PULHEEMS

A NEW SYSTEM OF MEDICAL CLASSIFICATION

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The Pulheems system of medical classification was officially adopted by the Army on April 1, 1948. It has also been accepted by the Royal Navy, the Royal Air Force, and the Ministry of Labour and National Service, whose Medical Boards took it into use on June 1, 1948.

The object of this paper is to introduce Pulheems to the profession and to stimulate interest in this new system of classification so that doctors called upon to examine recruits or to act as medical officers will be familiar with the principles involved. The Pulheems system commands attention because it provides us for the first time with a method of expressing on paper in a concise and easily recognizable form the physical and mental capacities of an individual. I consider that when it becomes generally known it will be accepted by the profession and applied on a wide basis. Certainly it goes a long way towards unifying and rationalizing our standards and towards improving our "clinical" appreciation of physical and mental fitness. While we are still unable to measure physical and mental capacity by purely clinical means, Pulheems is undoubtedly a great advance on methods hitherto employed.

It is hardly surprising that the Forces Medical Services should be responsible for developing a comprehensive system of medical classification, since in the Services organized medicine has been developed to a high level and Service requirements clearly call for some means of assessing accurately the fighting-man's physical and mental capacity. It seems probable that with a National Health Service, and in view of the necessity for the economic employment of our man-power in industry and elsewhere, the Pulheems system of medical classification will meet an essential need. Further, if the physical fitness of our people is to be safeguarded comprehensive health surveys of the population will have to be undertaken, and in order to derive full benefit from such surveys we must pay due attention not only to clinical states but also to "health" or physical and mental capacity.

Medical Classification in the Past

The need for a system of medical classification in the Army became apparent during the South African War (1899-1902), when for the first time officers and men were examined with respect to their physical fitness for service at home or abroad. It was not until the war of 1914-18 that any further breakdown of these two broad classes was attempted; and following the introduction of the Military Services Act in January, 1916, the scope of medical classification was extended to include all serving officers and men at home and abroad. The system of lettered categories, which later became so familiar, was introduced at that time, and

it was with this system of classification in vogue that we were called upon in 1939 to face the war. During the ensuing years the increasing demands on man-power necessitated successive extension of the medical categories used, and as a result the category system became more and more complicated, while at the same time it failed to meet the new demands placed upon it.

Briefly, the reasons for the failure of the former system of medical categorization are as follows:

The medical categories used (a) did not adequately define a man's physical or mental limitations, and it was therefore not possible to allocate the man to employment in which full use could be made of those capacities which were not in any way impaired; (b) gave no indication of the mental and emotional make-up of the individual, factors which in total warfare are no less important than the physical attributes; and (c) merely indicated restrictions on employability of a very generalized nature, giving no information about the particular disability involved. They therefore provided no guidance on the most suitable type of work for any given soldier with due regard to the nature of his disability. In short, the medical category system was designed to meet the requirements of our traditional Army (and particularly the infantry soldier), which marched on its feet and fought with a rifle. It was not a system designed to cater for the modern mechanized Army engaged in technological conflict.

With the introduction of personnel selection procedure into the Army in 1942, the deficiencies and shortcomings of the medical category system were further revealed and emphasized. The range of employments available in a modern army is extremely wide and varied, and each individual job brings into use different mental and physical functions, which in turn may have to be qualified according to the conditions and environment in which the work has to be performed—e.g., tropical, arctic, front-line action, etc. It will be agreed that to ply a trade under direct shell-fire is totally different from practising the same trade in the safety of a base workshop, and that a man with chronic ear disease who may be perfectly fit to serve in a temperate climate is likely to break down when serving in the Tropics or subtropics. Clearly, minor disabilities which are of little significance to a member of the training staff of a static base installation can represent a serious liability in an active combatant unit.

From the foregoing it is apparent that the lettered system of medical categorization proved very wasteful from the point of view of man-power economy. In order to employ men satisfactorily in the Army the medical authorities must provide a clear-cut specification of the individual's

functional capacities. Only in this way can men be employed to the best advantage, man-power economy be effected, and the individual himself be satisfied.

Progress towards a New System

Had it not been for the crisis of 1939 it is likely that steps would have been taken to improve our system of medical classification to meet the demands of mechanization and the numerous new employments created; but the British Army authorities considered it both undesirable and totally impracticable to introduce a new system once war had started. However, in 1943 the Canadian Army authorities introduced a new system of medical classification which they called "Pulhems," chief credit for which goes to Major-General Brock-Chisholm, then Director-General of the Canadian Army Medical Services. It was he who first suggested that men should be examined in respect of seven subdivisions of bodily and mental function, and as a result a committee was appointed to investigate the possibilities of such a scheme. This committee designed the Pulhems system of medical classification now used by the Canadian Army.

Subsequently the attention of the British Army authorities was drawn to this system and selected groups of Army intakes were examined by that method. The trial, though limited, proved that it was possible to assess the functional capacity of the individual and record the findings in terms which would be easily understood by his employers (and selection officers); but, as already indicated, it was not possible to introduce the system generally at that time. In 1946 an Inter-Services Committee was formed "to devise a system of medical classification which would be suitable for use by the Royal Navy, the Army, and the Royal Air Force." It was agreed that "Pulhems" should form the basis of discussion, and eventually this committee devised the system known as "Pulheems—a system of medical classification for the Fighting Services." It is this system which has been adopted and which I will now proceed to describe.

The Pulheems System of Medical Classification

The Qualities.—Under the Pulheems system of medical classification examination of the individual is carried out objectively, with particular reference to seven subdivisions of bodily and mental function, the code letters of which go to make up the word "Pulheems" as follows:

- P—Physical capacity
- U—Upper limbs
- L—Locomotion
- H—Hearing (acuity)
- EE—Eyesight (visual acuity)
- M—Mental capacity
- S—Stability (emotional).

These subdivisions are known as *qualities*.

Visual Acuity (EE).—Under the former systems of medical categorization specified visual standards were laid down and each category was permitted certain of these standards—e.g., A1—V.S.1, 2, or 3; A3—V.S.4; A4—V.S.5 or 6, etc. Such visual standards are still being used by the Canadian Army, hence their use of the single "E." The Royal Navy and the Royal Air Force found that the wide range of vision permissible in some of the categories previously used made accurate employment of men in various technical trades extremely difficult. In the discussions which took place on the subject these two Services insisted that, to meet the requirements of their tradesmen, the new system must specify the precise degree of visual acuity in each eye separately, both without and with the aid of glasses. This requirement was met by introducing a separate "E" for

each eye, subdividing the medical box under each of the "E's" so that the unaided vision could be shown in the upper half of the box and the aided vision in the lower half. The method of recording visual acuity is based on the following standards:

6/6 = 1	6/24 = 5
6/9 = 2	6/36 = 6
6/12 = 3	6/60 = 7
6/18 = 4	Less than 6/60 = 8

Thus, for example, EE is recorded as follows for a man whose uncorrected vision is R=6/12, L=6/18 and whose corrected vision is R=6/6, L=6/9:

E	E
3	4
1	2

the first "E" indicating the visual acuity in the *right* eye and the second "E" that in the left eye.

Degrees of Each Quality.—There are eight degrees under each quality, but for reasons which will emerge later not all of these are used in the case of U, L, H, M, and S, as the following table shows:

P	U	L	H	E	E	M	S
1	1	1	1	1	1	—*	—*
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	—	—	—	4	4	—	—
5	—	—	—	5	5	—	—
6	—	—	—	6	6	—	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8

Functional Interpretation of the Degrees of Each Quality

The degrees of each quality, excepting H and EE, refer to functional ability. The degrees of H and EE are related to definite standards of hearing and eyesight, degree 8 under H signifying the man is unfit for any form of military service. Table I shows in detail the functional requirements of the degrees used under each of the qualities other than EE. Under this quality the minimum visual requirement for certain essential duties—e.g., shooting, driving, etc.—is detailed.

Climatic Restriction.—During the 1939–45 war major causes of invaliding to the United Kingdom from overseas theatres were skin, ear, eye diseases, and psychiatric disorders. After treatment in the United Kingdom many of these men recovered sufficiently to become fit even for full combatant duties provided they were retained in a temperate climate. In order to avoid sending such men to climates where they would break down because of disabilities which remain quiescent only in a temperate climate it is essential to indicate the necessity for climatic limitation. Under the Pulheems system degrees 4, 5, 6, and 7 are used for this purpose. In the assessment of the qualities U and L, any pathological condition of the limbs, such as osteomyelitis, will have a general constitutional effect. This also applies to diseases of the ears and eyes—as opposed to hearing (H) and eyesight (EE). It is therefore convenient to confine the specification of climatic restriction so far as the qualities P, U, L, H, and EE are concerned to the assessment of the P quality only, and for this reason degrees 4, 5, and 6 are not used under U, L, and H. With regard to M and S, experience in the last war indicates that men of low intelligence adapt themselves poorly to strange and unfamiliar surroundings. Intelligence once assessed remains a constant factor and is not directly related to the question; for Army purposes,

*With regard to "M" and "S," degree 1 implies functional efficiency "above average," which it was considered extremely difficult to assess; thus degree 2 under these qualities indicates normal or better.

TABLE I.—Guide to Pulheems: Functional Interpretation of Degrees of Each Quality

MEN

Degree	P	U	L	H	EE	M	S
1	Fit, after training, for full strain and fatigue on combatant duty. Fit to withstand exposure to all kinds of weather. A front-line fighter in any part of the world	Muscle power above average. Must be able to handle a rifle and do heavy manual work, including digging, washing, dragging, heaving, lifting, and climbing. All tasks carried out with rapidity and efficiency	Capable of very severe locomotor strain for 5 or 6 days. Can undertake forced marches and fight at the end of such marches. Can run, climb, jump, crawl, dig, and perform all kinds of labour quickly	Very good hearing. Ability to hear sufficiently well to perform any duty	Unaided vision E E 3 3 or 1 6 Able to see to shoot and drive		
2	Fit for normal work or strain but unable to endure "extreme" degrees for long periods. A front-line fighter in any part of the world	Muscle power average. Able to do all a U.I. man can do but at a slower pace	Same as L1, but pace may be slower	Good hearing. Able to hear sufficiently well to perform any duty	Aided vision E E E 8 8 8 3 3 or 1 6 Able to see to shoot and drive	Ability under Army conditions to learn to perform successfully full combatant duties. Includes those who can be trained as tradesmen and specialists	Emotionally fit to perform Army duties adequately under full combatant conditions in any part of the world
3	Fit for ordinary work. Has not the stamina, even after training, to endure strain and fatigue of full combatant duty. Fit for restricted service in any part of the world	Must be able to use a weapon for defensive purposes and be capable of less severe forms of manual work than U2	Capable of marching 5 miles or further in an emergency. Able to stand for periods of at least 2 hours. Fit for guard duties	Able to hear sufficiently well to perform any duty where moderate impairment of hearing does not disqualify	Aided vision E E E 8 8 8 3 6 or 6 3 Able to see to drive but not to shoot	Ability under Army conditions to learn to perform simple labouring duties, including fitness to bear arms in self-defence	Whilst having a history of emotional instability is at present well adjusted and fit to serve in any part of the world in a role which is not primarily a fighting one
4	Fit, after training, for full strain and fatigue of full combatant duty provided he serves in temperate climates only				Aided vision E E E 8 8 8 5 5 Able to see for ordinary purposes (not shooting or driving—binocular)		
5	Fit for normal work or strain but unable to endure "extreme" degrees for long periods. Fit for service in temperate climates only				Aided vision E E E 8 8 8 3 7 7 3 Able to see for ordinary purposes (not shooting or driving—monocular)		Whilst having a history of emotional instability is sufficiently well adjusted to serve in temperate climates in a role which is not primarily a fighting one
6	Fit for ordinary work. Has not the stamina, even after training, to endure strain and fatigue of full combatant duties. Fit for restricted service in temperate climates				The E E boxes bear no relation to the degrees of the other qualities—i.e., P, U, L, H, M, and S—being a simple record of vision unaided and aided	Because of low mental capacity is unfit to bear arms, but is capable of simple labouring duties under supervision, including a minimum of responsibilities. Service in U.K. only	Emotionally fit to perform Army duties adequately under living conditions favourable to the individual in the U.K.
7	Capable of performing useful Army duties within limits of his disabilities. Not likely to break down if suitably employed, which includes time for regular meals and rest. Service in U.K. only	Capable of sedentary and routine work of a lighter type. Includes personnel unable to bear arms on account of physical disability (ankylosis of elbow, etc.). Service in the U.K., but may serve overseas in the base area	Able to walk 2 miles per day at own pace. Can stand for moderate but not prolonged periods. Service in the U.K., but may serve overseas in the base area	Able to hear sufficiently well to perform any duty where marked impairment of hearing does not disqualify. Service in the U.K., but may serve overseas in the base area			

UNFIT FOR ANY FORM OF MILITARY SERVICE

Factors to be considered	Age, build, strength, and stamina-guts	Strength, range of movement, and general efficiency of upper arm, shoulder, girdle, and back	Strength, range of movement, and efficiency of feet, legs, pelvic girdle, and lower back	Auditory acuity	Visual acuity	Mental capacity	Emotional stability
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however, men whose mental capacity is incompatible with employment in any part of the world can be employed only at home (i.e., degree 7), hence degrees 4, 5, and 6 are not used under M. The S quality has a material bearing on climatic restriction, but it is considered that a man who requires restriction to service in a temperate climate because of emotional instability is unlikely to be employable in a combatant role; therefore under S degrees 6 and 7 only are used. Men with psychosomatic disorders—e.g., effort syndrome, functional dyspepsia, etc.—may require a lower assessment under P as well as S. Finally, if an individual has a low assessment under one of the qualities other than P, it does *not* follow that the same assessment must be made under P—e.g., a man who is assessed L7 but is physically fit to be assessed P3 should be classified P3 and not P7. Lowering of the P assessment to 7 in such a case would impose unnecessary restriction on employment. Any individual, however, assessed degree 7 under P, M, or S can serve only in the United Kingdom.

From the foregoing it will be seen that climatic restriction is decided by the assessment of the individual under the qualities P and S, and to a lesser extent under the quality M. Employment within the various areas in the theatre—i.e., forward, lines of communication, or base—is dependent thereafter on the complete assessment.

Temporary Assessment.—(a) “R” Assessments:—Where an individual is suffering from a condition which is remediable by surgical operation or other means (e.g., hernia, poor physique) he is classified according to his present capacities (but not lower than 7) and the letter R is inserted immediately after the degree of P, U, L, or S affected, the period of temporary restriction from full duty of the assessment being stated—e.g., P3R for three months. Such an individual remains on duty, and at the conclusion of medical treatment is reassessed.

(b) “O” Assessments:—When an individual is off duty and under medical care he is temporarily unfit for military service. This is shown as degree “O” under P, U, L, or S as appropriate and the period of temporary incapacity is stated—e.g., P—“O” for six months.

Method of Assessment.—The medical assessment of any man under this system is based on *functional efficiency at the conclusion of training*. For this reason the *pre-Service* assessment allotted by the civilian medical board is verified by the military medical authorities when the man joins for duty and an *initial* assessment is allotted. At the conclusion of basic training a full medical examination is carried out and a Service assessment is made, which remains effective until alteration is considered necessary by a military medical board. To record the findings, in addition to the assessment under each of the seven qualities, age (represented by the last two figures of the year of birth), height, weight, and colour perception standard are recorded in a medical box, in which there is space to enter the reason for an assessment below 2 under P, U, L, or S. The medical box takes the following form:

Y. O. B.	P	U	L	H	E	E	M	S
20	2	2	3	1	1	1	2	2
Ht. 68 ..	P							
C.P. 2 ..	U							
Wt. 138 ..	L	Pes planus—moderate. Medical board: 3/7/46						
	S							

Such an assessment indicates a man who is fit in every way except for a moderate degree of flat-foot, and at a glance it is easy to see that he is suitable for full employ-

ment in any part of the world with mechanized troops but not with infantry (because of L3).

With the introduction of the Pulheems system into the three Services it has been necessary to review medical documentation in general, and a much improved system is being devised for use by all three Services which it is hoped will be introduced in the near future.

Administrative Application of the System

From Table I it will be seen that the degrees of P, U, L, H, M, and S are interpreted and signify suitability for various ranges of employment as follows:

TABLE II

Degree	Functional Capacity	Combatant Capacity	Climatic Restriction
1	Above average	Full	Nil
2	Above average	Full	Temperate
3	Average	Full	Nil
4	Average	Full	Temperate
5	Average	Full	Nil
6	Moderate defect	Restricted	Temperate
7	Moderate defect	Restricted	Service in U.K. only
8	Marked defect	Restricted	
	UNFIT FOR ANY FORM OF MILITARY SERVICE		

The term “restricted” implies service in a role which is not primarily a fighting one.

It is evident, therefore, that the Pulheems code number (i.e., the recorded assessment) provides in effect a complete indication of the fitness, physical and mental, of the individual for employment under varying conditions. It is possible to reduce this code number to a simple two-letter code for use as an employment standard, and so simplify the administrative application of the system.

This has been done within the Army and the Royal Air Force, and the employment standards used by the Army are as follows:

- FE—Employable on full combatant duties in any area in any part of the world (FE—forward everywhere).
- FT—Employable on full combatant duties in any area in temperate climates (FT—forward temperate).
- LE—Normally employable in the lines of communication or base area in any part of the world, but may be employed in the forward area in any role which is not primarily a fighting one (LE—L. of C. everywhere).
- LT—Normally employable in the lines of communication or base areas in temperate climates only, but may be employed in the forward area in any role which is not primarily a fighting one (LT—L. of C. temperate).
- BE—Employable only in the base area in any part of the world (BE—base everywhere).
- BT—Employable only in the base area in temperate climates (BT—base temperate).
- HO—Employable in the protected area in the United Kingdom only (HO—home only).

It has been said that the two essentials required in any system of medical classification are (a) a detailed qualitative estimation of the individual, and (b) a qualitative analysis of the available employments expressed in the same terms.

Under the Pulheems system these two requirements are met. For the Army's purposes employment standards have been worked out in relation to each arm of the Service. For employment forward of the base the standard has been set according to the general functions of the arm, while in base areas it has been determined in relation to the actual employment itself. This difference is necessary to meet the requirements of reinforcement demands.

Minimum Standards : The Infantry Soldier

To conclude my description of the Pulheems system of medical classification and to provide an illustration of the working of the system it is convenient to start with the specifications of the infantry soldier, since it is such men whom every army particularly needs and who must possess the highest standards of physical competence. To be efficient an infantry soldier must have the following functional attributes:

P for Physical Capacity.—"Must be able to endure severe strain, do heavy physical work, and engage in hand-to-hand combat."

These are general capacities derived from a man's whole physical development: his height and weight, his ability to acquire physical stamina with the proper training, his capacity for work, and his general good health.

U for Upper Part of the Body, or Upper Limbs.—"Must be able to lift and carry heavy loads. Be able to dig and throw hand grenades and use weapons."

To do these things a man must have strong arms, shoulders, and back, and must be able to use his hands with normal dexterity.

L for Lower Part of the Body, or Locomotion.—"Must be able to stand at his post for long hours and march more than 20 miles a day without difficulty."

H for Hearing.—"Hearing must be good so that he can understand commands made under difficult conditions and hear suspicious sounds when on night watches."

EE for Eyesight.—"Must be able to see the enemy at considerable distance and use his rifle sights with either eye."

M for Mental Capacity.—"Must be intelligent in order to learn the use of his specialized weapons and field craft."

S for Stability (Emotional).—"Must also be a man of stable temperament with self-confidence and determination."

Expressed in terms of Pulheems, the minimum standard permissible for the infantry soldier therefore is:

P	U	L	H	E	E	M	S	—Employment Standard
				8	8			
2	2	2	2	—	—	2	2	—F.E.
				3	3			

Discussion

Under Pulheems the emphasis is placed on the functional capacity of the individual to work rather than on any existing abnormality, whether anatomical or otherwise. It is generally agreed by all concerned that, given a reasonably correct functional assessment of a man's ability to work, a more accurate allocation to suitable employment becomes possible. It is hoped that in the future there will be few, if any, "square pegs in round holes" in the Services.

One of the factors on which there is some diversity of view among medical men is the effect of the age of the individual on assessment, particularly under the P quality. It must be admitted that as one advances in years moderate constitutional defects begin to appear which can easily be recognized on examination, such as increase in weight, rise in blood pressure, cardiac irregularity, and so on; and over the age of 40 years the likelihood of a man or woman being assessed P1 or P2 becomes less and less as age advances. In the absence of such constitutional defects, however, in a man of good physique and with a good previous history there is no reason why an assessment of P2 should not be given to the really fit individual. In an organization such as the Army, the medical officer is inclined to think in terms of "fighting" fitness, and therefore he tends to assess the 40-year-olds and over as P3

rather than P2. It should always be remembered that the employment of an individual must be governed by both his medical fitness and his age, and the latter alone is sufficient to contraindicate posting in a fighting role.

The Pulheems system of medical classification was subjected to some criticism because for the first time in the history of medical categories in the Services it specifically took into consideration the two qualities mental capacity (M) and emotional stability (S) and introduced their routine assessment for each individual. It has even been stated in this connexion that the Pulheems system was little more than a "psychiatric racket" which, it was implied, might be detrimental to and prejudice the chances of men entering the Forces. There can surely be few to-day who would deny that psychiatric disorders are as important as physical diseases, and in the light of increasing knowledge the dichotomy between mind and body appears more and more arbitrary and indistinct. Medical fitness is a *total* problem, and we cannot separate the mind from the body. It is hoped that the introduction of Pulheems by the Services will help to underline in the mind of the public as well as in that of the medical profession the importance of regarding the individual as a complete unit, in whom the mental and physical functions must be considered and assessed simultaneously. Service medical officers are trained to use their clinical judgment in assessing an individual as normal or better—i.e., M2 and S2; it is only when there is doubt or any definite indication that the individual is abnormal that psychiatric advice should be obtained.

Within the Services, therefore, it has been possible to introduce a new system of medical classification which, while giving a much more detailed picture of the man's capacity to work, is also very simple in its application and use by non-medical personnel. In the Army, standards have been worked out for all the trades and employment available; and it is hoped to take steps to prove our norms and in the end to obtain some definite information on what is compatible with normal and what is definitely abnormal.

The tendency in the past in the medical world has been to teach the medical student the care of the sick and disabled, little attention being paid to his education in what is considered normal. There are many ways of being "well," but the whole question of just how well a man must be in order to carry out satisfactorily any particular one of the hundreds of jobs that are available in a modern army has never been satisfactorily determined. The present drive towards positive health will, it is hoped, be very materially assisted by the use of Pulheems, since it is evident that an accurate method of assessing the fitness of an individual is a prerequisite of the determination of positive health. It is for these reasons that I suggest that such a system need not be confined to the Services alone and could well be used by industry generally, police forces, and other similar bodies.

It would appear from Service experience regarding medical classification generally that comparatively little attention has been paid to it in the past, and that the systems of classification formerly used have not been understood properly either by medical men or by laymen. Where the employment of men has been considered, a great deal of stress has been placed on welfare, environment, working conditions, and so on, but practically no attention has been given to the question of their fitness for their particular type of employment. It is hoped that academic bodies in the future will consider teaching *methods* of medical classification to medical students and also to postgraduates. It is contended that the concentration on disease in hospital teaching and elsewhere is unwise, and that the time has come when more consideration must be given to health

and fitness and the application of clinical knowledge to its assessment. Almost all medical men are called upon at one time or another to examine men for the Services, and the despairing efforts of the newly qualified medical officer when faced with a group of recruits whose fitness he is expected to assess is well known. The fault lies essentially with the teaching rather than with the new doctor.

One of the difficulties in using any system of medical classification is the wide divergence of opinion among medical men regarding assessment generally and more particularly the influence of various diseases and other morbid conditions on assessment. In the literature which has been produced by the Services on the Pulheems system an attempt has been made to issue some guidance in this matter. It is hoped that with increasing experience this aspect of the subject will be reviewed from time to time and greater precision will be achieved. It remains for civilian bodies to carry the project one stage further. If it is possible to achieve the necessary liaison between civil and military medical authorities there seems to be no reason why in the end all medical men should not be able to allot to each individual the same medical assessment, a development which would be more than welcome to the Services.

Conclusion

The Pulheems system of medical classification has been introduced in the Services to remedy the shortcomings of previous systems used and to facilitate the optimum employment of man-power. Our objectives briefly are: to set up a common system for use by all three Services; to provide a functional assessment of the individual's capacity for work; to assist in expressing the physical and mental attributes appropriate to individual trades and employments within each Service; to allocate men to the employment for which they are most suited in view of their physical, intellectual, and emotional make-up; and to provide a system which is administratively simple to apply in both peace and war.

I consider that the introduction of Pulheems by the fighting Services marks a great step forward in this field of activity. The conception of a uniform assessment of the functional abilities of the population as a whole, whether in terms of war requirements or of industrial potential, is striking enough to require no further elaboration.

ARMY PUBLICATIONS

Pulheems—System of Medical Classification for the Fighting Services, dated November, 1946.

The Application of the Pulheems System of Medical Classification to the Army (W.O. Code No. 1792—restricted).

These pamphlets are in the process of being rewritten, and it is hoped that the first, which deals with the medical aspect entirely, will be available for purchase at H.M. Stationery Office early this year.

I wish to express my thanks to the Director-General of the Army Medical Services, Lieutenant-General Neil Cantlie, C.B., M.C., F.R.C.S., K.H.P., for permission to publish this paper. My gratitude is also due to the Director of Hygiene, Brigadier A. E. Richmond, C.B.E., K.H.S., and my colleagues Lieutenant-Colonel A. N. B. Odert, O.B.E., R.A.M.C., and Major R. B. Stalbow, General List, for much valuable help and criticism in the presentation of this paper.

Offenders who are remanded on bail under provisions of Section 26 of the Criminal Justice Act, 1948, may now be sent to certified institutions or certified houses (among other places) for medical examination and report. The Mental Deficiency (Amendment) Regulations, 1948, which came into operation on Dec. 27, prevent such an offender being received in a certified institution or certified house which is already accommodating the full number of patients for which it has been certified as suitable unless the Minister consents to his reception.

"PALUDRINE" (PROGUANIL) IN PROPHYLAXIS AND TREATMENT OF MALARIAL INFECTIONS CAUSED BY A WEST AFRICAN STRAIN OF *P. FALCIPARUM*

BY

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(From the Malaria Laboratory, Horton Hospital, Epsom, Surrey)

"Paludrine" was first used for the treatment of human malaria at the Liverpool School of Tropical Medicine in 1945 by Maeagraith and his colleagues, who published records relating to 22 patients naturally infected with West African strains of *Plasmodium falciparum*, 16 of whom were considered to be suffering from primary attacks. The dosage of paludrine administered varied from 50 to 600 mg. twice daily for 14 days. The clinical response was satisfactory in all cases, and was as rapid in those receiving 50 mg. of the drug twice daily as in those who were given a dosage ten times as great. Owing to difficulties in follow-up it was not possible to determine the radical cure rate (Maeagraith *et al.*, 1945).

Subsequently an extensive series of prophylactic and therapeutic trials with paludrine on volunteers exposed to infection with New Guinea strains of *P. falciparum* and on troops suffering from malaria contracted in that area was undertaken by Fairley and his colleagues at the Land Headquarters Medical Research Unit, Cairns, Australia, on the same lines as those previously employed at this centre with mepacrine. Paludrine was found to act as a true causal prophylactic against infections due to New Guinea strains of *P. falciparum*. Radical cure was effected in 41 out of 41 natural and in 46 out of 47 experimentally induced sporozoite infections treated with a ten-days course of 100 mg. of the drug thrice daily. In most cases there was rapid clearance of asexual parasites from the peripheral blood, but, though the overt attack was readily controlled even by very low dosage, the clinical response was described as "not rapid." Gametocytes were not destroyed in the peripheral blood but were rendered non-infective to mosquitoes for a variable period, depending on the size of the dose administered (Fairley *et al.*, 1946).

Since the publication of the Liverpool and Cairns trials a number of prophylactic and therapeutic trials with paludrine have been carried out in India and in Malaya, with generally favourable results. The drug has proved exceedingly useful in both these countries, particularly among labour forces and village populations, where a single-dose treatment of 300 mg. has been generally adopted. It should be noted, however, that the great majority of the subjects treated have been semi-immunes, and there is little evidence regarding the radical cure rate. Chaudhuri (1948) drew attention to the existence in India of strains of *P. falciparum* infections from which are not radically cured by a dosage of 300 mg. of paludrine daily for ten days, and cited the case of a patient who experienced a second overt attack nine days after the completion of treatment and a third attack 11 days later. Other reports from clinicians practising in India and in Malaya indicate that for the treatment of *P. falciparum* infections in non-immune persons paludrine is not entirely adequate in the dosage originally recommended.

In Sardinia, Bettini (1948) treated 94 cases of *falciparum* malaria with 100 mg. of paludrine thrice daily for 10 days