Item No. 4464000—Tubing, rubber, special, 3/16-inch inside diameter, 1/16-inch wall, acid-cured.

Item No. 4002000—Adapter, Y tube, glass, 5-mm bore.

Item No. 4458000—Tubing, glass, 6-mm outside diameter.

The stem of the Y tube is connected to the suprapubic tube. The limbs of the Y tube are connected to rubber tubing leading on one side to the irrigation bottle and on the other to the collecting bottle. Most patients can be taught to irrigate their own bladder. The system may be disconnected to allow the patient up in a wheel chair. Air in the tube line does not interfere with function.

(2) *The automatically controlled or tidal system of closed drainage* requires for efficient operation the constant attendance of trained personnel. Knowledge of the individual dynamics of each paralyzed bladder is necessary for its correct use. Air in the tubing impairs the mechanical efficiency of the system—an inconvenience in the care of ambulatory patients. There are several systems of "tidal irrigation," and the essential equipment is available in the Medical Supply Catalog.

(3) A 2 percent solution of boric acid is a satisfactory irrigating solution. Solution "M" of Suby and Albright has the advantages of being mildly bacteriostatic and of dissolving phosphatic concretions on catheters and tubing. The formula for solution "M" is:

Citric acid	32.35 gm.
Sodium carbonate (anhydrous)	8.84 gm.
Magnesium oxide	3.84 gm.
Distilled water q. s. ad	1000 cc.

The solution should be autoclaved before use and may be tinted distinctively by the addition of methylene blue or other dye.

c. The suprapubic tube may be removed as soon as it appears that reflex bladder action would be adequate for automatic micturition. Prompt recognition of this phase of recovery is not always easy. Modified cystometric studies through the suprapubic tube and specific interrogation of patients as to bladder function should be undertaken regularly at intervals of 2 weeks to facilitate recognition of reflex bladder action. Removal of the suprapubic tube is warranted when the cystometric studies show a bladder capacity of 400 cc or less, a normal or hypertonic curve, an atonic curve with maximal voluntary pressure of at least 60 cm of water, or urethral voiding. After removal of the suprapubic tube, there is likely to be continued leakage of urine with delayed closure of the cystostomy wound and maceration of the surrounding skin. For these reasons, the removal of the suprapubic tube is an indication for the *insertion of an urethal catheter*, sizes 18 F or 16 F, soft rubber, with two holes. Larger catheters are a source of complications and should be avoided. A self-retaining catheter may be used. The catheter should be fastened in place by adhesive tape to the skin of the penis. The tip of the catheter should be adjusted to give effective dependent drainage of the bladder. Urethral catheters should be changed and adjusted at intervals of 1 week.

d. Healing of the suprapubic wound is likely to be delayed. Excision of exuberant granulations and efficient urethral drainage of bladder urine are helpful adjuncts. Surgical closure of the cystostomy is rarely necessary.

e. Removal of the urethral catheter may be considered after the suprapubic wound is healed. Cystometric study showing evidence of good reflex activity, high maximum voluntary pressure, or both, or voiding around the catheter are features warranting a trial at voiding. No set cystometric values appear to be a completely reliable guide for the proper time to remove the catheter. Close observation of bladder efficiency is important during the period of trial at voiding. A residual urine of more than 100 cc is an indication for further catheter drainage. Overdistention of the urinary bladder should not be allowed. The efficiency of automatic bladder action fluctuates with the general condition of the patient. Constant vigilance to prevent overdistention is necessary even though reflex action appears satisfactory for the first few days after removal of the catheter.

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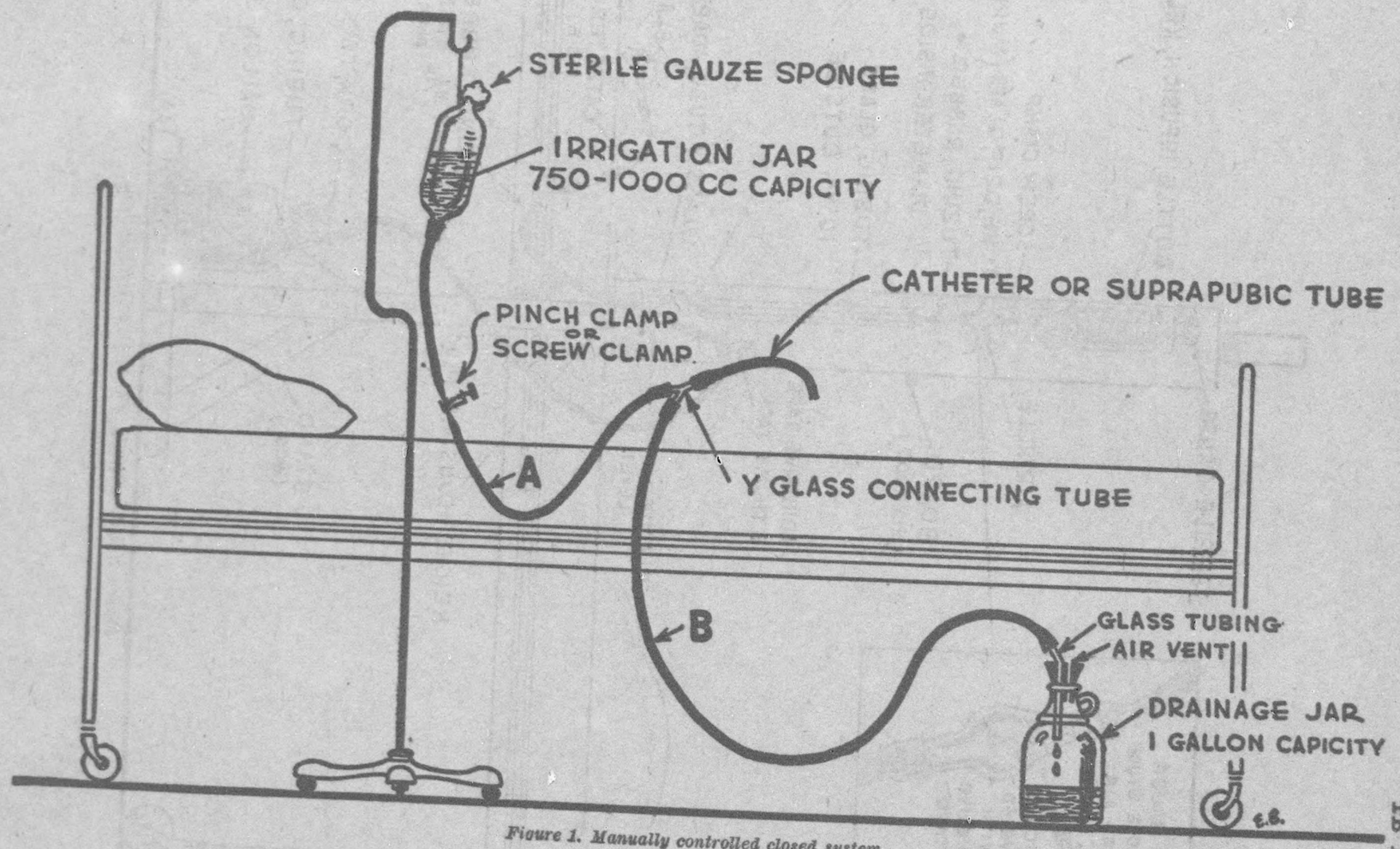

Figure 1. Manually controlled closed system.

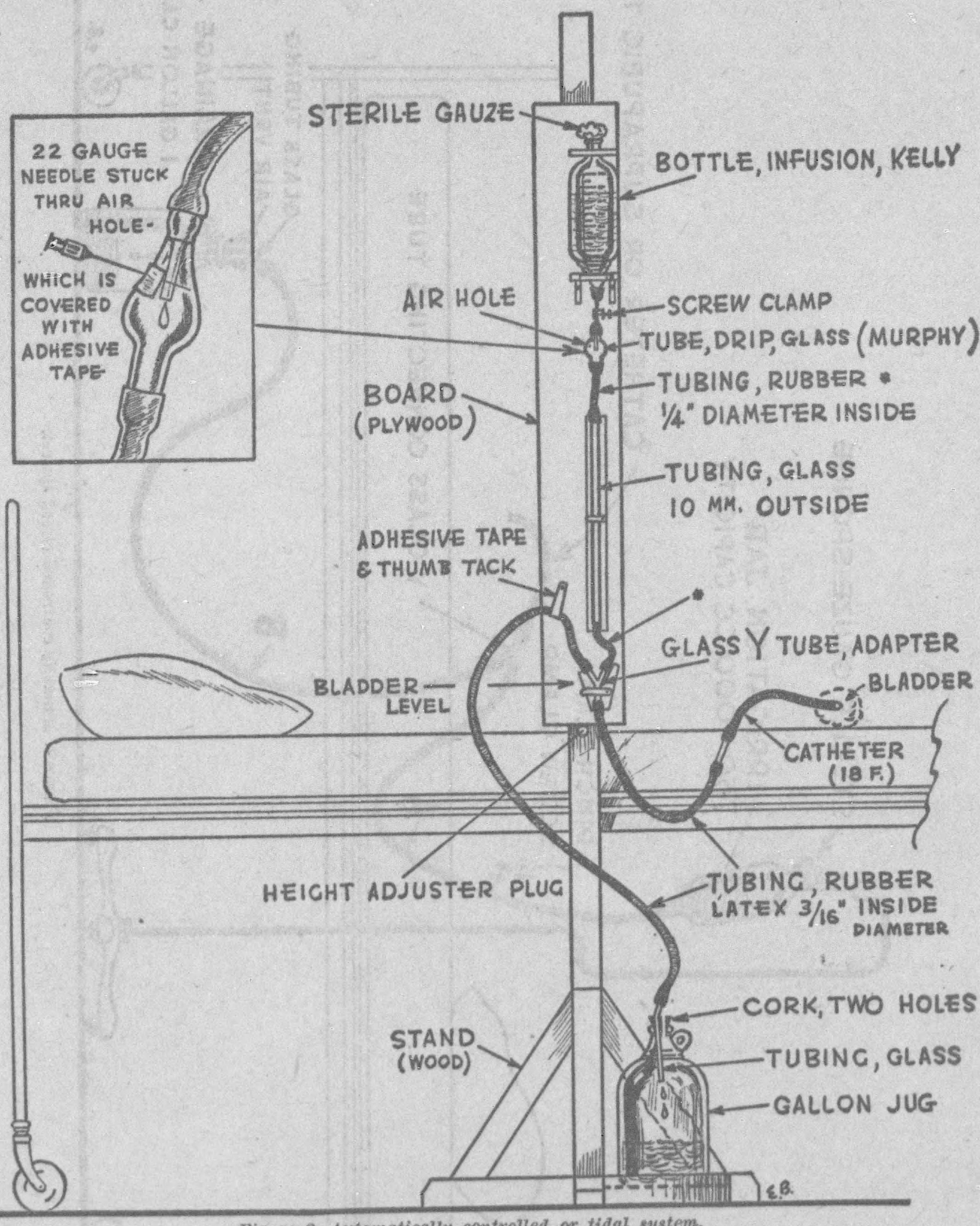

Figure 2. Automatically controlled or tidal system.

f. Periodic X-rays for urinary tract calculi are suggested in patients immobilized in recumbency for several months. Intravenous urograms may be helpful in the explanation of obscure febrile reactions. Cystoscopy has no place in the routine care of the neurogenic bladder.

7. TREATMENT OF DECUBITUS ULCERS. Bed sores and decubitus ulcers are the late consequence of ischemic gangrene of the skin and subcutaneous tissue. They are preventable. Topical applications of antiseptic drugs and healing ointments have no demonstrable value.

a. Superficial cutaneous abrasions may be healed by the avoidance of pressure, frequent postural changes, and the maintenance of nutrition.

b. Deeper ulcerations should be treated by surgical excision of the necrotic slough with primary or delayed skin closure or skin grafting. Undermining of skin to facilitate closure, when feasible, is preferable to skin grafting. Systemic penicillin therapy and whole blood transfusions are legitimate adjuncts to this surgical program.

8. PHYSIOTHERAPY. The objective of physiotherapy is to maintain tissue vascularity and joint mobility until such time as physical reconditioning may be instituted. This is usually the period of spinal instability; that is, 6 weeks to 3 months for penetrating wounds of the cord, and 3 to 6 months for major vertebral fractures. Pain on attempted motion should be investigated by X-ray to identify periarticular calcification.

a. Massage and passive exercise help retain tissue turgor and joint motion.

b. Heat lamps and ultraviolet lamps are of questionable value.

c. Hot water tub treatments are not recommended. They are, in general, more debilitating than helpful.

9. PHYSICAL RECONDITIONING. An aggressive policy of physical reconditioning is the cornerstone of successful rehabilitation of paraplegic patients. Didactic instruction and personal supervision by a skilled and enthusiastic physical instructor are essential to the success of the program.

a. The objectives of physical reconditioning are—

(1) To maintain, as nearly as possible, the level of physical fitness present when disability was incurred.

(2) To promote recovery and restore function of weakened and affected muscles.

(3) To restore and actually increase the strength of the muscles of the shoulder girdle in anticipation of increased dependence upon the upper extremities during ambulatory convalescence.

(4) To instill self-confidence into the patient. Increased appetite, improved nutrition, and heightened morale contribute to a general sense of well-being.

b. There should be a definite administrative organization for the program:

(1) The *medical officer* should advise the physical reconditioning instructor and confer with him from time to time as to the progress of individual patients. No patient should be exercised before the medical officer has completed the diagnosis and noted the precautions to be observed. The absence of the protective pain mechanism dictates an initial restraint in prescribing exercises. After tolerance has been established, graded exercises are prescribed to the limit of ability consistent with common sense (see TB MED 137, January 1945).

(2) One *physical reconditioning instructor* should be assigned the responsibility of conducting the exercise program for paraplegic patients. Additional personnel, if needed, should be designated as assistants. A roster of patients with records of individual progress should be maintained. New patients require orientation as to the objectives and requirements of the program.

(3) The *patients* take the exercises in the position they are in at the selected time for calisthenics. Patients are encouraged to keep personal records of their progress, measurements being in terms of times and numbers of exercises or increase in range of motion. It has been found helpful to maintain competitive charts with weekly records of body weight, circum-

ference of arms, and the number of the various exercises performed.

c. The *schedule of exercises* should provide for conducted and voluntary periods.

(1) Group exercises under supervision and instruction "by the numbers" should be held for a 30-minute period each day Monday through Friday.

(2) Patients should perform the group exercises "on their own" at a time announced by the ward nurse for a second period of 30 minutes each day Monday through Friday, twice daily on Saturdays and Sundays.

(3) Special exercises may be prescribed for voluntary performance at hourly intervals throughout the day. Pull-ups on a trapeze, dumb-bell exercises, and the like may be given in this fashion.

d. It has been demonstrated that the ambulatory phase of convalescence is dependent upon preliminary physical reconditioning. If this is neglected or ineffective, patients are unable to move freely, suffer from arthritic and radicular pains, and cannot tolerate even a wheel-chair existence.

10. AMBULATORY TREATMENT. The two greatest drawbacks to the establishment of an ambulatory regime are: persistence of the mass reflex; and persistence of atony of the urinary bladder. These complications require special consideration (see pars. 11 and 12).

a. The *use of a wheel chair* is possible for the great majority of patients as soon as there has been sufficient development of the arm and trunk muscles. Occupational or vocational therapy may be begun in earnest.

b. Attempts at *walking* should be instituted under the guidance of a consulting orthopedist. Use of the tripod training walker is a matter of election. Crutches, braces, and splints usually have to be fitted. Tendon transplants and joint fusions may be indicated. Flexor spasm is a neurosurgical problem. Each case should be treated in accordance with individual needs. In general, corrective procedures of this sort should be allocated to the final stages of convalescence.

c. Most patients retaining function of the upper extremities can be made ambulatory and may enjoy life within the limits of their intelligence. They can carry on ordinary daytime activities without urinary or fecal incontinence or having to evacuate the bladder oftener than every 3 hours. They can sleep through the night without involuntary soiling or having to get up. These objectives should be the visualized goals of every patient.

11. UROLOGIC COMPLICATIONS. Infections, calculi, and the persistently hypotonic bladder are the most frequent and serious urologic complications. Urinary retention from improper bladder drainage leads to back-pressure and stagnation of the urine as etiologic factors in many instances. Bacterial contamination of bladder urine is an inevitable accompaniment of tube or catheter drainage. Loss of retroperitoneal fat as part of the generalized nutritional depletion permits obstructive kinking of the ureters as they pass over the pelvic promontory. General demineralization of bone as part of the atrophy of disuse contributes to the excretory burden of the kidney. A broad concept of the etiologic factors is essential to successful management of urologic complications. Cystoscopic maneuvers through an infected bladder carry an excessive incidence of severe reactions. Observation cystoscopy of the urinary bladder, when indicated, may be performed through the cystostomy tract. X-ray and intravenous urography are the preferred diagnostic aids.

a. Urinary tract infection should be considered as a possible explanation of any obscure febrile reaction in a paraplegic patient.

(1) *Pyelonephritis* or *cortical abscesses* may be relatively "silent" except for fever and X-ray evidence of obstructive changes in the upper urinary tract. Treatment is frequently empirical. Systemic treatment with penicillin, sulfonamides, or both, is useful unless *B. proteus* or *B. pyocyaneus* are the *only* etiologic bacteria. A high urine volume should be maintained. Whole blood transfusions are necessary to prevent anemia.

(2) *Epididymitis* is readily recognized. It is chiefly a complication of urethral drainage. Removal of the catheter and institution of suprapubic drainage is reserved for persistent or repeated infection. Systemic chemotherapy and scrotal support suffice for the average case. The surgical drainage of pus is rarely necessary.

(3) *Periurethral abscess* may occur at the peno-scrotal angle. Early incision and drainage is the treatment of choice. If the abscess is large, it may be necessary to remove the urethral catheter and institute suprapubic drainage.

b. Calculi, once formed, present the same problems in treatment established for the non-paralyzed patient. After indicated surgical procedures, a temporary loss of bladder tone should be anticipated.

c. The persistently atonic or hypotonic bladder is largely an unsolved problem. Tidal drainage is indicated for all or most of the time. During ambulatory periods, the catheter may be allowed to drain in a urinal. The purpose of continued tidal drainage is to prevent ultimate fibrosis and contracture of the bladder wall.

12. NEUROSURGICAL COMPLICATIONS. Pain, progressive paralysis, and mass reflexes associated with intractable flexor spasm and ultimately flexor contractures are the most common neurosurgical complications. It is important to differentiate nonspecific and arthritic pains from true neurologic difficulties. The proper management of neurosurgical complications may tax the judgment and ingenuity of the most skilled specialist. The decision for operative intervention should entail wide consultation.

a. Excessive proliferation of bone at the fracture site may be responsible for *progressive paralysis or pain.* Decompression is helpful.

b. Retained foreign bodies or displaced bone fragments in the cauda equina should be removed. Purely exploratory procedures for the identification of pathologic neural change are condemned.

c. Radicular pain due to pressure on the nerve roots at the site of injury may require appropriate rhizotomy.

d. Certain patients complain of *intense burning pain* in completely paralyzed extremities. If the lesion is in the cervico-dorsal region of the spine, anterolateral cordotomy may be necessary for relief. If the lesion is at the dorsolumbar junction or below, the burning pain may evidence a true causalgia due to injury of the cauda equina and amenable to sympathectomy. Paravertebral novocain block of the lumbar sympathetic ganglia will indicate the cases in which sympathectomy is warranted.

e. Massed reflexes, or reflex motor spasm in response to minimal stimuli, may be so severe as to handicap the entire program of rehabilitation. They may be associated with the involuntary discharge of urine and feces. Many patients show this massed motor activity during the convalescent phase. Massed reflexes are not necessarily an indication of complete section of the cord. As purely spinal reflexes, they tend to become exhausted with the passage of time with reduction of power and excitability. Appropriate rhizotomy will abolish the reflex but operation is justified only after all hope of spontaneous recovery has been abandoned.

13. DISPOSITION OF PATIENTS. Perhaps in no other group of patients is successful rehabilitation so dependent upon a continuous and integrated program of convalescence. Changes of environment and professional assistance are damaging to the loyalty, morale, and self-confidence of patients. The road to maximal recovery is long and arduous, beset with many discouragements. There is a high moral obligation upon medical officers to provide continuous and uninterrupted treatment to the point of maximal rehabilitation for these soldiers. Disposition by certificate of disability, discharge, or retirement to home or veterans facility will be accomplished only after maximal hospital benefit has been obtained.

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL
Chief of Staff

OFFICIAL:
J. A. ULIO
Major General
The Adjutant General

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Refer to FM 21-6 for explanation of distribution formula.

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TB MED 159

WAR DEPARTMENT TECHNICAL BULLETIN

AMEBIASIS

War Department, Washington 25, D. C. • • • May 1945

This Bulletin supersedes paragraph 7, SGO Circular Letter No. 33, 1943.

This bulletin follows TB MED 158, subject, "Menopause." Distribution given TB MED 158 was as follows: AAF (5); AAF (WAC Staff Dir) (1); AGF (5); AGF (WAC Staff Dir) (1); ASF (2); ASF (WAC Staff Dir) (1); T of Opn (25); Dept (5); Base Comd (5); Island Comd (5); Def Comd (5); Arm & Sv Bd (1); S Div ASF (1); Tech Sv (2); SvC (10); SvC (WAC Staff Dir) (ZI) (1); GH, Named (60); SH, Named & Regional (40); Gen & Sp Sv Sch (5); ASTU (1); Repl Tng C (2); Tng C (2) except Ord Tng C (4) & Army Med Tng C (60); Sep C (10); SvC Lab (5); A (5); T/O & E 8-510 (15); 8-520 (2); 8-534 (5); 8-532T (15); 8-550, Numbered GH (60); 8-550S (45); 8-560, Numbered SH (40); 8-572S (5); 8-580 (40); 8-581 (30); 8-590 (20); 8-591T (15); 8-595T (10).

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1. GENERAL. Amebiasis is infection with *Endamoeba histolytica.* It is primarily an intestinal infection with its principal localization in the large intestine. Other parts of the body, however, are not infrequently involved. There is no clear evidence of any natural immunity, although many individuals who harbor this parasite apparently are asymptomatic. Amebiasis has a wide geographic distribution, being found sporadically in most parts of the world. It is especially common in areas with warm and hot climates, where it may have more or less constantly high incidence. Localized epidemics may occur in any region. Estimates of the incidence of infection with *Endamoeba histolytica* in the United States vary from 5 to 20 percent.

2. ETIOLOGIC AGENT. *Endamoeba histolytica* is a rhizopod protozoon. At least four other species of amebae also inhabit the human intestine, but none of these is known to cause lesions. *Endamoeba histolytica* has been found naturally occurring in monkeys and perhaps other animals, in addition to man. A number of animals, especially kittens, are susceptible to artificial infection. Strains of the organism vary in virulence, but neither the size of cyst associated with the strain nor any other criterion is considered a reliable means of differentiation. The life cycle of *Endamoeba histolytica* includes trophozoite, precystic, and cystic stages. As far as is known, only the cystic stage persists free in nature. Trophozoites and precystic forms rapidly disintegrate after passage from the intestine, which in general occurs only in association with diarrhea. Although it has been shown that under artificial conditions, trophozoites may pass through the stomach, natural infection occurs only through the ingestion of cysts. When cysts reach the region of the ileocecal valve, excystation occurs, resulting in free trophozoites which may attack the tissues. Trophozoites appear to be especially adapted for life in the tissues where they reproduce by fission. Encystment does not take place in the tissues, but only in the lumen of the gut. Cysts are usually passed only in association with formed or semiformed stools. They may remain viable in feces at room temperature for at least 2 weeks and may persist in water for a month or more. Cysts withstand freezing for a year, but a tempera-

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ture of 55° C. kills them in a few minutes. They are highly susceptible to drying which kills them almost instantly. Both trophozoites and cysts are briefly described in paragraph 5.

3. TRANSMISSION. Amebic infection is acquired by the ingestion of food or drink contaminated by feces containing amebic cysts. So-called carriers or infected individuals who, at the time, do not have diarrheal or dysenteric stools are the principal source. Infected rats and other animals may be sources of human infection, but their role in the natural spread of the disease is not considered important. Under some circumstances, such as unhygienic crowding, transmission from man to man may be direct. Usually the disease is transmitted indirectly. The most important means of spread is by the contamination of food and drink by those who handle it during its preparation, serving, or at any time before it is consumed. In extensive areas, especially Mediterranean, Middle Eastern, and Far Eastern regions, truck gardens are fertilized with raw human feces which often contain viable cysts. Vegetables grown under such conditions, unless they are thoroughly cooked, may be a dangerous source of infection. Flies and other insects, including cockroaches, by spreading cysts through direct contact or in their feces, may contaminate food or drink. Contamination of the water supply with infected feces is a frequent means of spread. Swimming or wading in contaminated water might be a means of acquiring amebic infection, but this does not seem to be a dangerous possibility.

4. COURSE. *a. General.* The severity of amebic infection is extremely variable. Many individuals who are infected never have symptoms which can be attributed to the disease with certainty. Some observers attribute relatively vague symptoms to the disease, such as lassitude, anorexia, indigestion, and abdominal discomfort, in cases in which these are the only disturbances present, but the significance of the association between such symptoms and amebic infection is uncertain. On account of the more or less ever present possibility of reinfection, the duration of amebic infections in the absence of clinical manifestations is not known with certainty. However, infections with *E. histolytica* may persist for many years.

b. Intestinal infection. Any part of the colon, and rarely the terminal portion of the ileum, may be affected. In some instances, lesions are limited to the cecal region. The appendix is occasionally involved. The earliest lesion is a small abscess, usually in the submucosa. Later, ulcers form which, as seen after death, tend to be ragged, undermined, and large. When symptoms develop, they may appear as soon as 8 to 11 days after infection, but usually the interval is longer, sometimes many months. As a rule, the onset is insidious. In the absence of treatment, the course is usually long drawn out, often with many remissions and relapses. It is an error to suppose that amebic intestinal infection must cause severe dysenteric symptoms, since in many cases only mild, though persistent, disturbances occur. The principal symptoms in mild cases are diarrhea (often without gross blood, pus, or mucus in the stools) and abdominal pain and tenderness. Fever and leukocytosis are absent. Diligent search of the stools demonstrates motile amebae in many such cases. In severe cases, the classical picture of dysentery may appear suddenly or it may grow gradually out of the mild condition just mentioned. The symptoms include headache, nausea, griping abdominal pain, abdominal tenderness, and fever. Urticarial lesions have been described in some groups of patients. Increased frequency of bowel movements and tenesmus occur in varying degrees. The stools are described in paragraph 5*b*(1). Clinical attacks may last only 5 or 6 days or they may continue, with or without remissions, for months. In some cases, periods of constipation alternate with those of diarrhea. When chronic infection is fully established, the intestine is profoundly altered, showing extensive ulceration and gross thickening. Secondary infection of the lesions is inevitable in such cases. The process may give rise to extensive adhesions or to peritonitis which may be either localized or generalized. Perforation of the intestine is an occasional event in both acute and chronic stages. Patients with chronic amebic dysentery are often emaciated.

c. Hepatitis and hepatic abscess. Involvement of the liver arises from intestinal infection. The exact frequency of amebic hepatitis and hepatic abscess is not known, but these

conditions are not rarities. Although the majority of patients with proved amebic liver disease give a history of dysentery, about a third of them do not. Hepatic disease usually appears 1 to 3 months after an attack of dysentery, but it may manifest itself directly in association with an attack or only many months or years later. Post mortem examinations in cases without a history of dysentery sometimes show intestinal ulcers. Diarrhea or dysentery is actually present in only about a fourth of the cases of proved liver disease. Diffuse amebic hepatitis may be an early stage of abscess formation. Abscesses are usually located in the right lobe of the liver and single, but abscesses in the left lobe and multiple abscesses are not rare. Abscesses develop insidiously, although the onset of symptoms may be abrupt. When diagnosed, they are often huge. The symptoms include pain or discomfort over the liver, with occasional reference to the right shoulder, irregular and intermittent fever, sweats, chills, nausea, vomiting, weakness, and loss of weight. Jaundice, except in mild degree, is unusual. The results of physical and laboratory examinations are mentioned in paragraph 5*b*(3). Secondary infection of amebic abscesses is unusual, but when present it has an important bearing on treatment and prognosis. Liver abscesses may rupture in any direction and into any neighboring organ. The common directions are into the pleura and lung, peritoneum, and pericardium. External rupture, which is unusual, may take place through the abdominal wall or through the right lumbar region.

d. Other lesions. In rare instances, the lungs, brain, and other organs are infected by hematogenous spread from the intestines. Lesions of the skin are occasionally infected with amebae, especially in the region of the perineum and buttocks and especially in association with traumatic and postoperative wounds.

5. DIAGNOSIS. *a. Terminology.* According to Medical Department usage, cases of amebiasis with intestinal symptoms and abnormal stools which contain motile amebae should be diagnosed "Dysentery, amebic." It should be noted that this diagnosis includes mild cases as well as cases with the fully developed classical picture of dysentery. Such diagnoses should be reported on WD AGO Form No. 8–122 (Statistical Health Report) (formerly WD, MD Form 86 ab); no other entries for amebic infections should be made on this form. Cases in which there are no symptoms and cysts alone are found in the stools should be diagnosed "Carrier of *Endamoeba histolytica.*" "Hepatitis, amebic" and "Abscess, liver, amebic" are acceptable terms for the indicated conditions.

b. Clinical diagnosis. The possibility of amebic infection should be brought to mind by the clinical picture (see par. 4) and by epidemiologic consideration. The final diagnosis should be based on the demonstration of the etiologic agent.

(1) Amebic dysentery must be differentiated from other forms of protozoal dysentery, bacillary dysentery, mucous colitis, intestinal tuberculosis, and schistosomiasis. Bacillary rather than amebic dysentery should be suspected when there is sudden and fulminating onset with prostration and bloody stools. Mild cases of cholera should not be mistaken for amebic dysentery. Confusion arises occasionally between appendicitis and amebic infection. Lymphogranuloma venereum (lymphogranuloma inguinale or lymphopathia venerea) involving the rectum may simulate amebic infection. In these cases, digital examination discloses a characteristic firm nodular condition. Inspection of the stools is helpful, since the results can be used, if necessary, as a basis for a tentative diagnosis. The stools of amebic dysentery are relatively less frequent, less watery, less purulent, and more fecal than those of bacillary dysentery. They are characteristically colored by flecks of both fresh and altered blood and contain characteristically tenacious mucus which is not intimately mixed with the blood. In chronic cases, the stools are especially malodorous.

(2) In suitable cases in which stool examinations have failed to be diagnostic, proctoscopy following a saline enema is a valuable aid, since lesions are often readily visible. It should be performed by, or under the supervision of, an experienced medical officer. As commonly seen through a proctoscope, amebic ulcers do not appear to be deep, ragged, or undermined, and may not suggest to the inexperienced observer the presence of serious disease. Pin-point

mucosal areas which are raised and hemorrhagic should be noted, since they often overlie small amebic abscesses. They may be good sources of material containing motile amebae. While the proctoscope is in place, material for examination should be obtained through the instrument from any lesion which may be in sight. A cotton applicator of sufficient length is often used. A more successful method employs a heavy walled 1 cc serological pipette with an outside diameter of 6 to 7 mm. The delivery end of the pipette is bent to an angle of about 45° and inserted into a rubber bulb from a urethral syringe. The pipette is inserted through the proctoscope and with gentle suction created by the rubber bulb is applied to a lesion. The specimen is ejected onto a slide by compression of the bulb.

(3) Amebic infections of the liver must be separated from other forms of hepatitis, including abscesses due to bacterial infection. The diagnosis of diffuse amebic hepatitis can only be suspected on clinical grounds. Fever, local pain, and tenderness, together with enlargement of the liver, are usually the only findings. If evidence of hepatitis persists after 5 or 6 days of treatment as described in paragraph 6*c*, the presence of an abscess should be suspected. When an abscess is present, the liver is usually enlarged and tender, but in some cases it is not palpable. Tenderness may be demonstrable by bimanual compression of the lower right chest wall. However, since tenderness may be well localized, it should be searched for with care. Signs of involvement of the diaphragm, pleura, or lung may be found. X-ray studies are exceedingly helpful. A moderate leukocytosis is usually present, but there is no eosinophilia. Amebae can be demonstrated in the stools of about a third of the cases. Liver abscesses contain a thick, semifluid material composed of more or less cytolyzed remains of tissue. This material often, but not always, has a dark reddish-brown or chocolate color. Motile amebae are found in it in about a third of the cases, depending largely on the part of the abscess from which the material has been derived (they may be entirely absent in the central area, where cytolysis is complete). Cysts are not present.

c. Routine laboratory studies. The blood may show leukocytosis of moderate degree. Eosinophilia does not occur, unless some other infection is present. The presence or absence of anemia is not helpful in diagnosis. An increased erythrocyte sedimentation rate has been reported, especially in patients diagnosed as having amebic hepatitis. The urine is not remarkable. The gross appearance of stools has been described in paragraph 5*b*(1), above. Their microscopic appearance is important. In comparison with the findings in bacillary dysentery, leukocytes, and macrophages are relatively scarce. Red blood cells are numerous in certain portions. Charcot-Leyden crystals may be present. The search for, and identification of, amebae is described in the paragraphs below. Smears should be made of material from hepatic and other abscesses, and examined for bacteria.

d. Specimens to be searched for amebae. (1) Motile forms of *Endamoeba histolytica* may be found in diarrheic and dysenteric stools, in exudates from lesions, and in abscess contents. Amebic infection should never be considered to be excluded as the result of a single examination. Search for motile amebae should only be made in freshly obtained material (for technique, see TM 8-227). Examination of specimens that have stood about for any length of time either in the ward or in the laboratory is not only a waste of time, but gives misleading negative results. On the other hand, motile amebae are often killed by overzealous warming of a slide. In some cases, especially those in which cecal infection without involvement of the lower colon or rectum is suspected, it may be necessary to give a saline cathartic in order to obtain a satisfactory specimen. Blood stained flecks of mucus in the stool are likely specimens for examination. In some instances, a good specimen can be obtained in the eye of a rectal tube. With suitable precautions, excellent material can often be obtained through a proctoscope, as described in paragraph 5*b*(2), above. When liver abscesses is suspected, material for examination may be obtained by aspiration, with the precautions mentioned in paragraph 6*b*.

(2) Cysts of *Endamoeba histolytica* should be sought in formed and semiformed stools. They may sometimes be found even in the more fecal portions of dysenteric specimens. When

stools are formed, examination of freshly passed specimens is preferable, but not essential, provided the specimen remains moist. Since a single examination detects only about 50 percent of cyst carriers, at least three specimens obtained on different days should be examined. Concentration by zinc sulfate flotation is the most certain method for finding cysts (for technique, see TM 8–227).

(3) Stool specimens obtained following an oily cathartic or a barium meal are unsatisfactory for examination. Another specimen should be collected after 48 to 72 hours.

e. Identification of amebae. (1) Identification of *Endamoeba histolytica* should be attempted only by trained personnel. Motile and encysted forms must be distinguished from other species of protozoa which are commonly found in human feces. Large mononuclear cells, vegetable organisms (such as *Blastocystis hominis*), and artifacts, are frequently identified by error as *Endamoeba histolytica.*

(2) Motile forms of *Endamoeba histolytica*, which are usually 20 to 40 microns in size, characteristically show active progressive locomotion and often contain red blood cells, the presence of which is confirmatory of the identification. Other inclusions, such as bacteria and debris, are infrequent. The clear ectoplasm is sharply differentiated from the homogeneous granular endoplasm and the blade-like pseudopodia are formed explosively. The nucleus is usually not visible in the living ameba, a point which together with the active locomotion, readily distinguishes *E. histolytica* from mononuclear blood cells. Precystic forms are smaller than ordinary trophozoites; they do not contain red blood cells and are practically nonmotile. It is particularly difficult to distinguish this stage of *E. histolytica* from nonpathogenic species.

(3) Cysts of *Endamoeba histolytica* are typically spherical, measuring 6 to 20 microns in size (average about 12 microns). The four nuclei present in mature cysts are visible only after staining (with iodine in fresh preparations, or hematoxylin in fixed smears). Large bar-shaped refractile chromatoid bodies with rounded ends may sometimes be seen in unstained cysts. When present, they serve immediately to differentiate cysts of *E. histolytica* from those of other amebae.

f. Cultures. Methods for growing *E. histolytica* from specimens may be of value when properly carried out. As a rule, however, direct methods of examination suffice to establish the diagnosis of clinical cases. Cultural methods have their greatest use in surveys to detect carriers. Material from an abscess should be cultured for bacteria which may be present.

g. Complement fixation. Tests have been described which are specific, but difficulties in preparing the antigen preclude general use of this test in Army laboratories.

6. TREATMENT. *a. General.* Patients with symptomatic amebic infection should be kept in bed, unless the symptoms are very mild (confinement to bed is indicated, if diarrhea, hepatitis, or hepatic abscess is present). The diet and fluid intake should be controlled as indicated below. In convalescence, all patients should gradually take a liberal building-up diet, supplemented by four multivitamin tablets a day. No single drug can be relied on to cure all patients with amebic infection. It is necessary, therefore, to use a combination of remedies. Penicillin and sulfonamides are ineffectual in amebiasis as such. They may be important adjuncts, however, in the treatment of cases in which secondary bacterial infection is present. The use of drugs to stop diarrhea in amebiasis, such as bismuth and opiates, should be restricted to instances in which it is considered imperative. Free or injudicious use of such drugs interferes with the chemotherapy of amebiasis. In general, cathartics and laxatives are not indicated and may be harmful.

b. Acute or chronic amebic dysentery. In acute cases, the diet should be liquid until symptoms subside and then soft with low residue, until convalescence is established. In chronic cases, the diet should be soft until the patient is convalescent. If signs of hepatitis or hepatic abscess are present, treatment should be given as described in *c*, below. The recommended antiamebic treatment includes three drugs. The administration of carbarsone and either diodoquin or chiniofon in addition to emetine is considered essential.

(1) Emetine hydrochloride is given subcutaneously or intramuscularly in doses for adults not to exceed 0.03 gm (½ grain) twice a day, or 0.06 gm (1 grain) once a day, during the period of diarrhea, but not for more than 4 to

6 days. Patients should be confined to bed while receiving emetine and for a few days thereafter. A course should not be repeated until 2 weeks have elapsed. Emetine should not be given to patients who have no symptoms or only very mild symptoms or to patients with heart disease. The toxic effects include nausea, vomiting, muscular weakness, neuritis, myocarditis (manifested by increased pulse rate or decreased blood pressure), and prostration. If available, electrocardiograms are helpful in following the toxic action of the drug. If any toxic sign appears, the administration of the drug should be stopped at once. Concurrently with the administration of emetine, carbarsone is given as described in (2) below.

(2) Carbarsone is given by mouth in doses of 0.25 gm (3¾ grains) three times a day for 7 days. It should not be given to patients with hepatic disease. Toxic symptoms, which are rare, include abdominal distress, diarrhea, nausea, and vomiting; very rarely, exfoliative dermatitis, and possibly visual disturbances may occur. Carbarsone is followed by diodoquin or chiniofon. If for any reason carbarsone is omitted, diodoquin may be administered concurrently with emetine.

(3) Diodoquin is given by mouth in doses of 0.63 gm or 9.6 grains (3 tablets of 0.21 gm or 3.2 grains each) three times a day for 7 days. No significant toxic symptoms have been reported.

(4) As an alternative to diodoquin, chiniofon may be given by mouth in doses of 1 gm (15 grains) three times a day for 7 days. The only toxic symptom commonly encountered is watery diarrhea.

(5) In some refractory cases, especially those in which ulcers are visible on proctoscopic examination, carbarsone or chiniofon should be given by enema, following a cleansing enema of water. Retention may be aided by the use of a mild sedative. Carbarsone 2 gm (30 grains) is dissolved in 200 cc of 2 percent sodium bicarbonate solution (carbarsone is insoluble in water). Chiniofon 4 gm (60 grains) is dissolved in 200 cc of sterile water. (Emetine and diodoquin cannot be given by enema.) Such enemas are given every night for 5 nights. If there is irritation, the frequency of enemas should be reduced to alternate nights.

(6) In refractory cases, bacterial infection may be present. In such instances, the use of penicillin or sulfadiazine is recommended.

c. Amebic hepatitis, hepatic abscess, and other metastatic lesions. Intestinal infection is usually present also. If the patient has dysentery, the diet should be as described in *b* above, otherwise, it should be soft until convalescence is established. The recommended treatment includes emetine and diodoquin or chiniofon. Carbarsone should not be given to patients with hepatic disease.

(1) Emetine hydrochloride is given as described in *b* (1) above, but continued for 8 days, provided no toxic symptoms appear. Emetine is followed by diodoquin or chiniofon.

(2) Diodoquin is given for 7 days, as described in *b*(3) above.

(3) As an alternative to diodoquin, chiniofon may be given for 7 days, as described in *b*(4) above.

(4) If hepatic abscess is present, the abscess should be drained by aspiration after 2 to 4 days of treatment with emetine. However, when the size and location of the abscess suggest that rupture is imminent, aspiration should be performed at once and treatment with emetine instituted at the same time. The site of aspiration should be carefully selected in accordance with the physical findings. The operation should be performed with scrupulous technique in an operating room. Open drainage should not be performed, unless it is demonstrated by smear or culture that the abscess is secondarily infected. Repeated aspiration may be necessary. In instances of secondary infection with susceptible organisms, the use of penicillin or sulfadiazine is recommended.

d. Amebic infections without symptoms or with only mild enteric symptoms. During treatment the diet should be soft; physical activity should be limited. The recommended treatment consists of carbarsone as described in *b*(2) above, followed by diodoquin as described in *b*(3), or chiniofon as described in *b*(4) above.

e. Follow-up. The results of treatment should be checked by means of repeated clinical and laboratory examinations. When encysted or motile amebae persist or are rediscovered, a further course of treatment should be given after a suitable interval. Symptomatic relapses should be treated vigorously, provided the pres-

ence of motile amebae is demonstrated. It should be noted, however, that the administration of antiamebic drugs is sometimes followed by diarrhea which may be persistent. Such diarrhea may not be the result of continued amebic infection. Courses of chemotherapy should not be repeated merely because of simple diarrhea when amebae are not demonstrated. The repetition on many occasions of courses of emetine without adequate use of other chemotherapeutic agents is especially undesirable. Patients should not be disposed of or released from medical supervision until three examinations have been negative, at least one of which should be obtained following a saline cathartic. It is desirable, when possible, to recheck patients by an examination about 1 month after completion of treatment, but patients should not be held in hospital for this purpose.

7. PROGNOSIS. The eradication of amebic infection is sometimes difficult, but it is nearly always possible with persistent appropriate treatment. When patients remain in highly endemic areas, the possibility of reinfection must be borne in mind. In acute dysentery, the response to prompt, well directed treatment is generally excellent, especially as regards symptoms. Under good management, uncomplicated hepatic abscesses rarely should be fatal. Old, well established chronic intestinal infections following repeated acute attacks, secondarily infected liver abscesses, and other metastatic lesions, especially brain abscesses, may be refractory to treatment and are dangerous to life.

8. PREVENTION. The prevention of amebic infection in military forces consists essentially in supervision of personal hygiene of mess personnel, the detection and adequate treatment of food handlers, the protection of food and drink from flies and other pest insects, the proper purification of water supplies, the sanitary disposal of human excreta, and the avoidance of eating uncooked fruits and vegetables which may be contaminated.

a. Food handlers. When facilities are available, stool examinations for *E. histolytica* should be made on personnel prior to their assignment as food handlers. Routine stool examination of mess personnel, using zinc sulfate concentration technique, to detect amebic carriers should be made at intervals of 6 months. In highly endemic areas, examination of food handlers at monthly intervals is recommended. Infected individuals must not be permitted to handle food until three negative stool examinations have been obtained following treatment. Native help should be excluded as food handlers at military installations. Personal hygiene, especially the proper cleansing of hands, must be emphasized and rigidly supervised for personnel preparing and serving food.

b. Food. Eating establishments located outside of military establishments which fail to meet sanitary standards in the procurement and serving of food should be declared out of bounds. In tropical or subtropical areas, fresh fruits and vegetables should be washed thoroughly and cooked before being served, or else treated with solutions of chemicals issued by the Quartermaster for this specific purpose. Sources of fresh vegetables should be supervised to prevent the use of human excreta as fertilizer.

c. Water. In the field, drinking water can be made safe only by special methods of chemical treatment or filtration, or by boiling. If an adequately filtered or treated water supply is not available, drinking water should be boiled and then chlorinated. Troops should be particularly cautioned not to drink water from untreated sources. As soon as practicable after occupation of a new area, wells should be drilled and maximum use made of subsurface water.

(1) For chemical treatment, a concentration of chlorine sufficient to give two parts per million residual after 30 minutes contact is required to destroy cysts of *Endamoeba histolytica.* When using canteens, two halazone tablets are sufficient to kill cysts, unless the water is turbid or colored, in which case four tablets should be used. It is important that 30 minutes contact will be allowed before the water is consumed. When using Lyster bags and calcium hypochlorite (grade A), the water will be treated to provide one part per million of residual chlorine after 10 minutes contact. An additional ampule of calcium hypochlorite will then be added and the water allowed to stand for 30 minutes more before use.

(2) In filtration to remove amebic cysts, certain precautions are necessary in the operation of standard portable water purification units. Pretreatment should include the application of

at least three parts per million of chlorine, a coagulent dosage of alum sufficient to give a heavy rapidly settling floc, and a minimum settling period of an hour. Filter output should be restricted to not more than 10 gallons per minute for portable units and to not more than 60 gallons per minute for mobile units. The recently standardized diatomaceous earth filter is highly efficient in removing amebic cysts, but pretreatment should always be used when the water is turbid or muddy. After any type of filtration, the water should show a chlorine residual of one part per million after 30 minutes contact. If this has not been accomplished by prechlorination, more chlorine should be added.

d. Control of flies. (1) Sanitary disposal should be made of human excreta to prevent fly breeding (see AR 40–205, AR 40–210, and FM 21–10). In the field it is essential that flies be denied access to human feces by flyproof construction of latrines. Where native labor is employed, proper latrine facilities should be provided and their use enforced. Kitchen and mess halls should be adequately screened. Destruction of adult flies with insecticides, traps, and fly swatters should be practiced routinely, especially in mess halls and latrines.

(2) DDT residual spray (5 percent DDT in kerosene, QM Stock No. 51–I–305) applied to surfaces on which flies commonly rest will remain lethal to flies lighting on such surfaces for 2 or more months. The spray should be applied at the rate of 200 mg per square foot (1 quart per 250 square feet). Screens, walls, ceilings, light fixtures, and garbage racks should be treated. Pit latrines, also, should be treated by spraying the walls of the pit, the inside and outside of the latrine box, and the walls and screens of the inclosure. To control fly breeding in pit latrines, it is recommended that DDT residual spray be applied evenly over the contents at the rate of 2 ounces per latrine box hole (½ ounce per square foot); or, 1 ounce of 10 percent DDT powder (larvicide, DDT powder, dusting, QM Stock No. 51–L–122) may be used (¼ ounce per square foot). This treatment should be repeated twice a week, unless local experience indicates that less frequent application will suffice.

[AG 300.5 (30 Apr 45)]

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G. C. MARSHALL
Chief of Staff

OFFICIAL:
J. A. ULIO
Major General
The Adjutant General

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TB MED 158

WAR DEPARTMENT TECHNICAL BULLETIN

MENOPAUSE

War Department, Washington 25, D. C. • • • May 1945

This bulletin follows TB MED 157, subject, "Chancroid, Lymphogranuloma Venereum and Granuloma Inguinale." Distribution given TB MED 157 was the same given TB MED 142.

1. It has come to the attention of the War Department that some confusion exists as to policy regarding the diagnosis and disposition of female military personnel with the menopausal syndrome. In order to clarify the situation the following is published.

2. The normal menopause is a physiological condition and not a disease. Those individuals presenting symptoms, mild in degree, should be treated on a duty status. Hormones used in the treatment of this condition are listed in the Medical Supply Catalog and should be obtained without cost to the individual.

3. In making a diagnosis all medical, surgical, and environmental factors should be considered in order to evaluate the condition correctly. This is particularly true in the case of individuals below the age of 40 who have had lower abdominal surgery.

[AG 300.5 (26 Apr 45)]

4. Individuals with significant symptoms at the time of menopause should be given a period of treatment, when indicated, with the appropriate use of gynecological and neuropsychiatric consultants, when available. If, at the end of 6 months' treatment, the individual has not shown improvement to the point of being able to render useful service, retirement or separation from the service should be considered.

5. Menopausal symptoms severe enough to warrant separation from the service may be dependent upon either gynecological or neuropsychiatric factors, or a combination of the two. Separations because of menopausal syndrome should not be accomplished without consultations with an internist, a gynecologist, and a neuropsychiatrist, when such specialists are available. Retirement or separation will be effected in accordance with the provisions of AR 605–250 or 615–361.

AGO 81A—May 637201°—45

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL
Chief of Staff

OFFICIAL:
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TB MED 157

WAR DEPARTMENT TECHNICAL BULLETIN

CHANCROID, LYMPHOGRANULOMA VENEREUM, AND GRANULOMA INGUINALE*

War Department, Washington 25, D. C. • • • April 1945

This Technical Bulletin rescinds paragraphs 5, 6, and 7, S. G. O. Circular Letter 74, 1942, subject, "Diagnosis and Treatment of the Venereal Diseases"

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Section I

CHANCROID

1. DEFINITION. Chancroid (soft chancre) is a localized venereal disease caused by the *Hemophilus ducreyi*, transmitted only by direct contact, and characterized by painful single or multiple genital ulcers, often complicated by suppurating inguinal bubo. The incubation period is usually 3 to 5 days, but may be shorter or longer.

AGO 462A—Apr. 637401°—45

2. DISTRIBUTION. The incidence of chancroid in the continental United States is comparatively low; but it is so much higher in most oversea theaters of operations, especially those in tropical and semitropical countries, as to be a problem of military importance.

3. EPIDEMIOLOGY. The disease occurs primarily among peoples that live on a low hygienic level. There are probably symptomless carriers, usually female.

4. COURSE. The disease begins as a vesicopustule which breaks down rapidly. The pustule soon ruptures, leaving a sharply circumscribed, shallow ulceration. The edges may become ragged and undermined. The base is moist and covered with necrotic, grayish exudate. When this is removed, an uneven base of purulent granulation tissue is revealed. The lesion is surrounded by erythema and is usually very painful. Multiple lesions may develop rapidly by auto-inoculation. Induration is usually absent in untreated lesions, but boggy induration may be present if local treatment has been applied.

The lesions occur in the following sites in order of frequency: in the male—prepuce, frenum, shaft, and anus; in the female—labia, clitoris, fourchette, vestibule, anus, and cervix. Spread by auto-inoculation may take place anywhere in the perigenital zone.

Regional adenitis frequently develops within a few days to 2 weeks. The bubo is usually large,

*This bulletin is based upon recommendations made by the Subcommittee on Venereal Diseases of the National Research Council.

unilateral, soft, fluctuant, acutely inflamed, and tender. Untreated, it has a tendency to rupture at a single point. However, it may subside without suppuration.

Phimosis and paraphimosis may occur. There is a tendency to spontaneous healing, both of genital lesions and of bubo, with scar formation. Systemic reactions are mild or absent.

5. DIAGNOSIS. All patients with penile ulcers of any description should be admitted to a hospital for diagnosis and treatment.

Since primary syphilis may clinically resemble chancroid, and since mixed infections of these two diseases may occur (the chancre appearing in the chancroid), the diagnosis of syphilis must be confirmed or ruled out by laboratory tests.

Local antiseptic applications must not be made until at least three negative darkfield examinations of the lesion or of lymph node puncture material are obtained on successive days. A blood serologic test for syphilis should be made on admission, repeated once a week for the first month, and at monthly intervals for 3 months, unless a diagnosis of syphilis is established earlier.

The diagnosis of chancroid may be aided by the laboratory examination of stained smears from the lesion, or by culture of pus from the lesion or the bubo.

6. TREATMENT *a. Chemotherapy.* (1) *Systemic.* Sulfadiazine should be administered in all cases. One gram (15 grains) four times a day for 5 to 7 days is recommended.

(2) *Local.* Nothing but cleanliness (soap and water) is necessary.

(3) If the patient is sulfonamide-sensitive, local application of mild antiseptics (Zephiran, 10 percent aqueous solution or 3½ percent tincture; gentian violet, 2 percent aqueous solution; potassium permanganate, 1:10,000 aqueous solution, or one 5-grain tablet to 3 liters of water) may be used.

b. Surgical treatment. (1) The bubo should never be incised. If fluctuation is present, aseptic aspiration with a 16-gauge needle is recommended; this may be repeated if necessary. Sulfadiazine ointment should be applied to the puncture wound.

(2) Marked phimosis or paraphimosis may be treated by immersion and soaking in hot magnesium sulfate or saline solutions during systemic sulfonamide therapy. Circumcision or dorsal slit is undesirable and is rarely necessary.

7. PROPHYLAXIS. Personal cleanliness is important. The standard U. S. Army chemical prophylactic kit, PRO-KIT (Item No. 9118000), has proved valuable in the prevention of chancroid.

Section II

LYMPHOGRANULOMA VENEREUM

8. DEFINITION. Lymphogranuloma venereum (also known as lymphogranuloma inguinale, lymphopathia venereum, and by numerous other names) is a systemic virus disease, acquired venereally, and characterized by a small evanescent herpetiform initial lesion frequently followed by regional lymphangitis and adenitis.

9. DISTRIBUTION. It is world-wide in distribution but is seen with greater frequency in tropical and semitropical climates.

10. EPIDEMIOLOGY. This disease is generally acquired through sex contact. The existence of asymptomatic carriers is suggested by the numerous individuals with positive Frei tests without clinical signs or symptoms of the disease.

11. COURSE. The disease usually begins as a trivial and transitory, painless, small erosion, papule, or herpetiform vesicle or ulcer, of the penis, vulva, vagina, peri-anal area, or anal or rectal canal which frequently escapes the patient's notice.

The invasion of the lymph nodes usually occurs from 10 to 30 days after infection. Inguinal adenitis is often bilateral and occasionally subsides without suppuration. During this stage, constitutional symptoms (prostration, malaise, fever, meningitis, meningo-encephalitis, or other bizarre manifestations) may be observed. The lymph nodes may fuse to the skin. Multiple areas of softening occur in the matted nodes followed by break-down and the development of numerous sinuses. Extensive scarring accompanies healing. The anorectal syndrome is more frequently found in the female and is characterized by rectal pain, discharge of blood and pus from the anus, a tendency to-

ward extreme chronicity, and the production of rectal strictures.

12. DIAGNOSIS. *a. Laboratory tests.* (1) *Cutaneous (Frei) reaction.* Only the chick embryo (yolk sac) antigen supplied through normal channels (item No. 1703300) will ordinarily be used. Directions for its use and for interpretation of the test will be found with each package.

A positive Frei reaction cannot be relied upon absolutely to establish the lymphogranulomatous nature of any clinical condition, since it is known that, in untreated infections with lymphogranuloma venereum, skin sensitivity persists for many years, probably for a lifetime. A positive test may, therefore, mean only that the patient has had lymphogranuloma venereum at some time in the past, rather than that his present symptoms are caused by this disease. False positive Frei reactions may occur in other related virus infections.

A diagnosis of lymphogranuloma venereum should not be made on the basis of a positive Frei reaction in the absence of clinical signs.

A negative Frei reaction in the presence of a clinically suspicious lesion of at least 3 weeks' duration is of value in excluding the diagnosis of lymphogranuloma venereum.

(2) *Complement fixation test for lymphogranuloma venereum.* This test is still in the experimental stage and is not advised for general use.

b. Differential diagnosis. Lymphogranuloma venereum must be differentiated from malignant tumors, Hodgkin's disease, tularemia, amebic proctitis, tuberculosis, meningo-encephalitis, pyogenic infections, plague, chancroidal bubo, granuloma inguinale, and syphilis. Syphilis should be ruled out by darkfield examinations of material from genital lesions or regional lymph nodes and by serologic examinations which should be repeated monthly for at least 3 months. Low titre false positive serologic tests for syphilis may occur in this disease.

13. TREATMENT. *a. Local.* The fluctuant nodes may be aspirated; but incision and drainage should not be used. Radical excision is inadvisable because of the risk of lymphatic obstruction and chronic swelling of the penis, scrotum, or vulva.

b. Chemotherapy. Sulfadiazine should be administered in a dose of 1 gram (15 grains) three times daily for 21 days.

c. Surgical. Patients with late complications, who do not respond to sulfonamide therapy, should be handled in the following manner:

(1) *Rectal stricture.* Prolonged gentle dilatation, preferably manual. Colostomy should not be performed unless dilatation is impossible because of location of the stricture, or has failed.

(2) *Peri-rectal abscess.* Surgical incision and drainage.

(3) *Fistula-in-ano.* Should be excised where possible.

Section III

GRANULOMA INGUINALE

14. DEFINITION. Granuloma inguinale is a chronic disease due to infection with a Donovan body, which is possibly of bacterial nature. It is a mildly contagious, progressive disease, characterized by a sharply defined, granulomatous, usually painless, initial lesion, involving the skin of the genital or inguinal region, and spreading gradually by continuity or contiguity. Rarely, it is a systemic disease involving bones, joints, and viscera. Granuloma inguinale is a distinct disease entity and should not be confused with lymphogranuloma venereum.

15. DISTRIBUTION. The disease has a world-wide distribution but is seen more often in tropical and semitropical countries.

16. EPIDEMIOLOGY. Some doubt exists concerning the manner of spread of granuloma inguinale. The consensus is that it is venereally acquired and that its communicability is low. There appear to be marked differences in racial and individual susceptibility.

17. COURSE. The disease starts as a vesicle, papule, or nodule. The surface epithelium becomes excoriated or eroded, leaving an ulcer with a beefy red granular base. An early lesion may be a clean, raised, velvety, smooth tuft of granulation tissue, situated at the mucocutaneous border of the vaginal orifice, at the preputial orifice, or on the glans or inner surface of the prepuce. The margin of the lesion is sharply defined. The granulation tissue, if traumatized, bleeds easily. The lesions are not painful unless grossly secondarily infected.

There is very little tendency to spontaneous healing. The lesions spread by continuity or contiguity. Extension is often slow. There is a predilection for moist contact surfaces, particularly in the cruroscrotal folds, the groins, and the cleft and folds of the buttocks. The advancing border of the lesion has characteristic rolled edges, the granulation tissue piling over onto the bordering epithelial surface.

The ulcerative process may remain more or less stationary for many years. Secondary elephantoid enlargement of penis, scrotum, or labia may occur. The lesions may heal with scar formation at one margin and progress at another. There are three types of lesions: exuberant, ulcerative, and cicatricial.

Ultimately, marked impairment of general health may occur, ending in extreme cachexia and death.

18. DIAGNOSIS. The clinical appearance of a chronic ulcerative process involving the skin of the groin and genital areas, without involvement of the lymph nodes, is characteristic of the disease. The demonstration of Donovan bodies confirms the diagnosis.

For this demonstration, spreads should be made from scrapings or punch biopsy of *clean* granulation tissue, and stained by Wright or Giemsa stain. Histologic study of tissue sections taken by biopsy from a peripheral area of diseased tissue may demonstrate the pathognomonic large cells with cystic spaces containing Donovan bodies.

Lymphogranuloma venereum, chancroid, carcinoma, and syphilis should be considered in the differential diagnosis, and appropriate diagnostic tests should be performed. A blood serologic test for syphilis should be made weekly the first month and at monthly intervals for 3 months unless a diagnosis of syphilis is established earlier.

19. TREATMENT. *a. Fuadin* (*a complex antimony compound*). This drug is also known as neoantimosan and stibophen. It is supplied in ampules containing 6.4 percent solution (0.064 gm fuadin, 1 grain, in 1cc). Fuadin solution is given intramuscularly. The first three doses of 1.5 cc, 3.5 cc, and 5 cc are given on successive days, followed by 5 cc two or three times weekly until complete healing has taken place; and, in order to prevent relapse, continued at weekly intervals for 6 months after complete healing. The most commonly reported toxic symptom is vomiting. Rarely, joint and muscle pains may appear. If any toxic symptom occurs, the dose should be reduced.

b. Antimony and potassium tartrate (*tartar emetic*). If there is no response to fuadin therapy after 6 weeks of treatment, antimony and potassium tartrate should be administered. This preparation contains about 36 percent antimony. One percent solution should be freshly prepared, using if available Medical Department supplies of sterile distilled water or physiological saline, rather than local supplies. The solution should be perfectly clear and free of sediment. It is sterilized by *gentle* boiling for 5 minutes. Solutions should not be autoclaved. The drug is best tolerated 2 to 3 hours after a light meal. It is administered intravenously and should be given slowly. Since the solution is very irritating, the needle should be wiped off with a sterile sponge and there should be no extravasation. The patient should remain recumbent for at least an hour after treatment. The first dose is 3 cc (0.03 gm tartrate). Provided no untoward reaction occurs, subsequent doses are given on alternate days and are increased on each occasion by 3 cc (0.03 gm tartrate), until the maximum individual dose of 12 cc (0.12 tartrate) is reached. If no toxic reaction appears the maximum tolerated dose may be given 3 times weekly for 15 doses. The toxic effects of antimony and potassium tartrate include coughing immediately upon injection, which is not important; nausea, vomiting, dizziness, and collapse. Transient electrocardiographic changes without corresponding clinical manifestations have been reported. If a toxic reaction other than coughing occurs during administration the injection should be stopped at once. Following any toxic effect, the subsequent dose or doses should be reduced or omitted according to the circumstances.

c. Healing under antimony is enhanced by adequate concomitant treatment of gross secondary infection. This may be accomplished by local application of daily wet dressings with weak solutions of potassium permanganate or

sodium perborate. Penicillin given intramuscularly every 3 hours, in injections of 10,000 units each, in a total dosage of 400,000 units, is also recommended for the treatment of secondary infection.

d. X-ray therapy combined with chemotherapy has yielded promising results.

e. Surgical excision of the entire diseased area may be necessary as a last resort. If used, it must be followed by chemotherapy.

[AG 300.5 (11 Apr 45)]

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TB MED 155

Change 1

WAR DEPARTMENT TECHNICAL BULLETIN

APHASIC LANGUAGE DISORDERS

War Department, Washington 25, D. C. . . . . 25 April 1945

TB MED 155, April 1945, is changed as follows:

2. GENERAL. Aphasic language disorders * * * or personality changes. **Especially important among the latter are a reduced ability in abstract thinking, an inability to shift attitude, and a tendency to perseveration.** The language defect * * * other treatment measures.

[AG 300.5 (17 Apr 45)]

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TB MED 155

WAR DEPARTMENT TECHNICAL BULLETIN

APHASIC LANGUAGE DISORDERS

War Department, Washington 25, D. C. . . . April 1945

	Paragraph
Purpose	1
General	2
Management of Aphasic Language Disorders	3
Routine Studies	4
Underlying Principles of Treatment of Aphasic Language Disorders	5
Language Therapy and Types of Aphasia	6
Disposition	7
Suggested Reference Material	8

1. PURPOSE. The purpose of this bulletin is to emphasize the general problem of aphasia and to establish uniform methods of study and management of the aphasic language disorders in military hospitals.

2. GENERAL. Aphasic language disorders are being seen with relative frequency in the specialized general hospitals caring for neurological and neurosurgical patients. The great majority of these cases have resulted from severe head injury encountered in combat, and most have, in addition to aphasia, other associated neurological defects of a motor or sensory nature and concomitant, emotional, intellectual, or personality changes. Especially perseveration. The language defect in most traumatic problems of the brain tends to improve spontaneously in the first several months following injury. The same may be said for those aphasic disorders occurring in the wake of vascular accident, inflammatory disease, or upon the removal of a tumor of the brain. Much can be done, however, in speeding progress and in directing improvement through speech training. Further, much can be done to influence the individual's psychological reaction to his speech and other defects by skilled management of the language disorder. This care should begin early in the patient's rehabilitation. Language retraining must go along with other treatment measures.

3. MANAGEMENT OF APHASIC LANGUAGE DISORDERS. *a.* Each specialized general hospital having a neurological and neurosurgical section is responsible for the care and treatment of aphasic disorders that are present currently in that hospital and satellite Army installations.

b. The neurological section is responsible for the early study and treatment of all aphasic disorders. Any aphasic patient whose disorder has surgical implication will receive the prompt collaborative attention of neurosurgeon and neurologist, and, so far as is practicable and proper, he will receive training in speech along with other treatment measures. When surgical measures are concluded, the patient should be transferred to the neurological section, where treatment of all residual defects is continued until maximum hospital benefit has been attained, namely, until the patient has reached a stabilized plateau in improvement.

c. The neurologist will be assisted by the clinical psychologist in the psychological evaluation of the brain-injured patient and will collaborate with the neurologist in the retraining of all aphasic disorders. Wherever possible, the clinical psychologist assigned to neurological centers will have a background in speech pathology so that he can better serve in the evaluation of aphasic disorders. In addition, the assignment of an enlisted or civilian speech correctionist to assist in the retraining of defective language functions is recommended where locally necessary.

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4. ROUTINE STUDIES. Routine studies on all aphasic disorders will consist of the following:

a. The usual delineative clinical neurological survey will be carried out, as in all severe head injuries or other intracranial pathology.

b. Mental testing of all aphasic patients will be done routinely, as a part of the neurologic study. This will be done by the clinical psychologist. The purposes of administering the mental tests are to determine the functional mental capacity, to estimate loss of capacity by comparison with previously recorded test scores, and to measure improvement as training progresses.

c. In order to assist the neurologist and clinical psychologist in more adequate evaluation of the aphasic patient, the following mental tests are recommended:

(1) *A. G. C. T. (retest) or Basic Battery.* This test is verbal, and of paper and pencil type, and is useful as a retest to enable comparisons with earlier recorded scores.

(2) *Wechsler-Bellevue Intelligence Score.* This is a scale consisting of 11 subtests. Analysis of subtest scores permit conclusions as to mental deterioration and loss of mental efficiency.

(3) *Goldstein-Scheerer Cube Test of Abstract and Concrete Behavior.* This test consists of four colored cubes having the same arrangement and distribution of colors. Individuals with definite impairments of abstract thinking ability are unable to analyze designs sufficiently to reproduce them with the cubes, and cannot learn to make the reproduction from simplified models provided after initial failure. The test is intended for studying impairment of abstract thinking or ability to generalize, and thus will be found especially useful in the study of patients with brain damage.

(4) In addition to tests noted above, much pertinent test material may be found in War Department Pamphlet No. 12–9, Handbook for Clinical Psychologists. This handbook includes test descriptions, illustrations, directions, and norms for interpreting test results.

(5) Language test items should include *writing a complex sentence* of about 10 words from dictation; *repetition of phrases* (after examiner); *oral reading* from a standard test selection; *performing simple arithmetical items* (addition and subtraction); *clock reading and clock setting; color naming; naming of common objects; use, manipulation, and identification of common objects* (searching also for apraxia and astereognosis).

(6) In all testing, the examiner should carefully note the frequency of slips of tongue and other paraphasic errors, the evocation of words under emotional stress which are not otherwise spoken, and the tendency of the patient to become fatigued and show signs of discouragement or frustration.

5. UNDERLYING PRINCIPLES OF TREATMENT OF APHASIC LANGUAGE DISORDERS. *a.* Language training, including reading and writing as well as speech, should be coordinated with general sensory and motor retraining, since speech training is but one aspect of a total rehabilitative program. Very often the aphasic patient has evolved a new kind of personality as a result of a brain lesion, hence speech therapy must also be directed at retraining the entire individual.

b. All therapy must be conducted with the patient as an individual and not with defects *per se.* Emphasis should be given assets, and maximum use made in training the unimpaired or relatively unimpaired sensory and motor avenues.

c. Language training should be based upon *past experiences* of the patient.

d. The aphasic's condition is not static. Inconsistency in performance is characteristic. At no time should improvement be taken for granted. Patients must be given repeated opportunities to practice what they have learned. Efforts must always be made to build up the patient's confidence in himself, and each therapeutic session should end with a feeling of accomplishment on the part of the patient. At all costs, *discouragement must be avoided.*

6. LANGUAGE THERAPY AND TYPES OF APHASIA. Direct language therapy will be determined by the patient's aphasic manifestations. For practical purposes we need consider only *expressive* and *receptive* aphasic symptoms. *Amnesic* aphasic patients will require the same training as patients with expressive aphasic symptoms. *Expressive-receptive* aphasic patients will require the

same training as that given to individuals with expressive or receptive aphasic symptoms.

a. Expressive (motor) aphasia. The patient's most serious difficulty is an inability to express ideas through spoken and written language symbols. He is likely to have difficulty both in the motor aspects of language production and in his ability to cope with symbolic formulations generally. Thus he will require training in articulation as well as language usage.

b. Receptive (sensory) aphasia. The patient's most serious difficulty is an inability to comprehend language, spoken or written. The ability to recognize objects, geometric figures, colors, and such other refinements as music and special skills, may also be impaired. There may be associated expressive defects which for the most part will consist of grammatical and verbal confusion (jargon). However, the receptive aphasic is not likely to speak hesitantly or be defective in his articulation. Thus, emphasis, in training of the receptive aphasic, should be placed on the use of sensory avenues other than those predominantly affected (auditory or visual), though the affected avenue should not be ignored. Speech (lip) reading should be taught for comprehension of spoken language. Braille reading should be taught as a basis for the comprehension of written symbols in the word blind (alexia). If Braille material is read aloud, additional association between the visual and the auditory aspects of language will be made. The receptive aphasic in common with the expressive aphasic must have new pathways established directly or indirectly, to compensate for existing cortical impairment.

7. DISPOSITION. In general, the aphasic patient will be given disposition primarily in accordance with severity of his basic craniocerebral pathology. Where medical judgment indicates that the patient has recovered, he will be returned to a general, or limited, duty capacity as the case may warrant. All patients who have reached a stabilized plateau of improvement in their speech and other neurological defects (have received maximum hospital benefit) and who are not to return to duty will be separated from the service. It is very important, however, where the aphasic disorder is still a primary part of the problem, that special note be made of this fact on the application for care to the Veterans' facilities. This is imperative, since specialized attention is being given aphasic language disorders in specific Veterans' Administration facilities.

8. SUGGESTED REFERENCE MATERIAL. The recommendations noted above may be readily augmented in such references as:

a. Head, H., Aphasia and Kindred Disorders of Speech, Vol. 2, New York, MacMillan Co., 1926;

b. Weisenburg, T. and McBride, K. E., Aphasia, Oxford University Press 1935;

c. Nielson, J. M., Textbook of Clinical Neurology, New York, Paul B. Hoeber, 1941;

d. Berry, M. and Eisenson, J., The Defective in Speech, New York, Crofts, 1942.

[AG 300.5 (24 Mar 45)]

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TB MED 154

WAR DEPARTMENT TECHNICAL BULLETIN

PSYCHIATRIC SOCIAL WORK

War Department, Washington 25, D. C. • • • June 1945

This bulletin follows TB MED 153, subject, "First Aid for Liquid Blister Gas Contamination of the Eye." Distribution given TB MED 153 was identical to that given TB MED 142.

	Paragraph
Purpose	1
Types and Classification of Psychiatric Social Workers	2
Duties of Military Psychiatric Social Worker	3
Psychiatric Assistant, WAC	4
Standards of Practice of Social Work	5
Administration and Supervision of Psychiatric Social Work Program	6
Relationship Between Red Cross and Military Psychiatric Social Workers	7
References to Utilization of Psychiatric Social Workers	8

1. PURPOSE. This Technical Bulletin is intended to serve as—

a. A guide for military psychiatric social workers and psychiatric assistants, outlining their administrative relationships and professional duties.

b. An outline for orientation and special reference use by psychiatrists, classification officers, and other relevant military personnel of the qualifications of various types of personnel and their practice in this field.

2. TYPES AND CLASSIFICATION OF PSYCHIATRIC SOCIAL WORKERS. *a.* SSN 263, Social Worker, and MOS 263, Psychiatric Social Worker, designate enlisted personnel, both male and female, who have civilian social work background as assistants qualified to aid neuropsychiatrists in hospitals, redistribution centers, separation centers, mental hygiene consultation services, disciplinary barracks, induction stations, and rehabilitation centers. SSN 263 is the designation used by the Army Ground Forces and the Army Service Forces.

b. The SSN qualifications require the individual to have a graduate degree in social work from a recognized school of social work, or at least 2 years supervised experience in social work activities in a private or public agency.

c. Individuals with minimum qualifications for SSN 263 show a wide variation in these qualifications in their professional education as well as civilian experience. Their competency will therefore vary widely, depending on this training and experience. Many military psychiatric social workers had had no experience in psychiatric organizations prior to their Army experience. Among social workers will be found not only psychiatric social case workers and social case workers, but also personnel especially trained in social group work, social administration, community organization, and social research. Standards for the selection and assignment of military psychiatric social workers must be based on Army needs and policies; and, of necessity, these will require readjustments of civilian professional standards. A continuous on-the-job training program of lectures and seminars, particularly to orient the new worker, will contribute greatly to efficient service.

3. DUTIES OF MILITARY PSYCHIATRIC SOCIAL WORKER. *a.* These duties cover specific social services, which should be delegated by the neuropsychiatrist. They may

AGO 813A—May 637201°—45

be separated into job assignments in relation to intake, orientation, referral, and follow-up of patients, as well as liaison with other services in the unit or of the installation. Under authority delegated to him by the neuropsychiatrist, the military psychiatric social worker:

(1) Obtains information from Army units; presents history material or interview content for the neuropsychiatrist, so that diagnoses, treatment, and disposition are facilitated.

(2) Will, under the direction of the psychiatrist, interpret the findings and/or the program of the psychiatric unit to agencies or persons concerned, such as other medical personnel, unit commanders.

(3) Will have the responsibility to explore and initiate effective use of opportunities and facilities within the Army structure, to aid in the solution of the patient's problem.

(4) Aids in the reorientation of the soldier to his problem, making such recommendations for, and reports of, treatment and disposition to the psychiatrist as may be pertinent and possible.

(5) Will assist, when directed, with group therapy, preventive psychiatry, or other programs for which the neuropsychiatrist is responsible.

(6) Will aid in administrative procedures, including the preparation of necessary records, and reports, schedules, and other related activities.

b. In assigning specific duties, the psychiatrist, or the psychiatric social case work supervisor, if delegated, will assume that the greater the total professional education and experience of the psychiatric social worker, including experience in Army social work, the greater the responsibility which safely can be given for the above. In addition to case work and therapeutic skill, full utilization will be made of special experience or ability in all personnel, such as social group work, organization, and administration.

4. PSYCHIATRIC ASSISTANT, WAC. Serves in neuropsychiatric units, carrying duties which require less professional experience and skill than those duties assigned to qualified psychiatric social work personnel.

a. Civilian qualifications include: Completion of a 1-year course in a recognized school of social work; or a college degree, or 2 years of college, plus 1 year full-time experience in supervised case work.

b. Duties of psychiatric assistant: Psychiatric assistants and other personnel not fulfilling the professional requirements of SSN 263, will be assigned primarily to—

(1) The selection and preparation of objective data related to patients, such as abstracting accessible medical and nonmedical records, maintaining records of psychiatric service, etc.

(2) Delegated aspects of the administrative responsibilities of the psychiatrist, such as initiation of CDD forms, reports to Boards of Officers under AR 615–368, AR 615–369, etc.

c. Individual differences in personality and native capacity will be such that under heavy pressure of need, psychiatric assistants may be assigned to the simpler duties requiring direct contact with patients. No assignment to such duties will be made without providing adequate safeguard to patients through close supervision.

5. STANDARDS OF PRACTICE OF SOCIAL WORK. *a.* The military psychiatric social worker is primarily a soldier, secondarily a social worker. It is to be expected that military responsibilities may take precedent, at times, over professional work. When possible, the soldier will have completed basic training prior to assignment as a psychiatric social worker.

b. The military social worker must adapt his previous civilian procedures, goals, and techniques to military neuropsychiatric purposes. This implies the recognition that the group is the primary unit and the individual secondary to the group. Effective use of his social work experience will depend largely on his orientation to and familiarity with the Army and the particular unit in which he functions. Specifically, he must recognize the limitations of time to be invested in any one patient; that process reports of an interview are rarely justified; that the importance of a patient's particular complaint must be judged in light of the Army program and plan for that soldier; that the recommendations and management of one individual have their influence and repercussions on the group to which he belongs and must be weighed from this point of view.

c. The attitudes of military social workers, as manifested towards the patient, may markedly benefit or harm him, no matter how slight the contact. Under all circumstances, the worker must remain objective yet sympathetic. All personnel working with psychiatric patients must refrain from expressing or implying censorious criticism or moralistic judgments except where sound psychiatric practice justifies its use. Special effort must be made never to make fun of the patient's ideas or behavior. Every worker must restrict his interest in the patient's history and personality to data which is pertinent to the mission of the unit. All information gained from patients is strictly confidential, and is not to be discussed except in professional situations.

d. In all liaison contacts, the social worker's written or verbal communications should avoid the use of psychiatric terminology and utilize simple English, intelligible to the layman.

e. It is to be expected that the military situation may make demands of the psychiatric social worker which are radically different than in civilian life. In making his own readjustment to the military situation, he should recognize that the opportunities for service in the Army are unlimited and that his personal opportunities for learning are limited only by his own attitudes and industry.

f. It must be borne in mind that the making of definitive diagnoses is the sole prerogative of medical officers.

g. The line of responsibility of the military psychiatric social worker and of the WAC psychiatric assistant is directly to the neuropsychiatrist in charge. The delegated and specific responsibility of the military psychiatric social worker and the psychiatric assistant will be determined by the military neuropsychiatrist and will vary with mission of the installation.

6. ADMINISTRATION AND SUPERVISION OF PSYCHIATRIC SOCIAL WORK PROGRAM. *a.* The chief psychiatric social worker, appointed by the psychiatrist on the basis of experience and leadership, carries delegated responsibility from the psychiatrist for the development of a military social service program based on a common interpretation and application in practice of administrative policies and procedures.

b. He is responsible for the quality of the performance of the psychiatric social work members.

c. In the fulfillment of these responsibilities, he—

(1) Establishes, with the psychiatrist, the social work policies of the organization.

(2) He assists the psychiatrist in relating the military social work activities with the activities of the clinical psychologist, the Red Cross, and with all related services.

(3) He supervises, through reading of records and conferences, the social case work activities of the 263's, or delegates supervision to qualified staff members.

(4) He plans, with the psychiatrist, on-the-job training for psychiatric social workers and for psychiatric assistants, and takes part in the appropriate instruction.

7. RELATIONSHIP BETWEEN RED CROSS AND MILITARY PSYCHIATRIC SOCIAL WORKERS. *a.* Personal, family, and other case work services to patients, as delegated to the American Red Cross, in accordance with AR 850–75, 30 June 1943, continue in neuropsychiatric units under the authorization of that regulation and in line with subsequent administrative policies.

b. In addition to their contribution to some of the strictly military social needs of a soldier, as outlined in section III, paragraph 12, the Red Cross psychiatric social worker is a strategically advantageous position to deal with his social needs of a civilian character.

c. Certain social services are essentially military in character, such as securing reports of the observations of patient behavior, the preparation of certain records, and direct assistance with some types of patient difficulties. In such instances, the fact that the patient recognizes his military social worker as representing the delegated authority of the psychiatrist will prove an asset in psychiatric social case work treatment.

d. Army psychiatric social workers will not undertake services which, by regulation and practice, have become the established responsibility of the Red Cross, such as initiating contact in behalf of the patients with civilian individuals or organizations.

e. In accordance with established policy, the Red Cross worker will not undertake supervision of the military workers; and conversely the military social worker will not supervise the work of the Red Cross. The Red Cross worker will participate in all appropriate neuropsychiatric staff meetings, lectures, seminars, etc.

f. Due to limited number of skilled social work personnel, available through either source, and due to the tremendous social and personal needs of patients, it is essential that duplication and confusion be avoided through planned, but flexible, allocation of duties.

8. REFERENCES TO UTILIZATION OF PSYCHIATRIC SOCIAL WORKERS.

a. War Department Technical Bulletins:

TB MED 103, Group Psychotherapy, 10 October 1944.

TB MED 84, Treatment Program for Psychiatric Patients in Station and General Hospitals, 10 August 1944.

TB MED 80, Reconditioning Program for Neuropsychiatric Patients, 3 August 1944.

b. War Department Circular:

Section V, War Department Circular No. 295, 1944, Psychiatric Social Worker.

War Department Memo No. 615–44, recurrent, Critically Needed Specialists.

c. ASF Circulars and Manual:

ASF Circular No. 419, 1944, Convalescent Hospitals (Revised Program).

ASF Circular No. 242, 1944, Army Ground and Service Forces Redistribution Stations (in particular: Appendix 4, sec. II, Medical Examination).

ASF Manual M 4 (30 April 1945), chapter 10, section VI, Consultation Service and Personal Adjustment.

d. Classification: TM 12–427, 12 July 1944.

e. A growing body of professional literature is to be found in psychiatric and social work journals, contributed to by medical officers, military psychiatric social workers, and civilians.

[AG 300.5 (23 May 45)]

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TB MED 153

WAR DEPARTMENT TECHNICAL BULLETIN

FIRST AID FOR LIQUID BLISTER GAS CONTAMINATION OF THE EYE

War Department, Washington 25, D. C. • • • March 1945

This bulletin follows TB MED 152, subject, "Medical and Sanitary Data on Paracel Islands." Distribution given TB MED 152 was identical with TB MED 150.

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1. GENERAL. When liquid blister gas enters the eye, the degree of efficacy of first aid is determined largely by the speed with which decontamination is carried out. Previous directives have advised irrigation when the contaminant is liquid mustard or nitrogen mustard, and BAL Eye Ointment [1] when the contamination is a liquid arsenical such as lewisite. Thus the soldier was required to remember *two* separate first-aid measures and to distinguish between chemical agents at a time and under conditions when this would be difficult. Recent studies on this problem have resulted in a first-aid procedure which may be used for *all* contaminations of the eyes by *any* liquid blister gas whether they be by mustard, a nitrogen mustard, lewisite (or other arsenical vesicant), or mixtures thereof. These studies have shown that the new decontamination procedure gives results equal or superior to those obtained by irrigation or BAL Eye Ointment alone.

2. PROCEDURE. The new first-aid procedure combines the use of BAL Eye Ointment, massage, and irrigation. Immediately after the eye has been contaminated, BAL Eye Ointment is inserted directly into the lower conjunctival sac. The eye is then massaged for 1 minute. This is followed by irrigation with water from the canteen or other available uncontaminated source. To accomplish this the head is thrown back, and the lids are forced open with one hand, while water is poured into the eye from a container held in the other hand a few inches away from the eye. The water should be poured directly and slowly into the eye and should be continued for *at least 30 seconds*, or until the canteen is empty, and not longer than 2 minutes. Field trials with human volunteers have proved that soldiers are able to insert BAL Eye Ointment into their own eyes and follow it by massage and proper irrigation with water from their own canteen in the time necessary to achieve the desired results. If BAL Eye Ointment is not immediately available, the eye should be irrigated as early as possible without waiting to obtain the ointment. The decontamination must be completed before the gas mask is put on in spite of the presence of gas vapor. Therefore, the individual should hold his breath as much as possible until the first aid is completed and the gas mask can be adjusted.

3. PROPERTIES OF ARSENICAL VESICANTS. When liquid lewisite or any other arsenical vesicant is the contaminating agent, the immediate pain and blepharospasm caused by the agent is rapidly relieved by BAL Eye Ointment. The blepharospasm may be so great as to preclude the placing of ointment into the lower sac immediately. In such cases the ointment may be placed on the outer lids and massaged well, thus working some of the ointment

[1] BAL Ointment, ¾-ounce tube (Medical Department Item No. 9102800) may be used.

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between the lids into the eye. This will relieve the pain and blepharospasm to such an extent as to permit the direct insertion of ointment into the sac, after which the procedure outlined in paragraph 2 is followed.

4. PROPERTIES OF MUSTARD AND NITROGEN MUSTARDS. Contaminations of the eye by liquid mustard or nitrogen mustard cause no immediate pain or discomfort. When BAL Eye Ointment is placed into an eye contaminated with these agents there will be immediate irritation and blepharospasm. *This is to be expected and the first-aid procedure should not be discontinued because of it.* The irritation from the ointment stops as soon as the irrigation is begun. However, the irrigation should not be stopped as soon as the stinging disappears, but should be continued for 30 seconds to 2 minutes as outlined in paragraph 2.

5. PRECAUTION. BAL Eye Ointment placed in an uncontaminated eye is quite irritating and causes immediate stinging and blepharospasm which may interfere with the individual's combat ability for a period up to 15 minutes. Therefore, BAL Eye Ointment should be used in the eye only when the individual is fairly certain that his eye has been contaminated by a liquid blister gas. The chance of liquid contamination is small except when in the close vicinity of a shell or bomb burst or in a direct airplane spray.

6. EFFECTIVENESS OF BAL EYE OINTMENT. In contaminations of the eye by liquid mustard the initiation of first aid within the first few seconds is markedly effective and after 2 minutes is of very little value. In the case of contamination of the eye by liquid lewisite or any other arsenical vesicant, BAL Eye Ointment is effective for a longer period of time. If it is used within 1 minute after contamination, the eye usually recovers in a few days. When it is used 10 minutes after contamination, the eye requires several weeks to heal and usually suffers permanent damage. After 30 minutes BAL Eye Ointment has almost no effect.

[AG 300.5 (19 Mar 45)]

BY ORDER OF THE SECRETARY OF WAR:

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The Adjutant General

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Refer to FM 21–6 for explanation for distribution formula.

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TB MED 152

WAR DEPARTMENT TECHNICAL BULLETIN

MEDICAL AND SANITARY DATA ON PARACEL ISLANDS

War Department, Washington 25, D. C. • • • March 1945

This bulletin follows TB MED 151 subject, "Surgical Management of Thermal Burns." Distribution given TB MED 151 was as follows: AAF (5); AGF (5); ASF (2); T of Opns (25); S Div ASF (1); Dept (5); Base Comd (5); Is Comd (5); AAF Comds (55); Arm & Sv Bd (2); Def Comd (5); Tech Sv (2); SvC (10); Named & Numbered GH (60); Numbered GH (NP) CZ (45); Named SH (Including RH & Numbered SH) (40); M Conc C (55); Gen Disp (ZI) (10); Fld Hosp (15); Hosp Tn (2); Hosp Ship Plat (5); Hosp Ship Complements (15); Conv Ctr (15); Conv Camp (10); Vet Gen Hosp (10); Vet Sta Hosp (10); Vet Evac Hosp (5); Vet Conv Hosp (5); Portable Surg Hosp (5); Evac Hosp (750 bed) (40); Evac Hosp (SM-400 bed) (30); Conv Hosp (20); Gen & Sp Sv Sch (5); Enlisted Techn Sch 8 (1); USMA (2); ASTPU (3); ROTC (2); Army Med Tng C (60); Repl Tng Ctr (2); Tng Ctr (2) except Med (60); Ind Sta (10); Sv C Lab (5); A (5); CHQ (5); D (55); AF (55). One copy to each of the following: T/O & E 3-25; 4-45; 4-145; 4-232; 5-35; 5-72; 5-95; 5-275; 6-35; 6-55; 6-65; 6-75; 6-95; 6-175; 6-325; 6-355; 6-365; 6-395; 7-85; 9-12; 11-25; 17-55; 17-125; 18-25; 19-35; 20-42. Two copies to each of the following: T/O & E 2-22; 4-152; 4-260-1; 5-386; 5-535S; 6-12; 6-45; 8-22; 8-26; 8-520; 9-35; 9-76; 10-22; 10-165; 10-217; 11-15; 17-15; 18-10-1; 18-35; 19-55; 20-46; 44-15; 44-25; 44-75; 44-115; 44-125; 44-225S; 44-315; 55-120-1. Three copies to each of the following: T/O & E 5-192; 7-95; 8-27; 10-45; 10-175; 17-115; 44-135; 44-320; 55-110-1; T/O & E 5-21 (5); 5-251 (6); 5-510S (35); 8-28 (10); 8-510 (15); 8-534 (5); 8-537T (15); 8-550 (60); 8-550S (45); 8-560 (40); 8-572S (5); 8-580 (40); 8-581 (30); 8-590 (20); 8-591T (15); 8-595T (10); 8-650 (10); 8-750 (10); 8-760 (10); 8-780 (5); 8-790 (5); 10-95 (7); 10-125 (6).

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Section I

INTRODUCTION

1. GENERAL. The Paracel (Hsi-sha Ch'un-Tao) archipelago consists of a group of 30 named coral formations including 15 islands, 2 sand cays, 7 banks, 5 reefs, and a rock, and innumerable, unnamed, partially submerged, coral outcroppings. These land masses are scattered over an area about 90 miles north and south by 100 miles east and west, between 15°42′ to 17°07′25″ N., and 111°11′20″ to 112°53′45″ E. (table I). There are two clusters of islands, the Crescent and the Amphitrite Groups, and three isolated islands, Triton in the southwest, Passu Keah in the south, and Lincoln in the northeast. Woody Island (Amphitrite Group), said to be the largest in area of all the Paracel islands, is about a mile long.

Sovereignty over the archipelago was in dispute in pre-war times. The Chinese have long considered the Paracels as part of their territory and have never relinquished their claim. The French Government has taken the view that, since the Paracel archipelago was a dependency of Annam when France took possession of Annam (in 1866), the Paracels belong to France.

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Section II

PUBLIC HEALTH AND ENVIRONMENTAL FACTORS INFLUENCING HEALTH AND SANITATION

2. PUBLIC HEALTH DEPARTMENT. There is no organized public health department functioning in the Paracels.

3. WATER. *Triton Island*, less than a mile long, is a sand cay. No source of water has been reported. *Money Island*, about 4,200 feet in length, is covered with brushwood. No source of water has been reported. The *Duncan Islands* (East and West) are covered with shrubs. The eastern island is the larger and is said to have a well or "something like a small lake" located near two conspicuous palms. The two islands are connected by a sand spit. One report states there are two wells of brackish water in the Duncan Islands. *Drummond Island*, about 2,600 feet long by 1,350 feet wide, is covered with brushwood and mangrove trees. No source of water has been reported. *Robert Island*, about 2,400 feet in length, is covered with vegetation and has a few houses. Two wells with slightly brackish water are reported, rainwater is collected in tanks, and a distillation apparatus (capacity unknown) was said to be operating in 1940. *Pattle Island*, about 2,600 feet long by 1,300 feet wide, is covered with brushwood and mangrove. Rainwater is collected, but it is said that ground water may be obtained by digging near three conspicuous (40-foot) coconut palms.

Lincoln Island, about 1¼ miles long and slightly over ½ mile wide, is covered with brushwood. A well is located near the center of the island, but no information is available regarding the quality or amount of water furnished by the well. *Woody Island*, a little over 1 mile long by about ¾ mile in width, is densely wooded except where clearings have been made for mining phosphates. The statement is made that the island has no wells but a report of 1933 states that there was a well with a pump, connected by big pipes with a reservoir located behind the office of the Japanese phosphate company. The same report further states that there were four reservoirs for storage of rainwater. Two small ones, made with metal sheets, had a capacity of about 4 cubic feet each. Two larger reservoirs of cement construction were each 12 feet square by 6 feet high. During the rains, water was collected from the roofs of several buildings into the reservoirs. The roofs were mostly constructed of galvanized iron. A water boiler was located near the shore and near it was a building, 24 by 12 feet in size, housing an "iron cauldron" which possibly might be a distillation apparatus. *Rocky Island* had two native huts in 1939. No source of water has been reported. No descriptions have been found of *South Sand*, *South Island*, *Middle Island*, or *North Island*. *West Sand* had a temporary native hut in 1939 at which time there were two old boilers (or possibly water tanks) at the south end of the sand cay. No source of water has been reported. *Tree Island* is covered with mangrove bushes. No source of water has been reported.

4. WASTE DISPOSAL. No data are available concerning methods of waste disposal in the islands. It is probable that human excreta, garbage, and other wastes are cast into the sea.

5. ANIMALS IMPORTANT TO MAN. Reports are scant or lacking in regard to animal life in the Paracels. Definite reports record the fact that Woody Island has an enormous number of rats (species not stated) which were thought to have contributed to an epidemic of typhus that occurred in the island in 1938–39. Lizards (species not stated) are reported in Woody Island. There are no snakes in the Paracels, it is said. Butterflies and moths are reported to be numerous. No data are available regarding the presence of mosquitoes, flies, lice, fleas, other insects, ticks, mites, spiders, scorpions, centipedes, mollusks, crustaceans, or mammals other than rodents.

It is not unlikely that the waters about the Paracels may contain harmful species of marine life known to be present in the South China Sea, such as the puff-toadfish (genus Tetrodon), the sting ray (genus Trygon), poisonous jellyfish, and sharks. In the puff-toadfish, the toxic principle (a thermostable alkaloid stated by some to resemble muscarine and by others to exert a physiological action resembling that of curare) apparently exists chiefly in the ovaries and testes. Eating the roe of this species is followed by serious illness (ciguatera) in a few minutes and

death may ensue in a few hours. The easily recognizable features of the species include a large head, the absence of scales, and the presence of numerous small spines on the body. It is a good rule to abstain from eating any fish which has no scales. The sting ray possesses a barbed spine in its whiplike tail which is capable of inflicting serious wounds that are slow to heal. Contact with some species of jellyfish produces a painful dermatitis.

6. PLANTS. The vegetation of the islands consists mainly of shrubs. Woody Island is well covered with trees (species not stated). A few palm trees are recorded from Duncan and Pattle Islands. Mangrove trees (Rhizophora spp. (?)) grow in Drummond, Pattle, and Tree Islands. It is said that species of ash (Fraxinus spp.) are found in some of the islands. The cleared areas of Pattle Island are grassed over with elephant grass (*Pennisetum purpureum* (?)) and "Filao" grass. Some of the floras of Money, Duncan, Drummond, Robert, Pattle, and Lincoln Islands have been recorded; those of medical interest are listed in table II.

7. FOOD IN RELATION TO HEALTH. Little information is available regarding food cultivation in the archipelago. Some of the islands have fertile soil, and prior to 1933 Japanese guano workers kept vegetable gardens. Coconuts and pineapples are reported to grow in Woody Island. The Annamese police kept a few sheep and goats in Robert Island to supply meat for personnel stationed there and in Pattle Island. It is said that most of the food supply of the Paracels always has had to be imported. The waters of the archipelago abound in edible marine life such as clams, crabs, fish, sea cucumbers, sea turtles, shrimp, snails, and squid. Fleets of fishing junks, from Hainan and Taiwan (Formosa) particularly, fish these waters regularly. Turtles, as large as 3 or 4 feet in diameter and weighing up to 100 pounds, are hunted in the spring months. Clams are gathered mostly during the autumn and winter. Turtles and clams are found in all the islands. Sea cucumbers (Cucumaria species) are particularly common around Duncan Island.

Many varieties of birds are found in the islands. Those which have been recorded include terns (*Anoüs stolidus pileatus*, *Sterna bergii cristata*, *S. fuscata infuscata*, *S. sumatrana sumatrana*), pelicans (*Sula leucogaster plotus*, *S. sula rubripes*), the frigate bird (*Fregata minor minor*), and (from Woody Island) a small terrestrial species, *Zosterops simplex*.

No data have been found concerning malnutrition or deficiency diseases among individuals living in the islands. Prior to the French occupation of the islands in 1938, there was no permanent population in the archipelago.

Section III

MEDICAL FACILITIES

8. GENERAL. It is reported that the Annamese police garrison in Woody Island had a wooden sick quarters equipped with an operating table. Two Annamese physicians were assigned to the archipelago in 1940, one in Pattle Island and one in Woody Island, to serve the needs of the police stationed there. Other than those mentioned above, there were no hospital facilities, medical personnel, laboratories, or welfare organizations in the archipelago in 1939. Existing buildings in the islands (suitability for occupancy by occidentals unknown) were reported in early 1940 as follows: Robert Island had houses for accommodation of about 50 people and 1 large godown (storage warehouse) 300 by 200 feet in dimensions; Pattle Island had a concrete godown in course of construction, a cement blockhouse police station, and a small village of thatched huts; Woody Island had several large godowns, a cement blockhouse police station, and 3 small bungalows. In 1933, the following description was given of buildings in Woody Island. "On the southwest corner of the island there is the office of the manager [of the Japanese phosphate mining company] 63 by 18 feet. Behind this is a storage room 66 by 24 feet. At the left of the office is a shop 24 by 12 feet. On the left of the shop there are 2 dormitories for the workers, each 90 by 15 feet. In front of the dormitories there is a worker's dining room 48 by 15 feet. In front of the shop is a kitchen 30 by 18 feet. Besides this there is a kitchen with a stove, 24 by 12 feet. On the left of the storage room there is a screened house probably for chickens or hawks. On the right there is a warehouse 228 by 48 feet, inside which there were still about 1,500 tons of

phosphate deposits." In early 1940 it was reported that Rocky Island had two native huts and West Sand had a temporary native hut. Pattle and Woody Islands each had a wireless telegraph station but the source of their power is not reported. The present (1945) status of buildings and equipment is unknown.

Section IV

VITAL STATISTICS

9. GENERAL. An unknown (but presumably small) number of Japanese from Taiwan (Formosa) and the Ryukyu Islands lived in Woody Island from 1919 to 1928, having acquired exclusive fishing rights and a monopoly for the exploitation of guano deposits. Hainanese and Formosan fishermen often live ashore during the spring turtle hunting season and the winter fishing season. From 1928 until the French occupation in 1938, the Paracels had no permanent population. A report of the situation in 1939 lists 6 to 8 Annamese police living in Robert Island, a total of 93 police and coolies from French Indochina in Pattle Island, while in Woody Island there were 41 Annamese (police, coolies, etc.), and 181 Japanese and Formosan coolies employed by the Japanese phosphate company. The other islands were uninhabited in 1939. No information is available regarding the presence of women and children in the islands. No morbidity or mortality statistics have been found. The population of the Paracels at the present time (1945) is unknown.

Section V

DISEASE INFORMATION

10. GENERAL. It is stated that a typhus epidemic occurred in Woody Island in 1938 and 1939. However, no details are given. The island is reported to have an enormous rat population and it is to be presumed that rat fleas are common. The occurrence of other diseases can only be surmised since available reports fail to mention them. Although flies have not been reported from the archipelago, their presence is not unlikely and intestinal disorders arising from ingestion of food contaminated by flies probably occur. Insect-borne diseases such as malaria, dengue fever, filariasis, plague, and relapsing fever may have been introduced into the islands at one time or another; but their propagation depends upon the presence of the necessary insect vectors. It is known that Japanese guano workers have lived in the islands for some years and in 1939 the population of the islands was reported to number some 320 Annamese, Japanese, and Formosans, mostly of the coolie class. It is to be presumed that diseases usually prevalent among such people in their homelands have been brought to the islands. Such diseases probably include (in addition to those listed above) dysentery, helminthiasis, and tuberculosis.

The monthly mean temperature in Woody Island (probably representative of the Paracel archipelago) is reported to vary between approximately 75° to 90° F., with readings between 70° and 80° in December, January, and February and between 80° and 90° during April to September, inclusive. The atmosphere is humid and the heat oppressive. Under such circumstances it is not unlikely that occidentals will exhibit heat reactions during the summer months, unless adequate precautions are taken to prevent them. Tinea infections, athlete's foot, and other mild skin diseases in a tropical climate such as that prevailing in the Paracels, tend to become acute. Abrasions and lacerations may result from more or less violent contact with the rough coral sands or rocks and easily may become secondarily infected.

Section VI

SUMMARY AND RECOMMENDATIONS

11. SUMMARY. Prior to the French Indochinese occupation of some of the Paracel islands in 1938, there was no permanent population anywhere in the archipelago. Two Annamese physicians were assigned to care for the French Indochinese police force in 1940, one being stationed in each of Pattle and Woody Islands. The police garrison in Woody Island had a wooden sick quarters equipped with an operating table. Other than the personnel and facilities just mentioned, there are no organized health or medical facilities reported in the islands. Well water, either brackish or of unknown quality, is available in a few of the is-

lands. The methods of waste disposal used in the islands are unknown. Rats are plentiful. Vegetation in the islands includes 35 known species of 20 families of plants, some of which possibly may be poisonous. Some of the islands have fertile soil and vegetable gardens have been cultivated in the past. The waters of the archipelago abound in edible seafood. However, the majority of foodstuffs needed must be imported.

The chief medical problems which will confront a military force operating in the islands will be concerned with water supply, disposal of human excreta and other wastes, control of rodents (in Woody Island), and prevention of heat reactions. The only diseases are those that have been brought in by Japanese workers or the Annamese garrisons.

12. RECOMMENDATIONS. The following recommendations are for personnel operating in the Paracel Islands, and are intended to supplement the general sanitary precautions ordinarily in force in all areas.

a. Water. Because of the low elevation of the islands, such ground water as is available or may be obtained by digging shallow wells can be expected to be brackish. Water from such wells and sea water must be distilled to furnish drinking water. The installation of facilities for rain water catchment will be desirable. If such means are insufficient to furnish adequate amounts of drinking water, a supply must be brought in by boat from time to time. In the latter case, adequate storage facilities must be provided. All water supplies from whatever source must receive adequate treatment.

b. Waste disposal. Provision must be made for sanitary disposal of human excreta, garbage, and other wastes.

c. Food supply. All foods must be imported. The storage, handling, and preparation of food should be done in such a way as to protect it from possible contamination by flies. In Woody Island, and possibly in other islands, food must be protected from rodents. Vegetables may be cultivated in some of the islands throughout the year, and edible forms of marine life (fish, turtles, clams) may be used to augment the food supply.

d. Control of rodents. All temporary, semipermanent, and permanent buildings should be of ratproof construction, and a rat-control program should be enforced in Woody Island. Precautions should be taken to prevent the transportation of rodents from Woody Island to ratfree islands. Native buildings, habitations, and warehouses in Woody Island should be considered as harboring rats and their vermin, and therefore unfit for living quarters or offices without preliminary sanitation.

e. Control of typhus. Complete equipment for delousing clothing, bedding, etc., and facilities for disinfestation of personnel should be available for all components of a force contemplated for this region. Vaccination against typhus fever is mandatory, and such immunizations should be complete prior to departure for the archipelago. Stocks of vaccine for stimulating doses will be required at the end of 4 to 6 months. Although mite-borne (scrub) typhus has not been recorded, medical personnel should keep in mind the possibility of its occurrence and should take proper precautions to guard against mites.

f. Control of flies. Because of the importance of flies in the spread of intestinal diseases, comprehensive fly-control measures must be instituted upon arrival and unremittingly carried out.

g. Control of mosquitoes. Although no specific information about the presence or absence of mosquitoes is available, troops for this area should be fully provided with facilities for mosquito control and for protection against mosquitoes.

h. Control of heat reactions. Control measures should include:

(1) Clothing should be loose, and shoes should not fit too tightly. Sun helmets should be worn by troops when exposed to direct sunlight for any length of time.

(2) Frequent rest periods of adequate length should be provided, when practicable, for troops who must work in the sun, especially during the heat of the day.

(3) Diet should include liberal amounts of cooked fruits and vegetables, if possible. Only light meals should be eaten during the heat of the day.

(4) Liberal amounts of water should be provided so that water will be available to satisfy maximum requirements. Troops should be encouraged to drink water as often as dictated by

thirst. The daily amount required per individual varies from ½ gallon for the resting individual up to 3 gallons for one doing manual labor throughout the day.

(5) Additional salt will be required to provide for that lost in perspiration. A 1/10 percent solution is suitable for drinking purposes and can be prepared by adding 1 pound of table salt to 100 gallons of water, by adding 0.3 pound to a 36-gallon Lyster bag, or by adding ¼ teaspoonful of table salt or two 10-grain salt tablets to each canteen of water.

(6) A water station and heatstroke center should be established to give aid and emergency care for threatened heatstroke cases.

(7) Troops should be instructed in the early warning signs of heatstroke and heat exhaustion (headache, giddiness, dry skin, nausea, fever or a subnormal temperature, abdominal cramps, or muscular cramps), and the necessity for complete rest and medical care in the event these signs and symptoms appear.

i. First-aid treatment of wounds. Serious infections may result from minor wounds in a tropical climate. All personnel should be made aware of the necessity for giving prompt first-aid treatment to all wounds, burns abrasions, and the like, no matter how trivial they may appear. Any skin infection must be given prompt attention.

Table I. Location, elevation, and area of named places in the Paracel Archipelago

Name	Latitude north	Longitude east	Height in feet	Estimated area in acres [1]
Herald Bank	15°42′ to 15°45′	112°12′ to 112°15′	------	----------
Triton Island	15°46′55″ to 15°47′30″	111°11′20″ to 111°12′15″	10	395
Bombay Reef	16°00′35″ to 16°04′35″	112°26′45″ to 112°35′30″	------	----------
Passu Keah	16°02′00″ to 16°04′53″	111°44′00″ to 111°49′45″	------	49
Discovery Reef	16°09′52″ to 16°16′30″	111°32′30″ to 111°48′30″	------	----------
Bremen Bank	16°15′32″ to 16°21′55″	112°22′10″ to 112°34′45″	------	----------
Jehangire Bank (SE)	16°18′45″ to 16°21′15″	112°39′32″ to 112°42′15″	------	----------
Jehangire Bank (SW)	16°19′45″ to 16°20′25″	112°37′40″ to 112°39′00″	------	----------
Jehangire Bank (N)	16°22′35″ to 16°24′45″	112°38′00″ to 112°40′44″	------	----------
Vulladore Reef	16°19′20″ to 16°22′29″	111°57′30″ to 112°04′30″	------	----------
Crescent Group	16°26′30″ to 16°35′45″	111°29′20″ to 111°44′44″	------	----------
Antelope Reef	16°26′30″ to 16°29′30″	111°33′45″ to 111°35′45″	------	----------
Money Island	16°26′37″ to 16°26′52″	111°29′20″ to 111°30′00″	24	74
Duncan Island (E)	16°26′47″ to 16°27′14″	111°42′30″ to 111°43′00″	16	(49) (107)
Duncan Island (W)	16°27′02″ to 16°27′16″	111°41′55″ to 111°42′13″	------	12
Drummond Island	16°27′45″ to 16°28′20″	111°44′17″ to 111°44′44″	------	(74) (99)
Robert Island	16°30′15″ to 16°30′30″	111°34′30″ to 111°34′47″	31	(37) (49)
Pat le Island	16°32′00″ to 16°32′35″	111°35′45″ to 111°36′16″	35	99
Observation Bank	16°34′00″ to 16°35′45″	111°41′22″ to 111°43′14″	------	7
Neptuna Banks (W)	16°29′00″ to 16°29′45″	112°29′40″ to 112°30′40″	------	----------
Neptuna Banks (E)	16°30′56″ to 16°31′45″	112°32′10″ to 112°33′20″	------	----------
Pyramid Rock	16°34′31″ to 16°34′42″	112°38′25″ to 112°38′43″	19	----------
Lincoln Island	16°39′29″ to 16°40′36″	112°43′19″ to 112°44′29″	63	(370) (783)
Amphitrite Group	16°45′00″ to 16°58′50″	112°11′50″ to 112°20′40″	------	----------
Iltis Bank	16°45′00″ to 16°47′33″	112°11′50″ to 112°14′16″	------	----------
Woody Island	16°49′45″ to 16°50′30″	112°19′18″ to 112°20′28″	39	(345) (371) (382)
Rocky Island	16°50′30″ to 16°50′45″	112°20′28″ to 112°20′32″	59	17
South Sand	16°55′31″ to 16°55′50″	112°20′12″ to 112°20′40″	------	37
South Island	16°56′31″ to 16°56′56″	112°19′30″ to 112°19′50″	------	49
Middle Island	16°57′07″ to 16°57′27″	112°18′45″ to 112°19′02″	------	24
North Island	16°57′40″ to 16°57′55″	112°18′00″ to 112°18′37″	------	49
West Sand	16°58′25″ to 16°58′50″	112°11′59″ to 112°12′17″	------	74
Tree Island	16°58′40″ to 16°58′50″	112°15′52″ to 112°16′13″	------	(24) (49)
Dido Bank	16°48′37″ to 16°49′10″	112°53′08″ to 112°53′45″	------	----------
North Reef	17°04′00″ to 17°07′25″	111°26′50″ to 111°33′42″	12	----------

[1] Areas are calculated from planimetric measurements. Figures in parentheses are estimates obtained from differing reports. The area o. Lincoln Island appears on U. S. Hydrographic Office map No. 2785 to be less than that o. Woody Island, and Triton Island appears to be smaller than either Woody or Lincoln.

Table II. Plants of medical interest reported from the Paracel Islands

Family	Species	Remarks
Amaranthaceae	Achyranthes aspera	Saponin in root, leaf, stem.
	Achyranthes bidentata	Saponin in root, leaf, stem.
Euphorbiaceae	Euphorbia pilulifera	Australian snake-weed.
Gramineae	Enarthria sp	Pollen producing.
	Rottboellia sp	Pollen producing.
	Stenotaphrum dimidiatum	Pollen producing.
Guttiferae	Callophyllum inophyllum	Saponin in exudate.
Leguminosae	Abrus precatorius	Abrin in seed coat.
Oxalidaceae	Oxalis corniculata	Oxalate in herb.

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[AG 300.5 (20 Mar 45)]

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TB MED 151

WAR DEPARTMENT TECHNICAL BULLETIN

SURGICAL MANAGEMENT OF THERMAL BURNS

War Department, Washington 25, D. C. • • • March 1945

This bulletin rescinds S. G. O. Circular Letter No. 161, 1943

This bulletin follows TB MED 150, "Medical and Sanitary Data on Sakhalin." Distribution given TB MED 150 was as follows: AAF (2); AGF (2); ASF (2); Dept (Med Lab) (1); Def Comd (3); S Div ASF (1); Tech Sv (Tng D) (1); SvC (Surg) (3); SvC (Tng D) (1); SvC (Med Lab) (1); AAF Sta (ZI) (1); PE (1); PE (Surg) (1); PE (Intell O) (1); GH (ZI) (1); RH (ZI) (1); SH (ZI) (1); Med Sv Sch for O (1); Med Techn Sch (1); ASF Unit Tng C (3); Med Lab (1); A (3); A (Med Lab) (1); CHQ (3); D (3).

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1. PURPOSE. Basic surgical principles in the management of burns have been supplemented by improved methods for the management of the seriously wounded. The function of plastic surgery requires definition in terms of reparative surgery and reconstructive surgery.

2. GENERAL CONSIDERATIONS. The treatment of burns by minimal débridement, pressure dressings, and plasma resuscitation is recommended as standard procedure. Tannic acid and other escharotics have been abandoned and are not to be used.

a. The principle of infrequent dressings should be followed. A properly applied initial dressing may be left in place for 10 to 14 days. The period following immediately upon resuscitation is concerned with the treatment of impending infection and the correction of the systemic disturbances incident to the injury. There is increasing clinical recognition of the later consequences of protracted initial anoxemia. It is still considered by some that a true toxemia may exist in the early stages of a severe burn but the "toxin" in the damaged tissue remains unidentified. Fluid, protein, and sodium loss with progressive anemia characterize the immediate convalescence. Compensatory redistribution of body fluids is most active during the first week after injury.

b. Water and sodium replacement is accomplished more safely by the oral route. The intravenous infusion of saline solutions may enhance the leakage of fluid and intravascular protein into the burned area. This risk is greater in the presence of depressed renal function. Pulmonary damage from the inhalation of hot or irritant fumes is another contraindication to vigorous intravenous therapy.

c. The progressive anemia and negative protein balance are most effectively anticipated by repeated transfusions of whole blood and a high dietary intake of protein and carbohydrate. There is increasing evidence of an expanded blood volume and poor tolerance for large or rapid infusions of blood, plasma, or fluid during the third to sixth day after extensive burning. Plasma infusions do not supply needed red blood cells and are of limited value

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in meeting the large protein demand. The value of plasma is restricted chiefly to the correction of the immediately post-traumatic hemoconcentration. The subsequent demand is for red blood cells (up to 300 cc whole blood per day) and two to four times the usual daily requirement of protein. Prompt consideration of these metabolic demands is of importance to wound healing and preparation of the patient for early skin grafting.

d. Penicillin is the chemotherapeutic agent of choice in the treatment of impending or established invasive infection in burns. The drug should be continued until the wounds are healed by epithelialization or skin grafting. Systemic penicillin therapy is directed; local penicillin therapy is not recommended. The sulfonamides have been abandoned in the treatment of burns, especially because of renal complications.

e. The removal of tissues destroyed by the burn is postponed of necessity until demarcation is apparent, usually 10 to 14 days. Surgical excision of sloughing tissue is preferable to proteolytic (Dakin's solution) or macerating (saline) dressings. Frequent dressings of granulating surfaces invite wound suppuration due especially to *Ps. pyocyanea* or *B. proteus*. The preferred method of management combines systemic penicillin therapy, surgical removal of devitalized tissue remnants, and the application of dry (not petrolatum) fine mesh gauze with pressure dressings, followed by skin grafting 3 to 5 days later.

f. It has been demonstrated that excessively high environmental temperature is poorly tolerated by patients with extensive burns. Tropical installations should anticipate the need for controlled temperature rooms.

g. Venous thrombosis and pulmonary infarction are recognized complications of serious burns.

3. EMERGENCY TREATMENT. Contamination of burned surfaces with organisms from the nose and throat is responsible for some of the more serious infections which develop subsequently. Masking of attendants to minimize contamination from this source should be done whenever practical.

a. The burned surface will be covered with a single layer of sterile fine mesh gauze (44-mesh gauze bandage is satisfactory), either dry or impregnated with petrolatum. Over this should be added a thick layer of sterile gauze dressing, the large or small first-aid dressings being especially suitable for this purpose. Finally, a gauze or muslin bandage should be applied firmly over all.

b. Pain from an extensive burn can ordinarily be relieved by ¼ grain of morphine. It is important to distinguish between the restlessness of pain and that of anoxia. Larger doses of morphine are dangerous in the presence of anoxia. If no syringe is at hand, morphine gr ¼ may be placed under the tongue until dissolved.

c. The prompt administration of plasma, when feasible, constitutes an important element in the emergency treatment of burns.

4. INITIAL SURGICAL MANAGEMENT.

a. Resuscitation. Anticipant or preventive therapy is preferable to corrective treatment for hemoconcentration or shock. The initial phase of resuscitation is accomplished with plasma. In the presence of extensive burns, quantities of plasma up to 12 units may be required in the first 24 hours.

(1) *Amount of plasma.* Adequate plasma administration is essential. Treatment is instituted upon clinical indications. Laboratory determination of the hematocrit percentage is a useful guide to subsequent dosage A rough rule is to give 100 cc of plasma for every point the hematocrit is above the normal of 45 percent. Restoration of a normal hematocrit is an acceptable objective in plasma therapy but should not outweigh general clinical considerations.

(2) *Blood transfusions.* Red blood cell destruction may accompany severe burns. In such instances, the serum is discolored by hemolysis but the latent anemia is obscured by the hemoconcentration. Plasma remains the agent of choice for treatment of impending or established shock and for correction of the initial hemoconcentration. Blood transfusions are desirable in the later stages of resuscitation, especially if there is evidence of red blood cell destruction.

(3) *Fluid infusions.* Parenteral fluid replacement other than that attained by plasma

or whole blood transfusions should be accomplished by the administration of 5 percent glucose in sterile distilled water. The intravenous infusion of sodium chloride solution should be reserved for those cases with established renal function and mineral depletion such as may occur with persistent vomiting.

b. Relief of pain. It is important to distinguish between pain and anoxia as a source of restlessness, anxiety, and apprehension. Asphyxia or carbon monoxide poisoning may be a complication of burns received in buildings or closed vehicles. Damage to pulmonary epithelium from hot or noxious fumes may produce pulmonary edema early or after a delay of several hours. Anoxia from these sources is not infrequent.

(1) *Morphine* in ¼-grain dosage should relieve pain. The intravenous injection of ⅙- or ⅛-grain doses may be indicated if peripheral circulatory failure precludes effective absorption from an intramuscular or subcutaneous injection. Larger doses of morphine may be dangerous in the presence of anoxia.

(2) *Barbiturates*, preferably nembutal sodium in 1 grain dosage intravenously, are effective sedatives to allay the anxiety and restlessness of anoxia. It should be remembered that sensitivity to these agents is increased during shock. Pentothal, if needed, should be used in analgesic rather than anesthetic dosage.

(3) *Paraldehyde* is contraindicated because it is a pulmonary irritant excreted by volatilization.

(4) *Oxygen therapy* is indicated during resuscitation and for the treatment of anoxia. The positive pressure mask is contraindicated in the administration of oxygen for anoxia resulting from pulmonary edema due to the inhalation of irritant gases.

c. Treatment of burned area. Local treatment of the burned area should be accomplished with strict asepsis and operating room facilities.

(1) *Minimal débridement.* If the burned surface appears clean, no further cleansing should be done. Small blisters should not be disturbed, but larger ones may be punctured or aspirated without removal of the epidermis. Loose shreds of epidermis should be removed. If the burned surface is grossly soiled, the area and the surrounding skin for a considerable distance should be carefully and gently cleansed using cotton or gauze, neutral soap, and water. Green soap and brushes will not be used. Too vigorous cleansing increases plasma loss and may precipitate circulatory failure. *General anesthesia should be avoided.* (See *b* above). Evidence of irreparable damage to the deeper layers of the skin may not be apparent for several days, and excision in such cases should be done subsequently as a secondary procedure.

(2) *Pressure dressing.* The burned surface is covered with a single layer of dry or petrolatum fine mesh gauze so as to favor absorption of excessive wound exudate. Over this should be added a thick, smooth layer of gauze and cotton waste. In the case of an extremity, this should surround the entire limb. The dressing is secured by a firmly applied stockinette roller or elastic bandage. Immobilization of the part by splinting should be effected when feasible. Portions of an extremity distal to the burn should be incorporated within the pressure dressing. The margin of safety between effective pressure and excessive compression is relatively small. The tips of the toes or fingers should be available for periodic inspection for several hours after the bandage has been applied. The principle of infrequent dressings is especially desirable in the treatment of burns. In the majority of cases it will be practical to leave the dressing in place for 10 to 14 days.

(3) *The treatment of impending infection.* Extensive fluid loss and depressed renal function increase the risk of renal complications from sulfonamide therapy. Penicillin is the drug of choice in the treatment of burns.

(*a*) *Penicillin* is to be administered by the *systemic route* as 25,000 units every 3 hours intramuscularly. In addition, 25,000 units should be given intravenously at the time of the first intramuscular dose. Persistent shock warrants continued intravenous therapy to insure absorption.

(*b*) The *local application* of sulfonamides, penicillin, or other antibacterial agents is *not approved.*

(*c*) Prophylaxis against *tetanus* is recommended for all deep burns.

(*d*) Repeated dressings are to be avoided. In general, secondary dressings of unhealed burns are done to excise the late slough of deep burns or to apply skin grafts. These procedures properly belong to the reparative phase of surgical management.

5. REPARATIVE SURGICAL MANAGEMENT. The reparative phase of burn management is concerned with the removal of hopelessly devitalized tissue and the early application of skin grafts. It seeks to prevent excessive scarring and contractures, but is not concerned primarily with the ultimate cosmetic result.

a. Replacement therapy is undertaken as soon as resuscitation is assured. Correction of fluid balance, whole blood transfusions, and increased dietary protein are part of this program (see par. 2*b* and *c*). The copper sulfate method of estimating the hematocrit, hemoglobin, and plasma protein concentration has proven satisfactory as a standard laboratory procedure. Diagnosis of hypoproteinemia on the basis of lowered plasma protein concentration demands preliminary correction of anemia. As a simple clinical index, it may be estimated that 500 cc of whole blood are necessary to increase the hematocrit by 3 points or the hemoglobin concentration by 0.9 gram. It should be remembered that hematocrit values are not indicative of blood volume. A normal or increased blood volume occurs frequently during the phase of convalescence after burns. For this reason, the volume of whole blood administered during any 24-hour period should never exceed 1,000 cc when the hematocrit is less than 40 percent, or 500 cc when the hematocrit is 40 percent or above. A practical objective of therapy is the establishment of an hematocrit of 40 percent and a plasma protein concentration of 6.5 grams percent. Repeated transfusions of 500 cc of whole blood to maintain hematocrit values throughout convalescence are better than larger transfusions given as immediate preparation for skin grafting. The minimal acceptable daily intake of protein is 125 grams, and effort should be directed toward dietary increase.

b. Removal of deep burn slough (see par. 2*e*). The patient with extensive deep burns will tolerate frequent short operative procedures better than a single prolonged operation. Excision of burn slough is undertaken at 10 to 14 days, or when demarcation is evident. If the involved area of deep burn is small, it may be excised and grafted at the same procedure. The excision of larger areas may be associated with considerable blood loss and this should be anticipated with coincident transfusion of whole blood. Significant bleeding at the time of excision of slough is in itself an indication to postpone skin grafting. An interval of 3 to 5 days between excision of slough and skin grafting permits more accurate restoration of hemoglobin values. The best evidence of an adequately prepared wound is its "clean" surgical appearance 3 to 5 days after excision of the slough. Skin grafting will be done commonly as a staged procedure at this interval.

c. Skin grafting. Systemic penicillin therapy is maintained. Granulating surfaces are prepared for skin grafting by excision of slough and the application of dry fine mesh gauze under pressure dressings (see par. 1*e*) for 3 to 5 days. Split, or Thiersch, grafts are recommended. "Stamp" grafts are acceptable when used to cover an irregular contour. "Pinpoint," "pinch," or Reverdin grafts are condemned. More complicated grafts, such as full thickness or pedicle, should not be undertaken as part of the program of reparative surgery. It is expected that all areas injured by deep burns will be covered by skin graft at the end of the fourth week after injury.

d. Early active motion of epithelialized extremities is to be encouraged. Prolonged immobilization is not usually necessary and contributes to protracted disability.

6. RECONSTRUCTIVE SURGICAL MANAGEMENT. Complete skin grafting should be done early, even though it be recognized that a more formal plastic operation will be required later. Operative procedures *to improve function* or *for cosmetic effects* are the responsibility of special centers for plastic surgery.

[AG 300.5 (14 Mar 45)]

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TB MED 150

WAR DEPARTMENT TECHNICAL BULLETIN

MEDICAL AND SANITARY DATA ON SAKHALIN

War Department, Washington 25, D. C. • • • March 1945

This bulletin follows TB MED 149, subject, "Descriptive List of Drugs and Chemicals in Far East CAD Units." Distribution given TB MED 149 was as follows: AAF (5); AGF (5); ASF (2); S Div ASF (1).

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Section I

PUBLIC HEALTH AND ENVIRONMENTAL FACTORS INFLUENCING HEALTH AND SANITATION

1. PUBLIC HEALTH DEPARTMENT. a. Organization. Sakhalin constitutes an oblast or state within the krai or territory of Khabarovsk (Khabarovskiy Kray), which is one of the component units of the Russian Soviet Federated Socialist Republic (R. S. F. S. R.). The R. S. F. S. R. is, in turn, a component part of the Soviet Union (U. S. S. R.). Khabarovsk Kray has its administrative center at Khabarovsk and comprises the following four oblasts or states: Amur, Nizhniy-Amur, Sakhalin, and Kamchatka; it also includes the Jewish Autonomous Oblast of Birobidzhan.

Sakhalin Oblast was organized on 20 October 1932 to include 5 raions* or regions, 2 urban districts, 3 workers' settlements, and 34 village soviets. The raions are as follows: Vostochno-Sakhalinskiy, Kirovsky, Okhinskiy, Rybnovskiy, and Shirokopadskiy. The urban districts are Aleksandrovsk-Sakhalinskiy and Okha, and the workers' settlements are Due, Mgachi, and Oktyabrskiy. The entire Sakhalin Oblast had an area of 40,700 square kilometers and a population of 90,000 in 1936.

According to the constitution adopted in 1936, the supreme health agency of the U. S. S. R. is the People's Commissariat of Health.

*A raion corresponds to a county in the United States.

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AGO 315A—Mar. 622801°—45——1

This agency is composed of a People's Commissar of Health (who is a member of the cabinet or Soviet of People's Commissars) and a group of 33 departments representing various branches of medical practice and medical administration. Each republic or autonomous state in the Soviet Union, for example, the R. S. F. S. R., has a national health commissariat, which consists of a commissar and a group of committees.

The Territorial Health Department of Khabarovsk is headed by a Director, who is appointed by the Territorial Soviet of Workers' Deputies, subject to confirmation by the People's Commissar of Health of the R. S. F. S. R. In addition, there is a sanitation service independent of but cooperating with the Health Department and headed by a Chief Sanitary Inspector, appointed by the Chief of the Sanitation Division of the Health Department of the Republic (R. S. F. S. R.) who in turn is directly responsible to the Chief Health Officer of the U. S. S. R.

The Territorial Health Department is subordinate to the Territorial Soviet of Workers' Deputies and to the People's Commissariat of Health of the R. S. F. S. R. It consists of special sections, including inspectorate, epidemiological section, building section, and statistical section. The chief of each section is appointed by the Director, with the approval of the People's Commissar of Health of the R. S. F. S. R.

The duties of the Khabarovsk Territorial Health Department include:

(*a*) Supervision of urban and rural health departments.

(*b*) Establishment of feldsher (surgeons' assistants), feldsher-midwife, and midwife aid stations in villages.

(*c*) Administration and construction of hospitals, clinics, milk stations, and health resorts.

(*d*) Control of environmental hygiene.

(*e*) Control of communicable disease.

(*f*) Supervision of medical practice, medical teaching, and medical research.

(*g*) Recording of vital statistics.

(*h*) Formulation of a general health plan for the territory.

The Sakhalin Oblast Health Department is subordinate to the Territorial Health Department and consists of special sections including inspectorate, epidemiological section, building section, and construction section. The chief of each section is appointed by the Director, with the approval of the chief health officer of the Khabarovsk Krai, with the approval of the People's Commissar of Health of the R S. F. S. R.

The duties of the Sakhalin Oblast Health Department include:

(*a*) Supervision of urban and rural health departments.

(*b*) Establishment of feldsher, feldsher-midwife, and midwife aid stations in villages.

(*c*) Administration and construction of hospitals, clinics, and milk stations.

(*d*) Control of environmental hygiene.

(*e*) Control of communicable disease.

(*f*) Supervision of medical practice.

(*g*) Recording of vital statistics.

(*h*) Formulation of a general health plan for the oblast.

The central sanitary authority of the oblast of Sakhalin is the State Sanitary Inspector, who is a physician trained in public health. This official is appointed by the Chief Sanitary Inspector of the R. S. F. S. R. and is aided by an assistant sanitary inspector. The sanitary authority of the oblast controls all medical and sanitary affairs in the municipal and rural districts into which the oblast is divided. These districts are administered by municipal and rural sanitary inspectors and their respective staffs. All sanitary regulations are promulgated through the Executive Committees of the City or Rural Soviets of Workers' Deputies and are published in "Sovetskiy Sakhalin," a daily newspaper.

The rural sanitary inspectors are responsible for public health administration in their respective districts. Their duties include supervision of rural dispensaries and disinfection stations. They also supervise the so-called feldsher and feldsher-midwife stations. Feldshers are trained assistants who are employed because of the scarcity of fully qualified physicians. Their education is discussed in section II.

Both the rural districts and the municipal districts are equipped with so-called sanitary-epidemiological stations. These stations have, theoretically, a standard organization, but many modifications are made according to local

needs and facilities. These in Sakhalin obviously do not contain all the sections or personnel set forth below for an ideal station.

(*a*) The least elaborate of these stations include the following:

1. Bacteriological and sanitary laboratory.
2. Disinfection section.
3. Vaccination section.
4. Health education section.

(*b*) Larger stations may also include:—

1. Communicable disease section.
2. Malaria section.
3. Antirabies section.
4. Statistical section.

(*c*) A fully developed sanitary-epidemiological station is supposed to have the following personnel:

1. Medical officer in charge.
2. Administrative assistant.
3. Epidemiologist (physician).
4. Sanitation expert (physician)
5. Sanitation officer (feldsher).
6. Vaccinator.
7. Quinine dispenser.
8. Public health nurse.
9. Disinfection officer.
10. Disinfection instructor.
11. Laboratory personnel:
(a) Director of laboratory.
(b) Director of section or specialty.
(c) Medical laboratory officer.
(d) Laboratory technician.
(e) Laboratory assistant.
(f) Medical registrar.
12. Health educators:
(a) Director of health education.
(b) Instructor in health education.
13. Repair and maintenance:
(a) Director of repairs.
(b) Chief plumber.
14. Statisticians:
(a) Director of medical statistics.
(b) Senior medical statistician.
(c) Medical statistician.

(*d*) In maritime sanitation and quarantine stations this staff is supplemented by a rat exterminator. Each port has a quarantine station; the chief station is at Aleksandrovsk. The maritime quarantine regulations are given in appendix I.

Social insurance. An important factor in the health service of the country is the extensive health legislation. The majority of the people are wage earners employed by the state and collective farmers who sell their crops to the state. All money, therefore, goes from the state to the people and back to the state. In the course of production, surplus values are created which are controlled and distributed by the government through its various agencies. Part of this surplus serves to finance the health work of the nation. The health service is financed primarily through social insurance, which is administered by the trade unions.

In 1917, shortly after the revolution, the Soviet government issued a decree providing—

(*a*) Insurance for all wage earners without exception.

(*b*) Insurance against all forms of disability, including illness, injury, old age, maternity, widowhood, and unemployment.

(*c*) The total cost of the insurance to be borne by the employer.

(*d*) The insured to have full control of insurance agencies.

In 1922 social insurance was placed on a larger and more uniform scale and was made to include all persons working in state and cooperative enterprises and all domestic help.

Social insurance funds are raised exclusively by enterprises, institutions, or persons employing labor. The funds have a fixed proportion to the amount of wages, but under no conditions may the funds be deducted from wages. The rate varies according to the health hazards involved and ranged, immediately preceding the war, from 4 to 10.7 percent of the wage bill, the average for 1937 being 6.3 percent.

Social insurance in the Soviet Union includes medical care, benefits in case of temporary disability (sickness, accident, quarantine, pregnancy, childbirth), additional benefits for babies and funerals, unemployment benefits, invalids' pensions, and old-age pensions. Benefits extend not only to the workers but also to their dependents. In case of temporary disability, the injured person is paid his full wages from the first day, while piece workers receive an allocation amounting to the average earnings during the last 3 months of work. In case of permanent disability, the insured receives a pension ranging from 40 to 100 percent of his former wages, depending on the extent and cause of disability. Pensions are further pro-

vided for dependent persons who have lost their main source of support; such pensions amount to the full wages of the deceased. All insured persons are entitled to old-age pensions of 50 to 60 percent of their wages. Recipients of the pensions must have worked for not less than 25 years in the case of men, 20 years in the case of women.

In 1933 supervision of social insurance was taken over by the trade unions. The workers thus obtained full control of the funds administered by the social insurance delegates elected by their fellow workers in the unions. These delegates collect the dues and distribute the funds in accordance with the rules laid down by the central offices. The central insurance offices are also divisions of the trade unions and consist of elected representatives.

Medical service furnished the insured workers and their families is controlled by the Commissariats of Health of the various parts of the U. S. S. R. The trade unions pay the Commissariats of Health for medical services rendered from social insurance funds.

In rural communities, the farms are operated in common and are known as kolkhoz (collective farms). The products are sold to the state, and the money is distributed among the members. From 10 to 20 percent of this money is laid aside for improvements such as machinery, for the construction of dispensaries and nurseries, and for health work in general. As the collective farmers cannot carry the burden of dispensaries alone, the state contributes funds for health stations and personnel.

b. Scope and effectiveness. Until 1905 Sakhalin was a dreaded penal colony on the outer fringe of the Russian Empire. At the end of the Russo-Japanese War, by the treaty of Portsmouth, the part of the island south of 50° north latitude was ceded to Japan while northern Sakhalin remained Russian. In the course of the Civil War and the subsequent blockade, Japan invaded the northern part of Sakhalin and remained in occupation until 1925. During this period the Japanese carried away all available coal, oil, lumber, and valuable furs, and acquired many private concessions in return for whiskey. In 1925, when the Japanese were forced to evacuate northern Sakhalin, the total population consisted of about 14,000 nondescript inhabitants.

In coordination with the first, second, and third 5-year plans the government planned to increase the population by promoting industry and colonizing the area with skilled and professional workers. These were brought from the more densely populated areas of western Russia. Oil became the most important product, and the city of Okha developed as an industrial center. Coal mining was second in importance, the mines being located at Oktyabrskiy, Arkovo and Mgachi. Forestry, agriculture, and fishing progressed rapidly. New settlements were constructed. Regular communications with the mainland by steamer and airplane were opened, and airlines linked the chief industrial districts and fisheries. Numerous corduroy roads were built through the trackless taiga. A railway was built from Okha to Moskalvo and pipe lines were laid from Okha to the coast, where the oil is loaded on tankers and shipped to Khabarovsk. Educational facilities were developed and cultural bases established. These bases included schools, libraries, motion-picture theaters, public baths, and small, well-equipped hospitals staffed with physicians, feldshers, and nurses. Health lectures are given regularly and prophylactic programs are initiated. Dental and veterinary services have been made available, and airplane transportation of patients from isolated points has been arranged.

At the outset of this period of modern development the natives, who lodged in filthy huts or "chums," or in deerskin tents, did not own a single cow or horse. The Gilyaks of the coastal region presented a complex ethnological problem, one type approximating the Ainu, another the Tungus, while a third was distinct from both. Hunting, fishing, and trading were their chief occupations and, until a generation ago, they carried on a slave trade with the Ainu and Goldy tribes. They worshipped the bear, and had a bear cage near each of their villages. In conformity with ancient custom, they never washed and never used milk as food.

New model settlements for Gilyaks and Tungus were built at Viski, Yukovo, Vyakhtu, and Nogliki. The national minorities were assigned to two centers, which included the Eastern National and the Western National District. These districts were further subdivided into 14 national village soviets or communities.

In 1930 cultural centers equipped with hospitals and schools were opened at Nyyvinskiy Zaliv and at Viskovo. The Gilyak population increased from 1,967 persons in 1925 to 2,115 in 1935. The increased birth rate was accompanied by a general improvement in cultural level.

By 1935, Sakhalin had 89 schools with 14,000 pupils. All children from 8 to 12 years of age are compelled to attend school. Two normal schools, 104 libraries, 17 kindergartens, and 60 children's recreation centers were established. Whereas the 1914 budget for public health and education was only 61,800 rubles, the 1935 budget was 12,744,000 rubles.

In 1940, the last year for which data are available, the health budget for Khabarovsk Kray was 76,000,000 rubles. The total health budget of U. S. S. R. for 1936 was 6,214 809,000 rubles, and was derived from the following items:

Budget	Rubles
Social insurance	2, 300, 000, 000
Local and state	2, 442, 309, 000
Consolidated state	1, 472, 500, 000
Total	6, 214, 809, 000

Between 1936 and 1941 the budget was almost doubled:

Total health budget, U. S. S. R.

Year	Rubles
1933	2, 540, 000, 000
1936	6, 214, 809, 000
1938	9, 433, 000, 000
1940	9, 663, 000, 000
1941	11, 960, 000, 000

From these considerations it is evident that the Soviet government has made valiant efforts to cope with the sanitary problems of Khabarovsk Krai. All the medical reforms were based upon thoroughgoing economic reconstruction. The actual results of these changes cannot be measured at the present time, since adequate statistical reports are not available.

2. WATER. The annual average precipitation ranges from 18 inches at Verkhne-Mikhaylovskoye (Langr) to 28 inches at Aleksandrovsk. It is highest from July to October. Snow falls from October to April; snow cover is from 2 to 3 feet in the valleys and lowlands and as much as 7 feet in the mountains.

An abundant supply of water is generally available from streams which, in the mountains, are small but numerous and perennial. In the interior lowlands and coastal plains the streams are larger. Springs occur in the mountains and at the edge of terraces and most of them give potable water. In the lowlands the ground water usually is close to the surface. Artesian aquifers are said to exist in all the lowland areas.

Permafrost (permanently frozen ground) occurs in islands over most of the lowland parts and some mountain slopes but its distribution and thickness are highly variable. Where the lowland ground is peaty the permafrost is within a few feet of the surface. Water occurs beneath the permafrost and sometimes within it, usually under pressure.

Almost no information is at hand concerning existing water supplies. Settlements are said to use surface water and, to some extent, shallow wells. Aleksandrovsk was one of 14 municipalities in Russia where the work week on water supply and sewerage projects was increased to 60 hours in 1939. (The work week was increased to 54 hours on similar projects in 54 other Russian cities.) This indicates that there is a piped water supply in Aleksandrovsk. Mineral springs occur in a number of places, and health resorts have been established at some, including Aleksandrovsk, Mgachi, and Okha.

Water from mountain streams is generally clear—that from streams in lowland areas frequently is colored and that under the winter ice sometimes is stagnant and unpalatable. Spring water usually is mineralized and often is high in sulfates. Shallow wells near the coast may deliver salty water. Since sanitation usually is crude or primitive, all water is potentially or actually contaminated and must be treated appropriately before it can be considered safe for consumption, regardless of its source.

3. SEWAGE. No data are available concerning sanitation on this island. It probably is similar to that of the adjacent mainland coastal area and thus is generally crude or primitive. Sewerage systems are probably absent except perhaps at Aleksandrovsk.

Excreta probably are deposited in privies or on the ground, or thrown into the sea or a nearby stream. On the trail, in areas where sledge dogs are used, these animals act as scavengers and at least during the winter probably dispose of any human feces as well as of miscellaneous food refuse.

4. ANIMALS IMPORTANT TO MAN. a. Mosquitoes. (1) *Anopheles.* There are no available data as to the presence of anopheles mosquitoes in Sakhalin. A few cases of malaria are seen each year but these are believed not to be indigenous.

(2) *Aedes. Aedes esoënsis* and *A. galloisi* have been found in Sakhalin. *A. esoënsis* deposits its eggs in small, shallow, natural and artificial streams, in pockets of water along borders of pools where algae grow, and in swamps, ditches, and seepages in the presence of aquatic plants. The adults live among dense vegetation and in tall meadow grasses. Man is attacked during the day in the absence of wind. Adults are able to fly great distances. They enter houses, tents, and barracks, as well as animal shelters. This species is also found in hay fields and other open spaces far from human habitations.

The flight of the first generation of *A. esoënsis* begins late in May and early in June. The number of succeeding generations depends upon climatic conditions, since atmospheric moisture and rainfall are essential to development. Two to three generations are hatched during the season, the first generation being the most numerous. The maximum population is attained around the last of June or early July; a sharp decline occurs during the first half of August. *A. esoënsis* has been reported from Vladivostok, and throughout the surrounding district, and from Maikhe and Shkotovo, as well as from Sakhalin. It is known to be a vector of Japanese B encephalitis in the Khabarovsk and Primorskiy (Maritime) Krays.

A. galloisi is a common and troublesome day-biting species which breeds in temporary pools which have abundant surface vegetation and in water-filled cavities in birch and elm trees often together with the larvae of crane flies (Tipulidae). In China, Korea, and Japan this mosquito is considered one of many vectors of filariasis caused by *Wuchereria bancrofti.*

b. Flies. Black flies of the family Simuliidae are a dreadful scourge to man and animals. Great swarms occur in Sakhalin. They constitute a serious menace to colonization and to the raising of cattle and reindeer. The species known in Sakhalin are: *Prosimulium kamtschaticum, P. kamtschaticum irritans. Simulium subpusillum,* and *S. venustum kamtschaticum.* Frequently the bite is painless, but an itching ulcer-like sore appears ultimately. The females bite by day but do not enter houses. These gnats appear near forest streams. They rest on the under surfaces of leaves, near the ground.

Horseflies of the family Tabanidae are a nuisance because of their numbers and their biting. *Tabanus montanus* is especially noteworthy since it is a mechanical vector of anthrax in Sakhalin. Although tabanids are believed to transmit tularemia also, this disease has not been reported from Sakhalin. Other diseases transmitted by tabanids are theileriasis (*Trypanosoma theileri*, cattle), dourin (*T. equiperdum*, horses), and piroplasmosis (*Gonderia tarandi rangiferis*, reindeer). There are no reports of the occurrence of these diseases in Sakhalin. The species of Tabanidae known in Sakhalin are: *Tabanus angustipalpis, T. astur, T. borealis, T. distinguendus, T. fulvicornis, T. lapponicus, T. luridus, T. montanus, T. tarandinus, T. tropicus, Chrysops nigripes, C. makerovi, C. suavis,* and *Chrysozona sakhalinensis.* Midges of the family Ceratopogonidae are known for their vigorous biting. The genera Lasiohelea and Culicoides are found in this territory in great numbers, and the nuisance caused by them has been great enough to impede the development of many areas in the Far East. In some seasons agricultural work is brought to a standstill and even town dwellers are driven indoors until nightfall. The bites are irritating and produce nodular swellings which itch for days or weeks; vesiculation and scarring may ensue. The insects insinuate themselves beneath the clothing and bite most commonly at some point where their progress is impeded, such as around the hatband, at the belt line, or where the sleeves are closely rolled against the arms, or at the shoe tops.

The house-invading flies are the common housefly, *Musca domestica*, the lesser housefly, *Fannia canicularis*, the latrine fly, *F. scalaris*, and the manure flies, *Muscina stabulans* and *Musca autumnalis*. Because of the lack of sewage disposal facilities, houseflies constitute a great problem.

The stable fly, *Stomoxys calcitrans*, is an important source of annoyance to livestock, and a vector of anthrax and infectious anemia of horses. It is a vigorous bloodsucker, attacking cows, horses, pigs, dogs, and man.

Blowflies and flesh flies include: the bluebottles, *Calliphora vomitoria* and *C. erythrocephala*, the green-bottles, *Lucilia caesar* and *L. sericata*, and the flesh flies: *Sarcophaga haemorrhoidalis*, *Parasarcophaga scoparia*, *P. similis*, and *Billieria melanura*. The ova or larvae often are deposited in wounds and ulcers, in the vagina, and in the eyes, or may be ingested with meat. *Wohlfahrtia magnifica* frequently deposits its larvae in wounds or in the nasal fossae. The larvae of the blowfly, *Cynomyia nasalis*, occur in the nasal passages of reindeer and cause extensive tissue destruction. Larvae of the northern scavenger fly, *Protophormia terraenovae*, are found in wounds.

Horn flies, *Haematobia serrata* (*Lyperosia irritans*) cluster in great numbers at the base of the horns of cattle. As a cattle pest this fly has few if any equals. It is about 4 mm long and in appearance resembles Stomoxys. These flies appear early in spring and become more abundant in late summer and early fall. Both cattle and horses are attacked, especially the former. The damage occasioned by the horn fly is chiefly through annoyance which impairs feeding and digestion. This results in loss of flesh and reduction of milk in dairy animals.

The louse fly of deer, *Lipoptena cervi*, is common among deer and cattle and may infest man. Its blood-sucking results in severe anemia and exhaustion of cattle.

The forest fly, *Hippobosca equina*, is a common species in the country and is found on horses, cattle, and birds. These flies rarely attack man, but some of them act as vectors of blood protozoa of animals. *H. capensis* occurs on dogs, *H. maculata* and *H. rufipes* occur on cattle. The two latter species are capable of transmitting *Trypanosoma theileri* of cattle.

Botflies and warble flies are represented in Sakhalin by *Gasterophilus nasalis*, *G. intestinalis*, *G. haemorrhoidalis*, *Rhinoestrus purpureus* (the head maggot), *Hypoderma bovis* (the cattle grub), *H. lineata* and *Oedamagena tarandi* (the warble of reindeer). The last-named species is very common in Sakhalin and Kamchatka. It is more prevalent in the tundra belt than in the mountain ranges and the mountainous taiga regions. Deer of lighter color are afflicted. The roebuck maral and spotted deer are subject to invasion by the larva of the roebuck botfly, *Cephenomyia stimulator*, and the maral botflies, *C. rufibarbis* and *Pharyngomyia picta*. Rock deer and elk are invaded by the larva of *Cephenomyia ulrichi*, and the northern reindeer is a frequent victim of the larvae of *C. trompe*, which lodges in the nasal cavity and the accessory sinuses.

c. Lice. *Pediculus humanus capitis*, *P. humanus corporis*, and *Phthirus pubis* occur in Sakhalin.

d. Fleas. The following species of fleas have been found in Sakhalin:

Species of flea	Usual hosts
Amphipsylla vinogradovi	Field mouse, vole, ground squirrel.
Ceratophyllus advenarius	Field mouse.
C. anisus	Rat.
C. calcalifer	Rat.
C. fasciatus	Rat.
C. mongolicus	Pica, ground squirrel.
C. runatus	Vole.
C. tamias	Chipmunk.
C. tesquorum sungari	Ground squirrel, rat.
Ctenocephalides canis	Dog, fox.
C. felis	Cat, dog.
Ctenophthalmus congeneroides	Rat.
C. dahuricus	Chipmunk, field mouse.
Ctenophyllus hirticrus	Vole, ground squirrel.
Ctenopsylla segnis	Domestic mouse, field mouse, man.
Neopsylla acanthina	Chipmunk.
N. bidentatiformis	Field mouse, rat.
Pectonoctenus pectiniceps	Field mouse.

e. Other insects. Among the insects found in Sakhalin are the bedbug (*Cimex lectularius*) and cockroaches (*Blatella germanica*, *Periplaneta americana*, and *Periplaneta orientalis*).

f. Ticks and mites. *Ixodes ricinus*, the castor bean tick, is commonly found in the country, especially in the northern portion, and infests cattle, deer, and man. *Dermacentor variegatus*

kamchadalus, the Kamchatka tick, occurs in the taiga zone, on goats and sheep. *Dermacentor sylvarum*, the forest tick, differs from other ticks in its seasonal distribution. It is the first tick to mature in the spring. The larvae and adults attack small rodents such as the field mouse (*Apodemus speciosus* and *A. speciosus giliacus*), the red lemming (*Clethrionomys rufocanus*), the chipmunk (*Tamias asiaticus*), the hamster (*Cricetulus nestor triton*), the Far Eastern taiga rat (*Rattus norvegicus caraco*), the hare (*Lepus manchuricus*), the harvest mouse (*Micromys minutus*), and the squirrel (*Sciurus vulgaris rupestris* and *S. vulgaris fuscorubens*). Mature ticks live on larger animals, such as cattle, horses, spotted deer, elk, rabbits, foxes, dogs, wolves, and tigers. *Dermacentor sylvarum* is a widely distributed forest and taiga species reported to be most abundant in the zone of European and Asiatic U. S. S. R. at 55° north latitude. It is a vector of spring-summer encephalitis in Khabarovsk Krai. The fully engorged female drops from the host and in 6 to 21 days lays eggs on the ground during early spring. The process of oviposition takes up to 51 days. During this period from 3,000 to 8,000 eggs are laid. The incubation period during the spring is 24 to 25 days. The larvae remain on the soil or on low growing vegetation while awaiting a rodent host. The period of larval engorgement lasts from 4 to 5 days after which the larvae drop to the ground and molt 12 days later. The nymphs, having reached a new host, engorge in 6 to 7 days and once more drop to the ground and molt in 18 to 23 days. The adult ticks now attack dogs and other large animals, engorgement requiring 6 to 12 days. Mating takes place on the host. This tick is responsible for the transmission of equine piroplasmosis (*Babesia caballi*), a condition reported to have been widespread in the Far East in 1933 and 1934.

Trombidiidae of several undetermined varieties have been reported as causing annoyance to human beings and animals.

Sarcoptes scabiei, the itch mite, and *Demodex folliculorum*, the follicle mite, are common in man, deer, and cattle. *Demodex pseudaxisi*, a newly described species, affects cattle and deer, producing miliary acariasis, which may be fatal.

g. Snakes, lizards, and amphibians. (1) *Snakes.* The common viper, or adder, *Vipera berus* var. *sachalinensis* is the only poisonous snake in Sakhalin. It is found in marshy lands, sandy forest areas, and meadows, and inhabits deserted animal burrows or the ledges of crevices. It is nocturnal, warming itself in the sun in the daytime and going forth to prowl at night. It feeds on small rodents, shrews, moles, and small birds which nest on the ground. This viper swims well but does not enter the water of its own accord. During the second half of August and the month of September, 5 to 16 eggs are laid by the female, and the young are born shortly afterward. With the advent of cold weather they hibernate in rocky crevices or bases of old trees. Nikolskiy has described two subspecies of the Sakhalin viper. They are *Vipera berus* var. *sachalinensis sachalinensis*, the insular form, and *V. berus sachalinensis continentalis*, which is found on the continent of Asia, mainly along the Samarga, Botchi, and Koppi Rivers, at Sovetskaya Gavan and as far west as the Stanovoy Khrebet. The insular form is found at Sakhalin, near the coast at the latitude of 54°30′ north, and the Shantarskiye Ostrova. In the Tym River Valley in the neighborhood of Voskresenkoye the vipers were reported to be numerous, frequently crossing the highways. Western Sakhalin from Mys (Cape) Yelizavety southward as far as the settlement of Valuyevka is said to be free from vipers.

The island viper has a broad head, narrow neck, short and stumpy tail, and a short upper jaw which, with the fangs, is directed obliquely backward. The pupil is vertical and is separated from the labial shields by a single row of scales, with the body scales smooth. The continental form has a double row of scales between the eye and the labial shield, with the scales ribbed, seldom smooth. Both subspecies of this snake are dangerously poisonous, savage, and quick. When ready to strike they emit a peculiar hiss, and the fangs are brought into position. The strike often misses. Newly born vipers hiss and strike in the same manner as adults, and their bite is just as venomous. The vipers are drawn toward campfires, which often are used as decoys. Biting occurs in the woods,

fields, or on swampy ground, and is most often caused by the victim stepping on the snake.

(2) *Lizards.* The viviparous lizard *Lacerta vivipara* is found in Sakhalin at Due, Pilevo, Rybnovsk, and Aleksandrovsk. The area of distribution extends from Valuyevka to Muzma.

h. Fishes. The sting-ray, *Trygon acajei*, is common along the coast of Vladivostok. It is dangerous because its sharp fins and barbed tail cause jagged, irregular wounds, which often become infected. The lump fishes, *Uranoscopus japonicus*, *Tetraodon oblongus*, *T. vermicularis*, *T. ocellatus*, *T. houckenyi*, and *Canthigaster rivulatus*, are found in shallow water around the reefs of the Sea of Japan. They are venomous and responsible for more than 100 deaths yearly in Japan. Their dorsal fins have 12 strong sharp spines which are capable of discharging venom at the slightest provocation. Venom is also found in the ovaries and in the roe.

i. Rodents. The brown house rat, *Rattus norvegicus*, is the prevalent species. A subspecies, *R. norvegicus caraco*, is found along the coast. The black rat, *R. rattus rattus*, has been found at Vladivostok (1936), having come there mostly from Odessa and other ports. This rat may be found in all the harbors of the Pacific coast from Vladivostok to Petropavlovsk.

Other rodents which are of epidemiological importance because they may serve as intermediate hosts of fleas are: *Apodemus speciosus*, vole; *A. speciosus giliacus*, Sakhalin vole; *Clethrionomys rufocanus arsenjevi*, lemming; *C. rufocanus rufocanus; C. rutilus amurensis; Micromys minutus*, harvest mouse; *Mus musculus tomensis*, Siberian domestic mouse; *Pteromys volans athenae*, Sakhalin flying squirrel; *Sciurus vulgaris fuscorubens*, red squirrel; *S. vulgaris rupestris; Sicista caudata;* and *Tamias asiaticus orientalis*, burunduk or chipmunk.

Other mammals that are hosts to fleas are: *Lepus timidus gichiganus*, white hare; *Myotis daubentoni ussuriensis*, bat; *M. mystacinus gracilis; Ochotona hyperborea hyperborea*, pica; *Plecotus auritus sacrimontis*, long-eared bat; *Sorex minutus gracillimus*, shrew; *S. tscherskii tscherskii;* and *S. unguiculatus.*

j. Dangerous animals. Wolves are common in Sakhalin. Two species occur: the European wolf, *Canis lupus*, and the Far Eastern red wolf, *Cyon alpinus alpinus.* The brown bear, *Ursus arctos lasiotus*, is found in the taiga region, near the large rivers and their tributaries. The tiger is found occasionally in the taiga region and around the Gilyak settlements of northern Sakhalin. Two species are found. The Korean tiger, *Tigris tigris coreënsis*, is characterized by its medium size and short, dark fur with reddish tinge. The Amur tiger, *T. tigris longipilis*, is of tremendous size and light coloring. Its very long fur is especially prominent at the sides, where it forms a sort of mane.

5. FOOD IN RELATION TO HEALTH. Until recent years Sakhalin has not been self-supporting, except for the native tribes which rely on fish and game much as we rely on bread. The main occupation of the natives is fishing, hunting, and trapping. The Gilyaks are skillful in hunting bear for food and fur. The flesh of the musk deer is eaten and its skin is used for clothing. The roebuck stag, rock deer, and spotted deer are found in large numbers and are now raised on collective farms and on national reservations. Fish is abundant and varied, both in the rivers and the sea. The two main fishing seasons are spring and the middle of June. To feed their dogs, the natives bury large quantities of fish in pits and cover them with earth to be opened only in the winter. This is called "sour-fish." Although it is intended for dogs, this fish is eaten by the natives during periods of famine. Most of the natives have never tasted salt. Another popular form of meat is the flesh of seals, which is divided into chunks of 30 to 40 kilograms and kept underground until it reaches a semiputrescent state, when it is consumed with great relish. In the winter, meat and fresh fish are eaten either raw or frozen. As a result of health campaigns, there is a growing tendency to cook all food in the summer. The settled and nomad natives have a high protein diet consisting chiefly of venison. Reindeer breeding is more profitable than fishing and there is now a movement toward this occupation among the maritime natives.

Because of the consumption of raw or partly cooked fish and meat, gastrointestinal diseases are very common, especially tapeworm infections. *Dibothriocephalus latus*, *Taenia saginata*, and *Ascaris lumbricoides* are the most common helminths and infect about one-half to one-

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third of the people, both natives and Russians. Because of the migration of seasonal workers to this territory, other forms of helminthiasis are becoming more common. Fishermen coming from Vladivostok and the Ussuri Territories, a large portion of whom are Chinese and Koreans, are often infected with ancylostomes and with such trematodes as *Troglotrema salmincola*, *Clonorchis sinensis*, *Metagonimus yokogawai*, *Paragonimus ringeri*, *Paragonimus westermani*, and *Schistosoma japonicum*.

The agricultural program was initiated in 1927 during the first 5-year plan. At this time the first state collective farm was organized. By 1934 there were 13 collective farms, equipped with tractors, threshing machines, potato diggers, and other implements. These farms specialized in grain, feed, certified cattle, hogs, and dairy products. Deer raising was undertaken. In 1934 over 78 percent of the deer farms were socialized. In addition to these organizations, there were 15 state farms, 3 municipal farms, and 6 model farms operated by the Sakhalin Complex Agricultural Experiment Station.

In connection with the development of the third 5-year plan, in which heavy industry was emphasized, the agricultural development of this territory became a matter of paramount importance. It was intended that the area become self-supporting. Agriculture and grain growing had never been attempted in Sakhalin prior to 1925. By 1936 there were over 6,100 hectares under cultivation. Of these, 3,100 hectares were devoted to winter crops including 2,800 hectares for oats, 200 hectares for barley, and 100 hectares for rye. Two thousand six hundred hectares were used for garden crops, including 2,000 hectares for potatoes and 600 hectares for various garden vegetables. Sakhalin Oblast, which had imported most of its foodstuffs before the war, has done much to create its own sources of supply. Industrial enterprises in the most important towns have now established their own farms nearby. New producers' cooperatives have been organized. The food industry has developed, as have the state and collective farms. Imports into Sakhalin are already sharply cut. All branches of industry have increased their production since the outbreak of the war. As the natives of the Far Eastern provinces rallied to the defense of their country a tremendous upward revision of plans for agriculture in Soviet Territory had to take place because of the loss of huge areas of farm land to the enemy in the West. Thus the acreage sown to winter wheat in Khabarovsk Krai, of which Sakhalin forms a component unit, was three times as large in the autumn of 1941 as in 1940. In 1942 there were even greater increases, evidently for the purpose of converting the Far East, which had imported grain until 2 years earlier, into a grain-exporting region. The agricultural independence of Khabarovsk Krai is of particular importance because the territory occupies an exposed position.

Successful trials with soy beans and sugar beets, and the need to compensate for the large territories that had been lost when the Ukraine was overrun, led to large-scale plantings in 1942. Tobacco, flax, buckwheat, and pumpkins were planted in Sakhalin for the first time in 1942. State-owned farms turned in 60 percent more potatoes and 120 percent more vegetables in 1941 than during the preceding year. Hemp, flax, and millet were grown successfully in 1941, contrary to the belief that these crops could not be raised under local conditions of climate and soil. In addition to increased plantings by farmers, home gardening by city people on plots secured for them by their employing syndicates increased greatly. Enterprising industrial executives everywhere utilized their prerogatives and the willing assistance of the trade unions to organize full-scale farming enterprises for the purpose of guaranteeing an unbroken supply of vegetables, meat, and milk to the personnel of their plants. Every mine and petroleum plant in Sakhalin had its own farm in 1942 and the total acreage sown was three to four times as large as that of the preceding year.

The center of agriculture in Sakhalin is in the Rykov district, in and around Derbinskoye, in the valley of the Tym and Poronaia Rivers and in the neighborhood of the Uda River. New areas are constantly being cleared of forest and rotation of crops has been instituted.

In 1939, Khabarovsk Krai possessed more domestic animals in proportion to the population than many other states of the Soviet Union. There were 59,700 horses, 166,100 cattle, 111,000 hogs, and 37,700 sheep and goats. The number of these in Sakhalin is not known. During the war these stocks have increased. Reindeer

raising has been undertaken on a large scale in Sakhalin with the establishment of a state deer reservation supplemented by four collective deer ranches. These ranches, operated by the natives under state veterinary supervision, have improved the breed and increased the number of the deer. Rock deer, spotted deer, musk deer, and maral also are raised. Model livestock and dairy farms specialize in certified cattle and dairy products. The state dairy farms, located at Krasnaya Tym in the very center of Sakhalin, are stocked with cattle of good quality and produce their own fodder. Enough vegetables are obtained in Sakhalin to provide a properly balanced diet and to prevent deficiency diseases. The chief shortcoming has been an insufficiency of acreage devoted to industrial crops. Strenuous efforts are being made to eliminate this weakness.

Until the development of the agricultural program, fishing was carried on chiefly as a subsistence measure. In 1937 the Azov and Black Sea fisheries, until recently lost to the U. S. S. R., accounted for 19 percent of the Soviet catch. The Far Eastern fisheries consequently have been called upon to make good the bulk of that loss in addition to supplying their normal output of 30 percent of the catch in all seas. During the first four months of 1942 the catch in the Sea of Japan was twice that during the same period of the preceding year. For the first time in their history all the coastal canneries were kept in operation during the winter months. The 1941 whaling season brought in an all-time record catch. Shirokaya Pad is the fishing center on Sakhalin, Vereshchagino has another important fishing syndicate, and many other fisheries are scattered along the coast of the Sea of Okhotsk and the Gulf of Tartary. Originally the fish were caught directly off shore in primitive nets, and the local fishermen were unaware of the fact that the largest shoals of fish passed by at considerable distances from the coast, and at some depth. This fact was revealed by the work of the Pacific Fisheries Institute and helped to increase the catch. In 1933 the state fisheries and collectives supplied the state with 137,300 tons of fish. In 1934 the catch was doubled. Salmon, herring, crabs, and seals are caught. The fishing collectives own a fleet of steam and motor vessels for deep-sea fishing. The fish is canned or salted in the island canneries equipped with modern American machinery. Fishing boats are manufactured here by the Kungasstroy, which supplies 20- and 60-ton kungases or boats not only for Sakhalin but also for Kamchatka and the entire northern shore of the mainland.

Section II

MEDICAL FACILITIES

6. HOSPITALS. In 1914 there were no hospital facilities in Sakhalin. In 1928 public health regulations called for the establishment of rural maternity homes with two or three beds each, in all Siberian and Far Eastern villages. Rural hospitals with 10 to 20 or more beds have been opened. Most of the rural hospitals are located in raion administrative centers, which are comparable to the county seats in the United States. There is at least one hospital in each raion. At the end of the second 5-year plan in 1937 there were 18 hospitals and 595 hospital beds in Sakhalin. No information is available as to the third 5-year plan in Sakhalin but it is known that from 1937 to 1942 it was intended that the number of hospitals in Khabarovsk Kray, of which Sakhalin is a component oblast, was to increase by 44 percent, and the number of beds by 72 percent. The number of maternity beds was to increase by 500 percent, and children's homes and nursery cribs by 125 percent. In the cities and towns 36 percent of the hospitals had from 20 to 50 beds, 31 percent had from 6 to 20 beds, and 18 percent had 50 to 100 beds. In the rural districts and in workers' settlements, 71 percent of the hospitals had from 6 to 20 beds, 16 percent had from 1 to 5 beds, and 13 percent had from 21 to 50 beds. Surgical beds occupied 20 percent of total hospital capacity in the cities and towns, and 3 percent in the rural districts. Obstetrical beds constituted 19 percent of the total in the urban hospitals and 12 percent in the rural hospitals. Internal medicine and tuberculosis occupied 18 percent of the urban and 3 percent of the rural hospital beds. In the rural districts 77 percent were classified as general hospital beds and were assigned to medical, surgical, and obstetrical patients, depending on the needs. Gynecological beds formed 6 percent of the total in

city hospitals and 0.3 percent in rural hospitals. Genito-urinary and dermatological specialties were served by 1.8 percent of the total beds in the towns but were not available in the rural districts. Physiotherapy wards held about 3 percent of the city hospital beds.

In 1937 Aleksandrovsk had a well equipped hospital with departments of internal medicine, neurology, psychiatry, otolaryngology, gynecology, hydrotherapy, pharmacy, roentgenology, and clinical laboratories. A training school for nurses was affiliated with this hospital. Additional facilities at Aleksandrovsk included two polyclinics for out-patients, a physiotherapeutic institute, a children's consultation center, a hospital for contagious diseases, maternity homes, crèches, and a sanitary-bacteriologic laboratory.

Other hospital facilities are located at the most populated towns and in the various rural medical districts. In 1937 there were general hospitals at Okha, Moskalvo, Mgachi, Nogliki, Viskovo, Derbinskoye, Rykov, Rybnovsk, Agnevo, Shirokaya Pad, Vereshchagino, Vyakhtu, and Yukovo, and industrial hospitals at the workers' settlements of Due, Mgachi, Oktyabrskiy, and Arkovo.

The hospitals in the cities and towns are of sufficient size and well equipped. In the smaller hospitals and nursing homes the laboratory and X-ray equipment was limited. A new pharmaceutical industry has been developed at Vladivostok in recent years and the supply of drugs and surgical goods is apparently adequate. In 1935 the Khabarovsk Psychiatric Hospital had a capacity of 757 patients. It was affiliated with a farm colony 18 kilometers from Khabarovsk. This farm of 135 hectares had facilities for occupational therapy, and accommodated 50 patients. During the second and part of the third 5-year plans the number of psychiatric beds in the Soviet Union was increased by almost 100 percent.

7. MEDICAL PRACTITIONERS. a. Physicians. The number of practitioners in Sakhalin has increased greatly in recent years. In 1914 there were only two physicians in the entire Sakhalin Oblast. In 1937 there were 88 physicians on the island. This corresponds to 1 physician to 1,136 inhabitants and compares favorably with the general rate in the Khabarovsk Krai of 1 physician to 1,311 inhabitants (1936). The medical personnel on the island included administrative and health officials, in addition to an unspecified number of experts who specialized in nutrition, housing, industrial hygiene, school hygiene, epidemiology, and other branches of preventive medicine. Medical officers were assigned to quarantine stations at the ports of the maritime service on Sakhalin. Of the physicians in Khabarovsk Krai, 23 percent specialized in industrial medicine, 13 percent in surgery, and 10 percent in hygiene and public health, while 11 percent were general practitioners. Women formed 55 percent of the urban and 60 percent of the rural medical personnel in 1937.

Soviet physicians complete a 5-year medical course after graduating from a secondary school. The U. S. S. R. medical schools or institutes, of which there were only 13 in 1917, now number over 60. They are directed by the Commissariats of Health. The course is divided into three branches: general medicine, public health, and pediatrics. The student is at liberty to elect any one of the three. Social sciences are given a large part in the curriculum. Students of specialties receive specialized instruction in their last year only. At the completion of the course, a state examination must be passed before the graduate is permitted to practice. Subsequently he is sent to practice for 3 years in a rural district selected according to local needs. He is usually assigned to a rural medical station as assistant to an experienced physician. The best students are frequently sent to distant regions such as Siberia, Sakhalin, and Kamchatka. They are given a basic initial salary of 275 rubles per month. In addition, all medical workers receive a 20 percent bonus for working in the Far Eastern Territory. Thus the total monthly salary of a physician is 330 rubles. In the Far North the bonus is 50 percent, making a total of 412.50 rubles per month during the first year. This wage is augmented by 10 percent each year. During their assignment to rural districts, they are provided with quarters with heat and light, rent free, a vacation of 30 days each year, and postgraduate courses at government expense without loss of salary, plus a living allowance. All physicians are in government employ, although private practice is permitted.

The medical school in Khabarovsk Krai is located at Khabarovsk. The Khabarovsk Medical Institute was founded in 1930, and had 720 students in 1939. Its library had 46,000 volumes. Well equipped laboratories, clinical facilities, and several dormitories were provided for the student body.

b. Dentists. No information is available as to the number of dentists in Sakhalin. It is known, however, that there was a total of 123 dentists in Khabarovsk Krai in 1937 and that these figures have been increasing steadily. It is assumed that some of the increase has been allotted to Sakhalin. Two categories are distinguished, dental surgeons and practical dentists. Today, dentists are trained in 5-year courses at the Stomatological Institutes, which may or may not be attached to medical schools. Dentists of the second category are trained in 3-year courses following graduation from a secondary school. Postgraduate courses are offered regularly to dentists just as to physicians.

Dentistry plays an important part in Soviet medicine, and there is no medical center that does not have its dental department. Dentists are trained in the 52 dental schools of the Soviet Union, while the Stomatological Institutes are for those who desire more comprehensive instruction. The graduates of the Stomatological Institutes have the base pay of physicians, while the graduates of 3-year courses at dental schools receive an initial salary of 225 rubles per month. There were 55 dental dispensaries and clinics in the cities and towns of the Khabarovsk Krai, and 41 rural dental dispensaries in 1937. The only dental school in the Far East in 1937 was located at Vladivostok. Dental treatment is included among health insurance benefits.

c. Nurses. Successful efforts have been made to interest native girls in the nursing profession. Nurses receive a 2-year course following graduation from a secondary school. There are 648 training schools for nurses in U. S. S. R. The Aleksandrovsk City Hospital has a 2-year course. Other nurses' training schools of the Far Eastern Territory are located at Vladivostok, Spassk-Dalniy, Iman, Artem, Blagoveshchensk, Khabarovsk, Bikin, Nikolayevsk, Voroshilov-Ussuriyskiy, Komsomolsk, Birobidzhan, and Petropavlovsk on Kamchatka. There were 1,187 trained nurses in the Khabarovsk Krai and the Primorskiy (Maritime) Krai in 1937. A trained nurse is given an initial monthly salary of 135 rubles in a rural district and 150 rubles in cities. There is no information available as to the number of nurses in Sakhalin.

d. Feldshers. In 1928 there were 18 feldshers working in Sakhalin. By 1937 these were increased to 185. The position of feldsher, both male and female (feldsheritsa), is a typical Russian institution. The word "feldsher" is of German origin and literally means "field-barber." The feldshers are the successors of the early barber-surgeons. During the nineteenth century most European armies replaced their feldshers with surgeons of academic training, but Russia, owing to its size and lack of trained physicians and surgeons, continued the system. Feldshers practice not only in the army but also among civilians.

The special functions of the feldshers were to assist physicians, carry out their instructions, practice minor surgery, vaccinate, and fight epidemics. Soon after the Revolution it was recognized that the country needed more feldshers and needed them quickly, especially in the rural districts. Feldsher schools were therefore increased from 59 in 1929 to 258 in 1939. A 3-year course is given, based upon graduation from a secondary school. In 1937, there were 44,770 students enrolled in these schools. The feldsher is trained in communicable diseases, minor surgery and obstetrics, public health, and hygiene. His monthly salary commences at 160 rubles.

The feldshers and feldsher-midwives do as much medical and obstetrical work as can be done by competent persons incompletely trained in medicine. They render first aid, perform minor operations, assist in major operations, make home visits, engage in preventive medicine, and, in general, endeavor to make up for the numerical deficiency of physicians. The system was inherited from the old imperial administration and was evidently designed as a semipermanent makeshift. In Sakhalin the greatest part of the therapeutic and preventive burden is carried by feldshers and feldsher-midwives.

There were no feldsher schools in Sakhalin in 1937. The feldsher schools in Khabarovsk

Krai were located at Blagoveshchensk, Birobidzhan, and Petropavlovsk in Kamchatka. In the Primorskiy (Maritime) Krai a feldsher school was located at Vladivostok.

e. Midwives. Midwives are of great importance in rural districts. They are usually attached to the staff of the feldsher-midwife station in the country and hold prenatal clinics, deliver parturient women, and follow each case. They assist in health education campaigns and hold classes in hygiene. Their main duty is to prevent the death of infants. No statistics are available as to the number of midwives in Sakhalin.

The course in midwifery covers a period of 2 years and is given in midwifery schools, of which there were 316 in the U. S. S. R. in 1939. There are no midwifery schools in Sakhalin. There are four schools in the Far Eastern Territory (Vladivostok, Blagoveshchensk, Khabarovsk, and Voroshilov). The initial salary of a rural midwife is 160 rubles per month.

f. Pharmacists. There is no available information as to the number of pharmacists in the Far Eastern Territory in 1937. The pharmacies are all state-controlled. Soviet pharmacists receive a satisfactory 3- to 4-year course, and are encouraged to undertake further study at government expense. Higher degrees are granted at the pharmaceutical institutes. The only pharmacy school of the Khabarovsk and Maritime Krais is located at Vladivostok. Pharmacists draw a monthly salary of 150 rubles and work 6½ days a week.

g. Veterinary surgeons. In 1929 the Khabarovsk and Maritime Krais had 42 well-equipped veterinary hospitals and a personnel of more than 300 veterinarians, veterinary feldshers, and other assistants. Later information is not available. As cattle raising has been encouraged in the past 10 years and national reservations for game and fur-bearing animals have been established, there is good reason to suppose that these industries are adequately provided with veterinary care. The Veterinary Institute of the Far Eastern Territory is located at Vladivostok. There are also state institutes for veterinary research and animal husbandry at Khabarovsk and Blagoveshchensk. Government veterinary hospitals are located at all administrative centers. The veterinary courses are 5 years in duration, the first 4½ years being devoted to laboratory and clinical studies and the last 6 months to original investigation. Obligatory testing of horses for glanders is carried out routinely. All cattle in U. S. S. R. are tested for tuberculosis and undulant fever. The tuberculin tests in cattle were positive in 7.2 percent in 1928. In 1931 the rate was sharply reduced to 2.4 percent. There has been a steady decline of bovine tuberculosis, as a result of vigorous veterinary health campaigns. All animals with clinical manifestations of tuberculosis and undulant fever are slaughtered.

8. SOCIAL SERVICES. During the period in which the official public health administration was built up in Sakhalin, several large volunteer health organizations were founded. These organizations have been of great importance in territorial health and welfare.

a. Trades and Professional Union Health Organizations elect chairmen and deputies of local committees to supervise the enforcement of health regulations at the factories, workers' homes, dormitories, restaurants, and public baths. These committees also arrange special lectures and informal talks on general hygiene and public health, given during lunch periods and attended by the workers and their wives. The committees provide training in community sanitary inspection, disinfection, and health education, and are entrusted with the organizing of industrial health and sanitary brigades, the members of which are trained after regular working hours.

b. The Red Cross and Red Crescent Society is a member of the International Red Cross. Its work consists of establishing Red Cross sanitary posts in many communities for the maintenance of general cleanliness; organization of Red Cross sanitary brigades for the enforcement of public health regulations through public lectures, meetings, and conferences in close cooperation with the administration and trade-union authorities; and the establishment of local branches of the Red Cross and Red Crescent. Red Cross stations assist in carrying out large-scale sanitary measures. Sanitary welfare work at homes, dormitories, barracks, cafeterias, clubs, children's homes and crèches, lodging houses, railway stations, seaports, and harbors is aided by local branches of the Red Cross.

Throughout the U. S. S. R. this organization has been active in disaster relief, health education. first aid, and the training of nurses' aides and health instructors. Included in its activities is a program for medical care of foreign sailors in Soviet ports. Other activities of the Red Cross include organized competition among the personnel of various food syndicates, and forming of health clubs for food handlers. The Red Cross trains disinfectors, mess managers, and barbers. It is empowered by the state to organize volunteer sanitary details, platoons, and brigades in emergencies. School children and children's "Pioneer" organizations (boy and girl scouts) are enrolled in the Red Cross as junior members and receive practical training.

c. The Society for the Study of Aviation and Chemistry, better known by the abbreviated name Osoaviakhim, is an organization with numerous local branches, whose members are trained in disinfection, insect and rodent control, and chemical warfare. They participate in public health campaigns, educate the community in the dangers and control of insects and rodents, organize disinfection stations for the chemical treatment of infested and contaminated clothing, and organize volunteer groups in workers' dormitories, barracks, lodging houses, and collective farms. Special details of experienced volunteer members are available.

d. Consumers' Cooperative Organizations have voluntary committees, which supervise sanitary conditions in warehouses, stores, and shops. Health campaigns are organized in the food and trade cooperatives by recruiting volunteer brigades of workers in each cooperative syndicate.

e. Rural, Village, and Collective Farm Health Committees are voluntary associations of village inhabitants, including the medical and teaching personnel, members of the Red Cross and Osoaviakhim Societies, industrial health crews, and a member of the workers' committee (who serves as chairman of the group) with two elected associate members. Their function is to cooperate with the medical authorities in all matters of public health and sanitation. The committee of three meets twice a month; the entire group meets once a month, at which time the committee reports to the group on health and sanitary matters.

Section III

DISEASE INFORMATION

9. DISEASES OF SPECIAL MILITARY IMPORTANCE. a. Dysentery. Dysentery has always been prevalent in the Far Eastern Territory. There were 3,991 cases reported in 1927. In 1928 there were only 42 reported cases of dysentery in Sakhalin, and 27 cases were reported during the first months of 1929. Later statistics are not available for Sakhalin, but 7 years later the general statistics for Khabarovsk Krai, Primorskiy (Maritime) Krai showed a sharp reduction of the disease, only 852 cases being reported in 1936. These figures obviously do not give the true incidence of dysentery infections, owing to the large number of mild cases that probably escape recognition. Bacillary dysentery in Khabarovsk Krai is usually caused by the Flexner type of bacillus (84 percent) and the Hiss-Strong type (8 percent). The outbreaks of dysentery reach their peak in July, but last through August and September. Studies of the age distribution of dysentery show the main incidence to be in children up to the age of 3 years. In a survey of 3,762 healthy children in the nurseries, a total of 151 children had positive cultures of dysentery organisms, of which 148 belonged to the Hiss and Flexner types and 3 to the Shiga type.

b. Venereal diseases. Syphilis and gonorrhea have been common among the aborigines of Sakhalin. Chancroid is rare. Thus, in 1915, 410 cases of syphilis and 202 cases of gonorrhea were reported on the island among a total population of 10,000 to 12,000. By 1928 a sharp reduction of venereal disease was noted, with 94 cases of syphilis, 70 cases of gonorrhea, and 2 cases of chancroid. Lymphogranuloma venereum was not reported. The control of venereal disease is one of the main functions of the public health authorities of the oblast. Free treatment is provided. All hospitals have beds for venereal diseases. There are numerous dispensaries and feldsher stations for ambulatory patients. A very careful check is kept of all patients and thorough treatment is given.

10. DISEASES OF POTENTIAL MILITARY IMPORTANCE. a. Cholera. Cholera may be introduced from Korea, China, and Mongolia,

and other endemic areas. The last outbreak of cholera in the Far East was reported in 1902, and affected 149 inhabited localities. The disease was brought from China to Vladivostok by ship and spread along the Amur Railroad to Khabarovsk, Nikol'sk-Ussuriiskiy, Blagoveshchensk, and Irkutsk. Although a total of 2,167 cases of cholera with 1,393 deaths were reported at the time, there were no reported cases on Sakhalin then or since.

b. Plague. Plague has never been reported from Sakhalin, and there have been no reported outbreaks of plague in U. S. S. R. since 1929. The possible introduction of the disease from the neighboring countries should not be forgotten. Plague may be introduced from the Lake Baykal region, from Manchuria, or the Primorskiy Krai, where it is mainly confined to the tarbagans (*Arctomys bobac*) and several other species of rodents. The tarbagan, when contracting plague in the autumn, may harbor the bacteria during hibernation. In the ensuing spring the infectivity may be renewed and an epizootic may start. Man is imperiled when he enters regions inhabited by the rodents and is bitten by their fleas.

c. Typhus fever. There were only two cases of typhus reported in 1915. Further information is not available, but there is no indication of the presence of the disease in Sakhalin. Since 1933 there has been a gradual decline of typhus in Khabarovsk Krai, and in 1936 only 46 cases were reported in the Far Eastern Territory, including the Chita and Zeya regions, which are no longer part of the Khabarovsk and Maritime Krais. The migration of the workers to Sakhalin and the presence of many refugees from the former occupied territories has not caused a reappearance of typhus because of very thorough physical and sanitary inspection of colonists during and immediately prior to arrival.

d. Respiratory infections. No information is available as to the incidence of upper respiratory infections in Sakhalin. The common cold, sinusitis, laryngitis, pharyngitis, and upper respiratory infections are common through the area. Influenza and pneumonia are frequent. Influenza epidemics have had a particular predilection for the native population.

e. Japanese B encephalitis. Although Japanese B encephalitis has not been specifically reported on Sakhalin, it is present in the Maritime Krai, and the possibility of its introduction from the mainland should be borne in mind. Suitable mosquito vectors exist.

11. SERIOUS DISEASES NOT OF MILITARY IMPORTANCE BUT LIKELY TO AFFECT SMALL NUMBERS OF TROOPS. a. Typhoid fever. Sporadic cases of typhoid fever have been reported on Sakhalin. In 1915 a total of 14 cases was mentioned and during the first 2 months of 1929 only one case was discovered. The sporadic cases occur during April and May, and other cases may follow because of flies, and especially because of the general disregard of sanitation among the natives. Flies appear in June and increase rapidly in July and August, perishing with the advent of the first frosts in early September. Sporadic cases are attributed to carriers. With the rapid growth of colonization and industry there may be an increase in typhoid fever because of the arrival of carriers to the island. The control of typhoid fever in the U. S. S. R. is aided by the Epidemiology Section of the People's Commissariat of Health under the regulation of 6 December 1940. According to this regulation, the following classes of persons are required to receive prophylactic vaccinations for typhoid fever, paratyphoid fever, and tetanus: railroad and navigation employees, police and convoy troops, all students in technical secondary schools, workers and managers of defense industries, employees in construction, excavation, and repair of highways, employees in the peat and turf industries, and employees of the water supply and sanitation systems. The regulation also prescribes the standards for the vaccines.

b. Paratyphoid fever. Paratyphoid fever is not uncommon in Khabarovsk Krai. Sporadic cases of paratyphoid B fever are reported in Sakhalin.

c. Acute gastroenteritis. Acute gastroenteritis due to *Staphylococcus aureus* has been reported from Khabarovsk Krai. The disease has been spread by dairy products, custard, and pastries. Contaminated milk was found to have been derived from cows afflicted with mastitis.

Salmonella infections, due to *Salmonella breslau* and *S. suipestifer*, have been reported.

12. DISEASES CAUSING HIGH MORBIDITY OR MORTALITY RATES AMONG NATIVE PEOPLE. a. Trachoma. This disease was common among the Gilyaks, Tungus, and Oroks, with 142 cases reported in 1915 and 20 cases in 1928. More recent information is not available.

b. Tuberculosis. This disease has long been a serious problem among the natives of Sakhalin. Although few statistics are available, those that exist indicate that the tuberculosis rates are high. In 1914, 157 cases of all forms of tuberculosis were reported in Sakhalin, representing a morbidity rate of 1,500 per 100,000 population. This rate was reduced to 890 per 100,000 in 1928. During the same year 7,784 cases of tuberculosis were reported from the Far Eastern Territory, of which Sakhalin was a component unit. This represented a reported morbidity rate of 430 cases per 100,000 population in 1928, as against 530 cases in 1913 in the Far Eastern Territory. These statistics suggest a very high tuberculosis death rate. This is borne out by the statement from other sources that in the Far Eastern regions the tuberculosis mortality rate was 140 per 100,000 population in 1942 as compared with 350 in 1913. It is thus apparent that tuberculosis is many times more common than in the United States, and probably constitutes the major health problem in this area, as well as in Kamchatka. It is claimed that the unfavorable climatic conditions of Sakhalin aggravate quiescent tuberculous lesions. The incidence of tuberculous infection among the Tungus was surveyed in 1937. In 306 natives the von Pirquet test was positive in 57 percent and negative in 43 percent. The sensitivity at various ages is shown in the following table.

Results of von Pirquet reactions—age distribution study of 306 Tungus

Age groups	Number tested	Positive	Percent positive
0 to 3 years	48	14	29. 1
4 to 7 years	46	30	65. 2
8 to 12 years	33	17	51. 5
13 to 16 years	28	19	67. 8
17 to 25 years	59	31	51. 0
25 years and over	92	63	68. 4
Total	306	174	56. 7

The clinical forms of tuberculosis included pulmonary tuberculosis, tuberculous adenopathies, and occasional instances of bone tuberculosis.

Recently the government of the U. S. S. R. has adopted a number of important control measures, including widespread prophylaxis, further improvement of medical care, research into new and more effective methods of treatment, and the provision of improved diets for patients. The number of tuberculosis dispensaries, hospitals, and sanatoria for adults and children has been increased during the past 2 years. One of the most important preventive measures is the routine examination of all the personnel of industrial enterprises, factories, and offices. The dispensaries, which are the organizational centers of the antituberculosis drive, keep a permanent record of all tuberculosis contacts and check up from time to time or their state of health.

Great attention is paid to tuberculosis among children. In addition to such routine measures as regular medical examination of school children, sanitary inspections of cafeterias, summer camps, and sanatoria, prophylactic inoculation with BCG vaccine is being widely employed. In 1943 more than 115,000 children were inoculated in U. S. S. R.. In 1944 inoculation of older children and adolescents was begun. The extension of this method of prophylaxis has been aided by the use of new methods for the preservation of vaccine.

c. Helminthiasis. Various types of worm infection are common among the natives of Sakhalin, among Russian colonists, and among seasonal workers in the fisheries. The high incidence of helminthiasis is attributable partly to importation by Japanese, Chinese, Koreans, and Mongols, and partly to the widespread consumption of inadequately cooked meat, fish, mollusks, and crustaceans. Careful studies of the types occurring in Sakhalin are lacking, but detailed studies have been made around Vladivostok, the coast of China, Japan, and Korea. As so many of the seasonal workers come from these areas, one may safely assume that many of the helminths parasitic in man in these areas will also be found in Sakhalin, though obviously some of those requiring an intermediate host may not become established. Those found

around the areas noted and, therefore, possibly to be found in Sakhalin, include the following:

(1) *Cestodes* (tapeworms). *Diphyllobothrium latum*, the fish tapeworm, is the cestode most often encountered. Between 33 and 50 percent of the natives and approximately 25 percent of other population groups are infected. Other cestodes which may be found among itinerant workers who visit Sakhalin during the fishing season include: *Diphyllobothrium minus* (Cholodkowsky, 1916), *D. strictum* (Talyzin, 1932), *D. tungussicum* (Podjapolskaia, Gnedina, 1932), *D. giliacicum* (Rutkevich, 1937), and *D. luxi* (Rutkevich, 1937). The last two are newly described species found among the native Gilyak population on the west coast of Sakhalin.

D. minus and *D. strictum* are common in Eastern Siberia, especially in the Lake Olkhon district of the Buryat-Mongolian Republic. *D. tungussicum* is found near the lower Tunguzka and Lena Rivers. *D. mansoni* (*Sparganum mansoni*) is common in the Far Eastern Territory and in Japan. Man becomes infected either through ingestion of the copepod intermediate host, *Cyclops leuckarti*, or through local application of the flesh of infected vertebrates, such as frogs, to the skin or conjunctiva as poultices. The latter practice results in the migration of the larvae out of the flesh into the human tissues. *Taenia saginata*, the beef tapeworm, is widespread in the U. S. S. R. and may have been transported to Sakhalin by colonists.

Infection with *Echinococcus granulosus* appears to be endemic in certain areas of Western Siberia and is very commonly found in pigs and reindeer. In Sakhalin, the great impetus given to reindeer raising in the past 10 years, together with the very large number of dogs in the country, may have resulted in an increased incidence of echinococcus infection, although no actual increase has as yet been reported. Owing to the fact that the northern reindeer is watched by dogs, it is frequently infected with echinococcus.

(2) *Trematodes* (flukes). Several kinds of trematode are encountered among migratory workers and recent settlers on Sakhalin.

(*a*) *Schistosoma japonicum*. This species is widespread in Japan and China and, on many occasions, has been imported into the U. S. S. R. Intermediate hosts are snails, including *Blanfordia nosophora*, *B. formosana*, and *Hemibia hupensis*. The final hosts are man, dog, and cat. According to Pavlovskiy this blood fluke infects many sheep of the Far Eastern Territory. No cases have been reported from Sakhalin.

(*b*) *Paragonimus westermani* has been found in the Far Eastern Territory in the natives of Japan, Korea, and Formosa, and probably occurs in Sakhalin.

(*c*) *Metagonimus yokogawai* is very prevalent in Japan, China, Formosa, and the maritime coast of the Far Eastern Territory. It is found in man, dogs, cats, pigs, and pelicans. Skryabin demonstrated an infection rate of 13 percent among the native Gilyaks, Goldy, Ulchi, and Udekheytsy living along the lower Amur and Ussuri Rivers. No statistics are available as to the occurrence of infection in Sakhalin. The snails *Melania libertina*, *M. ebenina*, *Blanfordia nosophora*, and *Piradus cingulatus* are the intermediate hosts. Upon its escape, the parasite becomes encysted in the trout, *Plecoglossus altivelis*, and eight other varieties of fish of the genera Coregonus and Cyprinus. These fish are eaten raw, frozen, or half-cooked, and human beings become parasitized.

(*d*) *Opisthorchis felineus* occurs in the regions of Tobolsk, Tomsk, and Obdorsk in the valleys of the Irtysh and Ob Rivers, where the infection rate is 100 percent in cats, 60 percent in dogs, and approximately 30 percent in men. No information is available as to the occurrence of this infection in Sakhalin. This fluke passes through snails of the genus Bithynia into fishes, and then into man and other mammals.

(*e*) *Clonorchis sinensis*. This trematode is widespread in the Vladivostok area among the native Chinese and Korean fishermen. It is transmitted through the snails, *Parafossarulus striatus*, *Bithynia fuchsiana*, and *Bithynia longicornis*, to 34 species of fish, with man, dog, cat, pig, marten, and badger as the final hosts. No information is available as to the occurrence of this infection on Sakhalin.

(*f*) *Dicrocoelium dendriticum* is common in Eastern Siberia and the Far Eastern Territory, infecting sheep and other herbivores, swine, rabbits, and man. Six cases were reported by Skryabin in 1929 at Khabarovsk.

(*g*) *Echinochasmus perfoliatus*. This is an incidental parasite common in the Far East and

transmitted through the snail, *Parafossarulus striatus*, to cats, dogs, pigs, and man.

(*h*) *Nanophyetes schikhobalowi.* This is a new species of fluke described by Skryabin and Podyapolskaya at Khabarovsk, which has been declared to resemble the American *Troglotrema salmincola.* It infects man and dog.

(3) *Nematodes* (roundworms). (*a*) *Strongyloides stercoralis* is endemic in the Suchan Mines of the Far Eastern Territory but the rate of infection is low (0.6 percent).

(*b*) *Ancylostoma duodenale* and *Necator americanus* occur in the coal fields of the Far East. Among Korean and Chinese miners in the Khabarovsk and Primorskiy Krais 15.6 percent were found infected in 1931.

(*c*) *Enterobius vermicularis* is widely distributed throughout the entire U. S. S. R.

(*d*) *Ascaris lumbricoides* is widespread throughout the U. S. S. R. In the Khabarovsk and Primorskiy (Maritime) Krais the rate of infection was found to be 13 percent in 1931.

(*e*) *Toxocara canis* is found in dogs, cats, wolves, foxes, and man.

(*f*) *Thelazia callipaeda* is found in the conjunctivae of dogs, rabbits, and man at Vladivostok.

(*g*) *Dioctophyme renale* is found in the kidneys of dogs, seals, otters, cattle, horses, and man. It has been reported to be present in the lower Amur region.

(*h*) *Dictyocaulus viviparus*, the thread lung worm, is found in the air passages, bronchi, and bronchioles of the lungs of sheep, goats, cattle, and northern reindeer. The presence of worms, and their eggs and larvae, sets up an inflammation of the lung, and bacterial infection may follow. Infected animals usually show larvae in the sputum, and the tapeworm is often found in the trachea and lungs.

d. Scurvy. This disease is common in Sakhalin, and affects newcomers mainly. Natives are rarely affected, probably because of the consumption of large quantities of garlic and other similar bulbs indigenous to Sakhalin. Scurvy may occur in newcomers, who are unaccustomed to native food and cannot obtain their customary articles of diet.

13. MISCELLANEOUS DISEASES. a. Malaria. Occasional imported cases of malaria have been reported although Sakhalin is not known to harbor the anopheles mosquito. Chronic malaria has been found in colonists from Central European U. S. S. R., and especially from the Caucasus and the lower Volga regions. In 1928, only 29 cases of malaria were reported in Sakhalin, and 13 cases were noted during the first 2 months of 1929. Much of the importation of malaria was mediated by transient seasonal workers who visited Sakhalin each year.

b. Measles. Measles is endemic in Sakhalin, and is particularly serious among the native Gilyaks, Tungus, and Oroks. In 1915 there was an outbreak with a total of 387 reported cases. Measles in the native population of Sakhalin has been characterized by its prevalence in a higher age group, by the severity of the symptoms and a high fatality rate (4.1 to 23.3 percent). The sequelae included pneumonia, bronchitis, and tuberculosis. The Russians living in Sakhalin have a more uniform morbidity rate and a lower fatality rate. Recent statistics are not available.

c. Scarlet fever. Scarlet fever has been reported on Sakhalin among the native population. In 1915 there was an outbreak involving a total of 311 reported cases. In 1928, seven cases were reported. In 1929 the scarlet fever morbidity rate for the entire Far Eastern Territory was 229 per 100,000 population. Further statistics are not available for Sakhalin. In 1937 the Dick test was positive in 33 percent of native Tungus from 1 to 17 years of age, and in 29 percent of natives over 17 years.

d. Diphtheria. Diphtheria has been reported in Sakhalin. There were 15 cases in 1915, but no cases of diphtheria were reported in 1928 or 1929. During this period, the diphtheria morbidity rate for the Far Eastern Territory was 5.8 per 100,000 population. In 1937 the Schick test was found to be positive in 42 percent of Tungus natives from 1 to 17 years of age, and in 23 percent of natives over 17 years.

e. Whooping cough. Whooping cough is undoubtedly more prevalent than is suggested by the few reported cases. In 1915 there was an outbreak of whooping cough in Sakhalin; 202 cases were reported. In 1928 only five cases were reported. During the first 2 months of 1929, 22 cases were reported. More recent statistics are not available.

f. Rabies. Although no official statistics are available, it is evident from official news reports that rabies is common in Sakhalin. Dogs are used to draw vehicles, and dog raising has become an important industry. The registration of dogs is mandatory. There is, in addition, a large number of wild animals which doubtless act as a reservoir for rabies virus. Rabies vaccine prepared at Khabarovsk is obtainable in Sakhalin through the health authorities at Petropavlovsk.

g. Relapsing fever. Louse-borne relapsing fever has occurred on Sakhalin. It is not known whether or not the tick-borne variety occurs there also.

h. Anthrax. Anthrax is reported to occur among reindeer and cattle, among which it is said to be spread largely by tabanid flies. The epizootics of anthrax are seasonal, and occur in direct proportion to the peak of the flight of the tabanidae, and are distributed in areas where these flies are most prevalent. The greatest incidence of anthrax is in reindeer and horses, with domestic cattle next, and sheep last. The malignant pustule in the affected animal occurs at the sites most frequently exposed to the bite of the horsefly. The anthrax bacillus has been cultivated from tabanids captured during the epizootics. The horseflies transmit anthrax not only from sick, but also from dead, animals, which they bite readily. Local reports suggest that the flies may even pollute drinking water. Although reports of human cases of anthrax are lacking, it may be assumed that they occur, secondary to the high incidence among the cattle and reindeer, and that tabanid flies may be important mechanical vectors.

i. Hoof disease of reindeer. An important problem in connection with the raising of reindeer on Sakhalin was the control of hoof disease of the reindeer. This condition is known in Koryak as "Yaypat-galvyyn," in Yakut as "dzhak," in Zyryan as "gyzh-potom," and in Samoyed as "toboleka." The lesions consist of inflammation of the hoof with abscesses in different portions of the lower extremity, especially in and around the joints. The abscesses open spontaneously, leaving characteristic large ulcers with ragged edges and a granulating base. The ulcers are indolent and heal slowly. The condition is chronic and the deer usually die from sepsis. This disease should be differentiated from epizootic foot and mouth disease. The latter condition is characterized by an incubation period up to 5 days, simultaneous spreading to many animals, and the appearance of aphthous lesions on the buccal mucous membranes, subsequently followed by lesions in the hoof. In hoof disease of reindeer the incubation period does not exceed 24 hours, and spread is slow, one or two animals being affected at a time. It commences with the appearance of the lesions of the lower extremities. Mouth lesions appear seldom toward the end of the course. The abscesses are characterized by their chronicity and the animal seldom recovers, due to a frequent complication of pasteureuosis.

Section IV

SUMMARY AND RECOMMENDATIONS

14. SUMMARY. a. In consequence of a vigorous colonial policy, Sakhalin has grown greatly in population in recent years. Although the region is still sparsely settled and therefore presents many of the health problems of rural areas, an active public health program has been adopted and has already done much to improve sanitary conditions. As a natural corollary, there has been a great increase in medical facilities.

b. Certain diseases are of special local significance. A high incidence of gastro-intestinal infections, venereal diseases, and respiratory infections may be expected among troops in the area. There is a high incidence of helminthiasis and tuberculosis among the native population. Malaria is uncommon.

15. RECOMMENDATIONS. The following recommendations are for personnel operating in Sakhalin, and are intended to supplement the general sanitary precautions ordinarily in force in all areas.

a. Water. All water supplies should be considered unsafe until proved otherwise by bacteriological tests or until subjected to proper treatment. All water which has not been chlorinated should be boiled and cooled prior to drinking.

b. Sewage. Since sewage disposal systems are few in number, local disposal should be organized wherever troops may be stationed, either in towns or rural areas.

c. Control of flies and mosquitoes. Flies are numerous. Comprehensive measures for the control of flies must be instituted and must be carried out unremittingly.

(1) Special measures will be necessary against mosquitoes and flies which in the North are as severe pests as in the Tropics. Mosquitoes of the genus Aedes, and biting flies, such as horseflies, black flies, and midges, may be so abundant as to cause incapacity of troops. These insects may be expected to become numerous 1 to 2 weeks after the last night frost. They cease to be troublesome before the first night frost in autumn. Since the dates of the last night frost in spring and the first night frost in autumn vary from year to year, it is impossible to provide exact dates for the period of the mosquito season. It ordinarily lasts from June until the end of August. The seasonal peak occurs in July. Inland, the mosquito season is usually shorter than that on the coast. The inconvenience arising from mosquitoes and other bloodsuckers varies greatly from year to year. These pests prefer still, damp, hot weather; in cold weather and windy summers they are much less troublesome.

(2) Because of the swamps and marshes there are very few places in which radical control of mosquito breeding can be instituted. In a district likely to be occupied permanently, it may be possible to carry out oiling or drainage. The control of black flies (Simulium) is almost impossible, for the larvae develop in torrential streams; under such conditions oiling is useless. Hence much of the region under consideration is unsuitable for radical control measures, and it will be necessary to concentrate on protection of the individual. Individuals can be protected by the use of repellents applied to the skin. It is desirable to cover exposed parts of the body with veils attached to a broadbrimmed hat; the lower end of the veil should be tucked inside the jacket. The veil should be of fine mesh (sandfly mesh) of sturdy construction. Fairly thick clothing and underclothing should be worn. These *two* protective layers are necessary to prevent mosquitoes from reaching the skin. Waterproof clothing is very efficient. Short trousers should be forbidden. Two pairs of thin socks are necessary. Mosquito nets must be provided, and tents and bivouacs must be protected by screens or nets. Smudges (small, smoky fires which can be made anywhere from peat moss or twigs) are valuable, but their use may be undesirable since smoke may reveal the location of military installations. The spraying of buildings and tents also is important.

d. Japanese B encephalitis. Although Japanese B encephalitis has not been specifically reported, measures to control this disease should be in readiness if it is encountered. In areas where this occurs, Aedes mosquitoes are prevalent from late August to late November in unforested steppes, along the shores of lakes and stagnant marshy pools. Control measures include elimination of breeding places or treatment by larvicides. Small collections of water (containers, etc.) should be covered or should be emptied at least once a week. Mosquito nets and mosquito repellents should be used and buildings should be screened or sprayed.

e. Venereal disease control. Venereal disease programs and control practices, including educational programs and adequate recreational facilities comparable to those in existence in the United States, should be instituted and should be carried out continually. An adequate supply of approved prophylactic material should be provided. Properly staffed and equipped prophylactic stations should be established in easily accessible places.

f. Intestinal infections. Intestinal infections, especially dysentery, are common in Sakhalin. The high incidence of these conditions is attributable to pollution of water, insanitary disposal of wastes, contamination of food by flies, consumption of uncooked foods, and general lack of food sanitation. Aside from measures to safeguard water, and to control flies, special care must be taken to protect all kitchens, mess halls, and other food depots against flies. Special measures include screen-

ing, spraying, fly trapping, and the control of breeding areas. The incidence of intestinal infections among natives is so high that their employment as food handlers is risky.

g. Louse-borne diseases. Scarcity of soap, a lack of fuel, and the presence of crowding favor infestation with lice. Complete equipment for the delousing of clothes and bedding, and facilities for the disinfestation of personnel should be made available to all components of a force contemplated for this region. Immunization against typhus should be completed prior to departure of the troops, and supplies of vaccine should be forwarded for stimulating doses.

h. Frostbite and trench foot. In the northern part of Sakhalin the cold winter climate may incapacitate a large number of troops unless proper precautions are taken. In cold districts frostbite is likely to develop. Trench foot is caused by cold and wetness coupled with muscular inertia at temperatures around or below the freezing point. If not treated in the initial stages, both conditions may give rise to gangrene. Approximately 20 percent of the troops who acquire trench foot can never be returned to combat. To prevent these dangerous conditions, proper clothing should be provided. Foot gear should be loose and roomy enough for 2 pairs of wool socks. Either arctic overshoes or shoe-pacs should be worn. It is important to change wet socks promptly. Provision should be made for a daily exchange of socks which may be accomplished at time of issue of rations. Stamping and moving the toes inside the boots improve the circulation; hot food and drink are also of value. After exposure, feet should not be warmed by placing them near a fire or in hot water. The trunk, however, may be warmed near a fire. If it is at all possible, rotation of troops in front lines every few days is advisable.

i. Snow blindness (niphablepsia). Glare from snow and ice may produce serious loss of visual acuity or even blindness. Recovery usually occurs in a few days or weeks but in extremely severe cases permanent blindness occasionally may result. All troops stationed in northern districts should be provided with dark glasses and made to wear them.

Table I. Average monthly temperatures—Aleksandrovsk, 1035

	Centigrade	Fahrenheit
January	−18. 0	−0. 4
February	−15. 7	3. 8
March	−9. 3	15. 3
April	−0. 1	31. 9
May	5. 6	42. 1
June	11. 1	51. 9
July	15. 7	60. 2
August	16. 9	62. 4
September	12. 2	53. 9
October	4. 2	39. 5
November	−5. 0	23. 0
December	−13. 1	8. 5

Table II. Monthly temperatures (Fahrenheit) May to September—Sakhalin

Months	Aleksandrovsk			Tym Experimental Station			Langr		
	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum
May	42. 1	75. 2	20. 2	41. 0	74. 1	10. 4	32. 0	39. 2	49. 2
June	51. 9	78. 9	29. 5	53. 2	83. 1	25. 2	46. 4	64. 4	29. 3
July	60. 2	83. 6	34. 3	59. 9	87. 9	32. 1	58. 2	71. 6	41. 0
August	62. 4	87. 4	39. 5	60. 4	86. 7	32. 7	7 . 1	68. 5	6. 8
September	53. 9	77 . 0	23. 4	50 . 9	73. 6	20. 1	51 . 0	65. 5	36. 6

Table III. Annual temperatures of Sakhalin and the Mainland (Fahrenheit)

	Aleksandrovsk, 1935	Tym 1935	Langr. 1935	Okhotsk 1915	Nikolayevsk, 1927
Mean annual temperature	32. 7	31. 7	26. 5	19. 5	28. 1
Extreme maximum	87. 4	87. 9	72. 3	67. 8	84. 5
Extreme minimum	−41. 8	−55. 3	−31. 3	−50. 0	−42. 4

Table IV. Precipitation—Sakhalin

Month	Inches
January	1. 71
February	. 92
March	1. 46
April	1. 37
May	1. 42
June	1. 52
July	2. 47
August	3. 13
September	3. 56
October	2. 69
November	2. 02
December	2. 24
Total	24. 51

Note. One inch of precipitation averages abou. 10 inches of snow On akhalin the maximum precipitation occurs in September.

Appendix I

MARITIME PUBLIC HEALTH SERVICE AND QUARANTINE REGULATIONS

1. The Maritime Public Health Service is conducted by the People's Commissariat of Health of the U. S. S. R. in cooperation with the Commissariat of Merchant Marine. Its purpose is to prevent introduction of disease from foreign ports. The diseases to which quarantine applies are plague, cholera, yellow fever, typhus, and smallpox.

The People's Commissariat of Health of the U. S. S. R. is responsible for—

(1) Examination of ships, crews, passengers, inhabitants of ports, and cargoes; inspection of food supplies, ships' provisions, storage establishments, and restaurants in the harbors.

(2) Inspection of water supplies and sewage disposal facilities in harbors.

(3) Isolation of persons afflicted with communicable diseases and contacts.

(4) Rodent control.

(5) Disinfection and disinsectization.

(6) Public health laboratories and bacteriological laboratories.

(7) Training and equipment of personnel.

(8) Health education.

(9) Operation of transportation facilities for patients and contacts.

The Commissariat of Merchant Marine of the U. S. S. R. is responsible for—

(1) Water supplies in rivers and harbors.

(2) Sewage disposal facilities.

(3) Ratproofing in ports, shipyards, and docks.

(4) Construction of buildings for patients afflicted with communicable disease, and for their contacts.

(5) Provision of transportation for patients, health officers, and other sanitary personnel.

2. All the important ports are provided with maritime quarantine stations. Less important ports are equipped with quarantine substations. The quarantine stations are equipped for disinfection and disinsectization of ships, while the substations merely direct all suspect ships to the nearest quarantine station. The personnel of each station is in charge of a senior medical officer. One or more physicians are on duty at all times.

General measures applied to vessels which arrive at the ports of the U. S. S. R. are as follows:

(1) The vessel is boarded; the master and the ship's surgeon are questioned, and the ship's bill of health is inspected.

(2) All parts of the ship are examined.

(3) The crew and passengers are inspected.

(4) The sick are isolated, and persons exposed to communicable disease are detained.

(5) Contact cases are kept under observation.

(6) The ship is disinfected and disinsectized, if necessary.

(7) Rat extermination is conducted.

(8) If the presence of smallpox or cholera is suspected, all unvaccinated persons are forbidden to land.

(9) Vaccination is given if necessary.

(10) A bill of health is issued for the ship.

On entering a Soviet port, every vessel subject to quarantine inspection must fly a yellow flag bearing the device $\frac{C}{Q}$ in accordance with the International Signal Code. In the presence of plague, cholera, yellow fever, or smallpox, the vessel must fly a yellow and black flag marked $\frac{M}{L}$. At night these flags are replaced by a red light affixed to the masthead. The vessel is considered to be in quarantine until it is given free pratique.

A ship is regarded as infected with *plague* whenever it has a case of this disease on board, or when one or more cases of the disease develop not less than 6 days after the ship has left its port of departure or any intermediate foreign ports, if plague-infected rats are detected on board. A ship is held under suspicion of plague if one or more cases of this disease are discovered on board within 6 days of clearing the port of departure or any intermediate port, or if undue numbers of rats dead from undetermined causes are found on board. A ship is regarded as noninfected if, despite departure from a plague-infected port, it has no cases of the disease at the time of departure, during the voyage, or upon arrival at a Soviet port, provided that thorough search fails to reveal undue numbers of dead rats.

A ship is regarded as infected with *cholera* if one or more patients afflicted with this disease is present on board or if such patient or patients be discovered on board not more than 5 days prior to the arrival of the ship at a Soviet port. A ship is held under suspicion of cholera if one or more cholera patients had been present on board at the time the home port was cleared or during the voyage, even though there may have been no cases of the disease aboard ship for 5 days prior to its arrival at a Soviet port. A ship is regarded as free from cholera if, despite clearing a cholera-infected area, it has no cases of cholera at the time of departure or during the voyage, or on arrival at a Soviet port. Any person who has clinical evidence of cholera is subject to the regulations which govern all cholera patients even if no cholera vibrios have been obtained from him. Carriers are always subject to the regulations which govern frank cases of cholera.

A ship is regarded as infected with *yellow fever* if a case of this disease has occurred on board at the time of departure or at any time during the voyage. A ship free from frank yellow fever is held under suspicion if less than 6 days have elapsed after departure from an infected port or departure from a port which, although uninfected, is in contact with an endemic center of yellow fever. A ship which has cleared from a known yellow fever area is regarded as uninfected if the vessel was not less than 6 days en route from the last known infected port, provided that the master of the vessel certifies that his ship remained not less than 200 meters from the populated coast or bridges or pontoons in the area, and that prior to its departure the vessel was subjected to thorough fumigation.

Appendix II

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[AG 300.5 (12 Mar 45)]

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WAR DEPARTMENT TECHNICAL BULLETIN

INSTRUCTIONS FOR PREPARING AND MAILING PROSTHETIC CASES TO CENTRAL DENTAL LABORATORY*

War Department, Washington 25, D. C. • • • March 1945

This bulletin rescinds S. G. O. Circular Letters No. 122, 1941; Nos. 106, 114, 128, and 147, 1943; and paragraph 16, S. G. O. Circular Letter No. 1, 1944

This bulletin follows TB MED 147, subject, "Notes on Care of Battle Casualties." Distribution given TB MED 147 was as follows: AAF (5); AGF (5); ASF (2); T of Opns (25); S Div ASF (1); Dept (5); Base Comd (5); Is Comd (5); AAF Comds (55); Arm & Sv Bd (2); Def Comd (5); Tech Sv (2); Sv C (10); Named & Numbered GH (60); Numbered GH (NP) CZ (45); Named SH (Including RH & Numbered SH) (40); M Conc C (55); Gen Disp (ZI) (10); Fld Hosp (15); Hosp Tn (2); Hosp Ship Plat (5); Hosp Ship Complements (15); Conv Ctr (15); Conv Camp (10); Vet Gen Hosp (10); Vet Sta Hosp (10); Vet Evac Hosp (5); Vet Conv Hosp (5); Portable Surg Hosp (5); Evac Hosp (750 bed) (40); Evac Hosp (SM–400 bed) (30); Conv Hosp (20); Gen & Sp Sv Sch (5); Enlisted Techn Sch 8 (1); USMA (2); ASTPU (3); ROTC (2); Army Med Tng C (60): Ind Sta (10); Sv C Lab (5); A (5); CHQ (5); D (55); AF (55); One copy to each of the following: T/O & E 3–25; 4–45; 4–145; 4–232; 5–35; 5–72; 5–95; 5–275; 6–35; 6–55; 6–65; 6–75; 6–95; 6–175; 6–325; 6–355; 6–365; 6–395; 7–85; 9–12; 11–25; 17–55; 17–125; 18–25; 19–35; 20–42. Two copies to each of the following: T/O & E 2–22; 4–152; 4–260–1; 5–386; 5–535S; 6–12; 6–45; 8–22; 8–26; 8–520; 9–35; 9–76; 10–22; 10–165; 10–217; 11–15; 17–15; 18–10–1; 18–35; 19–55; 20–46; 44–15; 44–25; 44–75; 44–115; 44–125; 44–225S; 44–315; 55–120–1. Three copies to each of the following: T/O & E 5–192; 7–95; 8–27; 10–45; 10–175; 17–115; 44–135; 44–320; 55–110–1; T/O & E 5–21 (5); 5–251 (6); 5–510S (35); 8–28 (10); 8–510 (15); 8–534 (5); 8–537T (15); 8–550 (60); 8–550S (45); 8–560 (40); 8–572S (5); 8–580 (40); 8–581 (30); 8–590 (20); 8–591T (15); 8–595T (10); 8–650 (10); 8–750 (10); 8–760 (10); 8–780 (5); 8–790 (5); 10–95 (7); 10–125 (6).

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1. GENERAL. *a.* All dental officers responsible for initiating or rendering prosthetic service will comply with the following instructions when cases are being prepared for the C. D. L.

b. Direct correspondence is invited between prosthetic officer at camp or station and the C. D. L. to assure the greatest operating efficiency.

c. Failure to comply with the basic instructions herein will result in a return of the case to the original sender untouched.

d. Every effort will be made to construct appliance in accordance with the design and materials requested, but the final decision regarding construction will be that of the C. D. L.

*The Central Dental Laboratory will hereafter, in this publication, be referred to as C. D. L.

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e. There are five C. D. L.'s in the continental United States, several subcentral dental laboratories, and the various C. D. L.'s in oversea theaters. While the oversea C. D. L.'s may have special "theater" rulings, as well as individual problems relating to supply and transportation, the general principles regarding case construction, cited in this bulletin, are applicable to all military installations. In general, the five C. D. L.'s located at the following centers in the United States serve stations in the geographical limits of the commands indicated:

(1) Army Medical Center—First, Second, and Third Service Commands, and the Military District of Washington.

(2) Fort McPherson, Georgia—Fourth Service Command.

(3) Fort Sam Houston, Texas—Eighth Service Command.

(4) Presidio of San Francisco, California—Ninth Service Command.

(5) Jefferson Barracks, Missouri — Fifth, Sixth, and Seventh Service Commands.

f. The C. D. L. will insert the name and Army serial number on all dentures constructed in the C. D. L. wherein such an identification is applicable.

2. POLICIES REGARDING DENTAL PROSTHETIC TREATMENT. *a. Dental services during and for six months after war* (A. G. 703.1 (4–16–42) MO–S–M, 25 April 1942). See paragraph 9*a* of this bulletin regarding partial dentures. A fixed bridge may be inserted in the anterior segment, in limited cases, as a morale and functional factor in those instances where extraction has caused a disfiguring space.

b. Treatment for dependents. Dental attendance for dependents will be limited to emergency treatment. Such treatment will interfere in no instance with the routine dental treatment of military personnel.

c. Treatment of War Department civilian employees within continental limits of United States. Dental attendance for civilian employees will be confined to emergency treatment as outlined in paragraph 2*c*(4) and (5), AR 40–505, 1 September 1942.

d. Treatment of War Department civilian employees on foreign military missions. In accordance with a Third Indorsement, W. D., S. O. S., S. G. O., 16 October 1942, to The Commanding Officer, Post of Ft. Read, Trinidad, B. W. I., the following policy is in effect:

"4. Replacement of missing teeth for the above outlined civilian personnel will be made when in the opinion of the dental surgeon it is necessary from a health or functional standpoint. Such replacements will be the standard type of full or partial dentures provided in the Army except that anterior teeth, lost in line of duty, may be replaced by fixed bridgework when in the opinion of the dental surgeon it is advisable. This type of replacement is to be kept at a minimum consistent with the best interests of the Government and the individual.

"5. The treatment outlined in Par. 4 above will interfere in no instance with the routine dental treatment of military personnel."

e. Treatment of Red Cross personnel. According to a First Indorsement, A. G. 703 (9–21–42) OB–P, W. D., A. G. O., 8 October 1942, to The Surgeon, U. S. Army Station Hospital, Fort Lewis, Washington, the following policy is in effect: "Red Cross Personnel on duty with the Army in the United States, where civilian facilities are available, are entitled to dental treatment only when an inpatient and if this treatment is necessary in connection with the condition for which they where hospitalized. *This does not include the replacement of missing teeth.*"

f. Treatment for prisoners of war. According to paragraph 87 of FM 27–10, Rules of Land Warfare, "Every camp shall have an infirmary, where prisoners of war shall receive every kind of attention they need." Prisoners, therefore, are entitled to the same dental treatment as outlined in A. G. Letter 703.1 (4–16–42) MO–SP–M, 25 April 1942, subject, "Dental Service during and for six months after the war."

g. Treatment for retired personnel. Paragraph 2*b*(2), AR 40–505, states that dental attendance will be provided for "Persons who are on the retired list of the Regular Army and who report in person at any Army dispensary or hospital, provided sufficient accommodations are available for their treatment." Dental treatment for retired personnel is a local problem.

h. Treatment of allied military personnel. Military personnel of allied nations in the zone of interior and theater of operations will receive the same dental treatment as U. S. Army personnel (A. G. O. Letter 370.5 (4–4–42) MS–SPGAM–M, 7 July 1942).

3. TYPE OF LABORATORY SERVICE ACCOMPLISHED AT C. D. L. *a.* Two C. D. L.'s are prepared to do vitallium work. No ceramic work is accomplished at any C. D. L. Ordinary inlays, single crowns, and attachments for bridges will be made in local camp or station laboratories, if facilities are available.

b. The C. D. L., Army Medical Center, Washington, D. C., is prepared to accept vitallium cases, and for this type of work will service the stations in the geographical limits of the first six service commands, Panama Canal, and foreign stations in the Atlantic area, while the laboratory at Fort Sam Houston, Texas, will serve stations in the geographical limits of the remaining service commands, Alaska, and all foreign stations in the Pacific area.

4. MATERIALS EMPLOYED IN APPLIANCE CONSTRUCTION. *a. Acrylic, gold, and vitallium.* Acrylic will be the material of choice for most dentures. Special dental materials, including gold and vitallium, are available for selected cases, and the expenditure of these materials is limited to the minimum consistent with good service. While vitallium is more economical than saddle and bar gold, the additional work and technical difficulties involved prohibit its use when condensite dentures meet the actual requirements of the case. Vitallium will not be used for temporary dentures, because of the lack of facilities and personnel, and at this time it is not recommended for the construction of full dentures.

b. Teeth and facings. (1) Either New Trubyte or New Hue teeth may be used. Substitutions are made in accordance with the following table:

New Hue:	63	66	67	69	77	79
	81	83				
New Trubyte:	40	41	43	52	46	55
	49	57				

In requesting shade always give *New Hue* shade, using *only* the above eight shades. As soon as present stock of New Trubyte is exhausted, all teeth will be furnished in the New Hue shades.

(2) Steele's facings are supplied in the following shades:

Upper: 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 20.
Lower: 7, 9, 15, 16, 20.

Always use Twentieth Century Shade Guide for facings.

(3) In specifying teeth, requests should be limited to the following molds. Additional information to aid the esthetics of the case should be provided the C. D. L.

Upper anterior molds 1 x 6: 115, 117, 123, 124, 126, 133s, 134, 135s, 136s, 155, 214, 217, 222, 224, 225s, 225, 226s, 233, 234, 235, 244, 262, 263, 264, 265, 266, 267, 275, 314, 315, 317, 324, 333, 335, 346.

Lower anterior molds 1 x 6: 22, 23, 24, 25, 26, 27, 31, 32, 33, 34, 35, 36, 43, 43s, 44, 45, 45s, 46, 46s.

Upper and lower posterior (30°): 28s, 28m, 28L, 30s, 30m, 30L, 32s, 32m, 32L, 34s, 34m, 34L, 32x.

1 x 8—upper and lower posteriors (20°): 29s, 29m, 29L, 31s, 31m, 31L, 33s, 33m, 33L, 35L.

(4) The C. D. L. does not have a supply of nonstandard items such as tube teeth and Steele's True Pontics, and there are no funds for these purchases. Therefore, if an officer desires such a nonstandard item, he must purchase it locally and forward it with the casts, or he may forward the C. D. L. sufficient funds for the purchase.

5. PRIORITY ON LABORATORY SERVICE. The word "Rush" may be written on the upper left corner of WD AGO Form 8–143, when time is an important factor in the case. *"Rush! Air Mail"* may also be inserted on this form. However, local air mail schedules between station and C. D. L. should be analyzed to determine whether an appreciable amount of time can be saved by such transportation.

6. PACKAGING AND MAILING. *a. Each cast should be wrapped separately, placed back*

to back in mailing box, and teeth should not come in contact with sides of the box. Mailing boxes should be tied with twine. Gum tape quickly ruins the boxes. and the package becomes first class mail rather than fourth class. Two sheets, WD AGO Form 8–143, will accompany patients' casts to the C. D. L. The carbon copy, with case for try-in, or with completed denture, will be returned to the station. Try-ins returned to the C. D. L. for completion will be accompanied by the same carbon form. When the C. D. L. returns casts to a station for additional mouth preparation or new models, the same WD AGO Form 8–143 will be used on all subsequent transferals. The mailing boxes are well constructed, expensive, and should, therefore, be saved for repeated use. Case, mailing, large, Item 5117000; and case, mailing, small, Item 5117500, are listed in the Medical Supply Catalog and are available for issue to stations through regular channels. WD AGO Form 8–142 (Label—Penalty) and WD AGO Form 8–143 (Prosthetic Case Record) are obtainable through the medical supply officer from the adjutant general depots.

b. Postmaster General Order No. 31361, 17 May 1943. This order states:

"4. Packages containing dentures (false teeth) or prosthetic dental appliances shall be accepted for mailing when properly prepared therefor, provided that the label or the address side of the parcel carries a printed or rubber stamp impression over the name of the sender in clear, legible type reading as follows: Mailing not prohibited by Sec. 607½ P. L. & R., 1940."

7. USE OF WD AGO FORM 8–143, PROSTHETIC CASE RECORD (old M. D. Form 124). All stations will complete the form as follows:

a. Station. Name of station and mailing address—*Leave ½ inch blank at left side of this space for entry of C. D. L. case number.*

b. Patient. Enter last name first, then first name and middle initial. Also enter Army serial number in this space.

c. Rank and organization. Self-explanatory.

d. Date. Enter date patient is first seen.

e. Number of years' service. Enter years of service and months by twelfths. Example: One year and six months—$1\frac{6}{12}$.

f. Patient's age. Nearest birthday.

g. Kind of denture. Use check mark, or "x" key on typewriter, for the one or more dentures being made.

h. Kind of work. List upper and lower teeth, etc.

(1) *Dentures.* (*a*) If a *full denture* is being constructed, enter the word *full* on this line. Do not list missing teeth or fill in number of anterior or posterior teeth. Do not list number of teeth in extreme right hand column.

(*b*) If a *partial denture* is being constructed, make no entry on this line. The C. D. L. will make necessary entry. Do not fill in number of anterior or posterior teeth, and do not list number of teeth in extreme right-hand column.

(2) *Inlay.* Enter only inlays which are not used as bridge abutments, giving correct symbol and number of tooth receiving the inlay and the surfaces of the tooth involved, as L15, m. o. Enter check mark in column, anterior or posterior, depending upon location of the tooth receiving the inlay.

(3) *Crown* (*other than bridge attachment*). Enter only three-quarter crowns, and crowns not used for bridge attachments. Enter correct symbol and number of tooth receiving crown on this line, and check location of tooth, anterior or posterior.

(4) *List bridge abutments.* Enter correct symbols and the numbers of the teeth receiving the bridge attachments on this line. In all cases where bridge attachments are cast by C. D. L., the carbon copy will be returned to the station with the finished attachments. If the attachments, with casts and bite, are returned to the C. D. L. for the completion of the bridge, the carbon copy should be returned with the attachments, etc. If the bridge is completed at the home station, after the attachments have been cast and returned by the C. D. L., the station will complete the following steps:

(*a*) Enter on carbon copy the gold they (the station) expended in completing the bridge.

(*b*) *Total* only the *gold* used *by station*, on the line Total.

(*c*) Notify the C. D. L. immediately that the bridge was completed and inserted at the home station.

(5) *Number of inlays, crowns, bridges, etc.* Enter in this column on the appropriate line total number of inlays, crowns, or bridges to be constructed.

(6) *Other entries.* In cases of bridge repair, denture rebased, reconstructed, or duplicated, the word "repair," "rebase," etc., will be inserted in the appropriate line, and a check or x will be inserted in column, "anterior" or "posterior."

i. Leave blank for C. D. L. Insert in this space, "Sent to C. D. L. (name of laboratory)." If a splint is to be constructed, the fact will be indicated in this space. C. D. L. may also use this space for remarks, such as: "Path of insertion of the case should be indicated."

j. Is try-in desired?—Yes or No. If centric occlusion is questionable, the laboratory may finish one denture and return the other for try-in. After the case has been checked by the station, if centric occlusion is satisfactory, enter "O. K." on carbon copy.

k. Shade. Enter only those shades listed in paragraph 4*b*(1) and (2) of this bulletin in the extreme left side of this block. Enter correct shade on all repair cases if teeth are to be replaced.

l. Mold. Enter only those molds listed in paragraph 4*b*(3) of this bulletin.

m. Material. Acrylic resin will be the material of choice.

n. Indicate clasps, rests, bars. Do not enter any information in this block, since the C. D. L. is equipped to survey models.

o. Date of impression. Self explanatory.

p. Date received in laboratory. To be filled in by C. D. L.

q. Date completed in Laboratory. To be filled in by C. D. L. If a denture is completed at home station, after it has been set up by the C. D. L., the C. D. L. will be notified immediately.

r. Date inserted. Self-explanatory.

s. Date sent to another station if patient transferred. If the case has been set up and returned for try-in by the C. D. L. and the denture is completed by the station and then forwarded to another station for insertion, the C. D. L. will be notified to this effect by forwarding station. Give name of station forwarding case, patient's name, C. D. L. case number, and station to which the case is forwarded. This does not apply to dentures which are completed.

t. D. C., U. S. Army. To be signed by the Dental Surgeon, Chief of Prosthetic Section, or any designated officer. Initials or rubber stamp are not acceptable.

8. FULL DENTURES. *a. Preparation of mouth.* Surgical preparation of the arches is frequently necessary, to permit an adequate space for anterior teeth replacements, and to eliminate undercuts in the maxillary tuberosity or other areas.

b. Impressions. Use any standard method which provides a muscle trimmed impression, giving the exact height of the buccal and labial flanges.

c. Casts. Casts will be poured in stone. Impressions will not be sent to the C. D. L. Casts should be poured to preserve the full border or roll of the impression. Casts trimmed too closely to the labial and buccal surfaces eliminate this border. The heels of the casts should be trimmed so that both casts will articulate properly when placed in the bite block. Make a small groove across the posterior border of the upper cast from tuberosity to tuberosity through the hamular notch. This line will show in the processed denture, and it will give a definite line to which the denture can be finished. Make all necessary insetting and mark the outline of the relief desired. The C. D. L. will make no insetting.

d. Bites. (1) Base plates will be well burnished to casts and built up with pink wax rims. The bite rims must fit accurately, and they must be reinforced with a wire of heavy gauge. Paper clip reinforcement is not acceptable. Bite rims will be locked securely in centric relation. *"Mush bites," or bites taken with a large roll of soft wax between bite rims, are not acceptable.*

(2) When impressions are taken inside a base plate tray, the station will pour and trim the cast. The base plate will be readapted to the cast, or a new base plate and bite rim will be constructed.

e. Median line and high lip line. Always indicate position of the median line and high lip line.

f. Occlusal plane of upper base plate should be absolutely level, since this is the only guide

used in mounting the case and setting up the teeth.

g. Build out the exact fullness desired in wax when it is returned for try-in by the C. D. L.

h. After trying in case, place an "O. K." in block on WD AGO Form 8–143, "Try-in Desired," if it is to be completed by C. D. L.

i. Do not wax base plates or try-in to casts.

j. Any dental officer may carry a denture or a bridge case through the various stages of construction, if he so desires. The teeth for each individual case will be issued by the C. D. L. upon direct request. Only molds and shades of teeth listed are available.

9. PARTIAL DENTURES. *a. Which soldier needs a partial denture.* It is not possible to state that a given number of natural teeth are necessary to masticate the average foods. The size, shape, condition, and position of the dental arches, as well as the teeth, are all determining factors which indicate the need for a denture. The replacement of a single tooth, or one tooth on each side of the arch, by a partial denture, ordinarily will not be accomplished. The insertion of a unilateral partial denture will be limited to the exceptional case, and such appliances generally will not be constructed. The morale of the individual, however, must always be considered.

b. Opening the bite. Partial dentures, which cover the remaining natural teeth, will not be employed in the opening of a bite.

c. Mouth and teeth preparations. (1) *Elongated teeth in close bite cases.* Elongated teeth in close bite cases often contact the opposing alveolar ridge. Such teeth should be extracted, and an alveolectomy, accomplished when required, if a denture is being constructed for an arch of this character. If a denture is being constructed wherein the opposite arch possesses elongated teeth, such teeth (elongated) should be shortened by grinding the occlusal or incisal surfaces, provided such a removal of tooth structure will create sufficient space for proper positioning of teeth or proper extension of the saddle. For example, it is often necessary to shorten lower anterior teeth when they contact the mucosa lingual to the upper anterior teeth (see fig. 1).

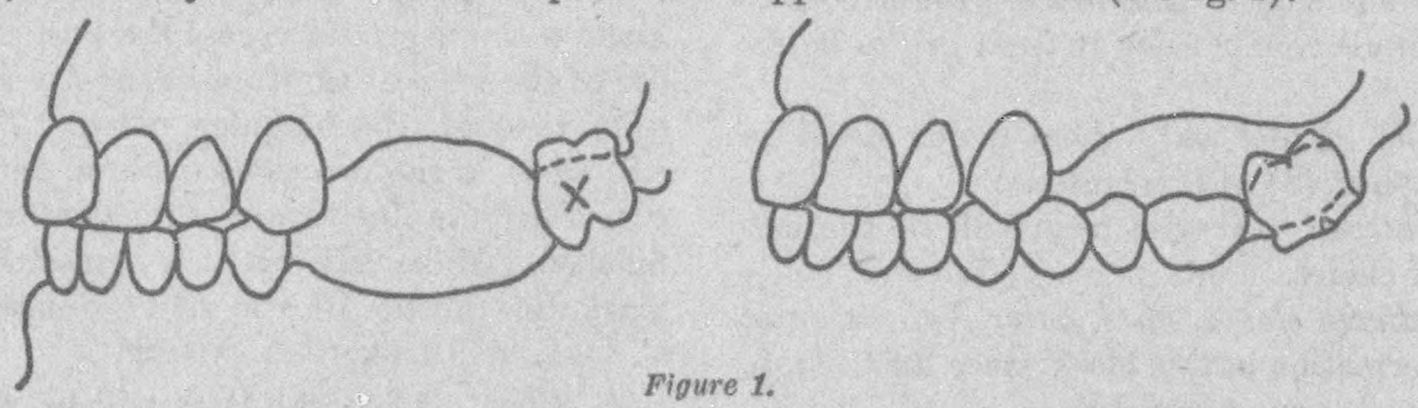

Figure 1.

(2) *Insufficient mesio-distal space for replacement of tooth.* Often when individual teeth are extracted, the space partially closes, and the adjacent natural teeth are tipped toward the area, which precludes the replacement of an average sized tooth. However, if the proximal surfaces of the converging teeth are disked sufficiently, so that they (the adjacent teeth to the space) are as near parallel as possible, a normal sized tooth frequently can be employed (see fig. 2).

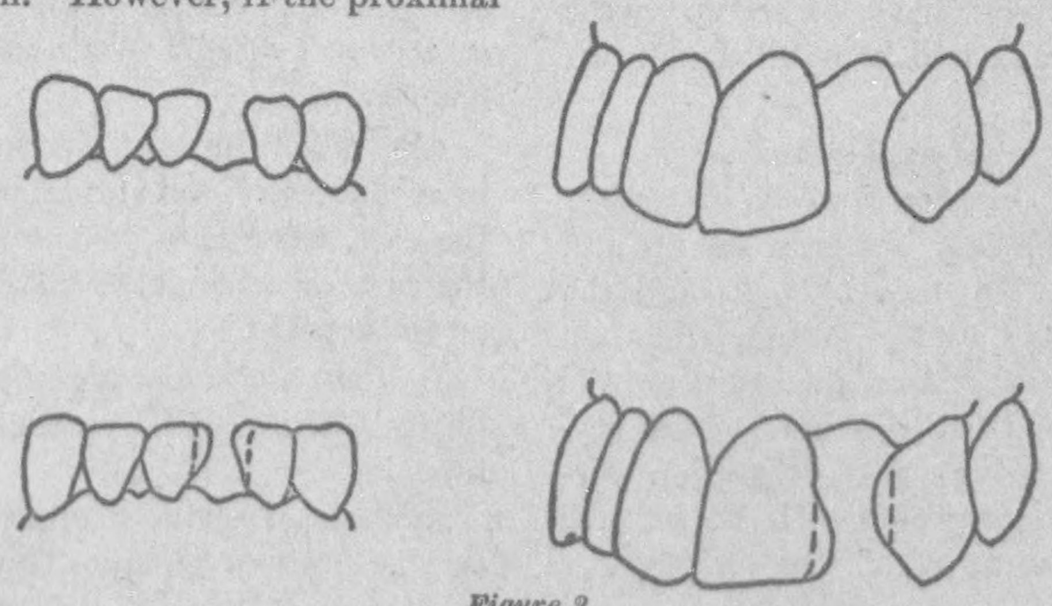

Figure 2.

(3) *Preparation of teeth for crib clasp.* Where all of the teeth are present on one side of the arch and it is necessary to make the proper preparation for a crib clasp, it is essential that sufficient space be created for a 16-gauge wire as well as a space for the occlusal rest. Do not destroy the contact point in creating this preparation. It is often necessary to shorten the cusps of the opposing teeth.

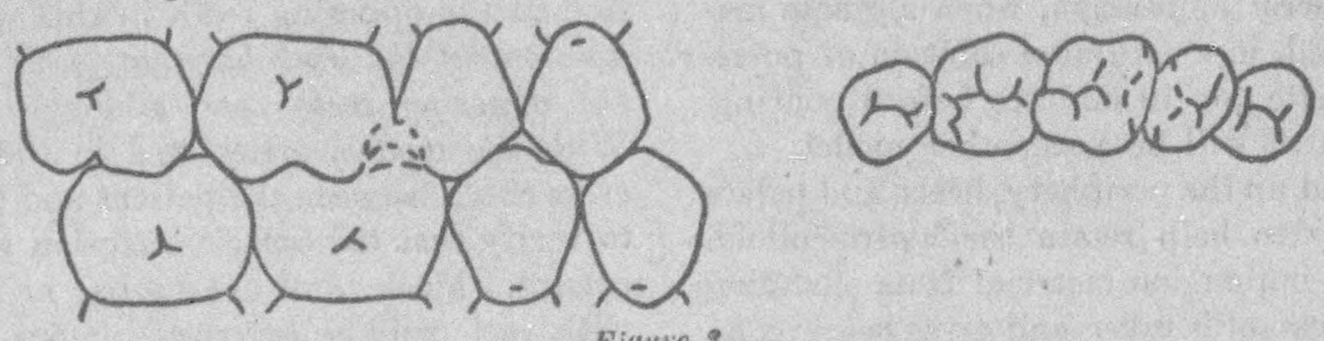

Figure 3.

(4) *Preparation of teeth for occlusal rests.* (*a*) *Always* reduce the marginal ridge and adjoining fossa with a mounted stone, and polish these areas with a rubber or burlew disk. *The occlusal portion of the rest preparation should be at a right angle to the long axis of all posterior teeth, regardless of that tooth's position.* (Avoid making a boxlike preparation or creating sharp angles in the natural tooth.) To create sufficient space for a good strong rest, it is often more desirable to relieve an opposing cusp rather than to remove all the enamel from the marginal ridge.

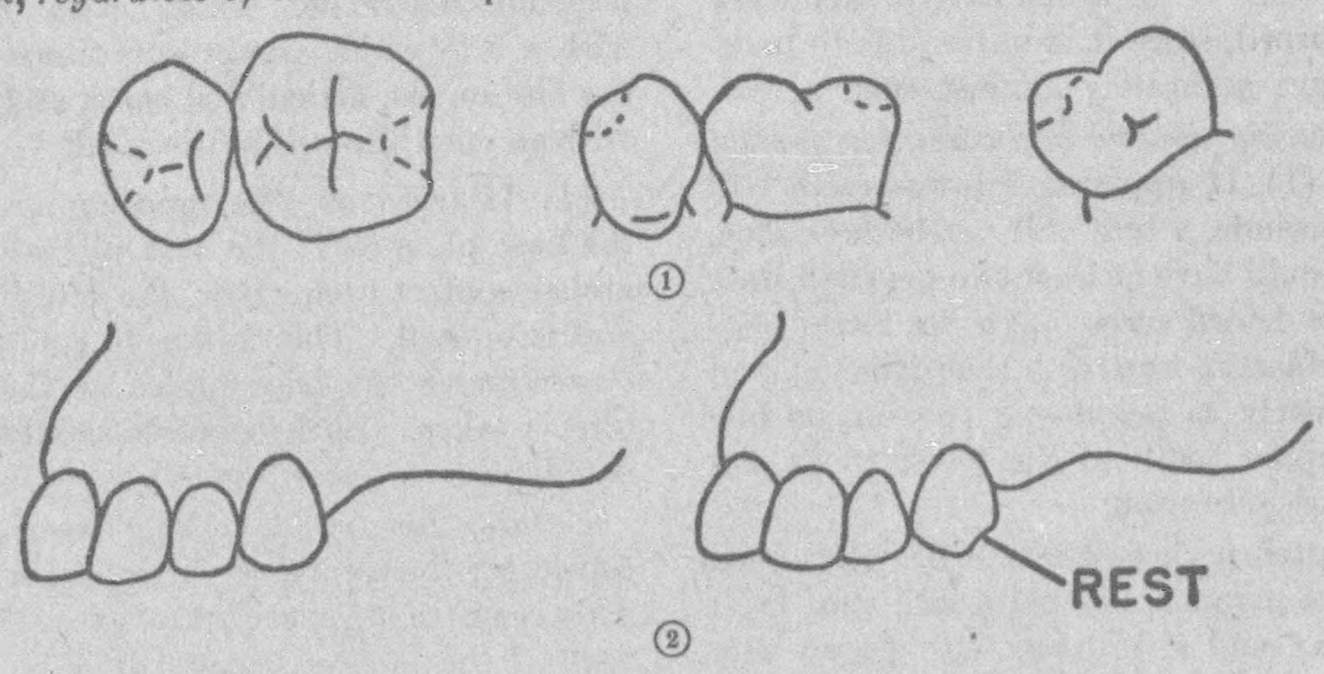

Figure 4.

(*b*) In clasping and placing rests on upper cuspids it is generally necessary to relieve the incisal or occlusal surface of the opposing tooth. If there is an edentulous area adjacent and posterior to the cuspid, it is best to prepare a rest on the disto-incisal angle.

d. Return of casts for additional mouth preparation. When casts are returned to the station sending the case, because elongated teeth, rests, preparations, or other conditions are not suitable for the making of a good denture, in no instance will corrections be made thereon. The correction must be made in the mouth. A new impression will be taken, and the resultant cast forwarded to the C. D. L.

e. Marking of areas prepared for occlusal rests by station. Occlusal rest areas, which have been prepared by the dental officer, will be lightly outlined with a black pencil. Do not black the entire area.

f. Impressions. (1) Scale and clean teeth before taking an impression.

(2) Hydro-colloid, sectional compound, sectional plaster, or substitute items for hydro-colloid, such as the accepted alginate materials, may be used.

(3) The following suggestions are made with reference to the use of hydro-colloid impression material.

(*a*) Rinse the mouth with warm water just before taking impression. Do not use cold water.

(*b*) Do not use petrolatum or other lubricant on the teeth or impression material.

(*c*) Immerse impression, when alginate material is used, in a saturated solution of potassium sulphate for 10 minutes before pouring, and the result will be a smoother model.

(*d*) Build up the periphery, heels, and palate of the tray to help retain the hydro-colloid. This keeps impression material from slumping when impression is taken and gives better compression to edentulous areas.

g. Stone casts essential. Do not send impressions to C. D. L. If there is a shortage of artificial stone, pour teeth only of the opposing cast in stone, and then pour remainder of cast in plaster. Trim all casts, especially the heels of the model, to permit proper articulation of teeth. Casts which have broken teeth will be returned, since it is impossible to process a denture accurately against such a cast.

h. Registering centric occlusion for partial dentures. (1) If upper and lower casts will definitely occlude, a bite will not be necessary, but casts should have at least two penciled lines on each side drawn across opposing teeth. Select the surfaces of two teeth that coincide, and draw, as nearly as possible, a continuous line from the upper tooth to the lower tooth, denoting centric occlusion.

(2) If centric occlusion cannot be determined in the above manner, baseplate bite rims built up with wax and reinforced with heavy wire will be necessary. Paper clips are entirely too flexible to be used as reinforcement. Baseplates should be well adapted to the casts and built up with pink baseplate wax. This wax should be thoroughly warmed and the patient instructed to close in centric. The *excess wax* should be removed so that the opposing teeth barely contact the pink wax. The surface of this wax should again be thoroughly warmed and the patient instructed to close in centric occlusion. Chill and remove from the mouth. Cut off 1½ to 2 mm from the occlusal surface of the pink wax and any base plate that contacts the opposing arch. (This will create a space between the bite rim and the opposing arch.) Add a small piece of boxing wax or tooth carding wax (which will be furnished by the Central Dental Laboratory upon request) upon the occlusal surface of the pink base plate wax; warm the wax thoroughly and have the patient close in centric. The registration of the opposing teeth in this wax should *not contact the pink baseplate wax* or *engage the opposing teeth over a depth of 1 mm.* With the models articulated in the bite rim, cross check between the patient and the models to verify that the centric occlusion recorded is correct. Mush bites are useless and all cases with such will be returned. Stone casts will not be waxed together because of the difficulty of separation, and it is impossible to survey such casts with wax in place.

(3) Extreme softening of the wax *cannot* be emphasized *too much.* Unless wax is extremely soft, the base plate will compress tissue. However, this is not true of alginate impression materials. Thus, casts articulated with a bite which compresses tissue will open the bite on the articulated casts, and a denture with an open bite will be the result.

(4) If teeth on the opposing arch contact the base plate or if the base plates of the two arches contact each other, the bite is incorrect and is opened. This is due to compression of tissue under the base plates at the time the bite is taken. Such contacts should be eliminated prior to recording centric occlusion.

i. Cases for try-in. Many requests are received for the return of partial cases for try-in. This requires a great deal of extra time on the part of the laboratory, and it is believed if a correct bite is recorded, either in the making of casts or by the use of the base plate, it is unnecessary in most cases. Full cases are routinely returned for try-in.

j. Rigid appliances. The path of insertion is written on the return slip by the C. D. L. The returned appliance which fits the cast sent in, will go to place through this path of insertion with little or no grinding.

10. C. D. L. REQUIREMENTS FOR: REPAIRS, REBASING DENTURES, SPLINTS, ACRYLIC AND GOLD CROWNS, BRIDGES, VITALLIUM, AND MISCELLANEOUS CASES. *a. Repairs.* Casts from hydro-colloid or similar impression

materials are made with the appliance in place. Occluding cast is made and bite is taken when such are indicated. The correct shade is always given if the teeth to be replaced are broken.

b. Rebasing dentures. (1) *Preparation. Eliminate all undercuts* which would prevent the removal of denture from cast. Reduce the flanges approximately 3 mm, leaving square peripheral margins.

(2) *Requirement.* Pour and properly trim cast, but do not separate. Trim impression material on facial surface to desired fullness.

c. Splints. Required: Accurate stone models secured from hydro-colloid or similar materials of both upper and lower arches, including all remaining teeth, and including at least ⅛ inch of the mucous membrane. Further, submit any bite data which will be an aid in assembling casts, as well as X-rays and a complete description of case.

d. Acrylic crowns. Since the facilities for the construction of these crowns are limited, priority will be given to fabrication of necessary dentures. The following models and impressions are required:

(1) The shoulders on all teeth for acrylic jacket crowns will be prepared with the same precision common to the construction of porcelain jacket crowns. This shoulder should be at right angles to the long axis of the tooth, and the depth or thickness of this shoulder should be uniform at all points in the preparation.

(2) An amalgam die is made from an accurate impression. The root end of the die should be tapering and comparable to that made for a porcelain jacket crown.

(3) A plaster impression of the arch including the tooth for which the jacket crown is to be made, ordinarily should include at least two teeth on each side of the prepared tooth. The impression of the shoulder of the prepared tooth must be extremely accurate. Operators are requested to accurately adapt inlay wax over the shoulder as well as the remainder of the crown, and then take a plaster impression over this wax. If it is adapted carefully to the shoulder of the crown, the wax will produce a very accurate impression. Do not pour this impression, but forward it to the laboratory for completion.

(4) In addition to the requirements already cited in (1), (2), and (3) above, there must be a stone cast of the opposing arch, a wax bite in centric relationship, and a New Hue shade.

e. Gold crowns. Same requirement as in *d* above, except for the elimination of the shoulder preparation and shade.

f. Bridges. A plaster impression is taken with attachments in place, ordinarily including at least two teeth on each side of the abutment teeth. In anterior bridge cases, the impression should generally include the corresponding teeth on the opposite side of the arch. If the station desires to pour this cast, a minute amount of moldine or wax should be placed on both sides of retention grooves. It may be poured in either stone or crown and bridge investment. An occluding cast, bite and shade are *always required.*

g. Vitallium. All casts for vitallium will be made of stone. This technique requires a special investment, and casts which are ordinarily used in gold work are useless. Do not varnish or lacquer these casts. If case is designed in a station, use ordinary lead pencil (not indelible) and definitely draw outline on model.

[AG 300.5 (3 Mar 45)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL
Chief of Staff

OFFICIAL:

J. A. ULIO
Major General
The Adjutant General

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TB MED 147

WAR DEPARTMENT TECHNICAL BULLETIN

NOTES ON CARE OF BATTLE CASUALTIES

War Department, Washington 25, D. C. • • • March 1945

This Bulletin rescinds SGO Circular Letter No. 178, 1943

This bulletin follows TB MED 146, subject, "Medical and Sanitary Data on Pratas Island." Distribution given TB MED 146 was as follows: AAF (2); AGF (2); ASF (2); Dept (Med Lab) (1); Def Comd (3); S Div ASF (1); Tech Sv (Tng D) (1); SvC (Surg) (3); SvC (Tng D) (1); SvC (Med Lab) (1); AAF Sta (ZI) (1); PE (1); PE (Surg) (1); PE (Intell O) (1); GH (ZI) (1); RH (ZI) (1); SH (ZI) (1); Med Sv Sch for O (1); Med Techn Sch (1); ASF Unit Tng C (3); Med Lab (1); A (3); A (Med Lab) (1); CHQ (3); D (3); AF (3).

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1. PURPOSE. In previous directives, certain broad policies and guiding principles on the care of the wounded in theaters of operations were present. Greater experience that has since accumulated has confirmed the soundness of these principles. It has also brought to light additional facts that indicate the need for re-emphasis of some of these principles, suggest the desirability of modifying others, and provide the basis for certain new developments the significance of which demand wider application. For these reasons and in order to assure continued improvement in the management of the wounded, this bulletin has been prepared for the guidance of all concerned. Certain details of the phases of wound management of especial concern to theaters of operations are outlined.

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2. GENERAL CONSIDERATIONS. The care of the wounded must always be shaped by conditions and circumstances that govern the tactical situation at the moment. It is erroneous, however, to assume that the surgery of war is entirely molded by concessions to the need for haste and the confusion of caring for overwhelming numbers of patients. Military surgery is not to be regarded as a crude departure from accepted surgical standards, but rather as a development of the science of surgery to carry out a specialized and highly significant mission. Modern surgical treatment employs many adjuvants to operative techniques, such as chemotherapy, fluid replacement therapy, the transfusion of whole blood and fractions of blood employed as substitutes, potent anesthetic agents and narcotics. These tools are as important to

the military surgeon as his scalpel, but are equally dangerous to the patient if used without expert precision. One of the major responsibilities of the military surgeon is to make full use of these and similar measures and at the same time to avoid the dangers that may attend their usage.

a. The ever present necessity for evacuation of the wounded to the rear is in fundamental conflict with ideal surgical management of the individual patient. To minimize this conflict, *close coordination between the functions of administration and professional services is required.* It is the responsibility of the medical officer charged with the surgical management of the patient to place technical procedures properly, both in time and in space, with due regard to the tactical situation on the one hand and to the welfare of the patient on the other. Unless the surgeon visualizes his position and the function of his hospital in relation to other surgeons and other hospitals, he may become confused in the mission he is to perform. Although some needed operation may be performed correctly, the military effort may be impeded and unforeseen harm done to the patient if the operation is done at the wrong time or in the wrong place.

b. It is the *responsibility of administrative officers* charged with the establishment of evacuation and hospitalization policies to adapt the schedules of movement of patients to the maintenance of highest standards of surgical treatment. Priority of movement must be accorded to patients with certain types of injuries just as the duration of hospitalization in a given zone must be differentially adjusted to the urgent surgical needs of the patients. The term "nontransportable" as relating to the unfitness of battle casualties for interhospital transfer must, when military necessity permits, be extended beyond actual danger to life by a consideration of the likelihood of deformity, ultimate disability, and delay of recovery when these hazards exist.

3. PHASES OF SURGICAL MANAGEMENT. Just as the placement of various types of hospitals and consequently the provision of the facilities for surgery are determined by the geographic deployment of a military force, phases of surgical management exist that in general will conform with military echelons. These phases of surgical management are: medical aid measures, initial wound surgery, reparative wound surgery, reconstructive surgery, and rehabilitation measures.

a. Medical aid measures. Within the divisional area, surgical management is limited to first aid measures and emergency resuscitation. Hemorrhage is controlled, splints and dressings applied, morphine administered for pain, plasma infused for resuscitation, a booster dose of tetanus toxoid is given, and chemotherapy initiated.

b. Initial surgery. Actual conditions of warfare will determine both the facilities provided for emergency wound surgery and their location with reference to the combat area. In general, initial surgery is concerned with complete resuscitation so that surgery may be performed, and with surgical procedures designed to prevent or eradicate wound infection. Many of the seriously wounded casualties can be resuscitated only by a surgical operation in conjunction with transfusion and plasma therapy. For this reason, it is important that delays for the purpose of resuscitation ahead of an installation equipped for major surgery be kept at a minimum. Placement of the advance surgical hospital in physical proximity to the divisional clearing station accomplishes this end.

c. Reparative surgery. The general hospitals of the communications zone receive casualties from the hospitals of the forward area for further surgical management. As the initial wound operation is by definition a limited procedure, nearly every case requires further treatment. Soft part wounds, purposely left unsutured at the initial operation, are closed by suture, usually at the time of the first dressing on or after the fourth day. Fractures are accurately reduced and immobilized until bony union takes place. Designed to prevent or cut short wound infection either before it is established or at the time of its inception, this phase in the surgical care of the wounded is concerned with shortening the period of wound-healing and seeks as its objectives the early restoration of function and the return of a soldier to duty with a minimum number of days lost. In addition, it affords the return of patients to the zone of interior at an earlier date and in better condition, and minimizes the ultimate disability

and deformity in the seriously wounded. The success of this important phase of surgery depends on the provision of an adequate period of hospitalization in addition to competent surgical care, particularly in specialized fields. It is not to be confused with the reconstructive phase of surgery, which may be postponed until return to the zone of interior. The ideal time for the procedures of reparative surgery will be found between the fourth and tenth days after wounding. The patient then becomes "nontransportable" for a period of time which, in the case of fractures, may extend to 10 or 12 weeks. Transfer of patients between fixed hospitals within the zone of communications must be regulated with these considerations in mind, otherwise the objectives of this phase of surgical management may be sacrificed. The establishment of special centers within general hospitals for certain types of surgery during this phase is highly desirable, as the procedures are oftentimes of considerable magnitude and call for mature and experienced professional judgment. Advancement of general hospitals in close support of Army or utilization of air evacuation from Army to more remote fixed installations are two measures that further the establishment of a program of reparative surgery. To use an oversea general hospital as a temporary custodial institution—a way station in a busy line of evacuation—where patients are held only if complications of the wound render them nontransportable, is to fail to utilize effectively and significantly one of the most highly integrated and specialized facilities of the medical service.

d. Reconstructive surgery. Early evacuation to the zone of interior is desirable for patients whose return to duty cannot be anticipated within the limits of the hospitalization policy of an oversea theater. The phases of reconstructive surgery and rehabilitation may then be integrated.

4. MEDICAL AID MEASURES. First aid measures have been adequately treated in revised editions of War Department Technical and Field Manuals.

5. GENERAL PRINCIPLES OF INITIAL WOUND SURGERY. *a.* In the preoperative examination of a battle casualty, X-ray examination is essential.

b. Adequate assistance and instruments, a good light, and access to the wound that is unhampered by faulty position of the patient are basic requirements. Ample preparation of a wide field by shaving the skin will allow for extension of the incision or counterincision.

c. Bold incision is the first essential step in an operation on a wound. Adequate exposure is necessary to carry out *excision* of devitalized tissues. On the extremity the line of the incision is placed parallel with the long axis of the limb; elsewhere it follows the natural lines of skin structure. Only the devitalized skin of the margins of the wound is excised in a strip rarely wider than 2 to 3 mm. The creation of circular skin defects is avoided.

d. Incision and excision of the fascial layers is performed in the same manner to give free access to devitalized muscle. Unrestricted exposure of successive anatomic layers permits the complete excision of devitalized muscle and the removal of foreign bodies.

e. The surgeon must be familiar with the blood supply of muscles, particularly large groups, like the gastrocnemius-soleus muscles of the calf, and respect these vessels in his dissection. Deep recesses of the wound containing foreign bodies may be approached by counterincisions planned anatomically rather than by sacrificing normal muscle structures.

f. Use fine hemostats. Use the finest ligature compatible with the procedure. Include the smallest possible amount of tissue in ligating a bleeding point. Do not repeatedly bite the wound with tissue forceps. Sponge gently with pressure instead of wiping. Remaining devitalized tissue produced by the missile or by the surgeon must slough before the wound can be closed by secondary suture.

g. Large wounds in regions of heavy muscles, particularly when complicated by comminuted fracture, require especial care. The depths of these wounds must be opened by a long incision with counterincision if necessary to allow free *dependent* drainage.

h. Only enough dry fine mesh gauze (bandage, gauze, roller, Item Nos. 2005000 or 2006000) is used to separate the surfaces of the wound.

It should be smoothly laid in the wound—not "packed."

i. Ether, white soap, and benzene have slight but definite necrotizing effects on living muscles. Green soap and various other substances used as detergents have greater necrotizing effects, whereas physiological saline solution is relatively innocuous. In general, progress in wound management points away from the introduction of any chemical agent into a wound for its supposed antiseptic effect.

j. Old wounds (48 hours or longer) are managed in accordance with the same principles, except that, in selected cases of established pyogenic infection and anaerobic cellulitis with toxicity, the general condition of the patient to withstand radical surgery may be improved by immobilization, penicillin, and repeated blood transfusions until an optimum time is selected for intervention. In postponement of surgery, the advantage that accrues from the immediate drainage of septic hematomas, large masses of dead muscle, and fascial plane abscesses is not to be forgotten. Postponement of surgery is not justified if clostridial myositis (gas gangrene) should be present.

k. Proper transportation-splinting is provided for skeletal and joint injuries. Soft part wounds are supported by firm pressure dressings and may, if extensive, be advantageously inclosed in a light plaster. Care is taken to avoid any constricting action of a pressure dressing placed on an extremity. Plaster casts must always be padded and split, or bivalved, before the patient is returned to the ward.

6. GENERAL PRINCIPLES OF REPARATIVE WOUND SURGERY. *a.* On arrival at a hospital where bed care can be assured for a period of at least 15 days (soft part wounds) the original dressing is removed in the operating room under aseptic precautions. X-ray films should be at hand. If the primary wound operation has been complete and has been properly done, all superficial wounds and many deep wounds may be closed by secondary suture at this time (4 to 10 days). Foreign bodies in soft parts adjacent to the wound are removed. Following suture, the part is immobilized, preferably by a light plaster, or if this is impractical, by bed rest.

b. The presence of residual dead tissue or established infection manifested by profuse discharge of pus, reddening and edema of the wound margins, persistent fever or toxicity is an indication for delay in secondary suture. When these manifestations are present but minimal, the wound is allowed to "clean up." This process can be hastened by moist dressings or by additional surgical excision of devitalized tissue remnants. Secondary suture can then be performed in a few days. If established infection is severe, or if the patient is toxic and anemic from deep-seated sepsis, a course of penicillin therapy and blood transfusions is instituted and followed by radical wound revision and staged closure.

c. Wounds that have been laid open properly at the initial operation tend to gape widely and give the impression of extensive skin loss. This appearance is actually due to loss of support of the deep fascia. Skin defects are more apparent than real in the majority of cases. Closure of a defect due solely to loss of skin is made from local tissue. Undermining with advancement or rotation of flaps provides sufficient skin in nearly all instances and is preferable to grafting.

d. Technical considerations that are important to the success of secondary wound closure are:

(1) Atraumatic handling of tissue.

(2) Avoidance of tension sutures.

(3) Accurate approximation of skin margins. The epithelial bridge is the main support of the wound for a considerable period of time.

(4) Obliteration of dead spaces by pressure dressings and immobilization. Stab-wound drainage may be instituted when desired and is preferable to drainage through the suture line.

(5) Leaving sutures in place for 12 days if stitch infection does not develop.

(6) Suture in straight lines rather than the creation of sharp angles.

e. Preliminary bacteriologic analysis of the flora of a wound does not provide information pertinent to making the decision to perform secondary suture or allow the prediction of the result. If the suture is not successful because of infection, appropriate studies and correc-

tive therapy are instituted before resuture is attempted.

f. The conditions that most often jeopardize results are:

(1) Suture of a wound that is discharging pus. This usually means dead tissue in the depths.

(2) Too early motion. (Wounds breaking down for this reason should be immediately resutured.)

(3) Unrecognized foreign bodies adjacent to the wound.

7. CONSIDERATION OF CLOSED PLASTER TREATMENT (methods of Ollier, Pirogoff, Orr, and Trueta). *a.* The regimen of closed plaster management of war wounds is not considered as satisfactory as the method described above, when field conditions permit the use of the latter. It is advisable to remove the initial dressing for inspection of the wound in all cases at least by the fifteenth day.

b. While the necessity for the rapid turnover of large numbers of casualties might justify an adoption of the closed plaster method of management of compound fractures, a high penalty in the form of skeletal deformity would be the inevitable result. Results obtained by secondary suture do not justify the use of closed plaster for soft part wounds.

c. When it is desired to allow granulations to cover exposed bone in deep irregular wounds, the wound may be encased in plaster subject to infrequent changes. This is also an accepted method of management for established infection of bone, particularly when the wound has caused an extensive loss of overlying soft parts or there is a large bone defect. Before application of the plaster, all devitalized tissue and loose bone fragments are excised. There should be no pocketing or pooling of pus in the fracture site or adjacent fascial compartments. Small surfaces of bare cortical bone may be removed surgically when this permits closure of the defect by suture or skin graft.

8. CRANIOCEREBRAL WOUNDS. *a.* Deep infection of penetrating wounds of the skull is almost always associated with incomplete removal of devitalized brain substance. The extent of the necessary débridement is oftentimes indicated by indriven bone fragments which are demonstrable by X-ray examination. Stereoscopic roentgenograms are helpful. A reduction in the incidence of infection can be effected by extending the débridement so that *these fragments of bone and the tissue that surrounds them are removed* at the time of the initial surgical procedure.

b. Dura defects are repaired by living grafts of fascia or pericranium. The scalp is closed by suture.

c. When a patient arrives at the base following initial débridement and closure of the wound in the forward area, neurological changes are carefully noted. When compared with former observations these may suggest improvement or regression. Signs or symptoms of increasing intracranial pressrue usually indicate deep wound infection, hematoma, or a mass of residual necrotic tissue. The tension and healing in the scalp flap and wound are at once determined. Should stereoscopic X-ray studies disclose the presence of residual bone fragments, secondary wound débridement can then be more readily directed. Even in the absence of symptoms it is usually wiser to remove large or clustered bone fragments. On the other hand, if the fragments are small or in a dangerous location, operation may be withheld, provided the patient is doing well and can be held for a period of observation. If secondary operation is to be carried out, necrotic or infected tissue and hematoma are removed and wound closure effected, even though frankly purulent cerebritis has been encountered. At times a temporary drain to a large dead space is permissible, or repeated aspirations employed, but only rarely is it necessary to exteriorize the infected area.

9. EYE INJURIES. *a.* Conservation in the enucleation of eyes in forward installations is advisable. Inasmuch as sympathetic ophthalmia never develops before 10 days and usually not before 2 weeks after the initial injury, the first 2 weeks following the injury may be considered the "safe period." Therefore, in forward installations enucleations should be done only when there is extensive damage to the eye and orbit, and removal of the ocular remnants is a necessary procedure in the débridement of the area. Enucleation with a glass ball implant in Tenon's capsule is the operation of choice. Evisceration should be limited to those cases showing a purulent endophthalmitis.

b. Pending enucleation, or while awaiting the repair of an eye injury, the injured eye is atropinized, ophthalmic ointment applied, and both eyes bandaged. The immobilization of both eyes is particularly important, as movement of the eyes is minimized with lessening of the danger of wound gaping and further prolapse of the intraocular tissue.

c. Every case of perforating injury is X-rayed as soon as possible to determine the presence or absence of an intraocular foreign body. Patients suspected of having an intraocular foreign body are best transferred to an installation where a giant magnet and accurate methods of X-ray localization are available. The removal of an intraocular foreign body should be attempted as soon as possible unless an established iridocyclitis is present.

d. Tarsorrhaphy is indicated in certain cases for protection of the eyeball during evacuation. The lids should be sutured together whenever there is serious injury or burn of the eyelids, or an exposed eyeball. This is accomplished in most cases by "freshening" the nasal and temporal lid margins and sewing the lids together with fine silk. Where there is much destruction of one of the eyelids, the other can often be brought up to cover the eye. If both lids are destroyed, the eye should be covered by a skin flap as a temporary measure.

10. MAXILLOFACIAL WOUNDS. *a.* The hazards to life of initial operative management are oftentimes greater than those of the original wounding. There should be no hesitancy in performing tracheotomy when indications exist to relieve obstruction of the airway by that method. On the other hand, the care of a tracheotomy is difficult in a long evacuation line, frequently requiring a personal attendant. The choice of the anesthetic agent, as well as the technics of its administration, requires expert judgment and skill.

b. The procedures of initial surgery are based on the following principles in order of importance:

(1) Reduction and fixation of fractures of the bony foundation structures. This may be by temporary measures for transportation purposes, with the intent that it will be replaced by more elaborate and precise splinting at a rear installation.

(2) Isolation of the buccal cavity from the wounds of the bone and superficial soft parts by suture of the mucous membrane.

(3) Primary closure of the muscles and skin with provision for adequate drainage in anticipation of infection. If the defect is such that primary closure is not possible and the wound enters the buccal cavity, the edges of the skin and mucous membrane should be carefully approximated.

(4) Application of moist pressure dressings.

c. The management of the soft-part wound by primary suture, with or without plastic repair, must not tempt the forward surgeon to hold a patient for supervision of healing, with the result that precise and firm splinting of the bony parts is postponed.

d. Those cases with severely comminuted fractures or loss of bony substance, and with major soft-tissue defects, require evacuation to the zone of interior as soon as they can care for themselves and after the dangers of infection have passed.

11. THORACIC WOUNDS. *a.* It is important to recognize two distinct phases that may be encountered in chest wounds: disturbance in cardio-respiratory physiology, and infection. The former develops immediately; the latter is usually delayed. Accordingly, in the forward area efforts are directed toward the restoration of physiologic equilibrium, whereas the less urgent complication of infection, if it occurs, may be controlled adequately at the base. Thus, success in the management of penetrating wounds of the chest depends upon the judicious timing and selection of surgical measures.

b. Occlusion of open chest wounds with gauze and adhesive strapping is the preferred management until the patient reaches a hospital staffed and equipped to carry out intrathoracic surgery.

c. Patients with a chest wound suffering from shock may be more advantageously treated in the prone position with the foot of the litter elevated than in a sitting position. Control of urgent physiologic disturbances that attend wounds of the chest in both preoperative and postoperative periods can be achieved by—

(1) Needle aspiration of air and blood. Early and repeated aspiration of hemothorax

without air replacement is essential in the proper management of chest wounds.

(2) Bronchoscopic or catheter aspiration of blood and mucus from the tracheo-bronchial tree.

(3) Infiltration of the intercostal nerves with procaine hydrochloride solution for relief of chest wall pain. This enables the patient to cough effectively and clear the air passages of blood and secretions.

(4) Insertion of a catheter with a flutter or water-seal valve for pressure pneumothorax.

(5) Administration of oxygen and whole blood transfusion. Autotransfusion of pleural blood should be used when practical. Care is taken to give the blood slowly in resuscitation after the systolic blood pressure has reached 80 mm of mercury, and the total amount administered should be only that essential to attain adequate resuscitation.

(6) Débridement of sucking wounds, with hemostasis of intercostal vessels and approximation of deep structures of the chest wall to close the pleural opening.

d. An anesthetist well trained in endotracheal anesthesia for thoracic surgery is an essential member of an operating team caring for war wounds of the chest. Endotracheal oxygen-ether, administered through a closed apparatus capable of maintaining positive pressure, is the form of anesthesia recommended in the management of penetrating and perforating chest wounds.

e. Early thoracotomy through an extension of the wound or by a separate incision at a site of election, is indicated in the presence of—

(1) Continuing intrapleural hemorrhage not controlled by hemostasis in the chest wall débridement.

(2) Anatomic likelihood of diaphragmatic penetration.

(3) A missile in the mediastinum or that has traversed the mediastinum with evidence of visceral damage.

(4) Large intrapleural foreign bodies or debris that is readily accessible by extension of the wound.

(5) Wounds of large bronchi or the intrathoracic portion of the trachea.

f. The following conditions are not in themselves indications for early thoracotomy either by extension of the wound or by separate incision:

(1) Foreign bodies; that is, metallic fragments, rib fragments in the lung, or small fragments that may be in the pleural space.

(2) Hemothorax. (Evacuation of blood from the pleural cavity by suction at the time of chest wall débridement is not considered a thoracotomy.)

(3) Lacerated or contused lung, unless there is definite evidence of continuing hemorrhage.

g. The incision for thoracotomy, or an extension of the wound, should be placed in the postero-lateral area of the thoracic cage, rather than anteriorly. Difficulty has been encountered with the break-down of anterior chest wall defects. Following thoracotomy, closed drainage of the pleural space is instituted unless definite contraindications exist. The drainage catheter is removed as soon as the clinical course permits, usually at the end of 48 hours.

h. Rather than invite pulmonary edema by excessive intravenous fluid therapy, it is advisable to keep a patient with an injured lung slightly dehydrated.

i. Late complications include residual "clotted" hemothorax and empyema.

(1) The accumulation of massive clots of fibrin in the pleural cavity is suspected when clinical findings persist and only small amounts of blood can be withdrawn with the needle. In addition, serial roentgenograms show no improvement during the third to sixth weeks. In such cases thoracotomy is done for the removal of clots from the pleural cavity and the dense layer of fibrin from the underlying lung. Early decortication in these cases permits normal expansion of the lung and prevents chronic empyema and other complications that lead to chronic disability. Penicillin is used both systemically and locally in the pleural cavity at the time of operation.

(2) Empyema complicating hemothorax demands prompt surgical drainage or, when the patient's condition permits, radical thoracotomy with the evacuation of residual clots and decortication of the lung. The latter procedure should be performed preferably before the tenth week, because the surgical line of cleavage becomes obliterated after this time by organiza-

tion of inflammatory exudate. Systemic and local penicillin is used as an adjuvant.

12. ABDOMINAL WOUNDS. *a. Resuscitation.* Surgical management of penetrating wounds of the abdomen demands rapid resuscitation with adequate amounts of whole blood and plasma and early operation. Continuing internal hemorrhage or advancing peritonitis frequently prevents a satisfactory response to blood transfusion, forcing the surgeon to proceed with operation and rely on support of the patient by transfusion during and after surgery.

b. Preoperative measures. Nasogastric intubation, with removal of gastric contents, is an important measure to prevent the aspiration of this material during anesthesia. It is a fortuitous event when passage of the tube provokes vomiting. Testing of the nerve function of the extremities and rectal examination to determine the presence of fresh blood indicative of injury to the rectum are the two most commonly overlooked features of the preoperative examination.

c. Anesthesia. Ether-oxygen anesthesia with a closed system, and preferably with an intratracheal tube, is the method of choice. Supplemental block of the field either by local infiltration or injection of the lower intercostal spaces in the axillary line may minimize the necessity for carrying these patients into the deeper levels of general anesthesia. Facilities should be available for bronchoscopy during or subsequent to the operation if there is reason to believe that gastric contents have been aspirated into the tracheo-bronchial tree. Postoperative aspiration pneumonia ranks with peritonitis as a life-endangering complication.

d. Incisions. The vertical paramedian incision affords the most useful approach and is least liable to complications. Fecal contamination of the peritoneal cavity will be reflected by postoperative infection of the abdominal wall incision in a considerable number of instances. The principles that apply to the management of heavily contaminated soft part wounds also apply to abdominal wall incisions, provided steps are taken to prevent evisceration. The peritoneum is closed, usually including the posterior rectus sheath in the suture line. The rest of the abdominal wall is loosely approximated, preferably with stay sutures of braided silk or wire. The skin is left unsutured. The provision of adequate drainage for the abdominal wall incision, the avoidance of buried sutures and ligatures, and a loose rather than taut approximation of the stay sutures are the most effective measures in the prevention of infection. When it is necessary to exteriorize segments of bowel or to provide intraperitoneal drainage for or in anticipation of localized sepsis or a fecal fistula, secondary incisions are made. These are short, laterally placed incisions that follow the direction of the fibers of the external oblique muscle. In the upper abdomen, incision for exteriorization of bowel must not impinge on the costal arch.

e. Small bowel injuries. Depending upon the extent of damage, repair is done by suture or by resection and anastomosis. Exteriorization of small intestine or double-barreled enterostomy is avoided as productive of serious life-endangering complications.

f. Large bowel injuries. It is important to note the distinction between exteriorization of a wounded segment of bowel and construction of a colostomy to divert the fecal stream. At times both purposes may be accomplished by one and the same procedure, but a clear understanding of the purpose of the operation is essential to the selection of technics involved. For either purpose the basic technical requirement is adequate mobilization of the segment of the large bowel that is brought to the surface of the abdominal wall. Insufficient mobilization with dependence upon suture or clamps to maintain the bowel in its abnormal position will result in retraction. Retraction leads to a fecal fistula that may be difficult to repair or, in the case of a defunctioning colostomy, defeats the purpose of the operation by allowing fecal matter to enter the distal segment. Early in the convalescence, retraction is productive of abdominal wall infection or intraperitoneal sepsis.

(1) *Exteriorization.* Exteriorization of the damaged segment through a laterally placed muscle splitting incision is the established procedure in the management of wounds of the large intestine. The loop of bowel must lie comfortably on the abdominal wall without tension and with proper orientation of its proximal and distal limbs; that is, not twisted upon itself.

The mesentery falls naturally into a fold on the medial aspect of the loop, leaving the bowel walls in contact on the lateral side. Properly performed, this simple procedure is adequate in the majority of instances when exteriorization is all that is required. Closure is made by suture or the application of a spur clamp in the area when the two limbs of the bowl are in contact. When the injury is larger than one-half the diameter of the bowel or a segment has been resected because of damage to the mesentery, exteriorization takes the form of a double-barreled spur. Sutures may be placed to approximate the antemesenteric borders of the intraperitoneal portions of the limbs for subsequent crushing by a clamp. Care must be taken not to penetrate the lumen of the gut or strangulate vessels by sutures.

(2) *Sigmoid colostomy.* Colostomy to divert the fecal stream is required for: injuries of the pelvic colon below the level where exteriorization is possible (in such an instance the perforation is repaired by suture and proximal colostomy done); wounds of the rectum; and certain perineal and buttock wounds as an adjuvant to wound healing and secondary suture. An appraisal of the length of time that may be necessary to defunction the distal bowel segment guides the technical details of construction of the colostomy, as well as determines the site chosen for the artificial anus. A tube cecostomy or partial exteriorization of the cecum does not divert the fecal stream from the remainder of the colon, and is never used for this purpose. Colostomy in the left half of the transverse colon is a useful procedure in the face of extensive pelvic injuries that may require subsequent repair by the abdominal route. This is particularly the case if a suprapubic cystostomy is also indicated, or if the missile has produced damage to the abdominal wall in the left lower quadrant. Usually, however, a left sigmoid colostomy will be satisfactory for injury of the pelvic colon or rectum and for perineal injuries. Placement of the colostomy in a defect produced by the missile, or in the laparotomy incision, is to be avoided. Formation of a loop with proper lateral orientation of the bowel, assured if desired by the placement of a few absorbable sutures on the antemesenteric borders or approximation of appendices epiploicae, provides an adequate sigmoid colostomy. Formal construction of a long spur is not necessary and may be undesirable. Extensive damage to the lower bowel segment, associated injury of the bladder and urethra, and wounds that extensively compound the bony pelvis, as well as the rectum, are examples of injuries that require a prolonged and complete defunctioning artificial anus. Under these circumstances the exteriorized loop is made sufficiently long to allow for complete transverse section of the bowel and some separation of the two stomata. As ultimate closure will be by end-to-end suture, formation of a spur is undesirable. Construction of a skin bridge between the arms of the loop would, in fact, be preferable. Small perforations of the rectum, or instances in which the perforation cannot be demonstrated but is thought likely, may not require prolonged or even complete diversion of feces. Small wounds of the rectosigmoid may heal promptly if suture is technically satisfactory. Under such circumstances, formation of a loop colostomy with a tentative partial opening on the antemesenteric border will suffice until a complete appraisal can be made at a fixed hospital. Many of these cases can be restored to duty within an overseas theater by extraperitoneal repair of the incompletely divided loop. If the need for long and complete diversion of feces is demonstrated, the loop is completely transacted to form an artificial anus. Colostomy as an aid to the healing of wounds of the buttocks and perineum need not be performed in the forward area unless laparotomy is being performed for other purposes. If done solely for management of the external wound, the patient will be rendered nontransportable because of a procedure that could have been postponed until arrival at a fixed hospital.

(3) *Cecostomy.* Tangential perforations of the cecum may be managed by a tube cecostomy or, preferably, by exteriorization. Single perforations require mobilization of the bowel to look for retroperitoneal perforation. Cecostomy, even when necessary because of direct injury to the cecum, is never to be used as a substitute for a proximal colostomy when indications for the latter are present.

(4) *Right colostomy.* In extensive injuries necessitating resection of the cecum and ascending colon, the most important principle to ob-

serve is complete separation of the ileostomy from the laparotomy incision or from a large abdominal wall defect. The most satisfactory method for dealing with the end ileostomy is separation of the ileum and the proximal end of the colon by creating a terminal ileostomy in a separate incision in the right lower quadrant and exteriorization of the end of the colon below the coastal margin. Every effort should be directed to the early anastomosis of the ileum to the transverse colon.

(5) *Perforations of rectum.* Wounds of the rectum are characterized by inaccessibility, difficulty of diagnosis, frequent damage to other structures and the hazard of pelvic and ascending retroperitoneal cellulitis. Deviations from the principles established for the management of wounds of the rectum continually lead to serious complications. Colostomy (not cecostomy) is mandatory, as also is free posterior drainage, best established by incision of the fascia propia exposing the rectal, sacral, and lateral paramedian spaces. Attempts to drain the retroperitoneal space by utilizing the missile wound of the buttock have been disastrous. In establishing posterior drainage it may be desirable to increase the exposure by removal of the coccyx. This is done as a disarticulation of the coccyx from the sacrum by sharp dissection and erasure of exposed articulating cartilage—not by incomplete amputation with a bone forceps.

g. Postoperative care. The postoperative care of patients with abdominal wounds is of the utmost importance and is the personal responsibility of the operating surgeon. Among the most important considerations are:

(1) Holding of the patient until his equilibrium is established, oftentimes a minimum of ten days.

(2) Nasogastric suction for 48 hours or more following operations.

(3) Whole blood and plasma.

(4) Parenteral fluid therapy is controlled by measurement of fluid intake and output and by determinations of cell volume and plasma protein concentration by the copper sulphate method. A daily urinary volume of 1,200 to 1,500 cc is maintained, a point of particular importance in connection with the use of sulfadiazine.

(5) Aspiration of tracheo-bronchial secretions. Postoperative pulmonary complications including pneumonia, atelectasis, and pulmonary edema are common in this group of patients. Oxygen therapy by means of an indwelling nasal catheter and aspiration of tracheo-bronchial secretions by catheter or bronchoscope are important measures and may be required frequently.

h. Postoperative complications. In cases that develop sepsis, small intestinal fistula, intestinal obstruction, and other complications or sequelae, it is essential to—

(1) Maintain nutrition by supplemental feedings.

(2) Correct the tendency toward vitamin depletion.

(3) Promptly diagnose and drain localized sepsis.

(4) Close small intestinal fistulas at the earliest moment that operative intervention can be tolerated.

i. Closure of colostomy. A defunctioning colostomy deteriorates into a useless fecal fistula when it no longer diverts the feces from the distal bowl. Reappraisal of the purpose of its continuation must be made and it should either be closed or reestablished as an effective artificial anus. Spillage of feces into the lower segment results in fecal impaction and delays healing of the wound of the bowel wall. In oversea theaters it is desirable to close certain colostomies and repair exteriorized segments, when this can be done, by suture of a partial defect of the bowel or by crushing a spur. Formal end-to-end suture is not recommended for oversea theaters unless the patient can be returned to duty in the theater.

13. PERIPHERAL VASCULAR INJURIES. Peripheral vascular injuries are of special importance, particularly where major vessels are involved. In many of these cases ligation or end suture will be necessary. Ligation in continuity should not be done. In the presence of thrombosis, the thrombosed segment is excised. Localized segmental spasm of the artery should be distinguished from thrombosis. Such cases, also termed "concussion" or "stupeur" of the artery, may follow various forms of trauma to an extremity, especially

when the traumatizing agent passes near a vessel. In such cases the limb is cold, pale, and pulseless, but evidence of hemorrhage or hematoma indicating that the vessel has been lacerated is lacking. These cases respond well to débridement of surrounding traumatized tissue and to periarterial sympathectomy or sympathetic block. Postoperatively, in all cases with peripheral vascular injuries, vasodilatation may be induced by daily sympathetic block using 1 percent procaine hydrochloride solution. Body warmth is carefully maintained but heat should not be applied to the involved extremity.

a. The *position of the extremity* is important, as elevation may accentuate ischemia. A dependent position is preferable even if a moderate degree of edema appears to be the result. A plaster cast on an extremity threatened by ischemic gangrene is bivalved and the anterior half removed. Continuous observation is essential to detect impending anaerobic infection. Repeated transfusions to establish a normal blood volume and maintain a high red cell volume is an important phase of management.

b. A patient with *impending ischemic gangrene* should be held at the initial surgical installation until a favorable result is assured or amputation is performed.

c. Operation for the extirpation of an *aneurysm* or an *arteriovenous fistula* is rarely an emergency procedure. Since wounds causing aneurysms may be infected, and since extravasation of blood into the tissues surrounding the wound usually occurs, delay in operation will diminish the chance of secondary infection and secondary hemorrhage. Moreover, *operation should be postponed until such time as collateral circulation has been established, so that major vessels may be safely ligated and divided.* This will usually require 3 or 4 months. Early operations are undertaken not for the cure of aneurysm but to arrest certain complications; namely, hemorrhage, impending rupture, nerve paralysis caused by pressure, or threatened gangrene of the extremity. In such cases, repeated sympathetic block using 1 percent procaine hydrochloride solution (or sympathectomy, if indicated) should be done both preoperatively and postoperatively to assure maximum vasodilatation and thus increase circulation in the involved part. Oversea patients with aneurysms should be evacuated to the zone of interior where, upon arrival, they should be sent to vascular surgery centers in accordance with paragraphs 1*k* and 3*c*, War Department Circular No. 140, 1944, and War Department Circular No. 235, 1944.

14. PERIPHERAL NERVE INJURIES. *a. Complete palsy with anatomic division of nerve.* (1) *Primary suture* of peripheral nerve injuries is advisable only during a period when small numbers of casualties are being handled or expected. In selected cases of soft part wounds uncomplicated by extensive muscle damage or skeletal fracture, complete or partial severance of a nerve may be repaired by formal suture following a meticulous initial débridement. Closure of the soft parts over the suture line without tension is advisable with primary or staged closure of the skin. This procedure should be undertaken only if the patient may be held under observation of the operating surgeon for a period of ten days, and is not recommended if the wound is heavily contaminated by debris or if evacuation from the field has been delayed. Primary nerve repair must never be undertaken at the expense of delay in débridement or neglect of concomitant injuries.

(2) The *more usual method of management* will be by undertaking formal nerve suture as a phase of reparative surgery in the following stages:

(*a*) It is the responsibility of the surgeon at the time of the initial débridement to make a careful record of the injury as he observes it. Preoperative appraisal of nerve injury is notoriously difficult and inexact in patients with multiple wounds, particularly if they are suffering from shock. The most precise information comes from anatomic observations at operation. Here again, it is not desirable to embark upon a painstaking dissection with extension of the field of operation beyond the zone of devitalized tissues.

(*b*) No attempt is made to repair the nerve by suture or to fix the nerve ends. Exposed nerves are covered with muscle so that the dry fine mesh gauze used in the wound is not in contact with the nerve. Petrolatum gauze is not recommended.

(*c*) Dusting of the wound with sulfonamide after débridement should not be done in the area of the nerve trunk.

(*d*) The joints above and below the point of injury are immobilized to minimize retraction of the nerve.

(*e*) A firm pressure dressing supported by a light plaster of paris cast is applied to reduce wound exudation.

(*f*) Penicillin therapy is maintained by the systemic route.

(*g*) On reaching a general hospital the original dressing is removed under aseptic precautions in the operating room. This usually is possible on or shortly after the fourth day after injury. Appraisal at this time is based upon the ultimate functional restoration of the extremity, taking into consideration muscle damage and bone or joint lesions in relation to the nerve injury. Electrical tests may be made if desired. Oftentimes a more deliberate examination will correct or supplement the initial notes made in the forward area. Procedures such as muscle suture or even shortening of the limb by removal of the devitalized comminuted bone fragments may be carried out at this time. The divided ends of the nerve may be approximated by a single fixation suture or otherwise identified with metallic sutures. The wound is closed if sepsis is not present, or if, after further excision of sequestrating tissue, the wound appears adequately prepared for closure. Closure of the skin may be further staged, or, if a large skin defect exists, a skin graft is applied at once, or as a staged procedure.

(*h*) When first intention healing has been secured—and this results in 80 to 95 percent of cases—formal suture of the nerve is performed under the protection of systemic penicillin. This should be feasible in many cases during the third or fourth week after injury.

(3) Patients with major nerve injuries, whether suture has been performed or not, should be transferred to the neurosurgical centers in the zone of interior with the least possible delay. It is important that splints or casts be removed at the earliest possible date. Cases are being received in the zone of interior with muscle atrophy and joint fixation resulting from unduly long periods of immobilization by casts.

b. Partial or transient palsies make up perhaps one-fourth to one-third of the nerve lesions arriving at the base. Recovery from simple contusion often begins within a few days, while more extensive injuries may proceed over a much longer period of time. In these cases it is desirable, though not imperative, to visualize the injury to the nerve trunk at the time of primary débridement or secondary wound suture.

15. AMPUTATIONS. The most important phase in the management of amputations is the functional rehabilitation of the patient by the fitting of a prosthesis. Amputation centers have been established in the zone of interior for this purpose. It is the expressed desire of The Surgeon General that the early management of amputations in overseas theaters conform with policies that have been set forth in numerous bulletins and circular letters.

a. In the forward area, amputations will be performed at the lowest possible level except that a proximal amputation may be done in preference to a disarticulation. The technic for the performance of amputations is as follows: An incision is made through the skin at the lowest level compatible with viable tissue, and the skin allowed to retract; the fascia is then incised at the level to which the skin has retracted. The superficial layer of muscle is then cut at the end of the fascia and permitted to retract. At its point of retraction, the deep layers of muscle are cut through to the bone. After the deep muscles have retracted, the periosteum of the bone is cleanly incised and the bone sawed through flush with the muscles. No cuff of periosteum is removed as in a closed amputation. Bone denuded of periosteum will sequestrate if infection is present, and a ring sequestrum often results when the periosteum has been removed. It is important also that no periosteum be elevated or torn from the bone in the stump by rough handling. The stump following a properly performed open amputation exhibits a slightly concave open cross section of the extremity and the skin can be pulled down gradually by traction to cover the end of the stump.

b. The proper dressing of the stump is important. The end of the stump is dressed with fine mesh gauze in such a manner that it does

not overlap the skin edges. Skin traction is applied immediately by a stockinette cuff attached with ace adherent or by adhesive tape. Traction is obtained preferably by a light plaster cast incorporating a wire ladder banjo splint. The cast always incorporates the joint above the amputation; for example, a spica for an amputated thigh. The Army Hinged Half-Ring Splint may be utilized as an alternative. Medical Supply Item No. 3661400, Cord, Elastic, for Traction, is available and is preferable to plasma tubing for the elastic traction. Before evacuation, the traction is examined and if doubt exists as to its effectiveness, it is reapplied. The tension of the elastic cord should be maintained by adjustment during transit.

c. At the base areas, skin traction is continued until the stump is healed or the case is evacuated. Closure of stumps by sliding flaps, plastic resection with sacrifice of bone length, or formal reamputation are procedures to be carried out in the amputation centers in the zone of interior rather than in an oversea theater. Skin grafting in lieu of traction is not indicated. Vertical incisions in the stump made for control of infection or as part of the initial débridement should be closed by secondary suture while skin traction is being maintained to cover the defect at the end.

d. In the communications zone continuous skin traction is maintained in all cases. After removal of the cast or splint, maintenance of traction using 4 to 6 pounds in below-knee and 6 to 8 pounds in thigh stumps over a pulley at the foot of the bed is indicated. Traction is continued until maximum healing of the wound is obtained. Traction in similar fashion is indicated in upper extremity amputations. Priority air evacuation to the zone of interior should be available for amputation cases as soon as they are able to be transported. Traction during evacuation is the same as in *b* above. Patients with injuries requiring amputation will benefit by an explanation of why the amputation is necessary prior to the operative procedure. They should be informed further that additional surgical treatment of the extremity will be required before fitting the prosthesis.

16. COMPOUND FRACTURES. The management of a compound fracture is divided into the following phases: first aid splinting in the field; débridement and the application of transportation splinting in a mobile hospital; final correction of the deformity and attainment of wound healing and bony union at a fixed hospital (reparative phase); reconstructive or corrective surgery (bone grafting, osteotomy, sequestrectomy, etc.) in the zone of interior. In every phase attention is directed to the *ultimate function of the extremity* which is dependent on muscles, nerves, blood vessels, and joints, as well as on skeletal integrity.

a. Transportation splinting applied subsequent to initial wound surgery for evacuation from mobile to fixed hospitals is not designed to provide anatomic reduction or prolonged fixation in suitable reduction. Except in rare instances it is by plaster of paris. Plaster bandages are adequately padded and bivalved or split through all layers to the skin. Skeletal fixation by the incorporation of pins or wires into the plaster is not recommended. The only indication for the use of internal fixation in the forward area is to preserve the vascular integrity of the extremity. Methods of transportation splinting that have proved safe and comfortable are:

(1) *Femur.* A low-waisted "one and one-half" double plaster spica with the knee slightly flexed and minimal abduction. The Tobruk plaster and the Army leg splint with skin traction provide temporary immobilization for transportation over short distances. While not as effective or comfortable as a spica, they may be used as emergency measures or when large numbers of casualties demand concessions to operating time, or for special indications such as the presence of a colostomy or suprapubic cystostomy. When restricted to lower third femoral fractures or knee joint injuries, the Tobruk splint provides adequate immobilization.

(2) *Humerus.* Comfortable and effective splinting is provided by a thoraco-brachial plaster with the arm forward in internal rotation or a plaster Velpeau bandage binding the arm to the trunk. The Army humerus splint designed for field (first aid) use is not designed for postoperative transportation splinting. A hanging cast is both uncomfortable and ineffective as a method of transportation splinting.

(3) *Forearm.* A split or bivalved circular plaster cast that extends to the midbrachial region with flexion of the elbow or a plaster slab in the form of "sugar tongs" is recommended. The forearm should be held in midpronation.

(4) *Tibia and fibula.* A split or bivalved circular plaster cast should be applied from toes to groin. The knee is slightly flexed (15°), and the foot held in neutral position at 90° to the axis of the lower leg.

b. Reparative surgery of compound fractures (cf. par. 7*c*). Reparative surgery in compound fractures is made necessary by leaving unsutured the large incisions made for débridement and the recognized fact that splinting suitable for transportation is inadequate for complete reduction and fixation of the fracture. The goal is functional restoration of the extremity and demands treatment of muscle and nerve injury as well as skeletal damage. Observance of certain basic principles are important to the success of this phase of management.

(1) *Preoperative correction of anemia by whole blood transfusion.* Despite whole blood transfusion for resuscitation in the forward area, a high percentage of compound fracture cases will arrive at a fixed hospital in the communications zone with low red cell volume (hematocrit) and hemoglobin. An approximate estimate of the quantity of whole blood needed to restore red cell volume may be deduced from the rough rule of 500 cc blood for each 3 points of the hematocrit or 0.9 gram of hemoglobin. In the use of whole blood transfusion for correction of secondary anemia or hypoproteinemia the total volume administered in a 24-hour period should not exceed 1,000 cc, except to replace blood lost at operative procedures. This is in contrast with the larger volumes that are administered for resuscitation when the total circulating blood volume may be greatly reduced. No correlation exists between the hematocrit or hemoglobin levels and circulating blood volume, and care must be taken not to precipitate pulmonary edema by overtransfusion of a patient in whom the blood volume has been restored by dilution but who still shows a greatly reduced cell volume (hematocrit) and hemoglobin.

(2) *Surgical elimination of residual necrotic tissue.* No available chemotherapeutic agent can "sterilize" an open wound containing devitalized tissue or blood clot. A properly managed clean wound requires no local antiseptic.

(3) *Control of invasive infection by systemic chemotherapy.* Systemic penicillin therapy in a dosage of 25,000 units every 3 hours is recommended as a routine adjuvant for secondary operations on compound fractures. Treatment is continued postoperatively until the likelihood of invasive infection is passed.

(4) *Reduction or closure of soft tissue defects.* Exposed cortex of bone, nerves, and tendons are vulnerable to the necrotizing effect of wound suppuration and are protected by the apposition of adjacent soft parts. Transversely divided important muscle groups are united by suture. Fascial compartments are restored, to minimize scarring and improve muscle function. Certain of these procedures may be staged operations. Emphasis should not be placed on early or complete skin closure, as in most cases any remaining cutaneous defect will heal before bony union occurs.

(5) *Provision of drainage for residual exudate.* Severely comminuted fractures may require dependent drainage in association with the apposition of soft parts over exposed bone. Fascial plane incisions and separation of muscle bundles with fine mesh gauze to exteriorize the fracture site have proven superior to stab wounds or rubber drains. Upper extremity fractures rarely present a drainage problem. The thigh may be drained by a postero-lateral incision between the vastus lateralis and the biceps. An adequate posterior drainage route for the shaft of the tibia does not exist and such an injury may necessitate a period of nursing in the prone position ("on the face").

(6) *Internal fixation of battle fractures* is not feasible commonly because of extensive comminution. Further, the method demands periosteal stripping and surgical trauma to the wound. Limitation of the use of this method to cases carefully selected by specialists fully experienced in the technics and hazards of its usage is strongly advised. An example of sound usage is the employment of screws for restoration of the articular surface of a major joint. Reduction of the fracture—not the use of internal fixation—is part of the goal of reparative surgery.

(7) *Use of suspension traction.* The application of suspension traction in the treatment of

fractures, particularly those of the femur, is the safest and most satisfactory method of management. In fixed hospitals, fractures of the femur should be treated by skeletal traction for 10 to 12 weeks, until enough union has been obtained to permit safe transportation to the zone of interior in a plaster spica. The use of suspension traction promotes the maintenance of joint and muscle function and prevents angulation or overriding deformity. Overpull and resulting distraction must be avoided at all times, particularly in cases associated with injury or division of the thigh muscles. Certain cases of this type require very expert attention and delay in the application of traction until firm fibrous union of muscles has been attained by suture.

17. JOINT INJURIES. Early complete débridement is the keystone of success in the management of wounds that compound a joint. The wound of the soft part is excised and the bone and cartilage damage assessed through incisions that provide complete exposure. Comminuted fragments of bone and cartilage are removed from the joint and a careful search made for foreign material. When it is necessary for badly comminuted fractures of the patella to be excised completely as a step in the débridement of a knee joint wound, every effort should be made after cleansing the joint cavity to close the capsule and to approximate the fibers of the quadriceps and patella tendons. The skin is left unsutured. Penicillin is inserted into a joint at the end of the operation. In joints that are accessible to needle aspiration, accumulating exudate may be withdrawn and penicillin injected during the postoperative period.

a. Closure of the joint is especially difficult in the face of extensive loss of soft parts. When it is impossible to close a joint by suture of synovia or capsule, an occlusive dressing is applied. On arrival at a fixed hospital, effort is directed toward closing the defect by advancement of a skin flap or other plastic procedure.

b. Adequate exposure of the *hip joint* is a specialized procedure that requires precise anatomical orientation. The same principles of management must be applied to improve the results after injury to this particular joint.

c. Wounds of the *ankle joint* with comminution of the os calcis or astragalus are peculiarly liable to sepsis. Initial débridement of comminuted bone fragments must be minimal if function is to be preserved. Efforts are made early in the reparative surgical phase to reduce or close the skin defect with split thickness graft when necessary. When sepsis is established, subperiosteal excision of necrotic bone fragments, followed by early wound closure by graft or suture, should not be delayed.

18. URINARY BLADDER INJURIES. *a.* Perforating wounds of the urinary bladder require repair. Drainage of the urine should be accomplished by suprapubic cystostomy, not by perineal urethrostomy. The space of Retzius should be drained always.

b. Certain technical details in the performance of suprapubic cystostomy are essential to successful subsequent management of the cystostomy. A number 34F Malecot or number 20F Pezzer type of tube *should be placed as high in the fundus of the bladder as possible* and brought out through the upper end of the wound. This placement is to avoid pressure necrosis and infection of the pubic bone and periosteum as well as trauma of the trigone by the proximal end of the tube. The suprapubic tube may be held in place by adhesive after the sutures have been removed.

19. BURNS. Progress in the treatment of burns is reflected in the more liberal use of whole blood transfusions during convalescence and the excision of third degree eschars to facilitate earlier skin grafting.

a. Medical aid or emergency treatment of the burned area is accomplished by the application of a sterile pressure dressing. The burned area is covered with strips of sterile dry fine mesh or petrolatum gauze and a thick layer of sterile gauze. This is held in place by firm bandaging.

b. Initial surgical treatment is instituted as soon as possible.

(1) Resuscitation or prevention of circulatory failure is achieved by the adequate use of plasma. In extensive burns, quantities of plasma up to 12 units may be required in the first 24 hours.

(2) Pain is relieved by morphine in dosage of gr. ¼. Pain should be differentiated from the restlessness and apprehension of anoxia. Barbiturates may be an effective supplement to morphine.

(3) The dressing is changed in an operating room with full aseptic precautions. If the burned area appears clean, no further preparation of the wound is indicated. Small blisters should be left alone, but larger ones may be drained by simple puncture. Gentle washing and débridement are reserved for grossly soiled burns. General anesthesia should be avoided if possible. The burned area is covered with dry fine mesh or petrolatum gauze and a pressure dressing. On burns of the extremities the pressure dressing should include the entire extremity distal to the burn. Immobilization of the part by splinting is desirable when feasible.

(4) Systemic penicillin therapy is instituted in preference to sulfonamide therapy.

(5) The prevention of anemia demands liberal use of whole blood transfusions as soon as the initial hemoconcentration is corrected. Protein depletion is offset more effectively by increased dietary intake and whole blood transfusion than by continued dependence on plasma.

c. Reparative surgical management seeks to prevent contractures and excessive scarring by proper splinting and early skin grafting.

(1) Unless complications develop, the initial dressing is not disturbed for 10 to 14 days.

(2) The excision of devitalized tissue may be begun at this time. If this is associated with minimal blood loss, the area may be grafted immediately. More usually the wounds will be dressed again with fine mesh gauze and pressure dressings in anticipation of skin grafting 3 to 5 days later. The adoption of staged procedures in the removal of devitalized tissue is especially recommended for patients with extensive burns.

(3) Systematic penicillin therapy should be continued until skin grafting is effected.

(4) The hematocrit (or hemoglobin) value should be maintained by repeated transfusion of whole blood until all grafting has been concluded.

20. GAS GANGRENE. The bacteriologic demonstration of Clostridiums in a war wound is a minor contribution to diagnosis and clinical management. *Evaluation of the patient* and *examination of the wound* are necessary to distinguish between anaerobic cellulitis and clostridial myositis (gas gangrene).

a. Diagnosis. Anaerobic wound infection should be suspected in battle casualties failing to respond to resuscitative measures. After initial surgery, the patient should be observed especially for pain in the wound, increasing pulse rate and disordered sensorium, either apathy or euphoria. In any suspected case the wound should be examined in an operating room with adequate light and instruments to permit thorough inspection and surgical treatment.

(1) *Anaerobic cellulitis* is characterized by the septic decomposition of tissues devitalized by trauma. Gas and pus may infiltrate fascial planes. The pus may produce necrosis of the surface of tissue exposed in the wound but there is no extensive invasion of living muscle. The patient may show signs of nonspecific toxemia in association with wound putrefaction.

(2) *Clostridial myositis* is characterized by the invasion and necrosis of living muscle tissue adjacent to the wound. The infection may be wet (edematous) or dry (emphysematous). The affected muscle is avascular, noncontractile and presents a variety of color changes. These findings are usually present in addition to those described for anaerobic cellulitis. The toxemia is more profound.

b. Predisposing factors are listed in relative order of importance:

(1) Delayed or inadequate initial surgical treatment of the wound.

(2) Interruption of arterial blood supply to a limb by trauma, thrombosis, ligation, or spasm.

(3) Constrictive bandages, especially unsplit plaster casts.

(4) Persistent circulatory failure and severe anemia.

(5) Certain muscles derive their blood supply from one or two main sources. This is especially true for the gluteus maximus, hamstrings, rectus femoris, vastus intermedius and gastrocnemius. Special care should be exercised in the surgical management of wounds of these muscles in order to preserve the blood supply.

c. Prophylaxis. The early application of sound principles of initial surgery is the most important factor in prophylaxis. Blood transfusion and penicillin therapy in selected cases supplement this program. The *wound should*

be left open at the time of initial surgery. Prophylactic gas gangrene antitoxin is not recommended.

d. Treatment. Anaerobic cellulitis responds to the secondary excision of devitalized tissue and the free incision of fascial planes. The same surgical procedure frequently will suffice to treat the infection and prepare the wound for later secondary closure. Clostridial myositis demands a more vigorous therapeutic program:

(1) *Surgery.* The most important factor in treatment is the prompt excision of all affected tissue. Local excision of a single muscle or group of muscles should be practiced in the interest of conservation of functional extremities. Amputation is advised for more extensive infection or where removal of the involved tissue implies loss of function of the limb.

(2) *Resuscitation.* The surgical excision of affected tissue contributes to resuscitation. Peripheral circulatory failure is frequently present, and whole blood transfusion is indicated. A severe anemia is usually present but hemoconcentration may occur in "wet" infections. Plasma is reserved for the correction of persistent hemoconcentration in selected cases. The demand for whole blood is considerable in the average case.

(3) *Chemotherapy.* Systemic penicillin therapy should be maintained in dosage of 200,000–400,000 units per day. (See par. 21.)

(4) *Thrombophlebitis* is an established hazard of anaerobic infection. Pulmonary embolism contributes to the mortality rate in gas gangrene. Aspiration of trombi and vein ligation should be practiced at the time of amputation or during convalescence upon indication.

(5) *Naso-gastric intubation* with suction is necessary to combat abdominal distention and gastric dilatation.

(6) *Anuria* occurs with sufficient frequency to warrant especial consideration of fluid balance and urine volume. The exact mechanism of the anuria is not known. The vulnerability of the kidney to tissue anoxia secondary to protracted circulatory failure should not be forgotten.

(7) *Gas gangrene antitoxin* is of doubtful therapeutic value. It is clinically impossible to distinguish the specific toxemia due to clostridial exotoxins from the nonspecific toxemia due to products arising from the septic decomposition of devitalized tissue. Current enthusiasm for therapeutic antiserum is restricted largely to the use of the trivalent serum containing antibody to the *Cl. oedematiens* toxin in the treatment of "wet" types of infection.

(8) *Retroperitoneal cellulitis* and abscess may demand drainage early in the convalescence from gas gangrene.

21. CHEMOTHERAPY (see TB MED 9, 12 February 1944). No presently available chemotherapeutic agent can sterilize a contaminated or infected war wound. Neither penicillin nor the sulfonamides can prevent the ultimate septic decomposition of dead tissue or contaminated blood clots. Sulfonamides administered systemically are effective in the prevention and control of invasive hemolytic streptococcal infection but are ineffective in the control of staphylococcal or invasive clostridial infections. Penicillin is effective against hemolytic streptococci and staphylococci and, in addition, prevents the spread of clostridial infection from a focus of affected tissue. The effectiveness and limitations of chemotherapy are established sufficiently to attribute poor results to errors in surgical technic or judgment rather than to drug failures.

a. The concomitant use of sulfonamides and penicillin is unnecessary. The use of sulfonamides as a supplement to penicillin therapy contributes only the risk of untoward reactions and complications. There is no clinical evidence of synergism with the two agents.

b. The routine local use of chemotherapeutic agents has been abandoned. Penicillin may be instilled into serous cavities or major joints to complement the initial or subsequent surgical management of injuries in these regions. Repeated dressings solely for the purpose of application of antibacterial agents contribute to persistent wound suppuration with aerobic wound pathogens.

c. Systemic chemotherapy is an adjuvant to the surgical management of a contaminated or infected wound. It does not offset the hazard of residual dead space or improper drainage.