absence of unconsciousness, however, has often caused too lenient a view to be taken of the case—especially in view of the remarks made above on the transitory nature of the unconsciousness, and the occurrence of automatism which tend to make the medical officer miss the diagnosis unless he makes careful enquiries. Physical examination may reveal nothing abnormal—or there may be signs of slight shock such as weak fluttering pulse, cold clammy skin and dilated pupils (*see para. 402 for cerebral shock*).

399. Treatment.—In deciding the line of treatment of any case the following considerations should be borne in mind:—

1. Except as a passenger no case should ever be permitted to fly or motor back from the scene of the accident.

2. *All cases, who cannot remember the very moment of the accident, should be tentatively regarded as calling initially for the same care as more obvious and severe cases.*

3. In cases of mild brain injury the development of after symptoms is the criterion by which the management of the case should be judged. As a guide to treatment, more reliance is to be placed on subjective symptoms than on physical signs, which (as mentioned above) are often unreliable.

4. Whenever brain involvement is suspected the patient should be put to bed and kept completely quiet, despite possible protests that he feels quite well.

5. Alcohol is definitely contra-indicated; and other drugs such as bromides and aspirin should only be employed where there is definite indication for their use.

6. In cases finally retained on the station a record of the condition should always be made on Form 42—in which the condition as regards heterophoria should not be overlooked.

400. For guidance as to the future conduct of minor head cases it may be said that :—

1. *The suspected case* should be kept under observation in bed in station sick quarters until such time as the medical officer is satisfied of the diagnosis and, if there is no evidence of damage to the cerebral tissues, may then be allowed back to duty in a progressive manner, *e.g.*, to light ground duty, to full ground duty, to limited flying, preceded, if necessary, by a period of dual, and finally to full flying—the effects of these varying degrees of duty on the individual being carefully observed.

2. *The proved case.*—Where the medical officer is of opinion that there is evidence of damage to the cerebral tissues, there is only one course to adopt, and that is transfer to hospital for continued observation and treatment.

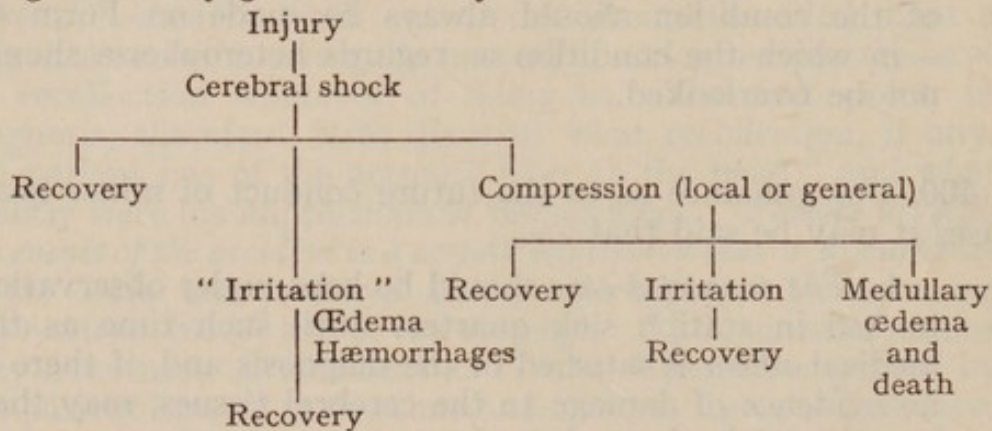
It may be laid down as a general rule that any case in which the brain has been involved, as shown by failure to recall the event of the accident, subsequent headache, dizziness, etc. (*vide* para. 398), should be retained in station sick quarters for observation, only for so long as it takes the medical officer to make the diagnosis, and that subsequently all such cases, when fit to be moved, should be transferred to hospital as a routine procedure. In other cases, where brain injury is definitely excluded and no other injury exists requiring hospital treatment, the case should be retained on the station and remain under the observation of the medical officer, gradually resuming duty as outlined at 1, above.

401. To summarise therefore :—

1. All cases of minor accident, where application of violence to the head is suspected, should receive careful examination and interrogation, even in the absence of any manifest signs of head injury.

2. Involvement of the cerebral tissues is to be strongly suspected where the patient fails to recall the moment of accident, even where no other signs or symptoms are present.

3. Every case of mild but definite involvement of the brain should be transferred to hospital for observation.

402. Cases of Severe Brain Injury.—The possible stages of progress in any given case may be indicated thus :—

External signs of injury are of importance since they afford access to infection, but they throw little light on the extent of damage to cerebral structures. Ecchymosis of the orbit or mastoid region, a fanshaped sub-conjunctival hæmorrhage, gradually spreading forward from the posterior pole of eyeball, are suggestive of fracture. Since this is almost certain to involve intracranial hæmorrhage, compression is a likely complication. A fanshaped hæmorrhage must be carefully looked for at the time of the accident, and for several days afterwards, as its development may be delayed. Its presence may be a grave symptom, and since the optic nerve may be involved, these cases should be seen while in hospital by the eye specialist. Cases detained temporarily in sick quarters can be seen after transfer to hospital.

Cerebral Shock.—In order to avoid confusion which prevails from the loose use of the term “concussion,” its meaning is limited to a syndrome which is described above, and it should not be regarded as a synonym of “shock.”

The signs and symptoms of “shock” (excluding those due to gross structural cerebral damage which may accompany them, *e.g.*, paralyses, etc.), are those of a state of low pressure—due probably to a temporary dislocation of the functioning

of the vital medullary centres. Its duration is variable, and may last for an hour (or less if there is extensive intracranial hæmorrhage due to rupture of a large vessel such as the middle meningeal artery producing early compression) to several hours. The shock may then diminish and the patient slowly recover, often passing through an intermediate stage of cerebral irritability, or it may merge into the stage of compression.











Cerebral compression may be due to a local agent, such as a fracture of the vault or its inner table. In this event signs of compression develop early. When due to a general rise of intracranial tension due to hæmorrhage or increase in the cerebrospinal fluid, its development is usually more gradual.

403. The recognition of the transition from the stage of Shock to that of Compression is of vital importance, since operative interference will be necessary if it develops beyond a certain stage.

For the purposes of reference the signs and symptoms of Shock and Compression are as follows :—

	Shock (state of low pressure).	Compression (state of high pressure).
Unconsciousness.. Stupor. Restlessness.	Patient can be roused with difficulty. Return to consciousness followed by relapse suggests onset of compression.	Becomes progressively deeper. Patient cannot be roused.
Pulse	Is typically weak—irregular and rapid—up to 130.	Becomes gradually retarded to 60 or below.
Respiration ..	Rate increased to 30 or 40 a minute. Shallow and sighing.	Rate retarded. May be stertorous and of Cheyne-Stokes type.
Skin	Pale, cold, clammy ..	Usually warmer and may be flushed.
Temperature ..	Subnormal	Gradually rises above normal.
Blood pressure ..	Systolic and diastolic pressure below normal.	Gradually mounts—often becomes markedly above normal.
Pupils	Equal—dilated, reacting sluggishly to light. Contract as shock passes off.	After the contraction of shock passes off, one may dilate (commonly on the side of lesion) producing inequality. This may be succeeded by dilation of the opposite pupil—usually indicating the terminal stage of compression.

404. The condition of the pupils and reflexes may be tabulated as follows :—

—			Shock (state of low pressure).		Compression (state of low pressure).
Pupils	..	..	Right.	Left.	
					Normal (equal).
					Shock (dilated—equal).
					Compression (contracted—equal).
					Compression (unequal) —right, normal ; left, contracted.
					Later stages, of compression (unequal).
Reflexes	..	..	Mild shock—Superficial absent. Severe Shock—Superficial and deep absent.		Abdominal reflexes may be depressed on side opposite compressed area. If the pyramidal tract is involved—plantar extension with ankle clonus and increased tendon reflexes on the side opposite the lesion.

These signs of shock are apt to simulate closely those of the terminal stage of medullary compression and oedema before death. In this state, however, there has been previously a state of compression with its typical signs of slow pulse (60) or less, slow respiration (12), inequality of pupils, etc. It is upon observations of the presence or absence of the preceding state that the differential diagnosis depends.

405. Treatment of Cases of Severe and Acute Brain Injury.—

This should be directed to two definite ends :—

1. To combat the condition of shock.

2. To anticipate and prevent as far as possible the incidence of cerebral compression due to an increase in intracranial tension, or some local compressing agent.

Shock.—During the period of shock the patient should remain as little disturbed by unnecessary movement, connected with transport and examination, as is compatible with correct diagnosis. It may be laid down as inadvisable to administer morphia as a routine procedure on account of the liability to

mask symptoms of compression. Only very severe pain justifies its use. At this stage, transfer to a hospital at any distance is not to be recommended. It is recognised that in many instances, the medical officer is influenced by a desire to transfer the patient as quickly as possible in order to remove him from the environment of the aerodrome, and to locate him in a hospital where greater facilities and conveniences for adequate treatment exist. It is, however, doubtful whether greater harm may not accrue from too hasty action in this stage of primary shock than from waiting until the signs show that this condition is at least subsiding. Whenever possible in such cases, expert opinion should be obtained before removal.

The usual methods of treatment by external warmth supplied by hot blankets, hot bottles or the electric radiator, together with enemata of glucose or hot coffee, should be carried out. In the meantime, any accompanying injuries may be dealt with, if this can safely be done without increasing the shock. In most cases simple first-aid measures should be carried out—the head injury being the most important.

With fractures of the base extending into ear or nose, attempts to disinfect by syringing may prove harmful, external cleansing with application of an antiseptic dressing only should be done.

Careful observation and complete quiet are necessary, pulse, respiration, pupils and temperature being recorded at half-hourly intervals, with a view to the diagnosis of any compression symptoms at the earliest moment. Where no signs of compression develop, it will still be necessary for the patient to remain quietly in bed for some weeks after the disappearance of any signs or symptoms. In the case of the development of a state of cerebral irritation, this period of rest will require to be considerably prolonged, if troublesome after-effects are to be avoided. In either event, it will be obvious that adequate treatment cannot be provided locally at a station. The patient, therefore, should be transferred to hospital as soon as compatible with safety after the subsidence of shock, which should be treated at or near the scene of accident.

406. Compression.—Where signs of compression due to an increase in intracranial tension show themselves, the question of operative interference arises ; and the case must be under constant observation, if possible, in a place where an operation can be conveniently performed should the development be progressive. Removal thereto should be carried out with the minimum of disturbance to the patient, and where possible air transport should be utilised.

Palliative and expectant treatment of a case where compression of a mild degree only is present resolves itself into complete rest and freedom from any disturbance, absence of light and noise, light diet, brisk catharsis, local application of ice-bag in the early stage. Prolonged rest will be required subsequently to prevent persistence of after-effects.

SECTION II.—SPINE CASES.

407. General attitude to be adopted towards Spinal Injuries.—

The general remarks as to head injuries (*vide* para. 395 *et seq.*) are in the main applicable, but when the signs and symptoms of spinal injury are not obvious, a difficulty always arises as to the line of treatment to be adopted.

Apart from gross injury to the spine where the spinal cord itself, or the nerve roots, are involved with consequent disturbance of nervous function, there are cases of injury to the vertebral column alone which are liable to be overlooked.

Such injury is to be looked for after an aeroplane accident or heavy parachute landing. In such, the vertebral column has to bear a considerable shock, which, if severe, may result in actual compression fracture. An injury of this nature may be misinterpreted as merely a bruising of the back muscles and the underlying damage overlooked, the patient, after a short local treatment, being permitted to return to duty. In such "missed cases," it is not until months, or even years later, that symptoms arise when bony absorption has taken place, with the subsequent deformity due to a wedge-shaped vertebrae—a condition known as Kümmell's disease.

408. The portion of the spine most likely to be affected in such injuries is :—

1. *Cervical region*.—As the result of falls on the head as are met with in hunting accidents or certain types of aeroplane accidents involving the head, the region about the sixth cervical vertebra is the most likely to be affected.

2. *Lumbar region*.—As the result of aeroplane accidents where the machine is more or less on an even keel, the shock is transmitted through the lower limbs and the region about the first and second vertebrae is the most likely to be affected.

409. *Pathology and Symptoms*.—The body of a vertebra generally sustains a compression fracture with probably some hæmorrhage into the cancellous tissue. There is little or no displacement and therefore no indication of the extent of the injury on ordinary examination.

Bruising of the back with pain on pressure and stiffness may be present. Hyperaesthesia has been noted early in some cases, and a temporary paraplegia, due to "spinal shock" may be present but rapidly passes off. No irregularity of the spine can usually be observed, and any signs or symptoms present disappear early. It is only subsequently that the local symptoms of pain and tenderness, with signs of pressure on the spinal cord or nerve roots, draw attention to the condition. A lateral x-ray picture may then reveal the extent of the damage.

410. Therefore, when examining a patient involved in an accident, careful examination of the spine must always be undertaken, bearing in mind that absence of signs of cord involvement does not exclude possible structural damage to the spinal column.

411. Diagnosis and Treatment.—For accurate diagnosis, an x-ray must be taken. This is advisable in all cases where spinal injury seems probable. Since the after-treatment of such an injury can only be properly undertaken in hospital, removal for this purpose is necessary when the case is fit to be moved. Severe cases, however, should not be transferred but retained under observation until expert opinion, if possible, has been obtained.

412. In less severe cases, local treatment such as rest by lying flat in bed and gentle massage of the muscles may help, but before return to duty, it is advisable that all such cases be sent for x-ray examination as a routine.

SECTION III.—EYE CASES.

413. Ocular Injuries.—Foreign bodies may produce—

Non-perforating wounds.

Perforating wounds or ruptures.

Burns and scalds.

Non-perforating wounds of the cornea which destroy only epithelium heal without a scar, provided no complications, such as a corneal ulcer, arise. Wounds deeper than the epithelium leave opacities which are permanent, their extent depending upon the area of substantia propria damaged.

Treatment.—Remove with the greatest possible care any foreign body which may be present, and if it is embedded in the cornea instil in each eye a drop of cocaine, one per cent. (or an ophthalmic tablet of cocaine) and after washing the

affected eye with boric lotion, 10 grains to the ounce, remove the foreign body with an ordinary eye spud. In all cases continue the use of a mild antiseptic lotion three times a day until all signs of local reaction have disappeared. Where there is considerable damage to corneal tissue dilate the pupil with 1 per cent. atropin three times a day until the reaction has subsided, remembering that in people over thirty years of age atropin must be employed with caution.

414. Perforating Wounds and ruptures may vary in character from an injury so small as to be found only on the closest examination to one so extensive that the eye is completely disorganised. Any one, or all, of the ocular structures may be involved, and the agent responsible for the injury may or may not be retained in the eye or orbit. Gentle handling during examination and subsequent treatment is necessary, for any undue pressure on a ruptured globe is liable to cause further damage to, and prolapse of, the ocular contents.

Treatment.—Repeated thorough washing of the conjunctival sac with normal saline, and the use of 1 per cent. atropin drops three times daily can result in nothing but benefit. Protective dressings must exert only the lightest pressure. In areas where the help of an ophthalmic surgeon cannot be obtained, a wound in the sclerotic, after disinfecting as far as possible with 1-5000 perchloride of mercury solution, is most easily dealt with by simply drawing the cut conjunctival margins over the gap and stitching them together by means of silk sutures.

415. Ulceration of the Cornea may follow any injury to its substance. If suspected, the instillation of an ophthalmic tablet of fluorescein will reveal the exact area of damage.

Treatment.—1. Wash out the conjunctival sac with a warm mild antiseptic solution three times a day.

2. Employ hot applications to the closed lids in the form of a wad of cotton-wool or flannel wrung out in water as hot as can be borne, every four hours and for a period of 10 minutes at a time.

3. Use 1 per cent. atropin drops three times a day ; and

4. Give the patient dark smoked glasses, which are preferable to an eye pad.

This treatment will generally effect a cure, but in the rapidly spreading ulcer with "hypopyon" (a layer of sterile pus in the anterior chamber caused by the violence of the reaction) sterner measures, such as the cautery, or the use of pure carbolic acid, must be resorted to. In using carbolic, cocainise the eye, and after carefully drying the ulcerated surface with blotting paper apply the acid to the affected

surface by means of a delicate brush or a pointed match-stick. Keep the lids separated until the carbolic has had time to act and to dry, and then resume the treatment above described.

416. Burns and Scalds of the lids and ocular surfaces are met with most commonly in units where caustic potash and soda are extensively employed. Aeroplane accidents, accompanied by fire, account for a few.

The chief complications are two—

1. Corneal ulceration.
2. Symblepharon (adhesion between lid and ocular conjunctival surfaces).

Treatment.—The immediate treatment depends upon the irritant or corrosive causing the injury. Alkalis are treated with a wash of very dilute acid and *vice versa* (e.g., 3 per cent. sodium bicarbonate lotion for acids, and milk or boric lotion for alkalis). In all cases repeated washings with normal saline should be employed and where there is any danger of adhesion forming between the lid and ocular conjunctival surfaces, sterile olive oil must be instilled three times daily, the lids being widely separated during each administration. Unless the initial damage is obviously of a superficial nature, cases of burns and scalds of the eye should be transferred to hospital.

417. Inflammatory Conditions of the Lids and Conjunctivae.—*Blepharitis*, or inflammation of the lid margins, is characterised by the presence of little collections of squamous material at the base of the lashes. A later ulcerated type also occurs. Refractive errors and tropical conditions are responsible for many cases, and must be remembered in connexion with general treatment.

Local Treatment.—The “crusts” are removed with 3 per cent. sodium bicarbonate lotion well warmed. When the lid margins are quite clean, 1 per cent. yellow oxide of mercury ointment is rubbed into the area affected, twice daily.

418. Conjunctivitis.—There are two important considerations to be borne in mind when dealing with cases of lid inflammation and general infection of the superficial vessels of the eye:—

1. Such condition may be extremely contagious.
2. The haphazard diagnosis of “Conjunctivitis” may result in lasting damage of an eye, in which the obvious conjunctival injection is but masking more serious disorders, such as glaucoma and iritis.

In order to minimise the possibilities of erroneous diagnosis under such circumstances, seven differential points are tabulated below.

—	Conjunctivitis.	Iritis.	Glaucoma (acute).
1. Superficial inflammatory changes.	Most marked on lids or sclerotic.	More marked in circum-corneal area.	Generally diffuse.
2. Blood vessels	Bright red in colour and mobile at circum-corneal area, blanching on pressure.	Some general redness, but circum-corneal area violet, non - mobile and not blanching on pressure.	General diffuse redness. Circum-corneal vessels may be affected. and if so do not blanch on pressure.
3. Cornea ..	Clear, except for occasional mucous flakes.	Clear	Substance hazy.
4. Iris and pupil	Unaffected ..	Iris pattern obscured. Pupil perhaps irregular and contracted.	Pupil oval (long axis vertical and dilated).
5. Visual acuity	Unaffected ..	Slight reduction.	Markedly reduced.
6. Pain ..	Slight (so-called irritation).	Definite (except where syphilitic).	Very acute.
7. Intra-ocular tension.	Normal ..	Normal (excluding complications).	Increased.

Cases of iritis and glaucoma should be reported immediately for specialist treatment.

419. Treatment.—Cases of conjunctivitis call for treatment along the following lines, according to the nature and severity of the infection. In all acute cases, precautionary questioning as to the presence or recent history of gonorrhœa should be made. Where more than one case occurs at a time, smear preparations should be examined and appropriate measures taken to prevent the spread of infection.

1. *Acute Conjunctivitis.*

(a) *Simple*.—The *purulent*, *muco-purulent* or *mucoïd* variety are best treated by washing out three times daily with a lotion of zinc sulphate and chloride ($\frac{1}{2}$ grain of each to the ounce of normal saline), and, if severe, by painting the everted lids daily with a solution of 1 per cent. silver nitrate.

(b) *Contagious* ("pink eye").—This variety, caused by the Koch-Weks bacillus, reacts after a time to repeated washings with a lotion of hydrarg. perchloridi (1-7000), and in cases where the acute symptoms have passed away, the use of a 1 per cent. solution of silver nitrate as a paint brushed over the everted lids, hastens recovery.

2. *Angular Conjunctivitis*.—This is characterised, as its name implies, by inflammatory changes confined chiefly to the inner and outer canthi, and it yields rapidly to washings out with a lotion of zinc sulphate and chloride ($\frac{1}{2}$ grain of each to the ounce of normal saline) three times daily.

3. *Gonorrhœa Ophthalmia*.—This is a most serious type of conjunctival infection, and so fulminating may be its progress that diagnosis scarcely calls for a history of urethral discharge, or of infection through the medium of towels or other property of a known sufferer.

Treatment.—In the first instance, one eye is usually attacked; in these circumstances, isolate the other eye immediately by means of a suitable adhesive plaster shield containing a glass window, with the only means of air-inlet on the outer side.

While arrangements are being made to bring the case under the care of an ophthalmic surgeon, wash the affected eye thoroughly every two hours with normal saline and apply hot dressings to the closed lids. Silver nitrate, five to ten grains to the ounce, is valuable as a paint to the everted lids in the early stage before œdema and stasis render its application unsuitable. All attending these cases should exercise the greatest care in protecting their own eyes from infection.

4. *Chronic Conjunctivitis*.—Although text books should be consulted when dealing with special cases, the following general routine treatment is valuable:—

(a) In employing lotions, eliminate the usual "eye cup" and proceed as follows:—Place the patient on a couch and with a piece of cotton-wool damped with the prescribed lotion clean the area of skin bounded by the orbital margins of the closed lids. Next, from cotton-wool squeeze a quantity of lotion into the depression made by the orbit and bridge of the nose, so that a pool of lotion is formed. The patient now opens his eye, and retracting

the lids, moves his eye in and out and up and down, thus effecting thorough contact between the lotion and the conjunctival surfaces.

(b) One or more paintings daily with silver nitrate, five grains to the ounce, will always accelerate the cure of the more resistant chronic cases.

420. Precautions in the Use of Cocaine and Lead Lotion.—

The use of cocaine, other than as an anæsthetic for operative work, is harmful. It should never be used to alleviate pain whilst examining or washing out an eye, as it has the effect of devitalising the corneal epithelium. The use of lead lotion as an application in the treatment of black eye, etc., is contra-indicated, for should an injury to the cornea be present a deposit therein of white lead results, which may seriously and permanently impair visual acuity.

CHAPTER VI.

ROUTINE PATHOLOGICAL EXAMINATION IN
RESPECT OF FLYING EFFICIENCY.

421. It has been aptly stated that pathology is physiology gone wrong. This is perhaps the best conception of what the term "disease" means, and it forms a satisfactory basis on which to build up a routine pathological examination for flying personnel. There is no sharp line of demarcation between physiological and pathological tests,—the one set merges into the other; by the former it is sought to ascertain whether the individual is normal, by the latter to detect any abnormality and its cause.

In the Royal Air Force the flying personnel are systematically kept under physiological observation, and every year each officer is tested for physical fitness in conjunction with his confidential report. Thus any abnormalities that may have developed during the previous twelve months are detected, and, unless the condition can be remedied at the station, the case is sent before a special medical board. If the board decides that any case is physiologically inefficient or doubtful, a routine pathological examination is usually carried out to aid in the assessment of the nature and probable duration of the disability.

Scheme of Routine Pathological Examination.

422. The following scheme has been adopted for all cases sent for such examination:—

Blood Tests—

- Counts. Red blood-corpuscles per cubic millimetre.
- Hæmoglobin percentage.
- Colour index.
- White blood-corpuscles per cubic millimetre.
- Differential leucocyte count (400 cells).
- Examination for parasites.

Culture.

Agglutination against *B. typhosus*.

B. paratyphosus A, B and C.

B. enteritidis Gaertner.

B. dysenteriae Shiga.

B. dysenteriae Flexner.

B. melitensis.

B. paramelitensis.

B. abortus.

Blood Tests—continued—

Wassermann and Sigma.
Hæmagglutinins.
Blood urea.

Urine Tests—

Routine. Specially examined
for albumin
blood.
pus.
sugar.
casts.
ova of schistosoma
(bilharzia).
T.B. and other pathogenic
bacteria.

Renal efficiency tests.

Fæces—

For pathogenic bacterial, protozoal, or helminthic
infection.

Sputum—

If available.

Throat Swabs and Peridental Smears—

If any indication of oral sepsis.

Procedure for carrying out Tests.

423. The tests are carried out at a definite hour of the day, namely, 8 a.m., the object of this being to render the results of all examinations comparable. This point will be appreciated when it is recollected that certain physiological processes vary with the time of day, and when these processes are abnormal the variation may be greater. For example, the period of time that has elapsed since the last meal will materially affect the total leucocyte count and the urea excretion.

The renal efficiency tests, occupying as they do the period of two hours, are started first. The subject is instructed to empty his bladder into a sterile flask, and this urine is used for the complete routine examination. Thereafter the urea meal is administered, and as further specimens of urine are collected at hourly intervals for the next two hours, there is plenty of time to carry out the remaining tests.

The subject is now given a history form to fill in, to supply particulars required for record purposes, and to aid in the interpretation of the results of certain tests. For example, the date of protective T.A.B. inoculation affects the agglutination test; a possible increased red blood count must be allowed for in subjects who have recently done much high flying or have sojourned long in a hot climate.

The blood count and hæmagglutinin tests are then proceeded with, but the collection of blood for Wassermann test, agglutination and culture is delayed until the end of the second hour, when the vein is punctured to obtain blood for the estimation of its urea content.

The results of the tests are recorded on a form designed to reduce clerical work to a minimum. A specimen of the blood and fæces report form is shown :—

Enclosure No.
in Form 48.....

FORM 478.

ROYAL AIR FORCE.

ROUTINE PATHOLOGICAL OVERHAUL.

Report No.....

Name.....Rank and Official No.....
Hospital or Unit.....Age.....
Clinical Diagnosis.....

BLOOD EXAMINATION.

Date and hour of collection of sample.....Temperature.....
Red blood corpuscles.....per cu. mm.
Hæmoglobin percentage.....
Colour index.....
White blood corpuscles.....per cu. mm.

Differential Leucocyte Count (400 cells counted) :—

Small mononuclear lymphocytes.....	%	}.....% Non-granular.
Large mononuclear lymphocytes.....	%	
Hyalines.....	%	
Transitionals.....	%	
Neutrophil polymorph. leucocytes.....	%	}.....% Granular.
Eosinophil polymorph. leucocytes.....	%	
Basophil polymorph. leucocytes.....	%	

Blood parasites.....
Blood culture.....
Wassermann reaction.....
Agglutination test.....Method.....Time.....

ORGANISM.	DILUTION OF SERUM.					
	$\frac{1}{10}$	$\frac{1}{50}$	$\frac{1}{100}$	$\frac{1}{200}$	$\frac{1}{400}$	$\frac{1}{800}$
B. typhosus.....						
B. paratyphosus A.....						
B. „ B.....						
B. „ C.....						
B. enteritidis Gaertner.....						
B. dysenteriae Shiga.....						
B. „ Flexner.....						
B. melitensis.....						
B. paramelitensis.....						

Date of last protective T.A.B. inoculation.....

FAECES.

Pathogenic bacteria.....
Pathogenic protozoa.....
Pathogenic helminths.....
Occult blood.....

(Note.—For reverse of Form, see para. 430).

Remarks on the Tests.

424. Blood Counts.—These are collected from the thumb, as blood obtained from the lobe of the ear gives varied and erroneous results, due to the tendency of the circulation to stagnate in the latter situation, especially during the cold weather.

The normal red blood-corpuscle count is accepted as six millions per cubic millimetre for all flying personnel under 30 years of age. Above that age five and a half or five millions per cubic millimetre is taken as normal, depending on the history of the case.

A rapid, simple and efficient method of staining is employed. A 0·5 per cent. solution of Leishman stain in methyl alcohol is used. The stain is kept in a stoppered cylindrical staining jar of sufficient size to receive at least four slides. By placing the slides in the pot in pairs, back to back, four slides can be stained at the same time. The specimens are left in this stain for five minutes, then rapidly washed in distilled water, allowed to dry in the air and are now ready for examination. The same stain may be used for hundreds of slides provided the pot is well stoppered. This method of staining prevents the appearance of artefacts derived from the distilled water, lessens the chance of deposit and saves much time.

For the differential count four hundred cells are counted, and the following seven types of cells are recognized :—

Small mononuclear lymphocytes.

Large mononuclear lymphocytes.

Hyalines.

Transitionals.

Neutrophil polymorphonuclear leucocytes.

Eosinophil polymorphonuclear leucocytes.

Basophil polymorphonuclear leucocytes.

This division has been found adequate for most of the information required from a blood count. Many medical men are dubious of the value of differential counts, but in the hands of careful workers, knowing their own standards, much valuable information may be given which may point to the correct diagnosis and direct the line of further investigation.

425. Blood Culture.—As is to be expected, the blood culture is in most cases negative, but its adoption as a routine test is justified by its value in the few early positive cases where correct and immediate treatment is of vital importance. Cases have occurred in which its use had been omitted, and where an early positive result could probably have been found; the after history of these cases emphasises the necessity for routine blood culture.

426. Agglutination Tests.—The routine agglutination test is carried out by Garrow's method in the following dilutions :—1/10, 1/50 and 1/100. Positive or doubtful findings by this method are controlled by Dreyer's technique. This test, in addition to being of value in detecting evidence of present or recent infection with the organisms tested for, acts as a check on the efficiency of the protective T.A.B. vaccine in use.

427. Wassermann and Sigma Tests.—The Wassermann test is performed by the Browning-Mackenzie method and is found very reliable. The Sigma test is also carried out and gives equally reliable results. It is more simple in practice, but until considerable experience is gained there is some difficulty in deciding on the degree of flocculation ; moreover, infected sera tend to give a fictitious positive result, and, unless there is a history of syphilis, a reading of less than four Sigma units is not accepted as positive. In such a doubtful case, it is necessary to inquire further into the personal history, a procedure which is liable to upset mentally many a patient. However, these defects are no greater than those connected with the Wassermann test, which tends to underestimate the number of positive cases and gives at times considerable trouble in working out the complement doses, owing to defective complement. The difficulty of keeping guinea-pigs during the hot weather in warm climates makes the supply of complement a difficult problem. It is on this account that the Sigma test has been adopted for routine work in Iraq.

428. Hæmagglutinins.—The knowledge of the group hæmagglutinins in any case of a severe crash is of great value. Moreover, by doing a thorough routine examination on all available personnel, a rapid means is afforded of certifying healthy blood donors. If the Wassermann test were performed only on suspected syphilitics, the suitability of the donor available would be very dubious. Similarly, a would-be donor, who had done service overseas, might have no history of malaria and yet show signs of the disease in his blood.

429. Blood Urea.—The blood urea is determined by the method of MacLean and de Wesselow. The normal blood urea is accepted as being somewhere below the level of 40 milligrammes per 100 cubic centimetres of blood in an individual under 30 years of age, and in any person a figure of 50 milligrammes and over is suggestive of abnormal urea metabolism. In cases of albuminuria without the presence of casts or pus, it is not possible to give an opinion of the cause in the absence of a blood urea estimation. In fact, patients come to the laboratory with a history of a normal urinary urea output, and

yet an estimation shows that this output is only attained by an increased head of urea in the blood. Thus, it is more satisfactory to all concerned to do full renal efficiency tests in every case.

430. Urine.—Renal Efficiency Tests.—The renal efficiency is tested after the administration of fifteen grammes of urea dissolved in 100 cubic centimetres of water, also by flooding with 1,500 c.cs. of water. The factors considered in assessing efficiency are embodied in the Form shown below :—

RENAL EFFICIENCY TESTS.

Blood urea per 100 c.c. of blood.....	mgm.
Before test passed.....c.c. urine containing.....	% urea.
First hour passed.....c.c. " "	% "
Second hour passed.....c.c. " "	% "
Urea concentration factor.....	
Diastatic index.....	Units.
URINE : Specific gravity.....	
albumen.....	
sugar	
chlorides	
casts	
cells	
crystals	
micro-organisms	
BLOOD PRESSURE. Systolic	mm. Hg. Diastolic.....mm. Hg.
HEART.....	

GENERAL CONCLUSIONS.

.....

Date.....Officer in Charge of Laboratory.

(Note.—Reverse of Form 473 referred to in para. 423).

As regards the urea concentration test, the normal urinary urea output is taken as 2·5 per cent. or over ; in calculating this percentage, due allowance is made for the quantity of urine passed. The urea concentration factor is considered to be most important and the normal figure is taken to be over seventy. The diastatic index is only performed as a supplementary test. Abnormal urinary constituents such as albumin, casts, pus and blood, especially in conjunction with an estimation of the chlorides, help to differentiate between parenchymatous and interstitial kidney lesions. The blood-pressure and state of the circulatory organs are investigated to ascertain whether any defect found is entirely renal.

The great value of these tests lies in the detection of vascular and interstitial changes in the kidneys. Chronic toxic conditions at any early stage may have a distinct, if moderate,

effect on the urea metabolism. Thus in chronic alcoholics, before permanent lesions are apparent, the urea excretion is often found to be abnormal. This, along with evidence of physical inefficiency, is an early sign of more damage to follow, unless the cause is removed. It is difficult to be sure, without the patient's admission, as to the exact toxin at work, but the complete examination eliminates many causes. Moreover, the results of the test are apparent to the patient, who is readily convinced of the damage done. By informing him that the present lesion is probably temporary and will become normal, if the excesses are stopped, the average patient sees reason and is soon rendered efficient. Further tests performed at intervals of a month or so show whether the case is likely to recover.

Although the newer renal tests are of great value, the older tests must not be ignored. Thus, cases of renal tuberculosis have been met with where full efficiency tests have revealed a defective renal excretion, but the urine had not been examined for the tubercle bacillus. Cases of slight albuminuria have been from time to time encountered, also, in which a detailed examination has revealed either the ova of *Schistosoma hæmatobium* or the *Bacillus tuberculosis* to be the cause of the trouble. In some cases the condition had been overlooked for a considerable period of time. For this reason microscopical and cultural examinations are performed on all urines, and the deposit is always stained for the tubercle bacillus.

The following case illustrates the importance of investigating the cause of all instances of albuminuria. The patient was born in Bareilly, India, in 1901, and came to England in 1903. He went to South Africa (Orange Free State and Natal) in 1906, and remained there until September, 1914, when he returned to the United Kingdom. He had not been out of the United Kingdom since that date, or, in other words, for nine years. The man claimed to have enjoyed perfect health at all times. He appeared before the Central Medical Board in April, 1923, to be tested for fitness to become a non-commissioned officer pilot, but was rejected on account of albuminuria. Subsequent examination revealed a heavy infection with living ova of *Schistosoma hæmatobium*. Had this patient not applied to become a pilot this infection would probably have escaped notice, and as he was on the waiting list for overseas the results might have been disastrous.

431. Fæces.—The importance of the early detection and eradication of infections of the gut with recognized pathogenic bacteria, protozoa and helminths is agreed upon by all, but this does not hold good for *Lambliæ* (*Giardia*) *intestinalis*.

That *Lambliia intestinalis* is pathogenic is suggested by the following observations. Repeatedly, during a routine investigation of a case, the blood picture has favoured the diagnosis of a protozoal infection, and on completing the examination the presence of lamblia in the gut has been the only abnormality found. Further, with the eradication of the parasites, improvement in the patient's general condition has followed. Many such patients show loss of nerve and muscle tone, as is made evident by the physical efficiency tests, and especially by the presence of heterophoria. Because infection with lamblia is so common in warm climates, and so difficult to eradicate, it is convenient to label it as non-pathogenic. The common cold occupies a similar position in these climes, but its pathogenicity is now no longer doubted.

432. Sputum.—Tuberculosis is so common and starts so insidiously that it is liable to reveal its presence first in the form of a lowered physiological efficiency. On this account the sputum is always examined, if available.

433. Throat Swabs and Peridental Smears.—The mouth, teeth and gums are examined as a routine in the laboratory. Oral sepsis, probably by virtue of the large blood-supply to the mucosa of the mouth, may cause rapid and profound symptoms of sepsis, the first signs of which are often of a nervous nature. Such defects are readily revealed by the general efficiency tests. The diphtheria bacillus is not the common offender here, but most frequently it is Vincent's bacillus and spironema, or a streptococcus.

434. Blood-sugar Content.—The blood-sugar content is not estimated unless there is a glycosuria. It has been found advisable to do full glucose tolerance curves on patients with sugar in the urine to make a correct diagnosis; the majority of these cases have proved to be examples of "lowered renal threshold" or defective liver storage, and not true diabetes.

CHAPTER VII.

DIFFERENTIAL DIAGNOSIS FROM THE POINT OF VIEW OF BACTERIOLOGY AND CLINICAL PATHOLOGY.

435. In view of the aid given by the clinical pathologist and bacteriologist in the quick diagnosis and expert treatment of certain diseases, as well as in the prevention of spread, and extermination, of those of an infectious or contagious nature, attention is drawn to the great importance of making early use of such help. With the advance of medicine these methods are continually assuming an increasing importance, not only in regard to general medicine at home but even more so in connexion with diseases met with during service in tropical and sub-tropical climates.

436. Since the diagnosis of a disease is often determined by a careful study of signs and symptoms, a list of these alphabetically arranged is here given with their diagnostic significance :—(1) As an aid towards the rapid narrowing down of the field of differential diagnosis ; (2) To draw attention to such pathological and bacteriological measures as should be undertaken by the medical officer as soon as possible.

Particulars in regard to the methods of sending specimens to the laboratory are given in Part I (paras. 266–287), and must be complied with in exact detail.

437. In respect of tropical and sub-tropical diseases further information is given in the War Office “Memoranda on Medical Diseases in Tropical and Sub-Tropical Areas,” which is issued to all medical officers. In addition, standard text books in regard to any particular disease should be consulted when necessary.

ALBUMINURIA.

438.—1. The presence of albumin in the urine may be of great or little importance. All cases of albuminuria require careful investigation, and most information is to be gained from renal efficiency tests which aim at ascertaining the condition of physiological balance between blood and kidneys. The chief point to be decided is whether the albuminuria is purely functional or organic, and if the latter, what is its origin. So-called functional cases may be attended with a considerable amount of albumin of relatively minor import,

whereas advanced chronic interstitial nephritis may be accompanied by little or no albuminuria. In addition, slight albuminuria may be met with in cases of pathogenic infection in which a detailed urinary examination will reveal the cause of origin—*e.g.*, the presence of *Bacillus coli*, of *Bacillus tuberculosis*, or of the ova of *Schistosoma hæmatobium* (bilharzia).

2. *Clinical Observations.*—Albuminuria may be conveniently divided into the following types :—

(a) *Physiological* : Occurs often in adolescence, especially after certain forms of muscular exercise.

(b) *Cardiac* : Associated with such conditions as valvular disease and high blood-pressure.

(c) *Nephritic* : Inflammatory as in fevers and nephritis generally, congestion, tumours and calculi.

(d) *Lower renal tract* : Inflammation due to gonorrhœa, tuberculosis, schistosomiasis (bilharziasis) and filariasis, congestions, tumours and spermatorrhœa.

(e) *Toxic* : Due to drugs, such as cantharides, santonin, mercury.

(f) *Bacterial* : Found especially with *Bacillus coli* infections.

3. *Laboratory Tests.*—In all cases of albuminuria an early morning specimen of urine should be sent for investigation with full details of the case. The pathologist will advise as to any further tests which may be necessary.

BLOOD IN THE URINE.

439.—1. The appearance of blood in the urine may denote the presence of whole blood, termed hæmaturia, or of hæmoglobin alone, designated hæmoglobinuria. The microscope is the quickest and safest method of detecting blood, and deciding whether the case is one of hæmoglobinuria or hæmaturia. The blood may enter the urine at various points along the genito-urinary tract, therefore the anatomy of this apparatus must be borne in mind. In bleeding from the kidney the blood is well mixed with the urine. Hæmorrhage from the bladder usually demonstrates its presence towards the end of micturition, whereas that from the urethra appears with the urine which is voided at the beginning of the act.

2. *Clinical Observations.*—The common causes of blood in the urine are :—

(a) inflammation, trauma, tumour or calculi of the urinary tract ;

(b) blackwater fever ;

- (c) Weil's disease or spirochætosis icterohæmorrhagica
- (d) schistosomiasis (bilharziasis) ;
- (e) snake-bite ;
- (f) certain drugs—e.g., cantharides, sulphonal.

The employment of X-rays may help materially in determining the cause of the hæmaturia.

3. *Laboratory Tests*.—All specimens for the investigation of this condition should be collected aseptically and transmitted to the laboratory as rapidly as possible. This is particularly necessary owing to the fact that the condition is often associated with renal tuberculosis or schistosomiasis.

COUGH.

440.—1. *Clinical Observations*.—It is to be realised that in cases complaining of a chronic cough clinical examination of the lungs is not sufficient. Especially is this so when the cough is dry, since such is frequently due to extra-respiratory causes, for example :—

- (a) cervical adenitis and adenoids ;
- (b) laryngitis ;
- (c) mediastinal tumours ; aortic aneurysm ;
- (d) pleural irritation, as is seen in simple pleurisy or in liver abscess.

It is to be noted also that intra-pulmonary causes include, in addition to the effects of commoner organisms which attack the lungs—

- (a) helminthic infections (ancylostomiasis and schistosomiasis) which frequently give rise to a bronchial irritation during the development of the parasites ; and
- (b) such infections as malaria, Malta fever, enterica, relapsing fever and plague, in which bronchitis is frequently a symptom.

It is advantageous, where possible, to have the thorax X-rayed.

2. *Laboratory Tests*.—Sputum should be examined in all cases of chronic cough or fever associated with expectoration. In addition, the examination of urine, fæces and blood may afford valuable information in some cases and accordingly should always be examined where any doubt exists as to the cause of the condition.

CONSTIPATION.

441.—1. Constipation leads to the retention of toxic bodies in the alimentary tract, later to the absorption of these into the general circulation, and thus tends to lower the general health. The condition is serious, even in temperate zones, but in warm climates it is decidedly worse, because it is a great predisposing factor to the occurrence of heatstroke and infections of the alimentary tract. In warm climates, therefore, it is well not to wait for patients to report sick with this symptom, but by means of lectures or pamphlets to bring home to everyone the dangers attendant on constipation. It is a wise saying: "Keep the bowels open and the mind easy," for this simple precaution will prevent much avoidable ill-health and will increase the available mental capacity.

2. *Clinical Observations.*—Many people are somewhat constipated always, but, whenever a patient complains of this symptom a detailed clinical examination should be made to differentiate, if possible, between cause and effect. The commoner causes are:—

(a) ill-regulated personal life, that is failure to go to stool at a definite hour;

(b) eating too much or too little, or the wrong type of food;

(c) loss of muscular tone, due chiefly to lack of exercise;

(d) local or general diseases, such as tumours or strictures of large bowel, or certain fevers.

The efficient prevention and treatment of this condition is to forestall or remove the cause.

3. *Laboratory Tests.*—In certain cases it will be found advisable to forward material (particularly fæces and blood) for the exclusion of the diseases indicated under 2 (d) above.

DIARRHŒA AND DYSENTERY.

442. 1. These in themselves are not diseases but symptom complexes of many diseases. All that the term "diarrhœa" denotes is frequency or looseness of stool; "dysentery," the passage of blood, mucus, or both, from the lower bowel, accompanied by colic or tenesmus. Many cases of dysentery are ushered in by a diarrhœa. Moreover, an attack of diarrhœa may predispose the patient to dysentery, or be an early symptom of enterica or cholera. In the tropics and sub-tropics all cases of diarrhœa should be treated on strict lines until their true nature is apparent.

Some idea of the great variety of possible causes of diarrhœa and dysentery may be gathered from the table given below :—

TABLE III.

Possible Causes of Diarrhœa and Dysentery.

Mineral kingdom – Sand.		
Mica.		
Waters rich in sulphates.		
Drugs.		
Vegetable kingdom Chiefly undigestible vegetable matter.		
Moulds.		
Animal kingdom—		
Bacteria -	Cocci	- Streptococcus or Enterococcus.
	Bacilli	- <i>B. dysenteriae Flexner.</i> <i>B. dysenteriae Shiga.</i> <i>B. dysenteriae Sonne.</i> <i>B. Morgan No. 1.</i> <i>B. Eyre No. 9.</i> <i>B. Typhosus.</i> <i>B. Paratyphosus A. and B.</i> <i>B. tuberculosis.</i> <i>B. pyocyaneus.</i> <i>B. prodigiosus.</i> <i>B. proteus vulgaris.</i> <i>B. faecalis alkaligenes.</i> <i>B. enteritidis sporogenes.</i> <i>Vibrio cholerae.</i>
	Spirochetes	- <i>Spirochaeta pallidum.</i>
Protozoa -	Sarcodina	- <i>Entamoeba histolytica.</i>
	Flagellata	- <i>Lamblia intestinalis.</i> <i>Trichomonas intestinalis.</i> <i>Tetramitus mesnili.</i> <i>Leishman-Donovan body.</i>
	Sporozoa	- <i>Plasmodium falciparum.</i>
	Infusoria	- <i>Balantidium coli.</i> <i>Nyctotherus faba.</i>
Helminths	Cestoda	- <i>Tænia saginata.</i>
	(Tape worms).	<i>Tænia solium.</i> <i>Dibothriocephalus latus.</i>
	Trematoda	- <i>Schistosoma mansoni.</i>
	(Flukes).	<i>Gastrodiscoides hominis.</i> <i>Watsonius watsoni.</i> <i>Heterophyes heterophyes.</i> <i>Paragonimus westermani.</i>

TABLE III—*continued*.Animal kingdom—*continued*—

	Nematoda	-	<i>Ancylostoma</i> or <i>Necator</i> .
	(Round		<i>Ascaris lumbricoides</i> .
	worms).		<i>Oesophagostoma apiostomum</i> .
			<i>Oxyuris vermicularis</i> .
			<i>Trichocephalus dispar</i> .
Arthropoda	- Insecta	-	<i>Diptera</i> (larvæ of certain flies)
	Arachnida	-	<i>Acarina</i> (certain mites).
Unclassified	- Carcinoma recti.		
	Hæmorrhoids.		
	Foreign body in rectum.		

Briefly, diarrhœa and dysentery are induced by some mechanical or chemical irritation of the gut. If the irritation is mild a simple hyperæmia and hypersensibility of the gut results, leading to frequency of stool. With increase of irritation there is further congestion of the bowel, overaction of its mucous glands, and later ulceration, producing such symptoms as looseness of stool, passage of mucus and blood. It is purely a matter of degree and the therapeutic problem is to lessen the degree. This can only be done by the rapid removal of the cause, and the application of rest and soothing remedies to the injured tissues.

2. *Clinical Observations*.—The foregoing table emphasises the importance of a proper routine examination. This should comprise a careful history and investigation of the case, bearing in mind the possibility of such diseases as cholera, enterica, syphilitic or tuberculous infection of the gut, carcinoma, hæmorrhoids, and malignant malaria.

3. *Laboratory Tests*.—(a) The whole of the first motion passed should be sent to the laboratory or, failing that, selected portions such as blood or mucus, the specimens being carefully protected against insects, especially flies.

(b) A blood smear for parasites, and perhaps a blood culture should also be sent. In enterica and at times in bacillary dysentery the casual organism can be isolated by means of blood culture during the first few days of disease.

The rapidity with which a diagnosis can be made rests greatly on the celerity with which a fresh sample of fæces is forwarded to the laboratory. Depending on the nature of the case, a report from the pathologist may be expected after an interval varying from 10 minutes to 48 hours. In the meantime, the patient should be put on the routine treatment for all acute cases of diarrhœa and dysentery unless there are

definite symptoms or signs pointing to some specific cause, such as amœbic or bacillary infection, when specific treatment should be instituted immediately.

FEVER.

443.—1. The great importance of the early laboratory investigation of fever is not sufficiently appreciated. In the tropics and sub-tropics where the conservation of energy is of prime importance, all short cuts to establishing a correct diagnosis of a fever are to be highly recommended and welcomed. Concomitant with the clinical examination there is no surer method of demonstrating the cause of the fever than by the isolation or detection of an organism commonly associated with fever, bearing in mind that in some cases more than one cause may be at work. In cases of fever the physician and pathologist must work hand in hand ; in fact, it is not going too far to say that with tropical fevers the help of a laboratory is absolutely indispensable.

The common causes of fever in the tropics and sub-tropics are as follows :—

Fevers likely to be encountered in the Tropics and Subtropics.

Malaria.

Typhoid.

Paratyphoid A B and C

Gaertner group of food poisoning.

Dysentery—bacillary.

Liver abscess (amœbiasis).

Relapsing fever.

Undulant, Malta or Mediterranean fever.

Tuberculosis.

Syphilitic fever.

Pneumonia.

Influenza.

Plague.

Heatstroke.

Weil's disease or spirochætosis icterohæmorrhagica.

Sandfly fever or phlebotomous fever.

Dengue.

Seven day fever.

Rat-bite fever.

Helminthic fever (including bilharziasis).

Leishmaniasis (kala-azar).

Trypanosomiasis.

Typhus.

Blackwater fever.

Fever accompanying intestinal catarrh (cholera, etc.).

The above list, by no means complete, brings out the necessity for some routine method of examining cases of pyrexia.

Every case should be investigated in the following order :—

Full clinical examination.

Laboratory tests.

Accurate record of temperature of patient ; and it may be added for the diagnosis of obscure cases of malaria, the effect of drugs, such as quinine, on the course of the fever.

2. *Clinical Observations.*—Particular attention should be paid to :—

(a) skin and conjunctivæ for jaundice, pallor, ulceration, bites and rashes ;

(b) lymphatic glands—size, tenderness, massing, adhesion ;

(c) spleen—size and tenderness ;

(d) liver—size and tenderness ;

(e) stool—general characters of ;

(f) urine for blood, albumin, bile and sugar.

3. *Laboratory tests* frequently give the most rapid means of direct diagnosis. A consultation of Table IV will show that a large number of fevers may be diagnosed or eliminated by such simple measures as blood smears, cultures or counts. Furthermore, it is evident that the sooner these investigations are undertaken the more likely is the causal organism to be found. Nothing is to be lost by the taking of early blood smears and cultures, much is to be gained. Delay in establishing the correct treatment for the disease may lead to permanent injury or even be fatal.

Blood films and fresh specimens should always be collected on the first day of fever, and subsequently daily for three or four days in case of a negative result. In relapsing fever, the causal parasite is only found in the peripheral blood during the fever, so also at times in some cases of malaria.

In most diseases where there is a blood infection, the maximum chance of isolating the organism by hæmoculture is in the first day or so of fever. This is especially so in the spirochæmal diseases such as Weil's disease, seven day fever and rat-bite fever. In typhoid and paratyphoid fever the organism usually disappears from the blood after the first week of the disease. *Bacillus dysentericæ* at times may be isolated from the blood stream, but only early in the disease.

Routine Procedure of Laboratory Tests to be adopted in every case of P.U.O.—The medical officer in charge of the case is responsible for the collection of the following material in all cases of fever. He must either collect the material himself or arrange for it to be done. Should the facilities not exist on the spot for the proper examinations to be made, the specimens must be forwarded without delay to the nearest laboratory.

(a) In every case of fever *a blood film must be made on the first day of disease*, or the first day that the case is seen by a medical officer. Should the film prove negative and the fever persist, further films should be collected for two or three days.

(b) *A blood culture* must be made if the fever lasts more than 24 hours. It is advisable to make the blood culture on the first day of the fever, but in every case of continued fever it must be collected *before the end of the first week*.

(c) When blood is withdrawn for blood culture a little should be set aside for agglutination (Widal) and complement deviation (Wassermann) tests. It is seldom that an agglutination test will be of much value until after the 5th to 7th day. Should blood films and cultures prove negative it is advisable to do an *agglutination test on the 10th day*, a further blood culture may be tried on that day also.

(d) *The fæces* should be examined for bacillary, protozoal and helminthic infection as early in the fever as possible, and *the examination repeated daily for three days*. The whole stool should be sent if practicable, otherwise any blood or mucus that may be present. In suspected cases of enterica the most likely time to isolate the organism from the fæces is in the *2nd or 3rd week*.

(e) The urine should be examined *at once* for albumin, blood, T.B. or ova of bilharzia. The best time to look for *Bacillus typhosus* and *Leptospira icterohæmorrhagicæ* is in the *3rd and 4th weeks* of the disease.

TABLE IV.

Table showing the rapidity with which many of the Fevers Occurring in Warm Climates may be correctly diagnosed with the aid of a Pathological Laboratory.

	Direct evidence of disease by identification of causal organism in				Indirect evidence of disease may be gained from		Further tests that may be applied.
	Blood Slide.	Blood Culture.	Fæces.	Urine.	Blood Count.	Blood serum agglutination.	
Malaria..	1st day of fever.				Increase of hyalines.		
Relapsing fever	Only during fever.				Pigmentation.		
Filariasis ..	Especially during fever.				Leucocytosis		
Leishmaniasis ..	With fever if at all				Neutrophilia.		
Trypanosomiasis	With fever				Eosinophilia		
					Leucopenia		Spleen puncture for parasite.
					Lymphocytosis.		Lymph gland or lumbar puncture for parasites.
					Leucopenia		Diazo reaction for urine.
					Eosinophilia.		
Typhoid fever..		1st day and for a week.	In 2nd-3rd week.	3rd week and after.	Leucopenia	After 10th day.	
Paratyphoid A, B, C.		"	"	"	"	"	

4. *The Recording of Temperatures* often gives a very valuable indication of the disease suffered from. The accurate taking and charting of the temperature must never be omitted. For convenience of description the temperature charts are considered under the headings :—

(a) Morning and evening charts.

(b) Four hourly (or two hourly) charts.

(a) *Morning and Evening Charts* are helpful in depicting the tertian, quartan or quotidian periodicity of malaria ; the 2 to 3 day fever of phlebotomus or sandfly fever ; the 5 to 7 day fever of dengue (saddle back type) ; the weekly recurrent waves of relapsing fever ; and three weekly recurrent waves of Malta fever, and so on.

(b) *The two to four-hourly Chart* shows the highest point of fever in the twenty-four hours. Broadly speaking, the temperature in malaria reaches its climax between 10 a.m. and 2 p.m. ; in Malta or undulant fever between 2 and 4 p.m. ; in enteric fever and sepsis between 4 and 6 p.m. ; in liver abscess between 6 and 8 p.m. ; and in syphilitic fever between 8 and 10 p.m. ; while in kala-azar and relapsing fever there may be a double rise in the twenty-four hours.

5. *Type of Onset and Termination of Fevers.*—Great attention should also be paid to the type of onset and termination of the fever. The following short tables exemplify this :—

Diseases with Onset showing a sudden Rise of Temperature.

Malaria.

Relapsing fever.

Dengue.

Weil's disease, or spirochætosis icterohæmorrhagica.

Plague.

Typhus.

Trench fever.

Influenza.

Pneumonia (lobar).

Blackwater fever.

Bacillary dysentery.

Paratyphoid " A ", at times.

Sandfly or Phlebotomus fever.

Diseases with Onset showing gradual Rise of Temperature.

Typhoid.

Paratyphoid.

Malta, Mediterranean or undulant fever.

Rat-bite fever.

Trypanosomiasis.

Liver abscess.

Kala-azar.

Fevers terminating by Crisis.

Malaria.
 Sandfly fever.
 Dengue.
 Relapsing fever.
 Blackwater fever.
 Pneumonia (lobar).

Fevers terminating by Lysis.

Typhoid.
 Paratyphoid.
 Weil's disease or spirochætosis icterohæmorrhagica.
 Bacillary dysentery.
 Malta fever.
 Liver abscess.
 Kala-azar.
 Trypanosomiasis.

GLYCOSURIA.

444.—1. Glycosuria may be of very serious or of minor importance. What is of greater significance is the percentage of glucose in the blood. The problem is to diagnose the cause and type of any case of glycosuria; whether it be an instance of true diabetes mellitus, or one of the various other conditions associated with the symptom glycosuria. Broadly speaking, only 20 per cent. of all cases of glycosuria are due to diabetes mellitus.

2. *Clinical Observations.*—The commoner types of glycosuria are :—

- (a) renal ;
- (b) hepatic (including alcoholism) ;
- (c) alimentary ;
- (d) nervous ;
- (e) septic ;
- (f) endocrine, which includes particularly diabetes mellitus as well as the glycosuria associated with exophthalmic goitre and acromegaly.

All these glycosurias, except the endocrine variety, can be more or less cured or alleviated ; most, in fact, are of minor importance.

Patients complaining of abnormal hunger, thirst, frequency of micturition, wasting, pruritus, boils, eczema, and ocular troubles such as phlyctenular conjunctivitis,

iritis, and cataract should have their urine examined for sugar and ketone bodies (acetone). The presence of ketones is a more serious sign than the occurrence of sugar in the urine.

3. *Laboratory Tests*.—(a) A specimen of any urine giving a reduction or doubtful reduction of Fehling's solution should be sent to the pathological laboratory for confirmation or otherwise of the presence of glucose.

(b) All cases in which glycosuria is found should be sent to the laboratory for examination of the blood sugar content, with a view to establishing the true nature of the condition.

HEADACHE.

445.—1. Headache is a very common symptom which is often glossed over. Enquiry should always be made for any history of a crash or a head injury, and the memory tested for recent and past events. It should always be ascertained whether there are any associated symptoms suggestive of meningitis or encephalitis, and the eyes should be examined.

The site and type of pain frequently aid in diagnosis :—

(a) Frontal headache is seen with abnormal ocular conditions, dyspepsia, constipation, sinusitis, coryza, nephritis and fevers.

(b) Vertical headache is seen especially in neurasthenia and pelvic disease.

(c) Parietal headache may accompany lesions of the ear.

(d) Occipital headache frequently indicates meningitis or syphilis ; in the latter case it is often worse at night.

(e) Headaches showing regular periodicity are suggestive of malaria, and the effect of quinine should be tried.

2. *Laboratory Tests*.—Depending upon the accompanying symptoms it will frequently be found advisable to forward material to the laboratory to aid in the establishment of a diagnosis—*e.g.*, blood smears for malaria, blood serum for syphilis, cerebrospinal fluid for meningitis.

IRITIS.

446.—1. *Clinical*.—In cases of iritis or irido-cyclitis the possibility should be borne in mind of venereal disease, rheumatism, relapsing fever, bacillary dysentery, trypanosomiasis, diabetes and oral sepsis (*see also para. 416*).

2. *Laboratory Tests.*—In cases of iritis it is advisable to carry out the following tests as a routine :—

- (a) Wassermann test.
- (b) Examination for gonococci, especially after prostatic massage.
- (c) Examination of blood smears and wet preparations for parasites.
- (d) Agglutination of blood serum against the dysentery bacilli.

JAUNDICE.

447.—1. *Clinical Observations.*—Jaundice is not a disease, but only a symptom of many pathological conditions. Clinically, jaundice may be grouped into three types—(a) obstructive ; (b) non-obstructive or hæmolytic ; (c) toxic and infective ; the last named being in some degree a mixture of the first two.

Some of the diseases that are more commonly associated with the various types of jaundice are as follows :—

(a) *Obstructive Jaundice.*

- Gall-stones (enterica).
- Helminthiasis (tape-worms, round-worms, flukes).
- Tumour of the liver and adjacent organs.
- Cholecystitis.
- Amœbic abscess (rarely).

(b) *Non-obstructive or hæmolytic Jaundice.*

- Blackwater fever.
- Pernicious anæmia.
- Ancylostomiasis.
- Banti's disease.
- Splenic anæmia.

(c) *Toxic and infective Jaundice.*

- Yellow fever.
- Weil's disease or spirochætosis icterohæmorrhagica.
- Malaria.
- Relapsing fever.
- Enterica (including "Camp jaundice").
- Epidemic catarrhal jaundice.
- Typhus.
- Scarlet fever.
- Snake bite.
- Arsenical poisoning.
- Congestion of liver.

2. *Laboratory Tests.*—(a) The urine should be examined for urobilin and bile pigments.

(b) The blood serum subjected to the Van den Bergh test which may materially aid in the diagnosis of the type of jaundice.

LARYNGITIS.

448.—1. *Clinical Observations.*—In cases of persistent or progressive laryngitis or altered tone of speech a laryngoscopic examination for tuberculosis should always be made.

2. *Laboratory Test.*—In all such cases a sample of sputum should be sent to the laboratory without delay.

PAIN IN RIGHT SIDE OF ABDOMEN.

449.—1. *Clinical Observations.*—Pain in this region may be due to many causes, not only to affections of organs directly underlying this region, but to more distant structures, such as the right pleura and lung.

Before arriving at a diagnosis of appendicitis, care should be taken to eliminate such conditions as colitis (especially amœbic), enteric fever, constipation, biliary affections, duodenal ulcer, lobar pneumonia and pleurisy, in all of which pain in the right side of abdomen may occur early in the disease.

The diagnosis may be simplified by paying attention to the exact site and nature of the pain, and its relation to food, posture and movements; by the presence or otherwise of areas of tenderness to pressure; and by noting any associated symptoms such as jaundice, blood-stained sputum, or abnormality of stools.

2. *Laboratory Tests.*—In certain cases laboratory methods will aid in the establishment of a correct diagnosis and any material collected should be forwarded without delay.

RIGORS.

450.—1. *Clinical Observations.*—Rigors may herald the onset of many acute septic conditions—septicæmia, pyæmia or sapræmia; they usually accompany the passage of a biliary or renal calculus. Recurrent rigors often occur in malaria, but liver abscess may show similar symptoms. The rigors of malaria frequently occur before mid-day, and are accompanied by the presence of the plasmodium in the blood; whereas, in liver abscess the rigors take place usually in the evening, and may be associated with pain in the region of the right shoulder, and with the presence of *Entamœba histolytica* in the stools.

X-ray examination is of value in detecting liver abscess and calculi.

2. *Laboratory Tests.*—In every case an attempt should be made to complete the diagnosis by means of such aids as blood counts for leucocytosis ; blood smears and cultures for the presence of parasites ; the urine for passage of blood and calculi ; the fæces for protozoa and gall-stones.

VOMITING.

451.—1. *Clinical Observations.*—The act of vomiting is governed by a centre in the medulla, which may be stimulated directly by increased cerebral pressure or by toxic bodies in the blood stream, and indirectly by reflex action from various abnormal conditions of distant organs.

In every case of vomiting a thorough clinical examination must be made and the vomitus inspected as to the condition of food and presence of blood, bile, etc. Lumbar puncture is a most valuable aid in the early diagnosis of meningitis in which vomiting is frequently an early symptom. Radiographic examinations after an opaque meal should be performed when indicated. In gastric crises the eye should be examined for pupil reflexes and retinal hæmorrhages.

Vomiting due to gastric disease is usually related to the taking of food and is accompanied by nausea ; the vomiting associated with intra-cranial lesions often occurs suddenly and without nausea.

Common causes of vomiting are :—

- (a) meningitis and increased intra-cranial pressure ;
- (b) toxæmias such as occur with diabetes mellitus, nephritis, many fevers (including malaria), and alcoholism—these conditions have other symptoms to help in the diagnosis ;
- (c) gastric ulcer, leading to relief of the pain ;
- (d) gastric cancer, in which the vomitus often contains blood and is foul smelling ;
- (e) gastric crises of syphilis and pernicious anæmia ;
- (f) cholera, in which the vomiting is prolonged and associated with diarrhœa ;
- (g) food poisoning ;
- (h) renal and biliary colic, which are often followed by albuminuria and jaundice respectively ;
- (i) hernia, especially of the Richter type ;

- (j) enlarged uvula ;
- (k) cervical adenitis ;
- (l) pelvic disease ;
- (m) neurasthenia.

2. *Laboratory Tests.*—(a) A specimen of the vomit with full details of the case should immediately be sent for examination.

(b) When necessary, for purposes of differential diagnosis, the results of a test meal should be sent for analysis.

(c) Cerebro-spinal fluid should be examined *early* where meningitis is suspected.

(d) With concomitant diarrhoea, fæces should be sent for examination.

(e) Blood smears should be sent for examination for parasites and general blood picture.

(f) In all cases it is well to send a specimen of urine for examination.

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