General application of the follow-up methods adopted by the Committee on Veterans Medical Problems for the VA may provide new and useful information on the natural history of certain diseases and requirements for medical care.

Methodology of Record Follow-Up Studies on Veterans*†

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THE medical records of the Armed Forces and the Veterans Administration provide unparalleled materials and opportunities for follow-up studies. The medical care system of the Armed Forces brings nearly all illnesses and injuries, even minor ones, under observation and treatment, creates clinical records for episodes involving loss of time from duty, and maintains a punch card index to such episodes. The medical and other records are retired in orderly fashion, usually in central repositories, and rapidly become accessible to study. In the Veterans Administration, the records representing most of the agency's contacts with an individual (except insurance) are preserved as a unit folder in a single numbered file, with the location of the folder always known at a central clearing point. In administering its numerous programs of veterans' benefits, the VA maintains contact with most veterans.

Although selected as to age, sex, and initial freedom from disqualifying defects, the population encompassed in these record systems is extremely large: about 16,000,000 served in World War II, and the total veteran population is now roughly 20,000,000. As a source of material for follow-up, the medical histories of service personnel and veterans have no counterpart in civilian medical practice or hospital experience. The quality of medical care, both in the Armed Forces and in the VA, is at least equal to that of the general population; and much has been done to standardize nomenclature and bring diagnosis and treatment to a uniformly good level.

At the end of World War II, recognition of these opportunities for a comprehensive follow-up program resulted in establishing in the National Research Council, the Committee on Veterans Medical Problems, to explore the possibilities of such an undertaking, and to act as an advisory group for the medical research program of the Veterans Administration.‡ The committee organized a statistical and records group to provide necessary technical assistance in the planning and conduct of follow-up studies.

The program developed in two parts: first, the clinical studies, in which relatively small samples of men, located near clinical study centers, are brought in for re-examination and laboratory study to evaluate their clinical status at

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‡ *Report on the Value and Feasibility of a Long-Term Program of Follow-Up Study and Clinical Research.* Washington, D. C.: National Research Council, 1946.

TABLE 1

Pilot Study Rosters *

Condition	*Number of Cases*	*Period*	*Source*
Syphilis	466	1918	National Archives (Admissions to American Red Cross Military Hospital No. 9, Paris)
Hodgkin's disease	338	1941–1945	Lymphatic Tumor Registry, Armed Forces Institute of Pathology
Diabetes mellitus	176	1944	Surgeon General, Army
Duodenal ulcer	612	1944	Surgeon General, Army
Scarlet fever	497	1944	Surgeon General, Army
Control	455	1941–1945	Random sample of Army serial numbers
Total	2,544		

* All rosters are white Army males. Those for syphilis and Hodgkin's disease include officers and enlisted men, the others, enlisted men only. The three SGO rosters are random samples from punch card files: that for diabetes is 20 per cent of all admissions, ulcer 6 per cent of United States admissions, and scarlet fever 8 per cent of United States admissions in the year indicated.

follow-up; and, second, the record studies, which employ larger samples to discover through existing records and by questionnaires the broader facts of mortality, survival, hospitalization, and disability. The clinical follow-up studies were initiated early, and many of these, including studies of hepatitis, psychoneurosis, peripheral nerve injuries, arterial injuries, tuberculosis, and schistosomiasis, are nearing completion.

The record follow-up studies were made the subject of an initial pilot investigation that was begun in 1948 and completed in 1950, and are further exemplified by later studies of testicular tumors, Hodgkin's disease, prisoners of war, survival in ground combat, tuberculosis, and Buerger's disease. This report will outline the methods of the record follow-up studies, most of which were evolved in the pilot investigation, in so far as they concern the technic of follow-up and the collection of data from existing records or from questionnaires. Other aspects of method, involving details of statistical procedures, will not be discussed, since they are common to all follow-up studies.

The six rosters used in the planning study are described in Table 1. Five were selected from World War II records and one from World War I. To determine whether continuing need for medical care would be an important factor in successful follow-up, the World War II rosters represent, in Hodgkin's disease and scarlet fever, almost the extremes in morbidity and mortality expectations, with diabetes and ulcer intermediate in this respect. The World War I syphilis group, included to examine the possibilities of long-term follow-up, provided an opportunity to estimate the lower limit of success to be expected if World War II records were to be traced forward for 30 years.

ELEMENTS OF METHOD

Rosters for follow-up are supplied by the services in accordance with specifications for the required samples, but responsibility for the identification of individual roster members and the coordination of their service and clinical records rests with the follow-up staff of the committee. Usually service serial numbers are received without names, or names without numbers, although both are required for further processing, and

TABLE 2

Summary of Follow-Up Results on Identified Men; Status as of June 30, 1948

	Number			Per cent		
	Total	*WW I*	*WW II*	*Total*	*WW I*	*WW II*
Tracing						
Total followed	2,544	466	2,078	100.0	100.0	100.0
Total traced	2,474	418	2,056	97.2	89.7	98.9
Dead	399	126	273	15.7	27.0	13.1
Living	2,075	292	1,783	81.5	62.7	85.8
Not traced	70	48	22	2.8	10.3	1.1
Locating						
Total not known to be dead *	2,145	340	1,805	100.0	100.0	100.0
Located	2,036	284	1,752	94.9	83.5	97.1
Not located *	109	56	53	5.1	16.5	2.9
Total known to be living	2,075	292	1,783	100.0	100.0	100.0
Located	2,036	284	1.752	98.1	97.3	98.3
Not located	39	8	31	1.9	2.7	1.7
Questionnaire response						
Total located	2,036	284	1,752	100.0	100.0	100.0
Questionnaire:						
Returned	1,804	220	1,584	88.6	77.5	90.4
Not returned	232	64	168	11.4	22.5	9.6

* Includes those not traced

must be associated with records confirming that the individuals received the diagnoses in question or satisfied other criteria of eligibility. In the planning study 3.7 per cent of the men on the original rosters were not identified. For 2.1 per cent the serial number could not be matched with a name, and for 1.6 per cent service clinical records could not be located to complete the process of identification through the matching of name and number with diagnosis.

When follow-up is initiated, VA files permit further verification of name, serial number, and often of diagnosis. A check list of service incurred conditions and date of birth on the pilot study questionnaire permitted verification of diagnosis and identity at the end stage of follow-up for survivors, as did cause of death, underlying conditions, and other specific identifying data from hospital records or death certificates for those who died.

Of the veterans included in the planning study, 98 per cent had a VA record, but about 20 per cent of these were insurance records only. The information was not always fully up to date or complete, but nearly all of it was useful. A substantial portion of the observations sought in follow-up came directly from the VA, and that agency provided, directly or indirectly, most of the leads to successful tracing. A number of additional resources, among them the Retail Credit Company, the American Red Cross, the Army, and other federal agencies and private organizations were used to fill in gaps in the information and bring the facts of survival status up to date. The questionnaire was especially useful in the confirmation of current survival, and also in uncovering some of the cases of wrong identification, in providing information systematically available from no other source on hospital admissions not federally financed, and in indicating in general terms the health and work status of the respondents.

GENERAL RESULTS IN FOLLOW-UP OF IDENTIFIED MEN

With such material and resources the planning study demonstrated that, in

TABLE 3

Tracing Results in the World War II Rosters, as of June 30, 1948

Roster	Total	Traced			Not Traced, Total	Per cent Traced
		Total	Living	Dead		
WW II — Total	2,078	2,056	1,783	273	22	98.9
Hodgkin's disease	338	336	116	220	2	99.4
Diabetes	176	175	166	9	1	99.4
Duodenal ulcer	612	604	595	9	8	98.7
Scarlet fever	497	491	478	13	6	98.8
Control	455	450	428	22	5	98.9

rosters of identified World War II men, the mortality and survival status of 98.9 per cent could be determined and verified at a point approximately four years from the date of diagnosis. For World War I men, 89.7 per cent could be accounted for 30 years after diagnosis, with 95.3 per cent traced at 20 years and 97.8 per cent at 10 years.

A summary of the results in tracing, locating, and questionnaire response is shown in Table 2. In the World War II groups, 99 per cent were traced, 98 per cent of those known to be living were located, and of those located, 90 per cent returned questionnaires. The corresponding figures for the World War I group are appreciably less, but are satisfactory considering the limitations of this older material.

Of the questionnaires received, 40 per cent came in on the first mailing. The second request was made by registered mail and brought the receipts to 94 per cent of the total returned. The remaining six per cent required three or more mailings.

In regard to the relation of severity of illness to success in tracing, Table 3 shows that when tracing is pursued as intensively as it was in the planning study this factor is immaterial. With less effort, however, the nature of the condition does play a role.

The feasibility of selecting from military medical records cases meeting rigid criteria of diagnostic reliability and satisfying particular clinical specifications was not examined in the pilot study, but has been exhaustively investigated in the clinical follow-up studies. There, the clinical investigators, each a specialist in the subject under study, examined critically the original service medical records and usually reviewed the relevant facts of medical history with the patient during the follow-up examination. These methods were successful in providing rosters meeting the required standards, but are practical throughout a roster only in the clinical studies. In record studies the amount of verification of diagnosis needed varies with the nature of the study and the condition. The Hodgkin's disease study, which is being continued beyond the pilot phase, and the completed testicular tumor study have required a review of the histological material of all cases by pathologists. In other conditions, a sampling of service clinical records for review may be sufficient. Certain conditions may best be represented by cases from general hospitals that are specialized treatment centers.

MORTALITY

The completeness and accuracy of reports of death and survival in a follow-up roster are of prime importance in the construction of valid life tables. At the inception of the pilot study it was planned to search state death records and national and other local sources of death reporting, anticipating that mortality discovery and verification would be one of the major problems of record studies. It developed that of the

399 deaths found in the virtually complete follow-up of the pilot study, just four, all in the World War I syphilis group, were not so recorded in VA files. Subsequently, in the study of 955 testicular tumors diagnosed prior to 1948, 98.0 per cent of the patients were traced at the end of 1949 and all but two of the 438 deaths were on record in the VA. In evaluating these indications that substantially all veteran deaths are known to the VA, it must be recognized that in both studies most deaths were in malignant conditions, and a good proportion occurred in service. The important feature of the evidence is the nearly complete verification of survival among those without a VA death record, made possible by the questionnaire and by the resources of a number of federal and other agencies. Although a small area of doubt remains in the one per cent of World War II men who could not be traced, there is some promise that VA files alone may be sufficient to establish the fact of death or survival.

Life tables for syphilis and Hodgkin's disease illustrate a major product of record follow-up. The syphilis cases were in all stages of the disease, so that, clinically, the life table for this group has little prognostic value. It showed, however, a significant excess of mortality beginning with about the tenth year after diagnosis. The observed value of l_{10} was 92.4 per cent, as compared with an expected 94.9 per cent derived from annual age-specific death rates for United States white males in the corresponding calendar years. After 28 completed years, survivorship was 73.3 per cent compared with an expected 78.9 per cent. The Hodgkin's disease life table, which is tentative pending such redefinition of the roster as may result from the recently completed histological review of the diagnoses, showed a five-year survivorship of 28.8 per cent as against an expected 98.7 per cent.* The median length of life was 2.40 years after diagnosis of Hodgkin's disease, compared with 43.95 years in United States white males.*

HOSPITALIZATION

The frequency and duration of hospital admissions can be useful measures of morbidity, if the opportunities and motivation for hospital care are reasonably uniform. Hospital facilities for veterans are presumably more accessible and their use less influenced by economic and other factors than those for nonveterans.

Information on VA hospitalizations was abstracted in the agency's regional and district offices from copies of hospital reports filed in claims folders. This procedure did not prove to be of maximum efficiency, but it was relatively inexpensive. The questionnaire, also an inexpensive device, proved to be quite useful in turning up facts of hospitalization, showing many admissions to non-VA hospitals, and some VA admissions not available from VA records. With respect to VA hospitalization, the VA records supplied 86 per cent of the total admissions reported by both sources and the questionnaires 73 per cent. Assuming each source provides a measure of the error in unreported admissions of the other, it was estimated that both together account for 94 per cent of all VA hospital admissions. This estimate is quite uniform from roster to roster, despite wide variation among the rosters in the frequency of admissions.

The two sources are in close agreement on the use of VA hospitals, without regard to number of admissions, which suggests that non-VA hospitalization reported on the questionnaire, and available from no other source, has some validity. The general relations in total, VA, and non-VA hospitalization, as

*Based on a life table for United States white males in 1945, prepared by the Metropolitan Life Insurance Company from material supplied by the National Office of Vital Statistics (unpublished).

shown on the questionnaire, are well illustrated by a comparison of the diabetes and ulcer rosters in which exposure in veteran-years is the same. The diabetics reported 89 admissions to all hospitals per 100 men over the whole period of nearly four years, with 54 to VA and 35 to non-VA hospitals. The ulcer patients reported 48 admissions per 100 men to all hospitals, about half as many as the diabetics, with 27 to VA and 21 to non-VA hospitals. In the World War II rosters the proportions of all admissions that were non-VA are: Hodgkin's disease 23 per cent, diabetes 40 per cent, ulcer 44 per cent, scarlet fever 70 per cent, and the control group 72 per cent.

It was of interest to find no significant difference in preference for VA as compared with non-VA hospitals, either with respect to economic class of the veteran as indicated by his reported occupation, or to his area of residence. For both factors, however, the groupings used were very broad.

The questionnaire used in the pilot study did not request exact dates or durations of hospital admissions, but it has been demonstrated in later studies that such information can be obtained. Two hospitalization indexes, annual admission rates and days in hospital per year, were computed only with the data of the more specific and fuller VA records. These indexes reflect sharply the diversities of severity and chronicity in the rosters of the pilot study. For example, during the second yearly interval after diagnosis the number of VA hospital admissions for all causes, per 100 veterans observed during the interval, was for Hodgkin's disease 46.4, for diabetes 19.3, for duodenal ulcer 9.8, and for scarlet fever and the control group combined 2.0. Admissions to all hospitals appear to show similar relations. Approximate total rates for the second interval, derived from these VA rates and the ratio of VA to total admissions, by roster, are 60.3, 32.2, 17.5, and 6.7, respectively. During the same interval the number of days in VA hospitals per 100 veteran-days was, for the four groups, respectively, 8.39, 1.45, 0.61, and 0.14.

DISABILITY

Disability, in the sense of impaired capacity for gainful employment, is difficult to evaluate quantitatively. The VA rating for disability compensation is a quantitative measure, the stated purpose of which is to evaluate reduction in earning capacity. It seemed important to determine whether average ratings in adequate samples measure disability differentials of comparative and prognostic value.

Each veteran's history of disability claims and assigned ratings was acquired from VA records with little difficulty. Analysis of the ratings showed that in average level and range they reflected the expected differences in disability among the study rosters. By way of illustration, at a point three years after diagnosis, the mean percentage disability rating was, for Hodgkin's disease 60.5,* for diabetes 32.6, for duodenal ulcer 17.0, for scarlet fever 3.9, and for the controls 3.4. However, it must be recognized that ratings are assigned in accordance with prescribed rating schedules adapted to specific impairments. Some independent evidence is available as to whether the ratings indicate realistically the clinical status of impairment. In the clinical studies on psychoneurosis, brain injuries, and arterial injuries, the investigators recorded their judgments of the patients' impairment at the time of follow-up examination. In the two traumatism studies the clinicians' evaluations were made without knowledge of the current VA compensation for disability. The average

* In the 44 per cent of the original group surviving at that point.

VA ratings proved to be in close enough agreement with the investigators' judgments to indicate that the ratings do provide rough, but clinically valid, measures of relative disability.

SUMMARY

The technics developed in the pilot study, and applied subsequently in specialized record studies, provide an efficient and systematic basis for exploiting the unique opportunities for record follow-up offered by the vast medical experience of Armed Forces personnel and veterans. Specifically, it has been shown that:

1. For a wide variety of conditions and environmental hazards satisfactory rosters can be defined.

2. Identification by matching name, service number, and diagnosis can be accomplished in 96 per cent of cases.

3. Of those identified, determination of mortality status can be made in 99 per cent of World War II men after four years, and in 90 per cent of World War I men after 30 years.

4. Data on VA hospitalization can be obtained readily for an estimated 94 per cent of such admissions.

5. Some data on hospitalizations outside the VA system can be obtained from a questionnaire.

6. VA disability ratings can be obtained in every case and the man's own report of his work status in 86 per cent of survivors.

The Journal 25 Years Ago

SANITARIANS HAVE BETTER QUALIFICATIONS TODAY

"We also need to convince governmental and municipal authorities who employ sanitary inspectors and other health workers that they can get better value for their money by insisting on proper qualifications for such workers." Thus, spoke Ernest W. J. Hague in his presidential address before the Sanitary Inspectors Association of Canada as printed in the August, 1928, issue of the *Journal*. Evidence of the soundness of this bit of advice can be found in the positive action taken in many states to stimulate the employment of only qualified sanitarians.

Leaders in the professionalizing of sanitarians have furnished the following information. New Jersey had already put into effect a licensing act for sanitary inspectors 25 years ago. Next in effect was the State of California, with enactment of its Registered Sanitarians Act in 1945. Since then three more states have enacted similar laws: Utah and Oregon in 1951, and Oklahoma in 1953. Proposed legislation (1953) in Massachusetts was not passed.

As an indication of the training of persons applying for licensure, data from California show that 88 per cent of applicants for the last five examinations have had college degrees even though the minimum requirement calls for completion of only two years of college work. Of the 1,800 applying for examination since 1945, 250 were refused admittance because of inadequate qualifications. The qualifying examination is one prepared by the Professional Examination Service of the American Public Health Association.

The past 25 years has assuredly witnessed acceptance of Mr. Hague's thesis that better qualified sanitarians are well worth the investment.