

matic or other conditions. Limited service does not necessarily disqualify a man for overseas duty.

There are many other special problems involved in disposing of the substandard military personnel, but enough has probably been said to give a general idea of the work involved in disposing of them. To the layman the term "disabled military personnel" brings to mind those men who have been wounded in battle. Theirs is a special problem and, fortunately, a relatively small one to date. It is, however, governed by the same basic principles.

It has fallen to the lot of some doctors to go out to adventurous fields with long periods of waiting, alternating with sudden excitement and the opportunity to be of incalculable value in saving life and limb at the forefront of battle. The lot of some of us has been to work prosaically in an effort to take care largely of prebattle illnesses and injuries. We feel that it is a very important by-product of this plodding work to help maintain a dynamic army by carefully sifting out the military unfit; or, in the language of David's time, to leave behind those that "were so faint."

Hoff General Hospital.

WOMEN IN INDUSTRY *

A STUDY OF ONE HUNDRED AND THIRTY-FIVE
WOMEN WORKING AS RIVETERS IN THE
AIRCRAFT INDUSTRIES

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ACCORDING to a recent survey published in the February number of *Fortune* magazine, about twelve and one-half million women were in the war-working force by December of 1942. About three and one-half million more will be needed in 1943, giving a total of about sixteen million women in essential work by the end of this year. A great many of these women are being employed in the aircraft industry. Sixty per cent of the employees in some plants are women already.

With the institution of numerous aircraft plants in California, thousands of women throughout this State are replacing men at this work. It has been said that women are not physically equipped or emotionally stable enough to do all the kinds of work that men can do. This has, naturally, resulted in numerous problems. The solution, for the most part, has been in the hands of the industrial group of physicians whose training and past experience had been chiefly the prevention and treatment of industrial accidents and occupational diseases. There can be little criticism and much praise of the manner in which they have responded to a tremendous task.

On the whole, little interest has been shown in the problem by those in the medical profession not directly connected with this type of work. This is

easy to understand, with the ever-increasing volume of private practice. It is for this reason that this paper is being presented in the Section on Gynecology and Obstetrics, rather than in the Section on Industrial Medicine. It is felt that those who, in the past, have been leaders in the field of gynecology and obstetrics should take an active interest in the protection of the health of women who are doing a big part of the winning of this war.

RECOMMENDATIONS OF COUNCIL ON INDUSTRIAL HEALTH

The Committee on the Health of Women in Industry of the Section on Gynecology and Obstetrics, headed by H. Close Hesseltine, made certain preliminary recommendations to the Council on Industrial Health before the Fifth Annual Congress in Chicago in January of this year. The following general statement was made:

Shortage of manpower and economic pressure necessitate the employment of millions of women in industry. Sufficient medical data are not available to draft final recommendations about the effect of various kinds of employment on the gynecologic or future obstetric health of women. . . . It is common experience in industry that women absent themselves from work more often than men, and that the duration of the individual absences tends regularly to be longer. The available data do not clearly assign the responsibility for this tendency directly to obstetric or gynecologic function (though it has been taken for granted by some) as against ordinary causes of disability which are equally applicable to men. All of these relationships need careful study over an extended period of time.

A review of the literature on the subject confirms the above report. Most articles deal with the subject of women in industry in a general way and few detailed reports are available. There are several surveys on postal clerks made by the United States Public Health Service. Their results indicate that women are absent much more often than men, but that the great majority of the absences are due to upper respiratory infections and other illnesses common to both sexes. Reports from all large centers reveal that a 5 to 15 per cent of workers engaged in war work are daily being reported absent. The normal peacetime estimate is 2 per cent. It has been determined that 35 to 50 per cent of this so-called "absenteeism" is due to physical disabilities.

With the many new types of work being done by women, numerous unusual complaints are being heard. There have been rumors among the women workers that riveting causes "female trouble." Some of the local physicians speak of the condition as "riveters' ovaries." This has stimulated a study of this particular problem to prove it either as a fact or a fictitious rumor, unfounded on true experience and possibly arising as a form of propaganda.

SOURCE OF MATERIAL

One hundred and thirty-five women riveters with pelvic complaints were studied. Some were admitted to the Santa Monica Hospital by private physicians for treatment, and others were examined and studied by one of the authors in a medical

* Read before the Section on Obstetrics and Gynecology at the seventy-second annual session of the California Medical Association, Los Angeles, May 2-3, 1943.

group treating plant employees. These were chosen because of the complete work-up of the patients and accurate pathological diagnosis of the operated cases in the hospital. Patients who were pregnant and developed complications were eliminated because of the probable inaccuracy of the history in these cases.

RECORDED DATA

The following items on each patient were recorded: age, previous occupation, pregnancies, operations, previous pelvic diagnosis, chief complaints, clinical findings on examination or pathological findings at operation.

Due to the prevalence of menstrual complaints, the following record was kept of these cases:

Menstrual history before employment as a riveter, including interval, duration, regularity, clots and dysmenorrhea, menstrual history since employment as a riveter, including interval, duration, regularity, clots and dysmenorrhea.

RESULTS

Tables 1, 2, 3, and 4 give information concerning the results.

TABLE 1.—According to Age
Ages 18-48 Years

Under 20	8	6%
20-29	73	54%
30-39	38	28%
Over 40	16	12%

TABLE 2.—According to Occupation

Occupation—riveters	135	100%
Previous occupation—		
40	30%	Light work, such as clerks and waitresses
95	70%	Listed as housewives
III—According to Personal History (Illness)		
Previous pelvic operations	30	22%
Pregnancies	84	62% 1-9 each
Previous pelvic complaints....11	8%	

TABLE 3.—Menstrual History After Employment as a Riveter in Relation to the Previous Menstrual History

Dysmenorrhea before riveting	81	60%
Increase in clots with menstruation	33	24%
Increase in dysmenorrhea	46	34%
Development of interval irregularity	39	36%
Increase in the duration	75	56%
Decrease in the duration	3	2.2%
Menorrhagia	54	40%
Aggravation of menstrual complaints	114	84%
No change in menstruation	21	15%

TABLE 4.—According to Authors' Diagnoses

(Clinical and pathological diagnosis of the 135 patients)		
Chronic pelvic inflammatory disease	52	38%
Fibromyomata uteri	33	24%
Fibros uteri and dysfunctional bleeding....	13	9%
Endometrial hyperplasia	14	10%
Prolapse, rectocele, cystocele	9	6.5%
Cervical or endometrial polyps	5	3.7%
Endometriosis internal and external	4	3%
Idiopathic uterine bleeding	4	3%
Hyperthyroidism	1	7%

Of the 135 women riveters studied, a pathological pelvic condition was diagnosed in all but five cases. Of the 54 cases of menorrhagia, 50 were examined and a pathological condition discovered in 49. No cause for the bleeding could be determined in two cases seen in the office, and two cases completely worked up in the hospital. The other case was one of hyperthyroidism.

COMMENT AND CONCLUSIONS

This report is preliminary, for it has been difficult to establish controls in the eight months of the investigation. Only probable conclusions can be arrived at at this time. This evidence, based on the study of 135 riveters with pelvic complaints, is offered in support of our contention that pathological pelvic conditions are probably subject to aggravation in riveters. With the exception of five cases, there was definite evidence of previous pelvic pathology before employment as a riveter. The presence of four cases where no cause for the pathological uterine bleeding could be determined is too small a group to suggest probabilities, though the smallness itself infers that riveting probably causes no pathological condition in the pelvis, or at least not frequently. We have no evidence as to the mechanism by which pathological conditions in the pelvis are upset by riveting. There are two outstanding theoretical possibilities. The mechanical vibration directly disturbs the physiology of the ovary, which is already unbalanced by existing disease; or, indirectly, the patient becomes emotionally upset by the constant vibration and noise, and this affects the physiology of menstruation.

We further believe that a good number of manpower hours can be conserved by a careful history and, more important, by an adequate preplacement examination of the pelvis of women workers. Some plants have good preplacement examination routines, including a careful pelvic examination. This should become universal. The number of manpower hours lost in transferring one riveter to another type of work after losing several weeks due to illness is costly. Paul McNutt, Chairman of the War Manpower Commission, says, in speaking of manpower conservation:

Industry has a bigger task than saving that time lost to prevent diseases and accidents. Your assignment is total conservation of manpower. Like military medicine, it means prevention and restoration. Prevention has the high objective of throwing around the soldier every known health protection to keep him in action. If he does succumb to sickness, accident or enemy attack, the duty is to restore him to action as quickly as science, skill and nature permit. Your task is to do the same for the men and women in our war industries. . . . Our industrial army without whom the United Nations cannot win."

It has been worked out that the next large group of women to be taken into the war industries will be drawn from married women with children over sixteen years of age. This means that fewer cases of pelvic inflammatory disease and abortions will be seen, and more cases of pelvic relaxations, dysfunctional uterine bleeding, carcinoma of the cervix, and the menopausal syndrome. These pathological conditions should be corrected before employment. Many of these patients are now under the care of their family doctor. An effort should be made to have these patients have an adequate preplacement examination. This should be our problem and responsibility to see that this is done. Industrial plants have a list of specialists who are consulted when needed. Doctor Hesseltine has recommended that a gynecologist and obstetrician

should be added to this list where a substantial number of women are employed. We think that this is a step in the right direction. For example, very few plants require routine interval check-ups, and yet here is an unparalleled opportunity to reduce the mortality rate of carcinoma. Industrial physicians are doing an excellent work in protecting the health and welfare of the nation's large number of industrial employees. They need the experienced and trained specialist to control and study the problems of women workers, that adequate rules and regulations can be drawn up for their protection and well-being.

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CANCER OF THE UTERUS: THE VAGINAL SMEAR IN ITS DIAGNOSIS*

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A NEW method for detecting the presence of uterine cancer is based upon the well-established vaginal smear technique. Much use has been made of vaginal smears in the study of the reproductive cycle in laboratory animals, as well as in women. Cells from the various epithelial surfaces of the uterine canal, the cervix and the vagina undergo changes in morphology and staining properties which are sufficiently characteristic to enable one to evaluate much of the normal or abnormal hormonal physiology responsible for the variable cell patterns. It is only necessary to collect the exfoliated cells from the posterior vaginal fornix; spread them upon a clean glass slide, fix them in an alcohol and ether solution, stain them, and they are ready for study under the microscope.²

In the course of routine studies of human vaginal smears, Papanicolaou discovered that not only were the normal cells shed and hence demonstrable in the vaginal smears, but also many pathological cells could be found, among them those of cancer.

AUTHORS' STUDIES

To determine the relationship of cancer cells in the vaginal smear to the incidence of malignant disease in the uterus, as demonstrable by clinical methods and the biopsy technique, Papanicolaou

and Traut have collaborated in a study covering three years at the Cornell Medical College. Vaginal smears, many thousands, were made and studied, with the result that, in their hands, the method has been demonstrated to have a decided advantage in that it enabled them to detect cancer without even a minor surgical procedure. The preparation of vaginal smears is easy, may be quickly carried out, and can be repeated at frequent intervals whenever desirable.

It is particularly valuable in the diagnosis of very early carcinoma of the cervix and fundus—even before such lesions can be demonstrated by the biopsy method—with the single exception of adenoma malignum.

METHOD USED

The method, therefore, will be described in some detail in the hope that others may become interested in learning how the malignant cells can be recognized. An adequate description cannot be attempted, however, for lack of space. The interested reader is, therefore, referred to a more complete work which is to be available shortly.³

The malignant epithelial cells exfoliate from the surface of neoplastic growths, much as do normal cells. They then float downward into the vaginal fornix, where they accumulate and become mixed with normal cells of epithelial and blood origin, as well as with mucus, bacteria, parasites and cellular débris. The rate of exfoliation of the malignant cells seems to be dependent upon the rate of growth of the neoplasm and its size. Young, small, and slow-growing lesions, therefore, usually shed only few cells, whereas a large and rapidly growing lesion will ordinarily contribute relatively rich showers of characteristic cellular elements.

Meticulous scrutiny of the stained smear preparations is an important essential as well, as that such searching may be done by a person trained in the details of this type of cellular diagnosis. An atlas³ with colored illustrations has been prepared and will shortly be available to aid those interested in learning the method. The details of the staining technique will also be given in all the details necessary to duplicate the color reactions as shown.

DIFFERENTIATION

In brief, the differentiation of the malignant cell from those of benign origins is based upon changes in the size, shape, staining reactions, and the characteristics of the chromatin elements in the nucleus, the nucleoli, and the cytoplasm. Variations in size, with lobulated, crenated, or elongated nuclei are most suggestive. If, in addition, the chromatin shows fragmentation, granulation, or displacement to one or other pole of the nucleus with one or more nucleoli, the probabilities of malignancy are great. If, in addition, one sees numbers of such cells in close proximity to one another so that the above criteria can be established by accurate comparison, a presumptive diagnosis of malignancy can be made. The word "presumptive" is used advisedly, as we do not feel one should ever use this method as the basis for an absolute diagnosis. Each of the

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Read before the Section on Obstetrics and Gynecology at the seventy-second annual session of the California Medical Association, Los Angeles, May 2-3, 1943.